EUROPEAN ORTHOPAEDIC RESEARCH SOCIETY

EORS

2015 BRISTOL

PROGRAMME

23rd Annual Meeting
2-4 September 2015

The ATTUNE® Knee System is the largest-ever research and development project from DePuy Synthes Joint Reconstruction. Novel testing protocols and methods were used during development. Each aspect of knee replacement design and surgical process was evaluated. And it was this rigorous process that has produced patented technologies to address the patient need for stability and freedom of movement.

6 years of development, implantations in over 173,000 patients[1], and a series of innovative proprietary technologies: the ATTUNE Knee System is designed to feel right for the surgeon in the OR and right for the patient. To learn more, speak to your DePuy Synthes Joint Reconstruction representative.

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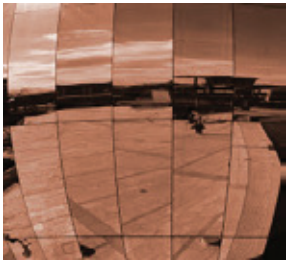
1. DePuy Synthes Joint Reconstruction 2015. Data on File.

CONTENTS

Welcome	2
President’s message	3
Speakers	4
Exhibitors	5
Sponsors	6
Programme	7
Abstracts	40



WELCOME

Welcome to EORS 2015 and welcome to the beautiful city of Bristol. We hope you enjoy the varied and exciting social and academic programme. Please use this conference as an opportunity to form networks and friendships across Europe and the world. Take time to see some of the architectural and engineering highlights of the city including the Clifton Suspension Bridge and Brunel's SS Great Britain.

We are particularly delighted to introduce our world renown keynote speakers Professors Kate Robson-Brown and Alice Roberts. Many of you will be familiar with Alice's work from television series such as Coast, Ice Age Giants and The Incredible Human Journey. Kate has particular expertise in Osteoarcheology and Evolutionary Biomechanics.

Have fun

Professor Ashley Blom
Co-chair of Organising Committee
Vice-President of EORS

Professor Richie Gill
Co-chair of Organising Committee

Dear colleagues and friends,

On behalf of the EORS Executive Committee I am honoured to announce the 23rd Annual Meeting of EORS 2015 taking stage in Bristol! After 21 years, the European ORS can be proud to host its conference for the second time in the United Kingdom with its impressive history and huge contributions to the field of orthopaedics.

Representing the uniting and translational spirit of clinical and basic science as meeting chairs, Professors Ashley Blom and Richie Gill have created a rich programme in three parallel sessions to attract and stimulate the orthopaedic research community from Europe and beyond.

As a society EORS always tries to innovate and improve to serve its members, meeting delegates and finally patients and society. In this context, EORS 2015 offers again attractive Young Investigator initiatives such as mentoring sessions or a YI-only social event. Two special short talk formats allow all presenting authors, including those of posters to speak and increase exposure of their work. Two of four plenum keynote speakers are outstanding women researchers, one of who is also a prominent TV presenter reflecting the EORS Female Leadership initiative and increasing quest for public outreach. Thanks to an EORS initiative, the winners of the Best Oral and Best Poster gain an exclusive spot in the “Best of ICORS” area of the International Combined Orthopaedic Research Societies during the 2016 Orlando ORS meeting.

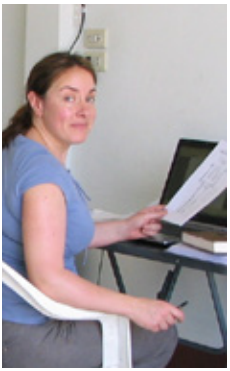
As a port city, Bristol has been a gate for exploration and ingress of new ideas. Let’s meet, discuss, interact and network in this spirit and attractive surroundings!

Bernd Grimm
EORS President

SPEAKERS

Professor Alice Roberts will give a lecture titled "Two legs good?" on September 3rd
Alice is a clinical anatomist and Professor of Public Engagement in Science at the University of Birmingham. She is also a broadcaster and has presented several landmark BBC science series including The Incredible Human Journey, Origins of Us, Prehistoric Autopsy and Ice Age Giants. She has also presented several Horizon programmes, on BBC2, and Wild Swimming, on BBC4. She occasionally presents Inside Science on Radio 4. She writes a regular science column for The Observer, and has authored five popular science books. Her latest book, The Incredible Unlikeliness of Being comes out in paperback soon.

Matthew Costa PhD, FRCS (Tr&Orth) Professor of Orthopaedic Trauma Surgery at the University of Oxford and Honorary Consultant Trauma Surgeon at the John Radcliffe Hospital, Oxford. Matt was appointed as Senior Lecturer and Honorary Consultant at University of Warwick and University Hospitals Coventry and Warwickshire in 2006, and was promoted to Professor at Warwick Clinical Trials Unit in 2011. Matt moved to Oxford to take up the post of Professor of Orthopaedic Trauma in 2015. Matt's research interest is in clinical and cost effectiveness of musculoskeletal interventions and he is Chief Investigator for a series of randomised trials supported by grants from the UK National Institute of Health Research and Musculoskeletal Charities. His work has been cited widely, and informs many guidelines from the National Institute for Health and Care Excellence.



Kate Robson Brown is Professor of Biological Anthropology at the University of Bristol. She graduated with a first in Archaeology and Anthropology (BA Hons, then MA) from the University of Cambridge in 1991, and remained there for her doctoral research (funded by the SERC/NERC), graduating in 1995. She then held the Graham Robertson Research Fellowship at Downing College, Cambridge until 1997, when she was appointed as a lecturer at the University of Bristol. She is now Faculty Research Director. Kate leads research in the fields of micro-computed tomography and computational modelling and their application to human evolution, osteoarchaeology, and forensic anthropology. She excavates human remains from archaeological and evolutionary contexts and leads multi-disciplinary research teams in the reporting and analysis of ancient populations. For modern humans these include the medieval populations of Llandough, South Wales, and Taunton, Somerset; the early Islamic population of Songo Mnara, Tanzania, the 19thC populations of the Bristol Royal Infirmary cemetery and the enslaved African cemetery from the island of St Helena. For extinct humans these include the Neanderthals of Spain (Cova del Gegant and Sima de las Palomas), South African australopithecines and the Miocene ape Nacholapithecus. Her work demonstrates how traditional anthropological questions can be complemented and transformed by the inclusion of microstructural data.

EXHIBITORS

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CORIN LIMITED	iPROMEDAi	MATERIALISE
NJR	SIMPLEWARE	THIEME MEDICAL PUBLISHERS

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Orthopaedics
Innovation in Practice

DETAILED PROGRAMME

12:00			
12:30 13:00 13:30 14:00 14:30	How to Create a Successful Orthopaedic Implant	Tendon Research Group Presents The Role Of Tendon Stem Cells In Tendon Disease And Repair	
15:00 15:30 16:00 16:30	Clinical Trials and Statistics in Orthopaedic Research		
17:00 17:30 18:00			Meet a Mentor Young Investigator Session
19:00 19:30	Welcome Drinks Reception Young Investigator Social		

	Great Hall	Council Chamber	Room 3
9:00	**Keynote Address By Matt Costa**		
	HIP 1 Bernd Grimm Mike Whitehouse	**KNEE 1** Enrique Gomez-Barrena & Andy Judge	**CARTILAGE** Denitsa Docheva & Sarah Dex

TALK 1 starts at 09:30	Pre-Operative Assessment & Critical Care Admission in hip/ Knee Arthroplasty by Graham Walkden, S. Lewis & J.Soar Presented by Graham Walkden	Biomechanical Assessment of Novel Distal Angular Condylar Femoral Intramedullary Nail by Ahmed Karakasli, Fatih Ertem, Nihat Demirhan Demirkıran, Yunus Emre Bektas & Hasan Havitcıoglu Presented by Fatih Ertem	Osteoarthritic Human Chondrocytes for Repair of Murine Segmental Tibial Defects by Alfred Kuo, Chelsea Bahney, Linsey Jacobs, Diane Hu, Hubert T. Kim & Ralph Marcucio Presented by Alfred Kuo
TALK 2 starts at 09:42	The Effect of Approach on Outcome from Revision Hip Replacement by Julia Blackburn, D. Lim, I. Harrowell, M. Parry, A.W Blom & M.R. Whitehouse Presented by Julia Blackburn	Patient Perspective on the use of Tourniquets in Knee Replacement by Imran Ahmed, Peter Wall, Louise Fraser & Andrew Sprowson Presented by Imran Ahmed	Hyaluronan Stimulates Chondrogenic Gene Expression of Inner Meniscus Cells by Takaaki Tanaka, Takayuki Furumatsu, Shinichi Miyazawa, Msataka Fujii, Hiroto Inoue & Toshifumi Ozaki Presented by Takaaki Tanaka
TALK 3 starts at 09:54	A Review of Outcomes Following Liner Dissociation from Harris-Galante Cups by Andrew Grazette, J Foote, M Whitehouse & A Blom	The Effect of Local Anaesthetic Infiltration on Chronic post-Surgical Pain after Total Hip and Knee Replacement: The APEX Randomised Controlled Trials by Vikki Wylde, Erik Lenguerrand, Rachael Gooberman-Hill, Andrew D. Beswick, Elsa Marques, Sian Noble, Jeremy Horwood, Mark Pyke, Paul Dieppe & Ashley W. Blom Presented by Ashley Blom	TGF-β2 Knockdown Under Osmolarity Improves Collagen Expression in Chondrocytes by Ufak Tan Timur, Anna van der Windt , Marjolein Caron, Tim J Welting, Pieter J Emans & Holger Jahr Presented by Ufak Tan Timur

TALK 4 starts at 10:06	Biomechanical Performance of Various Hip Labral Repair Techniques by Fatih Ertem, Onur Hapa, Onur Basci, Levent Horoz, Ahmet Karakasli & Hasan Havitcioglu Presented by Faith Ertem	Geometric Accuracy of Elbow Flexion-Extension (F-E) Axis based on Approximation to the Epicondylar Axis by Zehao Tan, Yeong Huei Ng, Andy Yew, Chueh Loo Poh, Joyce Koh, Bernard Morrey, Howe Tet Sen Presented by Zehao Tan, M.D	SOX-9 Expression in Chondrocytes is Regulated by Nrf2 by Holger Jahr, R. Beckmann, M. Tingart, T. Pufe & C. Wruck Presented by Rainer Beckmann
TALK 5 starts at 10:18	Development of an Acetabular Cup Loosening Detection Using Vibration Analysis by Abdullah A. Alshuhri, Anthony W. Miles & James L. Cunningham Presented by Abdullah A. Alshuhri	Method to Evaluate the Delamination Risk of TKA Polyethylene Materials by Thomas M Grupp, Bernhard Fritz, Ines Kutzner, Georg Bergmann & Jens Schwiesau Presented by Thomas M. Grupp	A Novel Tri-Layered Collagen Scaffold for Knee Osteochondral Defect Repair by Ashwanth Ramesh, Tanya Levingstone, Robert Brady, John Gleeson, Pieter Frama & Fergal O'Brien Presented by Ashwanth Ramesh
TALK 6 starts at 10:30	Are Ceramic Bearings Releasing Ions? By Alessandro Alan Porporati, J.P. Kretzer, R. Sonntag, H. Kiefer, J. Reinders, A. A. Porporati & R. Streicher Presented by A. A. Porporati	Hip Rotation as Risk Factor for ACL Injury in Females by Tadashi Yasuda, Yuki Yokoi, Keiichi Oyanagi & Kazutaka Hamamoto Presented by Tadashi Yasuda	Disc Regeneration using MSC Transplanted via the Endplate Route by Gianluca Vadala Fabrizio Russo, Maria Musumeci, Francesca De Strobel, Marco Bernardini, Giulia De Benedictis, Luca Denaro, Domenico D'Avella, Rosaria Giordano & Vincenzo Denaro Presented by Gianluca Vadala

BREAK

	HIP 2 Ashley Blom Richie Gill	KNEE 2 Edward Valstar & Julia Blackburn	REGENERATION 1 Puck Vergroesen Geoff Richards
TALK 1 starts at 11:00	Resistance to Damage of Materials for THR Bearing Surfaces by Piconi Corrado, Porporati, Alessandro Alan & Streicher, Robert Michael Presented by Corrado Piconi	Medium-to Long-Term evaluation of Contoured Focal Knee Resurfacing Prosthesis by Lily Li, Akash Patel, Humam Jundi & Harish Parmar Presented by Lily Li	Bone Turnover Markers In Nonunions Treated with Expanded Autologous Cell Therapy by Nicola Baldini, G. Ciapetti, C. Fotia, D. Granchi, M. Rojewski, P. Rosset & E. Gómez-Barrena Presented by TBA
TALK 2 starts at 11:12	Tibial Component Without Stem in a Trabecular Metal Cone Construct by Marrigje Meijer, Alexander L. Boerboom, Martin Stevens, Inge H. F. Reininga, Dennis W. Janssen& N. Verdonschot. Presented by Marrigje Meijer	Polyetheretherketone in an All Polymer Total Knee Arthroplasty by Temitope Adesina, S Ajami, MJ Coathup & GW Blunn Presented by Temitope Adesina	Low Doses of Proteasome Inhibitor, Bortezomib as a New local Treatment Against multiple Myeloma-Invivo by Seemun Ray, Ulrich Thormann, Ursula Sommer , Thaqif El Khassawna, Marcus Rhonke, & Volker Alt Presented by Thaqif El Khassawna
TALK 3 starts at 11:24	Analgesia in Hip Fractures. Do Fascia-Iliac Blocks Make Any Difference? by J Callear & K Shah Presented by J Callear	Finite Element Analysis of the Tibial Component Stem Orientation in Revision Total Knee Replacement by Benjamin Rastetter, Samantha J Wright, Sabina Gheduzzi, Anthony W Miles & Sally E Clift Presented by Benjamin Rastetter	Osteoporosis Affects Stem Cell Migration that is Ameliorated by CXCR4 by Anita Sanghani, Coathup M; Samazideh S; Kalia P; Di Silvio L & Blunn G. Presented by Anita Sanghani

TALK 4 starts at 11:36	Early Death Following Revision Total Hip and Total Knee Arthroplasty by Mark D Jones, Michael Parry, Michael Whitehouse & Ashley W Blom Presented by Mark D Jones	Development and validation of knee simulator: beyond squatting by Matthias Verstraete, Stefaan Van Onsem, C. Stevens, Stijn Herregodts, Nele Arnout, Jan Victor Presented by Matthias Verstraete.	Are Osteocytes Involved In Implant Degradation And Bone - Implant Anchorage? by Seemun Ray, Thaqif El Khassawna, Ulrich Thormann , Ursula Sommer , Marcus Rhonke, Michael Gelinsky, Thomas Hanke,Christian Heiss & Volker Alt Presented by Thaqif El Khassawna
TALK 5 starts at 11:48	Role of Toll-like Receptor 4 in Immunological Responses to Cobalt by Helen Lawrence, David J Deehan, James P Holland, John A Kirby & Alison J Tyson-Capper Presented by Helen Lawrence	Arthroplasty Induced Post-Traumatic Immunosuppression is Reversed by Anti-Coagulated Salvaged Blood by Nahidul Islam, Michael Whitehouse, Sanchit Mehandale, Ashley Blom, Gordon Bannister, Rhodri Ceredig & Benjamin Bradley Presented by Michael Whitehouse	Expanded Autologous MSCs / Biomaterials in Nonunions: a European Clinical Trial by Enrique Gomez-Barrena, Philippe Rosset, Philippe Hernigou, Florian Gebhard, Christian Ehrnthaller, Nicola Baldini & Pierre Layrolle, On behalf of the REBORNE Consortium. Presented by Enrique Gomez-Barrena
TALK 6 starts at 12:00	Computational Analysis of Taper Junction Fretting of Femoral Hip Implants by Dennis Janssen, T. Bitter, B.W. Schreurs, T. Marriott, I. Khan & N. Verdonschot Presented by Dennis Janssen	Do CAS-Measurements Correlate with EOS 3D Alignment Measurements in TKA? by Marrigje Meijer, Alexander L. Boerboom, Sjoed K. Bulstra, Inge H. F. Reininga & Martin Stevens Presented by Marrigje Meijer	COL1A1, COL5A1 AND GDF5 Polymorphisms, Associated with Rotator Cuff Disease by & Inmaculada del Catillo, MD Presented by Sonia Vidal Rodriguez

TALK 7 starts at 12:12	Refixation of loosened Hip Prostheses: Osteogenic Capacity of Periprosthetic Tissue Cells by Monique A.E. Schoeman, A.E. Oostlander, K.E. de Rooij, C.W.G.M. Löwik2, E.R. Valstar & R.G.H.H. Nelissen Presented by Monique A.E. Schoeman	Can Magnetic Resonance Imaging (MRI) Scans Be Used To Determine Pre-Operative Knee Alignment In Patients With Osteoarthritis? By Rakan Kabariti, Niall Sullivan & Michael Whitehouse Presented by Rakan Kabariti	The Effect of Subacromial Corticosterids Injections on Normal and Injured Rotator Cuff: Biomechanical and Imaging Study in Rats by Oleg Dolkart, Yehuda H, Zarfati Y, Brosh T, Chechik O & Maman E. Presented by Oleg Dolkart
TALK 8 starts at 12:24		What Factors Affect Patient Decision-Making in Knee Replacements? by Timothy Barlow, Damian Griffin, Pat Scott & Alba Realpe Presented by Timothy Barlow	Tendon Reattachment Using Demineralized Bone Matrix and Mesenchymal Stem Cells by Tanujan Thangarajah, Catherine J Pendegrass, Shirin Shahbazi, Simon Lambert, Susan Alexander & Gordon W Blunn Presented by Tanujan Thangarajah
TALK 9 starts at 12:36		Does Malalignment Affect Outcome Following Knee Replacement and Revision Rates: A Systematic Review by M. Hadi, T. Barlow, I. Ahmed, M. Dunbar & D.Griffin Presented by I. Ahmed	The Effect of Scoliosis Implant Design Parameters on Whole Spine Mechanical Behaviour by Arts J.J., Hazrati Marangalou J., Meijer G., Ito K., van Rietbergen B., & Homminga J. J. Presented by Arts J.J.
			Simpleware Workshop

LUNCH

13:30	Keynote Address By Professor Alice Roberts, Two Legs Bad		
	HIP 3 Stefan Descamps & Chris Arts	**SPINE AND UPPER LIMB 1** Gianluca Vadala & Brett Rocos	**SOFT TISSUES INJURY & REPAIR** Angela Oostlander & Holger Jahr
TALK 1 starts at 14:00	Impact and Preference for Treatment of Infection after Joint Replacement by Andrew Moore & Rachael Gooberman-Hill Presented by Rachael Gooberman-Hill	Raman Spectroscopic Study of Cancerous and Irradiated Human Mandible Bone by Surya P. Singh & I. Parviainen Presented by TBA	Extreme Femoral Valgus Following Lateral Plate Fixation of Femur Fracture by Ahmed Ezzat & Christopher Iobst Presented by Ahmed Ezzat
TALK 2 starts at 14:10	Rest and Movement Pain Hip and Knee Replacement by Adrian Sayers, Vikki Wylde*, Erik Lenguerrand, Andrew Beswick, Rachael Gooberman-Hill, Mark Pyke, Paul Dieppe & Ashley W Blom Presented by Adrian Sayers	A Meta-Analysis of the Long-Term Outcomes of Distal Radius Fractures by Conor Gouk, Paul Rebgetz & Michael Thomas Presented by Conor Gouk	Layered Stem Cell Differentiation by a Biomimetic Osteochondral Defect Repair Scaffold by Conor Moran , Levingstone, TJ.1, 2, 3 & O'Byrne JM.1, 4, O'Brien, FJ1, 2, 3 Presented by Conor Moran
TALK 3 starts at 14:20	Do Cobalt and Chromium Products Affect the Formation of an Extracellular Matrix? by Hayley Floyd, Janet Lord, Edward Davies, Owen Addison & Liam Grover Presented by Hayley Floyd	Bryan Disc Arthroplasty versus Anterior Cervical Iscectomy and Fusion. A Systematic Review of Level I-II RTCs by María Aragonés, Eduardo Hevia, Alberto Caballero & Carlos Barrios Presented by Eduardo Hevia	Decellularized Osteochondral Graft: Process Development by L Barnouin & Elise Gunzel-Saint-Upery Presented by L Barnouin

TALK 4 starts at 14:30	Self-Reported Systemic Complaints in Patients with Metal-on-Metal Hip Arthroplasty by Jetse Jelsma, R. Senden, M. Schotanus, N. Kort, B. Grimm & I. Heyligers Presented by Jetse Jelsma	Surgical Correction of AIS Patients does not Improve the Preoperative Limited Maximal Exercise Tolerance by Rafael Lorente, Luis Fernández-Pineda, Jesús Burgos, Luis M. Antón-Rodrigálvarez, Eduardo Hevia, Cristina Pérez-Encinas & Carlos Barrios Presented by Jesús Burgos	An Acellular and Viroinactivated Meniscus Allograft by E. Günzel, L, Barnouin, P. Delépine & F. Le Pape Presented by E. Günzel
TALK 5 starts at 14:40	Study of Biomechanical Screw Purchase Performances of Five Types of Cortical Screws: An Innovative Measurement Method by Ahmet Karakaşlı Mehmet Hilal Özcanhan, Ahmet Karaaslan, Ramadan Özmanevra, Fatih Ertem & Didem Venüs Yıldız Presented by Ahmet Karakaşlı	Rib Cage Modifications Following Surgery in Adolescent Idiopathic Scoliosis by Carolina Hernández, Jesús Burgos, Luis M. Antón, Vicente García, Eduardo Hevia & Carlos Barrios Presented by Jesús Burgos	Processed Meniscus Allograft: Preliminary Results of Phase II Study by Ruiz, N., Barnouin L. & Robert H. Presented by L Barnouin
TALK 6 starts at 14:50	Effect of Hip Implant Positioning on Edge-Loading Occurrence and Severity by Oscar O'Dwyer Lancaster-Jones, Mazen Al-Hajjar, Jonathan Thompson, Graham Isaac, John Fisher Presented by Oscar O'Dwyer Lancaster-Jones	Prevalence of Anaerobic Infections in Lumbar Disc Herniation. A Single-Centre Pilot Study by Eduardo Hevia, Andrea Paniagua, Carlos Barrios, Alberto Caballero, Ana Chiaraviglio & Jesus Flores Presented by Eduardo Hevia	Operative versus Non-Operative Management of Partial Anterior Cruciate Ligament Tear: A Systematic Review by Gemma Green, Neil Wickham, Arash Aframian & Presented by Caroline Hing

TALK 7 starts at 15:00	Comparable Blood Loss after THA with Dabigatran, Enoxaparin and Rivaroxaban by Marcin Krzysztof Wasko, Konstancja Bobecka, Wesolowska, Ines Pokrzywnicka & Gajekn & Jacek Kowalczewski Presented by Marcin Krzysztof Wasko	Prevention of Lumbar Pedicle Screw Misplacement using Pedicle Mid-Track Stimulation by Luis M Anton-Rodrigálvarez, Jesus Burgos, Lidia Cabanes, Carlos Barrios, Eduardo Hevia, Gema de Blas & Vicente García Presented by Jesús Burgos	A Preliminary Persistent Compression Dynamic Plate for Treatment of Long Bone Fractures: An In Vitro Biomechanical Study by Ahmet Karakaşlı, Eyad Skiak, İsmail S Satoglu, Nihat D Demirkiran, Fatih Ertem & Hasan Havitcioglu Presented by Ahmet Karakaşlı
TALK 8 starts at 15:10	Long-term Outcome following Acetabular Fractures Asossicated with Posterior Hip Dislocation by Seng Juong Wong, J.Nicholson, I. Ahmed, A. Ning & J. F. Keating Presented by Seng Juong Wong	Variable Biomechanical Benefits of Screw Augmentation in Proximal Humerus Fractures - Jason Inzana, Claudia Münch, Peter Varga, Ladina Hofmann-Fliri, Norbert Südkamp, Markus Windolf Presented by Jason Inzana	The Anterolateral Ligament of the Knee: Magnetic Resonance Imaging Evaluation by Robert Hurley, Dr Conor Barry, Dr Diane Bergin & Mr Fintan Shannon Presented by Robert Hurley
TALK 9 starts at 15:20	Inaccuracies in Data Submitted to the National Hip Fracture Database by Duncan Cundall-Curry & John Lawrence Presented by Duncan Cundall-Curry	Evaluation of Junior Doctor Hand Examination Skills by W. A. K. Al-Azzani C Hill, A Czepulkowski & A Logan Presented by W. A. K. Al-Azzani	Does Accuracy of Ultrasound-Guided Corticosteroid Injection Predict Outcome in Pain and Function in Subacromial Impingement Syndrome? by P Raval, R Ogollah, A Hall, N Foster & E Roddy Presented by P. Raval

TALK 10 starts at 15:30	Inserting Femoral Stems Slowly Generates High Cement Pressures for Longer by Alex Goubran, Stephen McHale & Colin Steinlechner Presented by Stephen McHale	Intramedullary Nailing for Distal Radius Fractures: A Systematic Review by Robert Jordan & A Saithna Presented by Robert Jordan	Regeneration of “Critical Size Bone Defects” using 3D-printed Scaffolds by Tobias Heigl, Philipp Lichte, Katharina Kloss, Horst Fischer, Thomas Pufe & Mersedeh Tohidnezhad Presented by Tobias Heigl
TALK 11 starts at 15:40	Hospital variation in Allogeneic Transfusion in Hip and Knee Arthroplasty by V.M.A. Voorn, P.J. Marang- van de Mheen, A. van der Hout, T.P.M. Vliet Vlieland, R.G.H.H. Nelissen & L. van Bodegom - Vos Presented by V.M.A. Voorn	Fixation versus Replacement for Comminuted Radial Head Fractures in Adults by Akash Patel, Lily Li & Abbas Rashid Presented by Lily Li	Implant/Skeletal Cell Interface: Harnessing Implant Topography to Improve Osseointegration by Vitali Goriainov, Rasmus Pedersen, Nikolaj Gadegaard, Douglas G Dunlop & Richard OC Oreffo Presented by Vitali Goriainov
TALK 12 starts at 15:50		Histone Lysine Demethylase KDM6a inhibitor Alleviates Osteoarthritis by Yi-Chih Sun, Yu-Shang Chen, Feng-Sheng Wang Presented by TBA	An Analysis of Patient Radiation Exposure in Trauma Operations by Mustafa Rashid, Sheweidin Aziz, Syed Haydar & Amit Datta Presented by Mustafa Rashid
BREAK			

	ELEVATOR PITCH 1 Denitsa Docheva & Bernd Grimm	**ELEVATOR PITCH 2** Mike Whitehouse & Richie Gill	**iPROMEDA** Workshop
TALK 1 starts at 16:00	Do You want to Improve Uncemented Stem Design for Total Hip Replacement? by Eduardo Garcia-Rey, Rosario Madero, Enrique Gomez-Barrena & Eduardo Garcia-Cimbrelo Presented by Eduardo Garcia-Rey	Distal Femoral Fractures: The Need to Review Standards of Care by James A. R. Smith, Ruth Halliday, Alexander L. Aquilina, Peter Hull & Michael Kelly, Collaborative - Orthopaedic Trauma Society (OTS) Presented by Alexander L. Aquilina	
TALK 2 starts at 16:03	Epidemic of Fractures during a Period of Snow and Ice; Has Anything Changed 33 Years On? by Waheeb A K Al-Azzani, Danial Adam Mak, Paul Hodgson & Rhodri Williams Presented by Waheeb A K Al-Azzani	Biomechanical Comparison of Titanium and Stainless Steel Locking Screws for Intramedullary Nailing by Ahmet Adnan Karaaslan, Ahmet Karakasli, Fatih Ertem & Hakan Aycan Presented by Ahmet Adnan Karaaslan	
TALK 3 starts at 16:06	MicroRNA-29 Mitigates Glucocorticoid-Induced Bone Loss and Marrow Adiposity by Feng-Sheng Wang, Yi-Chih Sun, Yu-Shan Chen & Jih-Yang Ko Presented by TBA	Investigating Patient Reported Outcomes in Foot and Ankle Surgery by Karam Ahmed, Mr A. Pillai & Mr K. Somasundaram Presented by Karam Ahmed	

TALK 4 starts at 16:09	Osteoblast-Specific MicroRNA-29a Ameliorates Estrogen Loss-Induced Osteoporosis by Yu-Shang Cheng, Feng-Sheng Wang, Yi-Chih Su & Jih-Yang Ko Presented by Tba	Assessment of Physical Function Following THA Requires More than PROMs by Stijn Bolink (On Behalf of the RESTORE collaborators) Lenguerrand E., Blom A.W. & Grimm B Presented by Stijn Bolink	
TALK 5 starts at 16:12	Knee Mal-Alignment and Hip Joint Pathology: an Observational Study by Jonathan Palmer, A Palmer, L Jones, S Glyn-Jones, W Jackson & A Price Presented by Jonathan Palmer	Assessing Patient Responsiveness Using Patient Reported Outcome Measures after Surgery by Adrian Sayers, Wylde V. , Lenguerrand E.1, Gooberman-Hill R., Dawson J., Beard D., Price A. & Blom A. W. Presented by Adrian Sayers	
TALK 6 starts at 16:15	Success of Masquelet's Technique Performed in a clinical Reality by Florella Gindraux, K. Oudina, A. Nallet, B de Billy, H. Petite & L. Obert Presnted by Florella Gindraux	Acetabular Inclination In Total Hip Arthroplasty by Iain Bohler, Nazzef Malek & Andrew Vane Presented by Iain Bohler	

TALK 7 starts at 16:18	A Comparison of Mortality following Distal and Proximal Femoral Fractures by Robert Jordan, G Chahal, M Davies & K Srinivas Presented by Robert Jordan	The Effect of Previous Arthroscopy on Outcome in Knee Replacements by V.N. Gibbs, H.G.R. Lowdon & T. Barlow Presented by V.N. Gibbs	
TALK 8 starts at 16:21	Formulation of Calcium Pyrophosphate by Eirk Hughes, Richard Williams, Gurpreet Chouhan, Parastoo Jamshidi & Liam Grover Presented by Eirk Hughes	Diagonostics of the Heterotopic Ossification in Patients with Spinal Cord Injury by Vladyslav Povoroznyuk & Maryna Bystrytska Presented by Vladyslav Povoroznyuk	
TALK 9 starts at 16:24	Arthroscopy is an Inadequate Gold Standard for Diagnosing Biceps Pathology by Robert Jordan & A Saithna Presented by Robert Jordan	Postoperative Bleeding Episodes after Primary Total Knee Replacement by Waheeb A K Al-Azzani, H.J. Iqbal, A.J. Thayaparan, S.P. White & M.C. Forster Presented by Waheeb A K Al-Azzani	
TALK 10 starts at 16:27	Comparison of Glenoid version Measurement using 2D and 3D CT by Ashley I. Simpson, R. Dattani & R.A. Sankey Presentation by Ashley I. Simpson	Impact of BMI And ASA Grade On Length of Stay Following Primary Total Knee Replacement by Waheeb A. K. Al-Azzani, H. J. Iqbal, Y. Al-Soudaine, A. J. Thayaparan, M. I. M. Suhaimi, S. Masud & S. P. White Presented by Waheeb A. K. Al-Azzani	

TALK 11 starts at 16:30	Structural and Mechanical Characterization of Periprosthetic Tissue by Angela Oostlander, A.M. Moerman, A.A. Zadpoor, M.A.E. Schoeman, R.G.H.H. Nelissen & E.R. Valstar Presented by Angela Oostlander	Photoactive TiO2 Antibacterial Coating on Surgical External Fixation Pins by Stephane Descamps, G.Villatte, C.Massard ,C. Forrestier & K.O.Awitor Presented by Stephane Descamps	
TALK 12 starts at 16:33	30-day Mortality Stratified by the Nottingham Hip Fracture Score by Natalie Hope Presented by Natalie Hope	Outcome of Fixation of Valgus Unstable Proximal Humeral Fractureswith a Novel Hybrid Fixed Angle Blade Plate Design by Cezary Kocialkowski & Chris Peach Presented by Cezary Kocialkowski	
TALK 13 starts at 16:36	30-day Mortality Stratified by the Nottingham Hip Fracture Score by Natalie Hope Presented by Natalie Hope	Distal Femoral Fractures - 5-Year Mortality And Secular Trends by Piers Turner, Robert Nicholas Green & Narasimha Murty Aradhyula Presented by Piers Turner	
TALK 14 starts at 16:39	Trajectories of Symptomatic Recovery after Lower Limb primary Arthroplasty by Erik Lenguerrand, Vikki Wylde, Rachael Gooberman-Hill, Adrian Sayers, Paul Dieppe & Ashley W Blom Presented by Erik Lenguerrand	Assesment of Finger Sweilling after Shoulder Arthroscopy by Cezary Kocialkowski, Chris Peach & Nick Philips Presented by Cezary Kocialkowski	

TALK 15 starts at 16:42	Managing Acute Osteomyelitis and Septic Arthritis in Children: Is Clindamycin Still First-Line? by Ahmed Ezzat, Dr John Lovejoy & Dr Kenneth Alexander Presented by Ahmed Ezzat	Fibrin Sealants and Tranexamic Acid in Primary Total Knee Arthroplasty by Jad Bou Monsef, Tom Schmidt-Braekling, Alejandro Gonzalez Della Valle, Michael Parks, Thomas Sculco & Friedrich Boettner Presented by Jad Bou Monsef	
TALK 16 starts at 16:45	Tribological Behaviour of the "Reverse" Inverse Shoulder Prosthesis by Reto Lerf Isabel Reimelt, Frank Dallmann, Daniel Delfosse Presented By Reto Lerf	One or Two-Stage Surgical Revision of Infected Hip Prosthesis: A Meta-Analysis by Setor K. Kunutsor, Michael R Whitehouse, Ashley W Blom & Andrew D Beswick Presented by Setor Kunutsor	
TALK 17 starts at 16:48		Outcome of the Unaffected Contralateral Hip in Unilateral SCFE by Atanu Bhattacharjee, R. Freeman, A. Roberts & N.T. Kiely Presented by Atanu Bhattacharjee	
	RESEARCH ROCKET 1 Denitsa Docheva & Bernd Grimm	**RESEARCH ROCKET 2** Mike Whitehouse & Richie Gill	**IPROMEDA** Workshop

TALK 1 starts at 17:00	New protocols for Evaluation of Orthopaedic Biomaterials Compatibility by Michael Gasik Presented by Michael Gasik	Finite Element Analysis and its Uses in Complex Tibial Fractures by Robert Hurley, Mr Jamie Concannon, Dr Nicola Lally & Mr John P McCabe Presented by Robert Hurley	
TALK 2 starts at 17:02	Carbon Reinforced Carbon: Its Potential as Material for Orthopaedic Applications by Reto Lerf, Carolin Witt & Daniel Delfosse Presented by Reto Lerf	Calcium Phosphate / Carbon Cloth Hybrid Materials for Bone Regeneration by Quentin Picard, S. Delpeux, N.Rochet, J. Chancolon, F. Fayon & S. Bonnamy Presented by Quentin Picard	
TALK 3 starts at 17:04	In Vivo Kinematic Evaluation of Primary Total Knee Arthroplasty: Fluoroscopic Analysis of ADL by S. Van Onsem, M. Verstraete, D. Lambrecht C. Van Der Straeten, W. Huysse & J. Victor Presented by S. Van Onsem	Effectiveness of the Cobb-Stainsby Forefoot Arthroplasty by Alex Matthews, N.A. Jagodzinski, M. Westwood, J. E. Metcalfe & K. T. Trimble Presented by Alex Matthews	
TALK 4 starts at 17:06	Tekscan Presure Measurement Accuracy for Orthopaedic Biomechanical Joint Contact Measurements by S. Herregodts, P. De Baets, J. Victor & M. Verstraete Presented by S. Herregodts	Internal Fixation of Intracapsular Neck of Femur Fractures – Two-Hole Sliding Hip Screw or Cannulated Hip Screws? by Simon Woods Presented by Simon Woods	

TALK 5 starts at 17:08	Early Ultrasonography versus Late X-ray's in Occult Scaphoid Fractures by Michael-Alexander Malahias, G.C. Babis, M.-K. Kaseta, D. Chytas, S.-T. Kazas & V. S. Nikolaou Presented by Michael-Alexander Malahias	A Comparative Study of Ultrasound-Guided Injections in Palmar Aponeurositis by Michael-Alexander Malahias, G.C. Babis, M.-K. Kaseta, D. Chytas, S.-T. Kazas & V. S. Nikolaou Presented by TBA	
TALK 6 starts at 17:10	A new Ultrasound Scale Grading Carpal Tunnel Syndrome by Michael-Alexander Malahias, V.S. Nikolaou, I. Sourlas, D. Chytas, K. Chrysikopoulos & G.C. Babis Presented by TBA	Comparing Guided to Blind Dissolution of Supraspinatus Calcific Deposit by Michael-Alexander Malahias, G.C. Babis, M.-K. Kaseta, E. Chronopoulos, E. Fandridis & V.S. Nikolaou Presented by Michael-Alexander Malahias	
TALK 7 starts at 17:12	Effect of Antibiotic-Loaded SBA-15 Ceramic on Staphylococcus Aureus Biofilm by Anna Aguilar-Colomer, Juan Carlos Doadrio, Miguel Manzano, Jaime Esteban, Maria Vallet-Regí & Concepción Pérez-Jorge Presented by Jaime Esteban	Patient-reported outcome and experience measures for hallux-rigidus. Chilectomy vs Fusion by Karem Ahmed, Mr A. Pillai & Mr K. Somasundaram Presented by Karem Ahmed	

TALK 8 starts at 17:14	Pelvic radiographs for Diagnosis of Neck of Femur Fractures by Jasmine Medhora, Lily Li & Atef Hakmi Presented by Jasmine Medhora	FID119: hyaluronan photocrosslinked hydrogel for articular cartilage defects by Riccardo Beninatto, Carlo Barbera, Mauro Pavan, Devis Galesso, Elena Serena & Nicola Elvassore Presented by Riccardo Beninatto	
TALK 9 starts at 17:16	Antibiotic Release from Fluoride-TiO2 Nanostructured Anodic Layers on Ti6Al4V Alloy by John Jairo Aguilera-Correa1, Antonio L. Doardrio2, Ana Conde3, Maria-Angeles Arenas3, Juan J. de Damborenea3, Concepción Pérez-Jorge1, Maria Vallet-Regí2,4 & Jaime Esteban1 Presented by Jaime Esteban	Intramedullary nailing of adolescent clavicle fractures by Alexandra Aquilina, Khalis Boksh, Imran Ahmed, Christopher Hill & Giles Pattison Presented by Alexandra Aquilina	
TALK 10 starts at 17:18	Fracture Management in the Fracture Clinic: Simple Manipulation and Moulded Cast by Orthopaedic Plaster Technicians Avoids Need for Further Intervention by Andrew Roberton & Nimesh Patel Presented by Andrew Roberton	3D Modelling of UGent Knee Simulator by Matthias Verstraete, S. De Coninck, J. Smis, P. De Baets & J. Victor Presented by Matthias Verstraete	

TALK 11 starts at 17:20	Investigating PROMs of First Metatarsal Scarf+/- Akin Osteotomy for Hallux- Valgus by Karam Ahmed, A. Pillai & Mr K. Somasundaram Presented by Karam Ahmed	Anatomical considerations of the posterior interosseous nerve in lateral surgical approaches to the radial head – A Cadaveric study by Fucai Han & V Prem Kumar Presented by Fucai Han	
TALK 12 starts at 17:22	How Does Outcome Prediction in Knee Replacements affect Patient Decision-Making? By Timothy Barlow, Pat Scott, Damian Griffin & Alba Realpe Presented by Timothy Barlow	Audit On The Safety And Effectiveness Of The Targon Fn Plate In The Fixation Of Hip Fractures by Amirul Islam, Nazera Dodia & EMH Obeid Presented by Amirul Islam	
TALK 13 starts at 17:24	The Clinical Outcome Following Primary Total Knee Replacement in the Nonagenarian Population – A Retrospective Comparative Cohort Analysis by Daniel Skinner, Baha John Tadros, Edward Bray, Mohamed Elsherbiny & Giles Stafford Presented by Baha John Tadros	Fracture in the Elderly Multidisciplinary Rehabilitation (FEMuR) Feasibility Study by Jessica L. Roberts, Nafees Ud Din, Claire Hawkes, Val Morrison, Andrew Lemmey & Nefyn H Williams on behalf of the FEMuR team Presented by Jessica L. Roberts	

TALK 14 starts at 17:26	Preventing the Inflammatory Response to Cobalt Ions by Amy Mawdesley, Sami Anjum, Helen Lawrence, David Deehan, John Kirby & Alison Tyson-Capper Presented by Amy Mawdesley	Biomechanical Assessment of a Novel Expandable Hip Screw versus Dynamic Hip Screw by Faith Ertem, Çağrı Havitcioglu, Mehmet Erduran & Hasan Havitcioglu Presented by Faith Ertem	
TALK 15 starts at 17:28	Damage-Control Orthopaedics and Acute lung Injury: Is There a Benefit? By Alexander Aquilina & Imran Ahmed Presented by Alexander Aquilina	Trunnionosis and Adverse Reaction to Metal Debris in uncemented metal-on-polyethylene Trident-Accolade total hip replacements – A Case Series and review of recent literature by Christopher Gee, Mr William Poole, Mr Dan Wilson, Mr James Gibbs & Mr Philip Stott Presented by Daniel Wilson	
TALK 16 starts at 17:30	Surgical Tourniquet and Cerebral Emboli: An Exploratory Observational Study by V.N. Gibbs, P.D Wall, A.P Sprowson, C.E Hutchinson, E. Ngandwe & A. Price Presented by TBA	Trauma and Orthopaedics (T&O) smartphone applications: A systematic review by Abdelaziz Elgindi & Mustafa Jafaar	

TALK 17 starts at 17:32	Comparison Clamping Drainage and Non-Clamping Drainage after Total Knee Replacement by Jimena Llorens de los Ríos, Manuel Angel Sandoval, Iván Pérez Coto, Susana Iglesias Fernández, Ana Escandón Rodruigruez & Daniel Hernández Vaquero	Online Curves: A quality analysis of scoliosis videos on YouTube by Peter Staunton, Joseph F Baker, James Green & Aiden Devitt Presented by Peter Staunton	
TALK 18 starts at 17:34	Effectiveness of Surgical Intervention For Adolescent Hallux Valgus by Oliver Beaumont, Aveek Mitra, Matthew Chichero & Sarah Irby Presented by Oliver Beaumont	Evaluation of Ultrasound-Guided Hydroneurolysis in Carpal Tunnel Syndrome by Michael-Alexander Malahais, G.C. Babis, E.O. Johnson, M.-K. Kaseta, D. Chytas & V.S. Nikolaou Presented by Michael-Alexander Malahais	
TALK 19 starts at 17:36	Daily Senoir Review and Documentation in Trauma and Orthopaedic Surgery by Alexandra Colby & Mr. S. Montgomery Presented by Alexandra Colby	Antegrade vs. Retrograde Femoral Nailing: An Audit of Clinical Practice by Raj R. Thakrar, Yaser Ghani, Amit Kotecha & Manoj Sikand Presented by Raj R. Thakrar	

TALK 20 starts at 17:38	Postoperative Change in the Size of the Medial Meniscus by Takayuki Furumatsu, Hiroto Inoue, Shinichi Miyazawa, Takaaki Tanaka, Masataka Fujii & Toshifumi Ozaki Presented by Takayuki Furumatsu	Evidence-Based Medicine: A Decade Apart Survey of Surgeons by Diarmuid De Faoite Presented by Diarmuid De Faoite	
TALK 21 starts at 17:40	Does addition of steroid to periarticular joint injection as multimodal analgesia improve outcomes? A Systematic Review by Gemma Green, Dr Yusuf Mirza & Professor Fares Haddad Presented by Gemma Green	The Impact of the Economic Crisis on the Orthopaedic research in Greece by Vasileios Nikolaou, Dimitrios Chytas, Michael-Alexander Malahias & George Babis Presented by Michael-Alexander Malahia	
TALK 22 starts at 17:42	Absorbable Polydiaxonone Duture Provides Lesser Complications in Tendo-Achilles Rupture Repair by Muhammad Baig & Robert Dinn Presented by Tba	Changing Trends in the Fixation of Extracapsular Hip Fractures by Piers Page, Conrad Lee & Benedict Rogers Presented by Inram Ahmed	

TALK 23 starts at 17:44	An Unusual Case of Hip Pain in a Four year old Child by Metin Tolga Buldu & Mr. Raghu Raman Presented by Metin Tolga Buldu	Tourniquet use for total knee replacement surgery: a survey of patient perspectives by Inram Ahmed Presented by Piers R.J. Page	
TALK 24 starts at 17:46	Mechanical Properties of Nanotextured Titanium Orthopedic Screws for Clinical Applications by Stephane Descamps, OK. Awitor, V Raspal, R Erivan & S Boisgard Presented by Stephane Descamps	The In Vivo Response of Calcium Sulfate of Different Purity by John Cooper, J. McKinnon, W. R. Walsh, R. A. Oliver, J.Rawlinson & C. Christou Presented by J. McKinnon	
TALK 25 starts at 17:48	Variability of Extraction Corkscrews: A biomechanical study by James W. A. Fletcher & Sam L. Evans Presented by James W. A. Fletcher	Ex-Vivo Organ Culture of the Porcine Femoral-Tibial Joint by Natalie Fox, Martin Stanley, Daniel Thomas, John Fisher & Eileen Ingham Presented by Natalie Fox	
TALK 26 starts at 17:50	Audit of transfusion rates in hip fractures by Nastaran Sargazi, E. Adamson & G.Cheung Presented by TBA	Time to Theatre: An Audit of Best Practice Tariff Attainment in Neck of Femur Fractures by Andrew Roberton, Nimesh Patel & Michael Hockings Presented by TBA	

TALK 27 starts at 17:52	Temporizing External Fixation of Calcaneus Fractures Prior to Plate Fixation by Brian M. Farrell, Carol A. Lin & Charles N. Moon Presented by Brian M. Farrell	Custom Anatomical 3D Printed Patient Specific ACL Femoral Tunnel Guide From MRI A Proof Of Concept Study by Mark Frame Presented by Mark Frame	
TALK 28 starts at 17:54	The role of CT in Assessing the Acute Elbow Dislocation by Robert Jordan, A Jones & S Malik Presented by Robert Jordan	Tranexamic Acid Decreases Blood Loss In Total Knee Arthroplasty Without Tourniquet, Using Rivaroxiban as Thrombo-embolic Prophylaxis by Iain Bohler Presented by Iain Bohler	
TALK 29 starts at 17:56	Acute Correction of INR for Patients Requiring Urgent Orthopaedic Surgery by Alexandra Colby & C. Butcher Presented by Alexandra Colby		

CONFERENCE DINNER

TIME	FRIDAY		
	Great Hall	Council Chamber	Room 3
	Ashley NJR Update		
	HIP 4 Mike Whitehouse & Eduardo Garcia-Rey	**OUTCOMES 1** Enrique Gomez-Barrena & Adrian Sayers	**REGENERATION 2** Holger Jahr & Hasa Havitcioglu
TALK 1 starts at 09:30	An Open-Source Multi-Solver Validated Femur Model by A. R. MacLeod, H. Rose & H.S. Gill Presented by A. R. MacLeod	A Prospective Randomised Non-Inferiority Controlled Trial on Fifth Metatarsal Fractures by Pavil Akimau, W. Dakin, K. Cawthron, C. Chadwick, C. M. Blundell & M. B. Davies Presented by P.I. Akimau	Hyaluronan-Tyramine Hydrogels to Tailor Cellular Microenvironments for Tissue Engineering Applications by Claudia Loebel, Tino Stauber, Matteo D`Este, Mauro Alini, Marcy Zenobi-Wong & David Eglin Presented by Claudia Loebel
TALK 2 starts at 09:42	A Pathway for the Referral of Hip Metastases to the Orthopaedic Team at Guy's and St Thomas' Hospitals: A Clinical Audit and Service Evaluation by Andrew Roberton, Roland Walker, Zameer Shah, Marcus Bankes & Marc George Presented by Andrew Roberton	The Effect of Using Enhanced Visual Representation (EVR) of Procedure Based Assessment (PBA) on the Process of Surgical Training and Feedback by Basil Budair & Giles Pattison Presented by Basil Budair	Fracture Healing and Sclerostin Depletion (Level 5) by Mohammad M. Alzahrani & Reggie C. Hamdy Presented by Mohammad M. Alzahrani

TALK 3 starts at 09:54	Large Keyholes Improve Torsional Resistance of THR Acetabular Cement Mantles by Jan Gosiewski Presented by Jan Gosiewski	Can Running Be Reliably Quantfied in Patient Activity Monitoring? By Malid Alizai, Matthijs Lipperts, Rob Houben, Ide C. Heyligers & Bernd Grimm Presented by Matthijs Lipperts	Biomechanical Evaluation of 2.7mm versus 3.5mm Plating Constructs for AO/OTA Type B clavicle by Mohammad M. Alzahrani, Adam Cota, Khalid Alkhelaifi & Edward J Harvey Presented by Mohammad Alzahrani
TALK 4 starts at 10:06	The Influence of Physical Activity on Metal Ion Concentrations in Hip Resurfacing by Jetse Jelsma, R. Senden, M. Schotanus, N. Kort, I. Heyligers, B. Grimm Presented by Jetse Jelsma	Online versus Paper Follow-Up of Patient-Reported Outcomes - Response, Completion Rate and Reliability by Jeannot Mijnes, Ide C. Heyligers & Bernd Grimm Presented by B. Grimm	Cartilage Thickness and Bone Density are Related in Healthy Tibias by Brigitte Jolles-Haeberli, Vivien Meyer, Alessandro Cavinato, Pritish Chakravarty, Patrick Omoumi 7, Julien Favre Presented by Julien Favre
TALK 5 starts at 10:18	How Well Do We Control Acute Pain Following Total Hip Replacement? By Mohammad Salhab, DA Macdonald, Pete Kimpson, Jonathan Freeman, Todd Stewart & Martin Stone Presented by Mohammad Salhab	THA Patients are Not Much Less Active than Healthy Controls but Avoid Specific Events and Intensitie by Matthijs Lipperts, Rachel Senden, Ide C. Heyligers & Bernd Grimm Presented by Matthijs Lipperts	Autologous Bone Plug With Aci In Osteochondral Defects In Knee by Atanu Bhattacharjee HS McCarthy, B Tins, JH Kuiper, S Roberts & JB Richarson Presented by Atanu Bhattacharjee

TALK 6 starts at 10:30		Habitual Activity of Knee Arthroplasty Patients is Less than Healthy Controls Mainly for Demanding Tasks by Sonia Ahmadinezhad, Matthijs Lipperts, Rachel Senden, Ide C. Heyligers & Bernd Grimm Presented by Matthijs Lipperts	Microfracture versus Autologous Chondrocyte Implantation in Knee Cartilage Repair by Federica Francesca Masieri & Natalie Byles Presented by Federica Francesca Masieri

BREAK

	BONE REPAIR AND REACTION Richie Gill Chris Arts	**OUTCOMES 2** Bernd Grimm & Stijn Bolink	**SPINE AND UPPER LIMB 2** Gianluca Vadala Brett Rocos
TALK 1 starts at 11:00	Chemokine Receptor DARC is Associated with Aseptic Loosening of Total Joint Arthroplasty by Schneiderova Petra, Vasinek Michal, Dohnalek Pavel, Fillerova Regina, Kriegova Eva & Gallo Jiri Presented by Petra Schneiderova	Hyperglycemia Increases Serum Sclerostin Levels and Expression by Osteoblasts In-Vitro by M. Pereira, S Gohin, P. Smitham, M. Oddy, I. Reichert & C. Chenu Presented by Ines Reichert	F.E. Modelling to Predict Non-Linear Fracture Behaviour of Vertebral by Pooya Mahmoodi, S.Gheduzzi & H.S.Gill Presented by Pooya Mahmood
TALK 2 starts at 11:12	The Effect of Cobalt on Inflammatory Cytokine and Adhesion Molecule Expression by Sami Anjum, Amy Mawdesley, Helen Lawrence, David Deehan, John Kirby, Alison Tyson-Capper Presented by Sami Anjum	Clay Gels Reduce the Effective Dose of Bone Morphogenic Protein by David Gibbs Presented by David M.R. Gibbs	The poro-elastic behaviour of the intervertebral disc: a new perspective on diurnal fluid flow By Pieter-Paul, A. Vergroesen, Albert J. van der Veen, Kaj S. Emanuel, Jaap H. van Dieën & Theodoor H. Smit Presented by Pieter-Paul Vergroesen

TALK 3 starts at 11:24	Relationship of Vitamin D with Bone Mineral Density, Fracture Type and Social Deprivation in Neck of Femur Fractures by Emma Formoy, Ekemini Ekpo, Timothy Thomas, Cezary Kocialkowski, Anand Pillai Presented by Cezary Kocialkowski	Prosthetic joint infection: The INFORM Programme by Simon Strange, Andrew Beswick, Michael Whitehouse, Ashley Blom & The INFORM Study Group Presented by Andrew Beswick	Influence of Vertebral Deformation on the Vertebral Pain Syndrome by Vladyslav Povoroznyuk & Tetiana Orlyk Presented by Vladyslav Povoroznyuk
TALK 4 starts at 11:36	Relative Fracture Risk for Plating and Nailing in Displaced Tronchantaric fractures by A. R. Macleod, H. Rose, H.S. Gill Presented by A. R. MacLeod	Tibio-Popliteus Impingement After TKA: is Normalsized Actually Oversized? By Michel Bonnin, Matthias Verstraete, Tom Van Hoof, Catherine Van der Straeten & Jan Victor Presented by Arnoud de Kok	Lumbar Sagittal Alignment after Oblique Implanted Total Lumbar Disc Replacement by Eduardo Hevia, Juan Solaz, Carlos Barrios, Alberto Caballero & Jesus Burgos Presented by Eduardo Hevia
TALK 5 starts at 12:00	Bioactive Glass can Potentially Reinforce Large Bone Defects by Arts JJ, van Gestel NA, Arts JJ, Hulsen DJ, Geurts J, Ito K, van Rietbergen B. Presented by Arts JJ	30-day mortality stratified by the Nottingham Hip Fracture Score by Natalie Hope, Pieta Blake, Joanna Richards, Karen Barnard & Alan Macleod Presented by TBA	Pullout Strength of Different Distal Terminal Fixation Constructs in Thoracolumbar Spine Surgery. An in-Vitro Biomechanical study by Ahmet Karakaşlı, Eyad Sekik, Ahmet Karaaslan, Fatih Ertem, Ceren Kızmazoğlu & Hasan Havitcioglu Presented by Ahmet Karakaşlı

TALK 6 starts at 12:12	Radiological Assessment of Bone Remodeling Around the Uncemented Tritanium Acetabular Component by Arts JJ, ten Broeke RH, Rudolfina R, Geurts J. Presented by Arts JJ	Taylor Surgery on Survival Estimation. Comparison of Three International Patients Population Using Decision Analysis Tool by M. Silvia Spinelli, A. Piccioli, G. Maccauro, Jonathan A. Forsberg, Rikard Wedin & The Italian Bone Metastatic Study Group Presented by TBA	A Novel Experimentally Scoliosis Model Induced by Temporary Interpedicular tethering by Carlos Barrios, Rafael LLombart, Borja Maruenda, Juan Alonso, Jesús Burgos & José M. Lloris Presented by Carlos Barrios
TALK 7 starts at 12:24	Does Bone Remodelling Protect a Femoral Implant: Finite Element Analysis by Jacob Koris Presented by Jacob Koris	Preoperative Widespread Pain Sensitization and Chronic Pain After Joint Replacement by Vikki Wylde, Adrian Sayers, Erik Lenguerrand, Andrew Beswick, Rachael Gooberman-Hill, Mark Pyke, Paul Dieppe & Ashley W Blom Presented by Adrian Sayers	Magnetic Resonance Arthrography versus Arthroscopy for Assessment of Shoulder Dislocations by Robert Jordan Presented by Robert Jordan
TALK 8 starts at 12:36	Local Tissue Reaction in Total Hip Arthroplasty with Titanium Modular Neck by Dalila De Pasquale, Alina Beraudi, Susanna Stea, Massimiliano Baleani, Giovanni Guerra, Aldo Toni Presented by Dalila De Pasquale	Patient-Reported Outcome Measures And Return To Work In Trauma Patients by Samuel Folkard, Thomas Bloomfield, Piers Page, Dan Wilson, David Ricketts & Benedict Rogers Presented by S.S. Folkard	

TALK 9 starts at 12:48	Roughened Surface Improves Fixation in Uncemented Alumina-on-Alumina Total Hip Replacement by Eduardo Garcia-Rey, Rosario Madero & Enrique Gomez-Barrena Presented by Eduardo García-Rey	THA/TKA Patients are More Physically Active Than the General Population by J. M. T. A. Meessen, W.F. Peter, R. Wolterbeek, R.G.H.H. Nelissen & T.P.M. Vliet Vlieland Presented by J.M.T.A. Meessen, Msc	
LUNCH			
13:30	**EORS Assembly**		
14:00	**Keynote Adddress By Kate Robson-Brown, Learning from the bones of ancient populations**		
	KNEE 3 Ashley Blom & Mattias Lipperts	**GENERAL & TRAUMA** Enrique Gomez-Barrena Mike Whitehouse	
TALK 1 starts at	A 15-year Follow Up of the Kinemax Total Knee Replacement by Andrew Grazette, Vikki Wylde, Samantha Dixon, Sarah Whitehouse, Ashley Blom & Michael Whitehouse Presented by Andrew Grazette	Central Pain Sensitisation and Radiographic Osteoarthritis after Total Joint Replacement by Vikki Wydle, Adrian Sayers, Adekoyejo Odutol, Rachael Gooberman-Hill, Paul Dieppe & Ashley Blom Presented by Adrian Sayers	

TALK 2 starts at	Smoking Status and Prosthetic Joint Infection Following Total Joint Arthroplasty by Andrew Gonzalez, Ilker Uçkay, Pierre Hoffmeyer & Anne Lübbeke Presented by Andrew Gonzalez	Evaluation of NaproxenSodium and CodeinePhosphate Combination in Osteoarthritis by Kaya Akan, Ünal Ömer K, Poyanlı Oğuz Ş, Kemah Bahattin, Erinç Samet & Özturan Burak Presented by Kaya Akan	
TALK 3 starts at	The Clinical Outcome of Unicompartmental Knee replacement in Octogenarians –A Retrospective Analysis by Baha John Tadros, Daniel Skinner, Mohamed Elsherbiny & Roy Twyman Presented by Baha John Tadros	Predicting Length of Stay in Arthroplasty Enhanced Recovery Programs by A. J. C. Vaughan, H. Arunachalam, Harold, B. Ayres, C. Eitel & M. Rao Presented by A. J. C. Vaughan	
TALK 4 starts at	Hyaluronic acid effect on adipose-derived stem cells. Biological in vitro evaluation by Elbashir M, D.S. Angadi, M. Latimer Presented by Mohamed Elbashir	Biological In-Vitro Evaluation of Hyaluronic Acid Effect by Alonson Moreno, Ana Martínez, Susana Olmedillas, Santiago Bello & Fernando de Miguel Presented by Alonso Moreno	
TALK 5 starts at	Local Infiltration Anaesthia (LIA) plus PainKwell Following Total Knee Arthroplasty by Mohammad Salhab, Pete Kimpson, Jonathan Freeman, Todd Stewart & Martin Stone Presented by Mohammad Salhab	αv Integrin Depletion on PDGFRβ+ Cells Regulates Skeletal Muscle Fibrosis by Iain R. Murray, Zaniah Gonzalez, John Iredale, Hamish Simpson, Bruno Peault & Neil C. Henderson Presented by Iain R Murray	

TALK 6 starts at		Outcomes following Surgery for Adolescent Hallux Valgus – A Systematic Review by Ziad Harb, Michail Kokkinakis, Hiba Ismail & Gavin Spence Presented by Ziad Harb	
TALK 7 starts at	Timing of Prophylactic Antibiotics in Trauma and Orthopaedic Patients by Waheeb A K Al-Azzani, E. Harris, J. Wells, S. Shah, S. Mahbouba & S. P. White Presented by W A K Al-Azzani	The Orthopedic Trauma Surgery Practice: Is It Safe? (Level 3) by Mohammad M. Alzahrani, Saad M. AlQahtani by Edward J. Harvey Presented by Mohammad Alzahrani	
TALK 8 starts at 15:40	Paediatric Elbow: A Cross-sectional Study of Trochlea and Olecranon Ossification Centers by Dashan Angadi, M. Elbashir, M. Latimer Presented by Mohamed Elbashir	Biological In-Vitro Evaluation of Hyaluronic Acid Effect by Alonson Moreno, Ana Martínez, Susana Olmedillas, Santiago Bello & Fernando de Miguel Presented by Alonso Moreno	
TALK 9 starts at 15:50	Does Accuracy of Ultrasound-Guided Corticosteroid Injection Predict Outcome in Pain and Function in Subacromial Impingement Syndrome? by P Raval, R Ogollah, A Hall, N Foster & E Roddy Presented by P. Raval	Markerless Motion Analysis and its Potential Uses in Orthopaedics by Robert Hurley & Aiden Devitt Presented by Robert Hurley	

TALK 10 starts at 16:00		External Validation of a Tool for the Estimation of Life Expectancy in Patients with Skeletal Metastases—Decision Analysis and Comparison of Three Major International Patient Populations by Silvia Spinnelli Presented by Silvia Spinnelli	

ABSTRACTS

HIP 1

PRE-OPERATIVE ASSESSMENT & CRITICAL CARE ADMISSION IN HIP/KNEE ARTHROPLASTY

Walkden GJ, Lewis S & Soar J.
North Bristol NHS Trust, Bristol BS10 5NB, United Kingdom

Background: The National Confidential Enquiry into Perioperative Deaths recommends that high-dependency (HDU) or intensive care unit (ICU) care is available following arthroplasty[1]. In hospitals without dedicated post-operative care units, patients can be transferred to wards more rapidly, which is associated with adverse surgical outcome, increased morbidity & mortality and unplanned HDU/ICU admission[2]. Pre-operative assessment clinics (POAC) have been demonstrated to reduce these adverse outcomes[3]. We present an evaluation of HDU/ICU admissions and a micro-cost effectiveness evaluation of POAC and planned HDU/ICU admission in hip/knee arthroplasty.

Methods: Data were obtained retrospectively for all patients undergoing hip/knee arthroplasty between 01/06/2013–30/06/2014 at North Bristol NHS Trust. n=2258 admissions were linked across coding, ICU (WardWatcher), and Myocardial Ischaemia National Audit Project databases. POAC records and patient notes were hand-searched for n=83 admissions to HDU/ICU. Cost estimates were derived from clinical coding and length-of-stay. The work was performed in STATA and registered under Trust ID 15545.

Results: Over eleven months, n=1917 elective arthoplasties were performed, with zero in-hospital deaths and n=68 transferred to HDU/ICU post-operatively. Unplanned HDU/ICU admissions (n=23; 33.8%) were outnumbered by planned admissions (n=38; 55.9%). Hospital length-of-stay was significantly longer ($p<0.01$) following unplanned HDU/ICU admission, 19.0±22.0 days, compared with planned HDU/ICU admission, 7.5±8.0 days. No significant difference was detected in the proportion of unplanned or planned HDU/ICU admissions that attended anaesthetist POAC (60.9 vs. 68.4%, $p=0.59$). The total cost of elective arthroplasty with an unplanned (£12200) or planned HDU/ICU admission (£7600) differed by £4500.

Conclusions: Our in-hospital mortality compares favourably with published estimates[4]. Unplanned HDU/ICU admission was associated with an increased cost of £4500 per arthroplasty, largely due to increased hospital length-of-stay. 39.1% of patients who required unplanned admission to HDU/ICU were not invited to POAC, which may represent a missed opportunity for reducing post-arthroplasty morbidity and costs.

Level of evidence: 2c

References:

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Notes:

THE EFFECT OF APPROACH ON OUTCOME FROM REVISION HIP REPLACEMENT

Blackburn J, Lim D, Harrowell I, Parry M, Blom AW, Whitehouse MR

Background: Study of the National Joint Registry of England and Wales showed no difference in revision rate for primary hip replacements done via a posterior or lateral approach, but possibly an improved outcome with the posterior approach. There are no studies of how surgical approach affects outcome from revision hip replacement.

Methods: Questionnaires were sent to 267 patients who had revision hip replacements between January 2006 and March 2010. They were asked to rate their pain from 0-10, and used the Self-Administered Patient Satisfaction Scale (SAPS), Oxford Hip Score (OHS), Western Ontario and McMaster University Osteoarthritis Index (WOMAC) and Short form-12 (SF-12).

Results: We performed 275 revision total hip replacements for aseptic loosening on patients in whom the primary operation details were available. Their mean age was 68.7 years (range 28-91) with 40.7% male and 57.8% right-sided procedures. Grouping by approach, 23% (63/275) had primary and revision lateral approaches, 18% (49/275) had primary lateral and revision posterior and 55% (152/275) had both primary and revision via posterior approaches.
202 patients responded to our questionnaires (209/275 hips, 76%). Unfortunately 19 patients had died, 4 had dementia and 13 declined to participate. We were unable to contact a further 33.

Outcome	Lateral/Lateral Median (IQR)	Lateral/Posterior Median (IQR)	Posterior /Posterior Median (IQR)	p
Pain	2 (6)	1(6)	1 (3)	0.418
SAPS	75 (31.3)	87.5 (25)	81.3 (25)	0.227
OHS	31 (15)	34 (17)	37 (18)	0.079
WOMAC	28 (46)	34 (31)	17 (39)	0.026
MCS	51 (16.8)	49.1 (15.5)	53.6 (18.4)	0.183
PCS	33.7 (17.1)	33.8 (16.5)	37.5 (21.1)	0.131

Conclusions: WOMAC score was significantly better in patients who had a posterior approach for both primary and revision surgery. Registry data may help further explore the relationship between surgical approach and outcome in revision hip surgery.

Level of Evidence: 2b - retrospective cohort study
Disclosures: No financial disclosures or conflicts of interests from any authors

Notes:

A REVIEW OF OUTCOMES FOLLOWING LINER DISSOCIATION FROM HARRIS-GALANTE CUPS

Andrew J Grazette, Julian Foote, Michael R Whitehouse, Ashley W Blom

Background: Dissociation of the polyethylene liner is a known failure mechanism of the Harris Galante I and II uncemented acetabular components. The outcomes of revision surgery for this indication and the influence of time to diagnosis are not well described.

Methods: We report a series of 29 cases revised due to this failure mechanism.

Results: The median time from primary to revision surgery was 13 years. At a median of 4 years follow up, the mean OHS was 34 (range 6-48) but results were poorer (mean 29, range 6-45) when the diagnosis and revision was delayed compared to when it was not (mean 39, range 20-48). A large proportion of our patients (n=14) presented with sudden onset of symptoms with or without trauma. Osteolysis was common in this series but the cup was well fixed in 20/29 cases. There was macroscopic damage to the shell in all cases.

Conclusion: In our experience, prompt revision of liner dissociation optimises outcomes in this group of patients and radiology reporting alone is not sufficient to identify these cases.

Level of evidence: 4

Notes:

BIOMECHANICAL PERFORMANCE OF VARIOUS HIP LABRAL REPAIR TECHNIQUES

Onur Hapa, Onur Başçı, Levent Horoz, Fatih Ertem, Ahmet Karakaşlı, Hasan Havitçioglu

Background: Acetabular labral tears can cause pain and microinstability and are the most common indication for hip arthroscopy. Hip labral repair demonstrates better clinical outcome scores at a mean of 3.5 years post surgery than labral excision and tends to be performed in a younger age group. While different labral stitch configurations are possible, the most frequently used are a mattress stitch passed though the hip labrum at its widest part, or a simple loop surrounding the labrum. To determine the strength of variousrepair techniques and the impact suture passer sizesonhip labrum failure after cyclic loading.

Methods: 35 unattached fresh-frozen bovine hip labrums were assigned to 5 repair techniques (7 specimens each): Group 1: horizontal mattress using a penetrating grasper; Group 2: vertical mattress using a penetrating grasper; Group 3: vertical mattress using asuture lasso; Group 4: Oblique repair using a penetrating grasper; Group 5: vertical mattress using a penetrating grasper and monopolar radio frequency device. Using a materials testing machine and after a 10N preload, each contruct was subjected to 20 cycles at 5N-80N. Cyclic elongation, peak-to-peak displacement, ultimate failure load, stiffness, and failure mode were recorded.

Results: Group 1 (249N) had lower ultimate load than groups 2 (277N), 3 (289N), 4 (281N), and 5 (278N) ($p<.05$) and higher peak to peak displacement, cyclic elongation (14mm) than group 3 (12mm) ($p<.05$). Group 2 (15mm) had higher peak to peak displacement than group 3 ($p<.05$). Group 3 had lower cyclic elongation and peak to peak displacements than group 4 ($p<.05$).

Conclusion: A horizontal mattress hip labrum repair demonstrates lower ultimate failure load than a vertical mattress or an oblique suture repair. A smaller diameter suture passing device demonstrated less cyclic displacement but no difference in ultimate failure load than a large diameter device. Radiofrequency treatment did not have any effect on the strength of the suture repair configuration.

Level of evidence: Level 5

Notes:

DEVELOPMENT OF AN ACETABULAR CUP LOOSENING DETECTION USING VIBRATION ANALYSIS

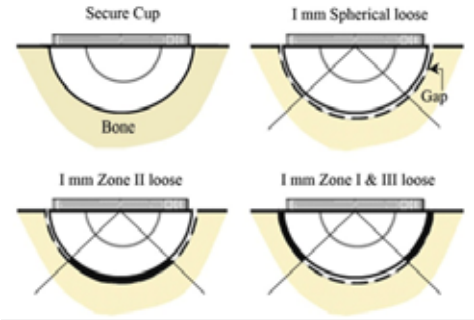
Introduction: Aseptic loosening of the acetabular cup in total hip replacement (THR) remains a major problem. Current diagnostic imaging techniques are ineffective at detecting early loosening, especially for the acetabular component [1]. The aim of this preliminary study was to assess the viability of using a vibration analysis technique to accurately detect acetabular component loosening.

Methods: A simplified acetabular model was constructed using a Sawbones® foam block into which an acetabular cup was fitted. Different levels of loosening were simulated by the interposition of thin layer of silicon between the acetabular component and the Sawbones block, as shown in Figure 1. This included a simulation of a secure (stable) fixation and various combinations of cup zone loosening. A constant amplitude sinusoidal excitation with a sweep range of 100–1500 Hz was used. Output vibration from the model was measured using an accelerometer and an ultrasound probe. Loosening was determined from output signal features such as the number and relative strength of the observed harmonic frequencies.

Results: Both measurement methods were capable of measuring the output vibration. Preliminary findings show different patterns in the output signal spectra were visible when comparing the stable cup with the 1mm of simulated spherical loosening at driving frequencies 1050 Hz ,1100 Hz and 1150 Hz ($p < 0.05$) using the accelerometer, whereas for ultrasound at frequencies 950 Hz and 1350 Hz ($p < 0.05$).

Conclusions: Experimental testing showed that vibration analysis could be used as a potential detection method for acetabular cup component loosening using either an accelerometer or ultrasound probe to detect the vibration. However, the capacity of ultrasound to overcome the attenuating effect of the surrounding soft tissues and its high signal to noise ratio suggest it has the best potential for clinical use.

Notes:



ARE CERAMIC BEARINGS RELEASING IONS?

J.P. Kretzer, R. Sonntag, H. Kiefer, J. Reinders, A. A. Porporati, R. Streicher

Background: The CoCrMo large bearings had shown a high failure rate, because of metal ion and particle release. Alumina matrix composite (AMC) ball heads have shown to mitigate such phenomena.
The aim of this study was to investigate the leaching properties of AMC clinically as well as experimentally.

Methods: Two patient groups were compared: a control group (n=15) without any implant (Controls) and 15 Patients with unilateral treatment with Biolox® delta ceramic-on-ceramic (CoC). Whole-blood samples of Controls and Patients (after 3 and 12 months from treatment with CoC) were measured by means of trace element analysis using a HR-ICPMS. The leaching behaviour of BIOLOX®delta was also analysed in-vitro: five Biolox® delta heads and five CoCrMo heads were immersed in serum for seven days at 37°C. Aluminium, cobalt, chromium and strontium were detected based on HR-ICPMS.

Results: In Patients, most elements remained below the limit of detection (LoD), except for aluminium and strontium. The aluminium values of Controls were below the LoD (27.2µg/L). The values of Patients after three months show a median of 34.2µg/L and after 12 months 37.1µg/L (p=0,510). Strontium ranged from 39.7µg/L of Controls and 79.6µg/L and 70.7µg/L of Patients, after three and twelve months, respectively. This difference was not statistically significant (p=0,322). The leaching experiments showed high amounts of cobalt (177.3µg/L) and chromium (4.2µg/L) released by CoCrMo. Ceramic heads didn't show any significant release.

Conclusions: The current study revealed that there was no significant increase of any element in patients with CoC bearings. Metal heads released high values of cobalt in leaching test. As this release occurred even without any joint articulation, as shown in the experiments, surface corrosion seems to be a relevant mechanism in the ion release of metal bearings. A limitation of the study is that Controls differed from Patients within the clinical trial.

Level of evidence: III

Notes:

KNEE 1

BIOMECHANICAL ASSESSMENT OF NOVEL DISTAL ANGULAR CONDYLAR FEMORAL INTRAMEDULLARY NAIL

Ahmet Karakaşlı, Fatih Ertem, Nihat Demirhan Demirkıran, Yunus Emre Bektaş, Hasan Havıtçıoğlu

Disclosure: Authors declare that there is no conflict of interest related to the present study.

Background: Currently about 4–6% of all femur fractures consist of distal femoral fractures. Different methods and implants have been used for the surgical treatment of distal femoral fractures, including intramedullary nails. Retrograde nail. By contrast with antegrade nails, surgical approach or retrograde nailing exposes the knee joint which may lead to tendency of infection and increased knee pain. Present study aims to compare the biomechanical behaviour of distal angular condyler femoral intramedullary nail (DACFIN), retrograde nail and plate fixation.

Methods: Fifteen 4th generation Saw bones were used to evaluate the biomechanical differences between the groups (Group 1: Plate fixation, Group 2: Retrograde nailing, Group 3: DACFIN; (n=5)). Biomechanical test was performed by using an electromechanical test device Shimadzu (AG-IS 5kN, Japan). Displacement values were recorded by using a Non-contact Video Extensometer (DVE-101/201, Shimadzu, Japan) during the loading each femur with 5 cycles of 500 N at a rate of 10 N/s to determine axial stiffness. The faliure stiffness was measured by axial load to each constructat a displacement rate of 5 mm/min . Torsional loading applied to all groups in amount of 6 Nm of torque with a velocity of 18 degrees/min.

Results: The mean torsion stiffness value of Group 3 (6,33 Nm/degree) was signifacantly higher than Group 1 (1,18 Nm/degree) and Group 2 (2,11Nm/degree), p<0,05). The failure stiffness, Group 3 (1725 N/mm) was significantly higher than Group 1 (1275 N/mm) and Group 2 (1290 N/mm). However, In axial stiffness, the mean value of Group 2 (2554 N/mm) was higher than Group 3 (1822 N/mm), and signifantly higher than Group 1(468 N/mm), p<0,05).

Conclusions: DACFIN is more stiffer than retrograde nail and plate fixation during torsional and failure load conditions. But in axial stiffness retrograde nail was more stiffer. DACFIN provide intramedullary femur condyle fracture fixations without open knee joint.

Level Of Evedince: Level 5

Notes:

TOURNIQUET USE FOR TOTAL KNEE REPLACEMENT SURGERY: A SURVEY OF PATIENT PERSPECTIVES

I Ahmed, P Wall, L Fraser, A Sprowson

Background: Tourniquets are routinely used in total knee arthroplasty (TKA) with an estimated use by up to 93% of surgeons. Advantages include the ability to provide a bloodless field of view to facilitate cement application and increase the success of the procedure. Overall reduction in blood loss is another perceived advantage, however recent research has demonstrated no measurable reduction and conversely a substantial increase in complications such as deep vein thrombosis and systemic emboli. Given the significant complications of tourniquet use we aim to identify patients' views on tourniquets and of emphasis their awareness of the possible risks involved prior to the procedure.

Method: A questionnaire-based study was carried out on 35 patients attending an elective orthopaedic centre for TKA surgery. Ethical approval was granted by NRES committee – East of England (REC Ref: 14/EE/1265). Patients were provided with an information sheet detailing the reasons for the tourniquet use and the associated risks and benefits. They were then provided with a questionnaire to ascertain their views and previous understanding of the subject. Simple statistical measures were implemented to analyse the data.

Results: Only 32% of patients were aware of the use of tourniquets during the operation. 19% were aware of the benefits prior to reading the information sheet provided with 29% understanding the risks involved prior to their procedure. Finally we found 97% of patients would like more information on the use of tourniquets preoperatively.

Conclusion: Tourniquets are widely used in TKA surgery, however, they carry significant risks which are not clearly relayed preoperatively to all patients. Given that 91,000 TKA operations are performed per year we believe it is of paramount importance that all patients are appropriately counselled on the risks and benefits of its use and fully informed consent, including risks of tourniquet use, should be obtained prior to the procedure.

Level of Evidence: Level 3

Notes:

THE EFFECT OF LOCAL ANAESTHETIC INFILTRATION ON CHRONIC POST-SURGICAL PAIN AFTER TOTAL HIP AND KNEE REPLACEMENT: THE APEX RANDOMISED CONTROLLED TRIALS

Vikki Wylde, Erik Lenguerrand, Rachael Gooberman-Hill, Andrew D. Beswick, Elsa Marques, Sian Noble, Jeremy Horwood, Mark Pyke, Paul Dieppe, Ashley W. Blom

Background: Total hip replacement (THR) and total knee replacement (TKR) are usually effective at relieving pain; however, 7–23% of patients experience chronic post-surgical pain. These trials aimed to investigate the effect of local anaesthetic wound infiltration on pain severity at 12 months after primary THR or TKR for osteoarthritis.

Methods: Between November 2009 and February 2012, 322 patients listed for THR and 316 listed for TKR were recruited into a single-centre double-blind randomised controlled trial. Participants were randomly assigned (1:1) to receive local anaesthetic infiltration and standard care or standard care alone. Participants and outcomes assessors were masked to group allocation. The primary outcome was pain severity on the WOMAC Pain scale at 12 months post-surgery. Analyses were conducted using intention-to-treat and per-protocol approaches. Ethics approval was obtained from Southampton and South West Hampshire Research Ethics Committee.

Results: In the hip trial, patients in the intervention group had significantly less pain at 12 months post-operative than patients in the standard care group (differences in means 4.74; 95% CI 0.95, 8.54; p=0.015), although the difference was not clinically significant. Post-hoc analysis found that patients in the intervention group were more likely to have none to moderate pain than severe pain at 12 months than those in the standard care group (odds ratio 10.19; 95% CI 2.10, 49.55; p=0.004). In the knee trial, there was no strong evidence that the intervention influenced pain severity at 12 months post-operative (difference in means 3.83; 95% CI -0.83, 8.49; p=0.107).

Conclusions: In conclusion, routine use of infiltration could be beneficial in improving long-term pain relief for some patients after THR.

Level of evidence: Randomised controlled trial

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Notes:

GEOMETRIC ACCURACY OF ELBOW FLEXION-EXTENSION (F-E) AXIS BASED ON APPROXIMATION TO THE EPICONDYLAR AXIS

Introduction: The epicondylar axis of the elbow is a surface anatomical approximation of the true flexion-extension (F-E) axis used in the application of an external fixator/ elbow arthroplasty. We hypothesise that the epicondylar axis coincides with the true F-E axis in terms of both angular displacement and position (ie. offset). This suggest that it can serve as a good landmark in total dynamic external fixator application and elbow arthroplasty.

Methods: Three-dimensional elbow models were obtained through manual segmentation and reconstruction from 142±40 slices of CT scans per elbow in 15 cadeveric specimens. Epicondylar axis was defined to be the axis through the 2 epicondyles manually identified on the elbow models. These points are depicted in yellow in Figure 1.
F-E axis was defined to be the normal of a circle fitted on 20 points identified on the trochlear groove, shown in magenta in Figure 1. Figure 1 shows the F-E axis (blue) and the epicondylar axis (green). The long axis (red) of the elbow was identified through a line fit through the center of the distal humerus on several slices along the elbow CT.

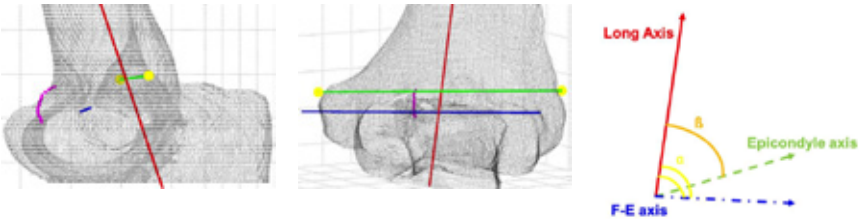

Figure 1. F-E axis and the epicondylar axis on a reconstructed elbow
Angle between the long axis and epicondylar axis was measured. Angular deviation of the epicondylar axis and the F-E axis was calculated in reference to the long axis. This is depicted in Figure 2.
All axes were projected onto the orthogonal planes on the elbow CTs and all measurements were repeated. Angular differences in the axial, saggital and coronal planes are described in internal/external rotation, flexion/extension and valgus/ varus respectively. Offset in the axial and coronal planes are described in the following directions respectively: proximal/distal and anterior/posterior respectively. Comparisons between angles were performed using student's t-test.

Results: Angle between the long axis and the epicondylar axis in our study (85.9±5.3o) was not significantly different when compared to an existing study (87.3±2.8o) (p=0.327). The epicondylar axis deviates from the true F-E axis by 1.9±4.5o (p=0.523) in flexion, 2.1±3.4o (p=0.442) varus, and 0.5±2.7o (p=0.851) in external rotation with an overall angular deviation of 2.2±4.8o (p=0.204). There was no statistical significance difference in the angle deviations mentioned (ie. Between α and ß in Figure 2). The offset between the epicondylar axis and the F-E axis was 15.6±3.4 mm anterior and 9.4±2.9 mm distal with an overall offset of 17.6±2.5 mm.

Discussion: Our study demonstrated small and statistically insignificant angular difference between the epicondylar axis and the F-E axis. However, offset between the axes exists and may be clinically significant. When the epicondylar axis is used as an approximation to the natural F-E axis, this offset may introduce a moment on elbow flexion resulting in additional strain on the elbow collateral ligaments and dynamic external fixators. Implications of this as well as ligament balancing and implant stress-strain patterns in elbow arthroplasty merit further research with potential modification of technique and jigs.

Significance: Although the angular difference between between the epicondylar and F-E axes was not statistically significant, an offset between the axes exist. Further research is required to elucidate its impact and the need for modification on elbow implants and external fixators.

Notes:

METHOD TO EVALUATE THE DELAMINATION RISK OF TKA POLYETHYLENE MATERIALS

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Background: Wear simulation in total knee arthroplasty (TKA) is currently based on the most frequent activity – level walking. A decade ago multi-station knee wear simulators were introduced leading to optimisations of TKA designs, component surface finish and bearing materials [1,2,3,4]. One major limitation is that current wear testing is mainly focused on abrasive-adhesive wear and in vitro testing does not reflect "delamination" as an essential clinical failure mode [5].
The objective of our study was to use a highly demanding daily activities wear simulation to evaluate the delamination risk of polyethylene materials with and without vitamin E stabilisation.

Methods: A cruciate retaining fixed bearing TKA design (Columbus® CR) with artificially aged polyethylene knee bearings (irradiation 30±2 kGy) blended with and without 0.1% vitamin E was used under medio-lateral load distribution and soft tissue restrain simulation. Daily patient activities [6] with high flexion (2x40% stairs up and down, 10% level walking, 8% chair raising, 2% deep squatting) were applied for 5 million cycles [7]. The specimens were evaluated for gravimetric wear and analysed for abrasive-adhesive and delamination wear modes.

Results: The total amount of gliding surface wear was 28.7±1.9 mg for the vitamin E stabilised polyethylene compared to 355.9±119.8 mg for the standard material.
The combination of artificial ageing and high demanding knee wear simulation leads to visible signs of delamination in the articulating bearing areas in vitro.

Conclusion: To evaluate Vitamin E stabilised polyethylenes in regard to ageing and wear behaviour in vitro, conditions are simulated to create clinical relevant failure modes in the reference material.

References:
[1] Walker et al. 1997
[2] DesJardins et al. 2000
[3] McEwen et al. 2005
[4] Grupp et al. 2009, 2013
[5] Walker et al. 2000
[6] Bergmann et al. 2014
[7] Schwiesau et al. 2014

Notes:

HIP ROTATION AS RISK FACTOR FOR ACL INJURY IN FEMALES

Background: Non-contact anterior cruciate ligament (ACL) injuries occurs with a higher incidence in female athletes compared with males after the onset of puberty. One anatomical factor with clinically observable differences between males and females is lower extremity alignment. The knee joint valgus in the coronal plane, which is associated with ACL injury risk, is composed of rotation of the tibia around the stationary femur and hip rotation combined with knee flexion. The purpose of this study was to prove the difference of hip rotation between female and male handball players with or without history of ACL injury.

Methods: Elite collegiate athletes on the varsity handball team (17 females and 24 males) were recruited. Whereas 8 females and 1 male had a history of ACL injury, there were 9 females and 23 males with no history of ACL injury. The 6 measures of hip joint motion [flexion, extension, abduction, adduction, external rotation (ER), and internal rotation (IR)] and the 2 measures of knee joint motion (flexion and extension) were measured with the standard procedure using a goniometer.

Results: The range of ER in ACL-injured females (37±7.5) was smaller than in uninjured females (49±8.2). The range of IR in ACL-injured female players (55±9.6) was greater than in uninjured females (41±13). There was no difference in ER+IR between ACL-injured and uninjured females. In the ACL-injured male handball player, ER was dominant to IR. Compared with the uninjured males, the ACL-injured female players showed smaller range of ER, greater ranges of IR and greater ER+IR.

Conclusions: ACL-injured female handball players had greater hip IR with smaller hip ER, compared with uninjured counterpart. Hip rotation may be a crucial risk factor for ACL injury in female athletes.

Level of evidence: 2b

Notes:

CARTILAGE

OSTEOARTHRITIC HUMAN CHONDROCYTES FOR REPAIR OF MURINE SEGMENTAL TIBIAL DEFECTS

Background: Tissue engineering strategies to heal critical-size bone defects through direct bone formation are limited by incomplete integration of grafts with host bone and incomplete vascularization. An alternative strategy is the use of cartilage grafts that undergo endochondral ossification. Endochondral cartilages stimulate angiogenesis and are remodeled into bone, but are naturally found in only small quantities. We sought to develop engineered endochondral cartilage grafts using human osteoarthritic (OA) articular chondrocytes.

Methods: Study approval was obtained from our human and animal ethics review committees. Human OA cartilage was obtained from discarded tissues from total knee replacements. Scaffold-free engineered grafts were generated by pelleting primary or passaged chondrocytes, followed by culture with transforming growth factor-β1 (TGF-β1) and bone morphogenetic protein 4. Samples were transplanted into immunocompromised mice either subcutaneously or into critical-size tibial defects. Grafts derived from passaged chondrocytes from either of two patients (64 year old and 68 year old men) where implanted into tibial defects in five mice. Bone formation was assessed with histology after four weeks of implantation.

Results: Engineered cartilage grafts generated from passaged OA chondrocytes underwent endochondral ossification after implantation either subcutaneously or in bone. The grafts bridged tibial defects, integrating with bone proximally and distally in all cases. Portions of the graft were remodeled into woven bone, which spanned the defects in two animals. Unmodified OA cartilage and engineered grafts formed from primary chondrocytes did not undergo endochondral ossification in vivo.

Conclusions: Human OA chondrocytes adopt an endochondral phenotype after passaging and TGF-β superfamily treatment. Engineered endochondral cartilage grafts can integrate with host bone, undergo ossification, and heal critical-size long-bone defects in a mouse model. Level of Evidence: Animal study. Disclosure: A patent application on this technology has been filed.

Notes:

HYALURONAN STIMULATES CHONDROGENIC GENE EXPRESSION OF INNER MENISCUS CELLS

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Background: Hyaluronan (HA) promotes extracellular matrix (ECM) production and inhibits the activity of matrix degrading enzymes in chondrocytes. The meniscus is composed of the avascular inner and vascular outer regions. Inner meniscus cells have a chondrocytic phenotype compared with outer meniscus cells. In this study, we examined the effect of HA on chondrocytic gene expression in human meniscus cells.

Methods: Human meniscus cells were prepared from macroscopically intact lateral meniscus. Inner and outer meniscus cells were obtained from the inner and outer halves of the meniscus. The proliferative activity of meniscus cells was evaluated by WST-1 assay in the presence or absence of HA (MW = 600-1200 kDa; Seikagaku). Gene expression of SOX9, COL2A1, and COL1A1 was assessed by a quantitative real-time PCR analysis. The effect of HA on the gene expression and cellular proliferation was investigated under the treatment of interleukin (IL)-1α. Meniscal samples perforated by a 2-mm-diameter punch were maintained for 3 weeks in HA-supplemented media. Cultured meniscal samples were evaluated by histological analyses.

Results: HA treatments stimulated cellular proliferation in both inner and outer meniscus cells. HA also increased COL2A1 expression in inner meniscus cells. On the other hand, HA did not induce COL2A1 expression in outer meniscus cells. Although IL-1α treatment decreased COL2A1 expression in inner meniscus cells, the decrease of COL2A1 expression was prevented by HA treatments. In addition, HA treatments increased cellular counts along the perforated surface of organ-cultured meniscal samples.

Conclusion: The present study demonstrated that HA activated the proliferation and chondrocytic gene expression of inner meniscus cells. In addition, IL-1α-dependent decrease of COL2A1 expression was prevented by HA treatment. Our results suggest that intra-articular HA injection may be useful in the treatment of inner meniscal injury.

Level of evidence: in vitro study, level IV
Disclosure: The authors have no conflicts of interest.

Notes:

TGF-B2 KNOCKDOWN UNDER OSMOLARITY IMPROVES COLLAGEN EXPRESSION IN CHONDROCYTES

Ufuk Tan Timur, Anna van der Windt, Marjolein Caron, Tim J Welting, Pieter J Emans, Holger Jahr

Background: Treatment of cartilage defects requires in vitro expansion of human articular chondrocytes (HACs) for autologous chondrocyte implantation (ACI). During standard expansion culture (i.e. plasma osmolarity, 280 mOsm) chondrocytes inevitably lose their specific phenotype (i.e. collagen type II (COL2) expression). This de-differentiation makes them inappropriate for ACI. Physiological osmolarity (i.e. 380 mOsm) improves COL2 expression in vitro, but the underlying reason is unknown. However, an accepted key regulator of chondrocyte differentiation, transforming growth factor beta (TGFβ), is known to stimulate COL2 production. In this study we aimed to elucidate if TGFβ signaling could potentially be driving the COL2 expression under physiological culture conditions.

Material and methods: After informed consent was obtained, HACs were isolated from five osteoarthritis (OA) patients and cultured in cytokine-free medium of 280 or 380 mOsm, respectively, under standard 2D in vitro conditions with or without lentiviral TGFβ2 knockdown (RNAi). Expression of TGFβ isoforms, superfamily receptors and chondrocyte marker genes was evaluated by qRT-PCR, TGFβ2 protein secretion by ELISA and TGFβ bioactivity using luciferase reporter assays. Statistical significance was assessed by a student's t-test.

Results: TGFβ isoform expression was differentially altered by physiological osmolarity. Specifically, 380 mOsm increased TGFβ2 expression and protein secretion (figure 1A) as well as TGFβ activity (figure 1B). Upon TGFβ2 isoform-specific knockdown (figure 1C) COL2 expression was induced (figure 1D). Physiological osmolarity and TGFβ2 RNAi also induced TGFβ1, TGFβ3 and their type I receptor ALK5.

Conclusions: We showed that TGFβ2 knockdown increases COL2 expression in human osteoarthritic chondrocytes in vitro, possibly through a regulatory feedback loop involving TGFβ1, TGFβ3 induction and an increased ALK5/ALK1 ratio. This study indicates that TGFβ signalling is involved in osmolarity-induced chondrocyte marker gene expression. Pharmacological targeting of this pathway holds potential to further improve future osmolarity-mediated phenotypic stabilization in advanced cell-based cartilage repair strategies.

Level of Evidence: preclinical.
Disclosure: We have nothing to disclose.

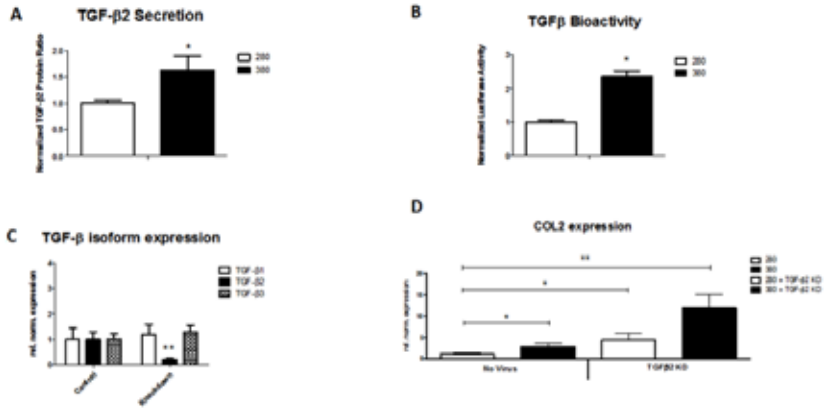

Figure 1: Relative normalized TGF-beta2 protein secretion (ELISA) in 280 (white) and 380 (black) mOsm cultures, respectively (A), next to TGF-beta bioactivity (B). TGF-beta isoform expression and TGFβ2-specific RNAi (C). Relative normalized COL2A1 expression in 280 and 380 mOsm (no virus control) and upon TGF-beta2 knockdown (KD) (D). Data are mean ± standard deviation and differences from the control condition (280 mOsm) are indicated: * $p < 0.05$ ** $p < 0.005$.

Notes:

SOX-9 EXPRESSION IN CHONDROCYTES IS REGULATED BY NRF2

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Background: Transcription factor nuclear factor E2p45-related factor 2 (Nrf2) is crucial for controlling the antioxidant response and maintaining cellular redox homeostasis. Binding of Nrf2 to antioxidant response elements (ARE) promotes the expression of anti-oxidative stress enzymes. In osteoblasts, Nrf2 directly interacts with Runx2, a strong transcriptional activator of osteoblast-specific genes. Sox9, a key regulator of chondrocyte differentiation is dominant over Runx2 in mesenchymal chondrogenic precursors. We therefore aimed to elucidate the role of Nrf2, and its regulation of Sox9, in chondrocytes.

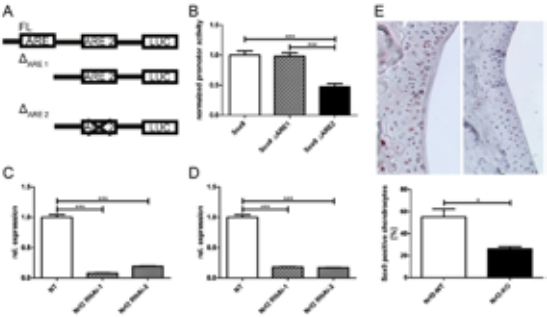
Methods: ARE sites in SOX9 promoter fragments were inactivated (Figure) and cloned into pGL3 prior to co-transfection with phRL-TK into
C-28/I2 cells for dual luciferase assay (n=4). Analyses of Nrf2 and Sox9 expression (n=3), following Nrf2 RNA interference (RNAi) (Sigma-Mission shRNAs library), was performed by qPCR (Applied Biosystems) as well as by Nrf2 and Sox9 immunohistochemistry in femoral condyle cartilage of wild type (WT) and Nrf2-knockout (KO) mice with ethical approval.

Results: The Sox9 promoter region contains several putative antioxidant response elements. Mutagenesis of the ARE2 site (A) reduced SOX9 promoter activity by 50% (B). Successful knock-down of Nrf2 using Nrf2-specific shRNAs (C) in C-28/I2 chondrocytes also revealed parallel suppression of Sox9 mRNA (D). Furthermore, Nrf2-KO mice have fewer Sox9-positive-chondrocytes in their articular cartilage compared to WT littermates (E and F).

Conclusions: Successive deletion of two putative ARE sites in the SOX9 promoter region suggests that ARE2 positively regulates SOX9 transcription and is in line with Sox9 mRNA suppression upon Nrf-2-RNAi. Nrf2 binding may thus directly stimulate Sox9 expression. Nrf2-KO mice reveal reduced numbers of Sox9-positive hyaline chondrocytes, which may have important consequences for the extracellular matrix production in these animals. Our findings reveal a novel mechanism regulating extracellular matrix synthesis in chondrocytes and may improve cartilage regenerative medicine.

Level of evidence: Preclinical.

Notes:



A NOVEL TRI-LAYERED COLLAGEN SCAFFOLD FOR KNEE OSTEOCHONDRAL DEFECT REPAIR

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Background: Articular cartilage has poor repair properties and poses a significant challenge in orthopaedics. Damage as a result of disease or injury frequently leads to formation of an osteochondral defect. Conventional repair methods, including allograft, autograft and microfracture, have a number of disadvantages in terms of cost, associated technical challenges and the requirement for multiple operations. A novel tri-layered scaffold developed in our lab, addresses this issue as it closely matches the structure and composition of osteochondral tissue.

Methods: In vivo assessment was carried out in a caprine model by creating 6 mm x 6 mm defects in the medial femoral condyle and lateral trochlear ridge of each joint. Defects were implanted with the tri-layered scaffold and for comparison also with a market-leading scaffold, while some of defects were left empty, acting as a control. Assessment was carried out at 3 month, 6 month and 12 month time points. The quality of the repair at the various time points was graded macroscopically and microscopically by histological staining of the samples and also assessed using micro-CT (computed tomography) analysis.

Results: From 3 to 6 months the tri-layered scaffold group showed improved macroscopic repair compared to the empty defect group. Greater levels of bone formation in the tri-layered scaffold group were evident on micro-CT evaluation, and this was confirmed by histological staining. Finally, at 12 months superior results were seen in the tri-layered scaffold group with formation of hyaline-like cartilage within the defect and regeneration of the subchondral bone.

Conclusions: Positive results to date show that the tri-layered to be a promising method for cartilage repair and regeneration by promoting natural cartilage re-growth. It negates the need for other biological agents such as genes and growth factors by stimulating the native tissue osteochondral repair mechanism.

Ethics Approval: The Ethics Committee of the University College Dublin (UCD) (AREC-P-11-31) approved this study and the Irish Government Department of Health (B100/4317) granted an animal license.

Level of evidence: Animal research

Notes:

DISC REGENERATION USING MSC TRANSPLANTED VIA THE ENDPLATE ROUTE

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Background: Stem cell based intervertebral disc (IVD) regeneration is quickly moving towards clinical applications. However, many aspects need to be investigated to routinely translate this therapy to clinical applications, in particular, the most efficient way to deliver cell to the IVD. Cells are commonly delivered to the IVD through the annulus fibrosus (AF) injection. However, recent studies have shown serious drawbacks of this approach. As an alternative we have described and tested a new surgical approach to the IVD via the endplate-pedicles (transpedicular approach). The Purpose of the study was to test MSCs/hydrogel transplantation for IVD regeneration in a grade IV preclinical model of IDD on large size animals via the transpeducular approach with cell dose escalation.

Methods: Adult sheep (n=18) underwent bone marrow aspiration for autologous MSC isolation and expansion. MSC were suspended in autologous PRP and conjugated with Hyaluronic Acid and Batroxobin at the time of transplant (MSCs/hydrogel). Nucleotomy was performed via the transpedicular approach in four lumbar IVDs and that were injected with 1) hydrogel, 2) Low doses of MSC/hydrogel, 3) High doses of MSC/hydrogel, 4) no injection (CTRL). The endplate tunnel was sealed using a polyurethane scaffold. X-ray and MRI were performed at baseline and 1,3,6,12 months. Disc macro- and micro-morphology were analyzed at each time point.

Results: The MRI index showed a significant decrease in the untreated group, the disc injected with hydrogel and those injected with low MSC dose compared to healthy discs in all time points. The discs treated with high dose of MSC showed maintenance of the MRI index compared to the healthy disc. Morphologically, the grade of degeneration evaluated using the were in agreement with the grades observed at the MRI.

Conclusions: An effective dose of autologous MSC (1x107 cell/ml) delivered via the alternative transpedicular approach regenerates the NP in a preclinical model of grade IV IDD maintaining the AF intact This preclinical study has high translational value as large animal model with the long fallow up were used, MSCs were expanded in GMP facility simulating the clinical scenario, and the hydrogel were composed of clinically available drags and materials.

Notes:

HIP 2

RESISTANCE TO DAMAGE OF MATERIALS FOR THR BEARING SURFACES

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Background: As the number of ceramic THR bearings used worldwide is increasing, the number of implants that experience off-normal working conditions, e.g. edge loading, third bodies in the joint, soft tissues laxity, dislocation/subluxation of the joint, increases too. Under all such conditions the bearing surfaces can be damaged, leading eventually to a limitation of the expected performances of the implant.

Methods: We characterized the damage resistance of different bearing surfaces (alumina matrix composite BIOLOX®delta, alpha-alumina BIOLOX®forte, zirconia 3Y-TZP, oxidized zirconium alloy Zr-2.5Nb, CoCr-alloy) by scratch tests performed following the European standard EN 1071-3:2005. Also the scratch hardness of same materials has been assessed.

Results: The Lc1 value (i.e., the load for the onset of a scratch) measured for BIOLOX®delta is about fivefold the one measured for the oxidized zirconium alloy (OXZr) surface and about tenfold the Lc1 measured for the CoCr alloy. The height of ridges along the scratch edges due to plastic flow in the composite ceramic BIOLOX®delta are only 21% in height than in CoCr, and only a small fraction (0,04%) of the height of ridges measured on OXZr surfaces. The scratch hardness of the metal samples tested (CoCr, OXZr) results one order of magnitude lower than the ones of ceramics. This behavior is not influenced by of the presence of the coating on OXZr surface.

Conclusions: The transformation toughened ceramics tested (BIOLOX®delta, 3Y-TZP) are the materials that exhibit the higher resistance to scratching. Ridges at scratch edges are lower in ceramics than in coated or uncoated metals. The result show the superior scratch resistance behavior of toughened ceramics for THR wear couples with respect to coated or bare alloys.

Level of Evidence: Level 1.

Notes:

TIBIAL COMPONENT WITHOUT STEM IN A TRABECULAR METAL CONE CONSTRUCT

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Disclosures: The department of Orthopaedics, University of Groningen, University Medical Center Groningen has received direct funding from the Anna Fonds (Oegstgeest, NL). Zimmer (Warsaw, IN, USA) has provided the instrumentation and tools for this study. The department of Orthopaedics, University of Groningen, University Medical Center Groningen receives research institutional support from InSpine (Schiedam, NL) and Stryker (Kalamazoo, Mich. USA). One of the authors (ALB) will be and has been paid as a consultant by Zimmer (Warsaw, IN, USA) for purposes of education and training in knee arthroplasty.

Background: Trabecular metal (TM) cones are designed to fill up major bone defects in total knee arthroplasty. Tibial components can be implanted in combination with a stem, but it is unclear if this is necessary after reconstruction with a TM cone. Implanting a stem may give extra stability, but may also have negative side-effects. Aim of this study was to investigate stability and strain distribution of a tibial plateau reconstruction with a TM cone while the tibal component is implanted with and without a stem, and whether prosthetic stability was influenced by bone mineral density (BMD).

Methods: Tibial revision arthroplasties were performed after reconstruction of an AORI 2B bone defect with TM cones. Plateaus were implanted in seven pairs of cadaveric tibiae; of each pair, one was implanted with and the other without stem. All specimens were loaded to one bodyweight alternating between the medial and lateral tibia plateau. Implant-bone micro motions, bone strains, BMD and correlations were measured and/or calculated.

Results: Tibial components without a stem showed only more varus tilt (difference in median 0.14° ($P<0.05$), but this was not considered clinically relevant. Strain distribution did not differ. BMD had only an effect on the anterior/posterior tilt (ρ:-0.72 ($P<0.01$).

Conclusions: Tibial components, with or without a stem, which are implanted after reconstruction of major bone defects using TM cones produce very similar biomechanical conditions in terms of stability and strain distribution. Additional stem extension of the tibial component may not be required after reconstruction of major bone defects using TM cones.

Level of evidence: IIb

Notes:

ANALGESIA IN HIP FRACTURES. DO FASCIA-ILIAC BLOCKS MAKE ANY DIFFERENCE?

Primary author: J Callear
Additional authors: K Shah
Abstract Presenter: J Callear

Introduction: Despite recent national advances in the care for the hip fracture patient, significant morbidity and mortality persists. Some of this morbidity is attributable to the analgesia provided in the hospital setting. The National Institute of Clinical Excellence recommends the use of simple oral analgesia including opioids, with fascia-iliac blocks used as an adjunct. Literature review reveals a paucity of evidence on this topic. The aim of this study was to evaluate the efficacy of fascia iliac blocks through analysis of pre and post-operative opioid usage, post-operative delirium, time to bowel opening and naloxone use.

Methods: A retrospective study was performed between September-December 2013. Inclusion criteria were determined. 41 patients who received spinal anaesthesia alone and 41 patients who received spinal anaesthesia and a fascia-iliac block were included.

Results: Patients who received a fascia-iliac block received significantly less post-operative and total analgesia ($p=0.04$, $p=0.03$), had lower rates of delirium ($p=0.03$) and those patients which were discharged directly home had a shorter inpatient stay ($p=0.03$). No patients who received a fascia-iliac block needed naloxone to reverse opioid toxicity, whilst two non fascia iliac block patients did.

Conclusions: Fascia iliac blocks either given in A&E or at the time of spinal anaesthesia are a useful adjunct to provide analgesia in the hip fracture patient. The John Radcliffe hospital aims to incorporate fascia-iliac blocks into the care pathway for the hip fracture patient.

Notes:

EARLY DEATH FOLLOWING REVISION TOTAL HIP AND TOTAL KNEE ARTHROPLASTY

Mark D Jones, Michael Parry, Michael Whitehouse, Ashley W Blom

Background: Frequency of primary total hip (THA) and total knee (TKA) arthroplasty procedures is increasing, with a subsequent rise in revision procedures. This study aims to describe timing and excess surgical mortality associated with revision THA and TKA compared to those on the waiting list.

Methods: All patients from 2003-2013 in a single institution who underwent revision THA and TKA, or added to the waiting list for the same procedure were recorded. Mortality rates were calculated at cutoffs of 30- and 90-days post-operation or addition to the waiting list.

Results: 561 and 547 patients were available for the survivorship analysis in the revision THA and TKA groups respectively. Following exclusion, 901 and 832 patients were available for the 30-day analysis and 484 and 568 patients for the 90-day analysis in the revision THA and revision TKA waiting list groups respectively. The 30- and 90-day mortality rate was significantly greater for the revision THA group compared to the waiting list group (excess surgical mortality of 0.357%, 95% confidence interval 0.098% to 0.866%; p=0.037) (odds ratio of 5.22, 95% confidence interval 0.626 to 43.524; excess surgical mortality of 0.863%, 95% confidence interval 0.455% to 1.153%; p=0.045). The 30- and 90-day mortality rate was not significantly greater for the revision TKA group compared to the waiting list group (excess surgical mortality of zero) (excess surgical mortality of 0.366%, 95% confidence interval 0.100% to 0.651%; p=0.075).

Conclusions: Revision THA is associated with a significant excess surgical mortality rate at 30- and 90-days post operation when compared to the waiting list for the same procedure. However, we have been unable to quantify any increased risk after revision TKA. We would encourage other authors with access to larger samples to use our method to quantify excess mortality after revision TKA.

Level of Evidence: III-Retrospective Cohort Study.

Notes:

ROLE OF TOLL-LIKE RECEPTOR 4 IN THE IMMUNOLOGICAL RESPONSE TO COBALT

Authors: Helen Lawrence, David J Deehan, James P Holland, John A Kirby, Alison J Tyson-Capper.

Background: Metal-on-metal (MoM) hip arthroplasty has been associated with adverse reactions including pseudotumours, and osteolysis. Tissues surrounding failed MoM hip implants are often infiltrated by inflammatory cells such as monocytes and neutrophils. The mechanisms by which these cells are recruited to the tissues remain unclear.
Cobalt from MoM implants activates Toll-like receptor 4 (TLR4), an immune cell surface receptor usually responsible for recognition of bacteria and prevention of sepsis. Activation by bacteria leads to secretion of pro-inflammatory cytokines which guide other immune cells to the site of inflammation. The effect of cobalt on this response is unknown and therefore this study aims to determine the effect of cobalt-mediated TLR4 activation on the migration of inflammatory cells.

Methods: A human macrophage cell line (MonoMac 6) was stimulated with a physiologically-relevant range of cobalt ions for 24h with or without pre-treatment with a TLR4 antagonist. Conditioned media was collected and used in a trans-well migration assay to determine its effect on migration of primary monocytes and neutrophils isolated from whole human blood. Migrated cells were stained with haematoxylin and counted at x40 magnification.

Results: Conditioned media from cobalt-treated macrophages caused elevated monocyte and neutrophil migration across all concentrations. Pre-treatment of MonoMac 6 cells with a TLR4 antagonist significantly decreased the response. This suggests that the cytokine profile produced in response to cobalt-mediated TLR4 activation is pro-migratory for immune cells.

Conclusions: Cobalt activation of TLR4 leads to secretion of inflammatory cytokines that attract monocytes and neutrophils. This work highlights a potential mechanism by which cobalt ions from failed MoM joints could be involved in inflammatory cell recruitment to the surrounding tissues. The TLR4 signalling pathway represents an exciting area for further investigation as a therapeutic target in the prevention of adverse reactions to cobalt ions.

Disclosure: This work is funded by DePuy Synthes Ltd and the Newcastle NIHR Biomedical Research Centre

Notes:

COMPUTATIONAL ANALYSIS OF TAPER JUNCTION FRETTING OF FEMORAL HIP IMPLANTS

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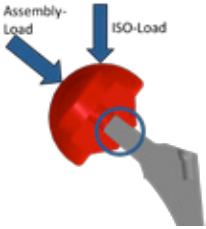
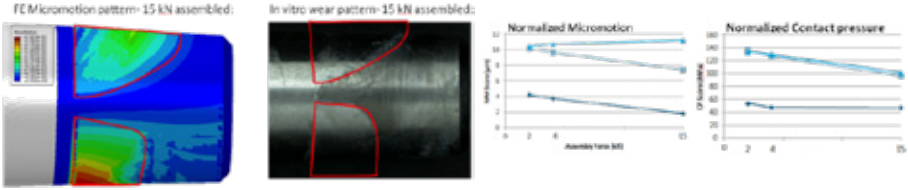
Background: Fretting at modular junctions is thought to be a 'mechanically assisted' corrosion phenomenon, initiated by mechanical factors that lead to increased contact stresses and micromotions at the taper interface. We adopted a finite element approach to model the head-taper junction, to analyze the contact mechanics at the taper interface. We investigated the effect of assembly force and angle on contact pressures and micromotions, during loads commonly used to test hip implants, to demonstrate the importance of a good assembly during surgery.

Methods: Models of the Bimetric taper and adaptor were created, with elastic-plastic material properties based on material tests with the actual implant alloy. FE contact conditions were validated against push-on and pull-off experiments. The models were loaded according to ISO 7206-4 and -6, after being assembled at 2-4-15kN, both axially and at a 30° angle. Average micromotions and contact pressures were analyzed, and a wear score was calculated based on the contact pressures and micromotions.



Results: The average contact pressure decreased when a higher assembly force was used, with loads being distributed over a larger contact area, but increased when tested at a 30° angle. Average micromotions reduced with a higher assembly load, except when assembled at a 30° angle. The wear score decreased with increasing assembly force, when applied perpendicularly, while when assembled at a 30° angle, the wear score did not reduce with assembly force.



Conclusions: The location and patterns of micromotions were consistent with retrieved tapers and those generated in in-vitro test models. Increased impaction loads reduced the average amount of micromotion and fretting. We intend to apply more complex loading regimes in future analyses, enabling to study phenomena such as edge loading and frictional torque.

Level of evidence: IIb - Experimental study

Disclosure: This study was financially supported by Biomet UK Healthcare Ltd.

Notes:

REFIXATION OF LOOSENED HIP PROSTHESES: OSTEOGENIC CAPACITY OF PERIPROSTHETIC TISSUE CELLS

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Background: Aseptic loosening of prostheses is the most common cause for failure in total joint arthroplasty. Particulate wear debris induces a non-stop inflammatory-like response resulting in the formation of a layer of fibrous periprosthetic tissue at the bone/implant interface. The current treatment is an invasive revision joint replacement surgery. However, this procedure has a high morbidity rate, therefore, a less invasive alternative is necessary. One approach could be to re-establish osseointegration of the joint prosthesis by inducing osteoblast differentiation in the periprosthetic tissue. Therefore, the aim of this study was to investigate the capacity of periprosthetic tissue cells to differentiate into the osteoblast lineage.

Methods: Periprosthetic tissue samples were collected during revision surgery of aseptic loosened hip prostheses, after which cells were isolated by collagenase digestion. Of 14 different donors, cells from passage 1 till 3 were used for differentiation experiments. During 21 days, cells were cultured under normal and several osteogenic culture conditions. Cultures were stained for alkaline phosphatase (ALP) activity and mineral deposits in the extracellular matrix.

Results: When cells were cultured in osteogenic medium, ALP staining was increased compared to normal culture medium in 12 donors. Mineralisation of the matrix was observed in 13 donors. Addition of bone morphogenetic protein 2 or 6 (BMP) increased the ALP staining even further in 4 donors, whereas the mineralisation increased by 2-3 fold in 2 different donors. Nevertheless, in 1 donor, addition of a specific GSK3β inhibitor (GIN) to the osteogenic medium or a combination of both GIN and BMP2 was required to induce mineralisation of the matrix.

Conclusions: Periprosthetic tissue cells show characteristics of differentiation into the osteoblast lineage when cultured under osteogenic conditions. However, the responses to different osteogenic stimuli were donor specific.

Level of Evidence: Level IV. Experimental research study.

Notes:

KNEE 2

MEDIUM- TO LONG-TERM EVALUATION OF A CONTOURED FOCAL KNEE RESURFACING PROSTHESIS

Background: Focal resurfacing can treat localised articular damage of the knee not appropriate for arthroplasty or biological repair. Independent results on these implants are limited. We previously published early results showing significantly improved Knee Injury & Osteoarthritis Outcome Score (KOOS4) without complication or re-operation, demonstrating this system gives good analgesia and functional improvement in selected patients. We present long-term follow-up of these patients.

Methods: We prospectively evaluated medium- to long-term results in patients with localised, full-thickness articular cartilage defects of the knee undergoing HemiCAP® resurfacing. All procedures were performed by one consultant surgeon. Post-operative rehabilitation was standardised. Outcome measures were KOOS4 score, visual analogue score (VAS), Kellgren and Lawrence arthritis grade, and re-operation rates.

Results: Six patients were evaluated with mean follow-up time of 74 months (range 61-96). Mean age was 44.8 years (range 33-51). One lateral and five medial compartments were resurfaced. Mean pre-operative KOOS4 was 39.1, mean 22-month follow-up KOOS4 improved significantly to 79.6, and mean latest follow-up KOOS4 remained good at 71.3. Mean VAS was 8.8 at latest follow-up. There was no loosening, migration or increase in osteoarthritis grade. One patient underwent revision to unicondylar knee replacement for pain after three years with comparable results at another centre (medial compartment, two year follow-up pre-revision KOOS4 84.6, latest follow-up post-revision KOOS4 73.6, VAS 6). Cause of pain was unclear (heel pain causing prolonged altered weight-bearing or failure of HemiCAP®).

Conclusion: Our results demonstrate that the use of the joint-preserving HemiCAP® system provides good pain relief and functional improvement in both the short and longer-term. Few studies assess functional outcomes of focal resurfacing for localised full thickness articular cartilage defects. Our study assesses both the contemporaneous and time-dependent behaviour of focal resurfacing. We believe this is one of the longest follow-up series to date.

Notes:

POLYETHERETHERKETONE IN AN ALL POLYMER TOTAL KNEE ARTHROPLASTY

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Background: Stress shielding and wear induced aseptic loosening cause failure in arthroplasty surgery. To improve survivorship, the use of a low modulus, low wearing biomaterial may be a suitable alternative to hard bearing prostheses, such as cobalt chromium (CoCr). There has been considerable research interest in the use of polyetheretherketone (PEEK) based on observed clinical success especially in spinal surgery. This study investigated the wear performance of PEEK, carbon reinforced PEEK (CFR-PEEK) and acetal as bearing materials in an all polymer total knee arthroplasty (TKA) using a unidirectional pin on plate test.

Methods: The following material combinations were tested:

PEEK vs. UHMWPE	CFR-PEEK vs. UHMWPE	PEEK vs. PEEK	CFR-PEEK vs. PEEK	CoCr vs. UHMWPE
PEEK vs. XLPE	CFR-PEEK vs. CFR-PEEK	PEEK vs. Acetal	Acetal vs. XLPE	CoCr vs. XLPE

Table 1: Tribological couples tested (Pin vs. Plate)

Using a previously validated modification of ASTM F732, 20mm diameter spherically ended pins with a radius of 25mm were articulated against 40mm diameter plates. A load of 1000N was applied to generate a contact stress of ~70MPa similar to contact stresses previously reported in the knee. The lubricant used was 25% newborn calf serum containing 0.3% sodium azide to retard bacteria growth and 20mM EDTA to prevent calcium deposition. Three repeats of pin on plate combinations (including 2 passive soak controls) were tested for 2 million cycles at a cycle frequency of 1Hz and a stroke length of 10 mm. Gravimetric wear was analysed every 250,000 cycles and results converted to volumetric wear using material density.

Results: All CFR-PEEK articulations were stopped due to excessive wear of the counter-surfaces. Results showed a linear wear rate of UHMWPE and XLPE plates over the test period. PEEK vs. XLPE showed similar wear rate to metal on polyethylene (MoP) bearings (Fig 1).

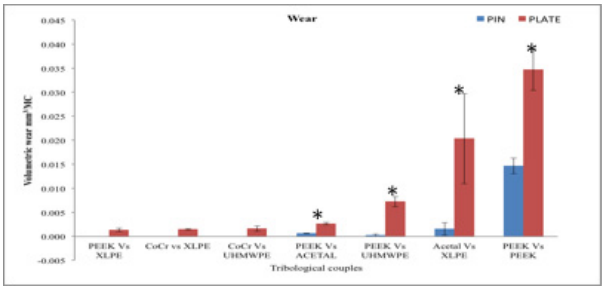

Fig 1: Average wear (± SD) of materials tested up to 2MC. Asterisks depicts significance $p<0.05$ when compared to volumetric wear loss of CoCr vs. XLPE combination.

Conclusion: At stresses representative of the knee, PEEK pins when articulated against XLPE plates generated volumetric wear similar to that noted in MoP bearings.

Notes:

FINITE ELEMENT ANALYSIS OF THE TIBIAL COMPONENT STEM ORIENTATION IN REVISION TOTAL KNEE REPLACEMENT

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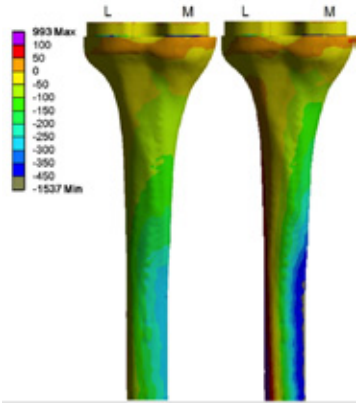
Background: Finite element (FE) models are frequently used in biomechanics to predict the behaviour of new implant designs. To increase the stability after severe bone loss tibial components with long stems are used in revision total knee replacements (TKR). A clinically reported complication after revision surgery is the occurrence of pain in the stem-end region. The aim of this analysis was the development of a validated FE-model of a fully cemented implant and to evaluate the effect of different tibial stem orientations.

Methods: A scanned 4th generation synthetic left tibia (Sawbones) was used to develop the FE-model with a virtually implanted fully cemented tibial component. The 500 N load was applied with medial:lateral compartment distributions of 60:40 and 80:20. Different stem positons were simulated by modifying the resection surface angle posterior to the tibias shaft axis. The results were compared with an experimental study which used strain gauges on Sawbones tibias with an implanted tibial TKR component. The locations of the experimental strain gauges were modelled in the FE study.

Results: Similar patterns and magnitudes of the predicted and experimentally measured strains were observed which validated the FE-model. An increase of strain at the most distal gauge locations were measured with the stem-end in contact to the posterior cortical bone. More uniform strain distributions were observed with the stem aligned to the intramedullary canal axis. The load distribution of 80:20 shifts the strains to tensile laterally and a large increase of compressive strain in the medial distal tibia.

Conclusions: A contributory factor of the clinically reported stem-end pain is possibly the direct effect of contact of the tibial stem-end to the posterior region of the cortical bone. The increased load to the medial tibial compartment is more critical for the development of pain.

Figure 1: Posterior view of the normal microstrain to the global y-axis with a medial:lateral load distribution of 60:40 (left) 80:20 (right).



Notes:

DEVELOPMENT AND VALIDATION OF KNEE SIMULATOR: BEYOND SQUATTING

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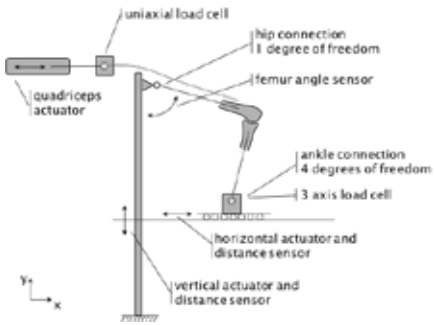
Background: In-vitro testing of knee joints remains vital in the understanding of knee surgery and arthroplasty. However, based on the design philosophy of the original Oxford knee simulator, this in-vitro testing has mainly focused on squatting motion. As the activities of daily living might drastically differ from this type of motion, both from a kinematic and kinetic point of view, a new knee simulator is required that allows studying more random motion patterns. This paper describes a novel knee simulator that overcomes the limitations of traditional Oxford simulators, providing both kinematic and kinetic freedom with respect to the applied boundary conditions.

Methods: This novel test simulator keeps the hip at a fixed position, only providing a single rotational degree of freedom (DOF) in the sagittal plane. In addition, the ankle holds four DOF, including all rotational DOF and the translation along the medio-lateral axis. Combining these boundary conditions leaves five independent DOF to the knee; the knee flexion angle is actively controlled through the positioning of the ankle joint in the antero-posterior and proximal-distal direction. The specimens' quadriceps muscle is actively controlled, the medial and lateral hamstrings are passively loaded. To validate the performance of this simulator, two fresh frozen specimens have been tested during normal squatting and cycling. Their kinematic patterns have been compared to relevant literature data.

Results: Kinematic patterns in line with literature data are observed for the squatting motion, e.g. displaying femoral rollback for both specimens. In contrast, the kinematic patterns that are observed during cycling differ remarkably from the patterns of the squatting movement.

Conclusion: The results provide confidence in the working principle of the presented knee simulator, the mechanical design and all processing steps. In addition, the remarkable differences observed in kinematic patterns between different studied motions indicate the need for broadening the research view to relevant motion patterns, beyond squatting.

Figure 1: Schematic of the developed knee simulator



Notes:

ARTHROPLASTY INDUCED POST-TRAUMATIC IMMUNOSUPPRESSION IS REVERSED BY ANTI-COAGULATED SALVAGED BLOOD

Nahidul Islam[1,2,3]; Michael Whitehouse[2]; Sanchit Mehandale[2]; Ashley Blom[2]; Gordon Bannister[2]; Rhodri Ceredig[1]; Benjamin Bradley[1,2,3]

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Background: Post-traumatic immunosuppression (PTI) after surgery increases vulnerability to nosocomial infections, sepsis, and death. Knee arthroplasty offers a sterile clinical model to characterise PTI and explore its underlying mechanisms.

Methods: This prospective non-randomised cohort study of primary total knee arthroplasty was approved by the Local Ethics Committee. Exclusion criteria included revision-arthroplasty, pre-existing infections, blood-transfusions, malignancy, and auto-immune disease. 48 recruited patients fell into two groups, the first received unwashed anti-coagulated autologous salvaged blood transfusions after surgery (ASBT cohort, n=25). The second received no salvaged blood transfusions (NSBT cohort, n=18). Venous blood was sampled pre-operatively and within 3-7 days post-operatively. Salvaged blood was sampled at one and six hours post-operatively. Biomarkers of immune status included: interleukins (IL) or cytokines (x15), chemokines (x3), Damage-Associated-Molecular-Patterns (DAMPS) (x5), anti-microbial proteins (x3), CD24, and Sialic-acid-binding-Immunoglobulin-type-Lectin-10 (Siglec-10). Results were expressed as fold-change over pre-operative values. Only significant changes are described.

Results: Certain biomarkers associated with sterile trauma were common to all 43 patients, including supra-normal: IL-6, IL-1-Receptor-Antagonist, IL-8, Heat-Shock-Protein-70 (HSP70), Calprotectin, CD24 and Siglec-10. But, whereas in NSBT patients post-operative pro-inflammatory biomarkers were sub-normal consistent with PTI, they were supra-normal in ASBT patients implying its reversal. These PTI-biomarkers included: IL-1β, IL-2, IL-17A, Interferon-gamma (IFN-γ), Tumour-Necrosis-Factor-alpha (TNF-α), and Annexin-A2. Reversal of PTI by salvaged blood was further endorsed in ASBT by sub-normal levels of the anti-inflammatory biomarkers: IL-4, IL-5, IL-10, and IL-13. Salvaged blood analyses revealed sustained supra-normal levels of DAMPs, CD24 and Siglec-10; and increasingly elevated levels of cytokines and chemokines during the six hour collection period. Interestingly, plasma CD24, Siglec-10, HSP70 and Calprotectin levels were significantly correlated, implying physical association within the circulation.

Conclusions: Several anti-inflammatory processes triggered by traumatised tissue induce systemic PTI, thereby increasing vulnerability to infections. Reversal of PTI by re-infusion of anti-coagulated salvaged blood suggests a novel source of immuno-stimulants.

Notes:

DO CAS-MEASUREMENTS CORRELATE WITH EOS 3D ALIGNMENT MEASUREMENTS IN TKA?

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Disclosures: The department of Orthopaedics, University of Groningen, University Medical Center Groningen receives research institutional support from InSpine (Schiedam, NL) and Stryker (Kalamazoo, Mich. USA). One of the authors (ALB) will be and has been paid as a consultant by Zimmer (Warsaw, IN, USA) for purposes of education and training in knee arthroplasty.

Background: Achieving optimal prosthesis alignment during total knee arthroplasty (TKA) is essential. Imageless computer-assisted surgery (CAS) is developed to improve knee prosthesis alignment and with CAS it is possible to perform intraoperative alignment measurements. Lower limb alignment measurements are also performed for preoperative planning and postoperative evaluation. A new stereoradiography system, called EOS, can be used to perform these measurements in 3D and thus measurement errors due to malpositioning can be eliminated. Since both CAS and EOS are based on 3D modeling, measurements should theoretically correlate well. Therefore, objective was to compare intraoperative CAS-TKA measurements with pre- and postoperative EOS 3D measurements.

Methods: In a prospective study 56 CAS-TKAs were performed and alignment measurements were recorded two times: before bone cuts were made and after implantation of the prosthesis. Pre- and postoperative coronal alignment measurements were performed using EOS 3D. CAS measurements were compared with EOS 3D reconstructions. Measured angles were: varus/valgus (VV), mechanical lateral distal-femoral (mLDFA) and medial proximal tibial angle (mMPTA).

Results: Significantly different VV angles were measured pre- and postoperatively with CAS compared to EOS. For preoperative measurements, mLDFA did not differ significantly, but a significantly larger mMPTA in valgus was measured with CAS.

Conclusions: EOS 3D measurements overestimate VV angle in lower limbs with substantial mechanical axis deviation. For lower limbs with minor mechanical axis deviation as well as for mMPTA measurements, CAS measures more valgus compared to EOS. Results of this study indicate that differences in alignment measurements between CAS measurements and pre- and postoperative EOS 3D are mainly due to the difference between weight bearing and non-weight bearing position and potential errors in validity and reliability of the CAS system. Surgeons should be aware of these measurement differences and the pitfalls of both measurement techniques.

Level of evidence: IIb

Notes:

CAN MAGNETIC RESONANCE IMAGING (MRI) SCANS BE USED TO DETERMINE PRE-OPERATIVE KNEE ALIGNMENT IN PATIENTS WITH OSTEOARTHRITIS?

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Background: Recent studies have suggested that full-limb radiographs are more accurate and sensitive than short film radiographs for pre-operative measurement of the anatomical angles required to achieve optimal knee alignment in Total Knee Arthroplasty (TKA). However, there are drawbacks associated with their use including excess radiation to the pelvic organs, the need for specialised radiography equipment and increased cost. Given these drawbacks, we compared the use of MRI scans, a commonly performed pre-operative investigation, with short film knee radiographs for measurement of knee alignment.

Objective: To investigate whether knee alignment measurements made on MRI scans correlate with those measured on short film knee radiographs in patients with osteoarthritic knees.

Methods: We retrospectively reviewed short film knee radiographs and MRI scans of 50 patients with knee osteoarthritis. The plain radiographs had to be performed whilst weight bearing. The MRI scans were performed supine and non-weight bearing. The exclusion criteria included previous trauma to the knee, previous TKA and previous fracture of the lower limb. 4 angle measurements defined by The American Knee Society (4): alpha, beta, sigma and gamma were measured using each of the 2 modalities. Kolmogorov-Smirnov and two- tailed paired t-tests were used for statistical analysis of the results. Pearson correlation coefficient was used for the measure of dependence.

Results: The alpha, beta, sigma and gamma angles obtained using the MR images were different to those obtained using short film weight bearing knee radiographs by -3°± 1° ($p < 0.001$), 1° ± 3° ($p=0.002$), 1° ± 3° ($p=0.047$) and 1° ± 4° ($p=0.113$) respectively. There was a weak correlation between the MRI based method and the radiographic method in measuring all 4 angles.

Conclusions: Our results have shown that the angular measurements performed on MR images should be interpreted with caution as they may vary depending on the MRI slice selected for evaluation. The differences observed and the weak correlation between the 2 modalities may be due to the different scopes used for determining the femoral or tibial axes. The measurements obtained using the plain radiographs were interpreted using a single 2D projection of a 3D structure. However, the measurements of the MR images were evaluated using a 2D image of a slice through a 3D structure. In conclusion, the use of MRI scans for pre-operative planning in TKA may not be advisable at this stage as the angular measurements obtained using the MR images were poorly correlated to those obtained using plain radiographs.

Notes:

WHAT FACTORS AFFECT PATIENT DECISION-MAKING IN KNEE REPLACEMENTS?

Timothy Barlow, Damian Griffin, Pat Scott, Alba Realpe

Background: Knee replacement surgery is currently facing three dilemmas: a high dissatisfaction rate; increasing demand with financial constraints; and variation in utilisation. A patient centred approach, usually achieved through shared decision-making, has the potential to help address these dilemmas. However, such an approach requires an understanding of the factors involved in patient decision-making.
This is the first study examining decision-making in knee replacements that includes patients at different stages of decision-making – this is critical when considering decision-making as a process.
We base our findings in a theoretical model, proposed by Elwyn et al, that highlights the distinction between deliberation and decision-making, and propose modifications to this model specific to knee replacement decision-making.

Methods: This study used two focus groups of six patients each and in-depth interviews with 10 patients to examine the factors that affect patient decision-making and their interaction at different points in the decision-making process. A qualitative analysis of themes, based on a constant comparative method, is used to analyse the data. This study was approved by the Dyfed Powys Research Ethics Committee (13/WA/0140).

Results: We describe 10 themes that affect patient deliberation over the decision: decision-making style; coping strategies; expectation of outcome; decision-making stress; personal situation; preferred model of care; trust in doctor; sources of information; mental state; and loss of control. We add to Elwyn's model by demonstrating the boundary between deliberation and decision-making is the decision-making threshold.

Conclusion: This study provides increased detail on a theoretical model that can be used to describe decision-making, and an understanding of the factors that affect decision-making for patients considering knee replacement. Such an understanding will aid patient centred care, and has particular relevance in developing interventions aimed at delivering information. This is likely to affect the satisfaction rate, demand, and utilisation of knee replacements.

Level of evidence: 4

Notes:

DOES MALALIGNMENT AFFECT OUTCOME FOLLOWING KNEE REPLACEMENT: A SYSTEMATIC REVIEW.

M. Hadi, T. Barlow, I. Ahmed, M. Dunbar, D.Griffin

INTRODUCTION: Total Knee Replacement (TKR) is an effective treatment for knee arthritis. One long held principle of TKRs is positioning the components in alignment with the mechanical axis to restore the overall limb alignment to 180°±3°. However, this view has been challenged recently. Given the high number of replacements performed, clarity on this integral aspect is necessary. Our objective was to investigate the association between malalignment and outcome (both PROMs and revision) following primary TKR.

METHOD: A systematic review of MEDLINE, CINHAL, and EMBASE was carried out to identify studies published from 2000 onwards. The study protocol including search strategy can be found on the PROSPERO database for systematic reviews.

RESULTS: From a total of 2107 citations, 18 studies, comprising of 2,214 patients, investigated the relationship between malalignment and PROMs. Overall 41 comparisons were made between a malalignment parameter and a PROM. Eleven comparisons (27%) demonstrated an association between malalignment and worse PROMs, with 30 comparisons (73%) demonstrating no association.
Eight studies investigated the relationship between malalignment and revision. Four studies found an association between a measure of coronal alignment and revision rate, with four not demonstrating an association. Only one study examined axial and sagittal alignment and found an association with revision rates.

CONCLUSION: When considering malalignment in an individual parameter, there is an inconsistent relationship with outcome. Malalignment may be related to worse outcome, but if that relationship exists it is weak and of dubious clinical significance. However, this evidence is subject to limitations mainly related to the methods of assessing alignment post operatively and by the possibility that the premise of traditional mechanical alignment is erroneous. Larger longitudinal studies with a standardised, timely, and robust method for assessing alignment outcomes are required.

LEVEL OF EVIDENCE: 2a

Notes:

REGENERATION
1

BONE TURNOVER MARKERS IN NONUNIONS TREATED WITH EXPANDED AUTOLOGOUS CELL THERAPY

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Background: Delayed bone healing and nonunion are complications of long bone fractures, with prolonged pain and disability. Regenerative therapies employing mesenchymal stromal cells (MSC) and/or bone substitutes are increasingly applied to enhance bone consolidation. Within the REBORNE project, a multi-center orthopaedic clinical trial was focused on the evaluation of efficacy of expanded autologous bone marrow (BM) derived MSC combined with a CaP-biomaterial to enhance bone healing in patients with nonunion of diaphyseal fractures. To complement the clinical and radiological examination of patients, bone turnover markers (BTM) were assayed as potential predictors of bone healing or non-union.

Methods: Bone-specific alkaline phosphatase (BAP), C-terminal-propeptide type I-procollagen (PICP), osteocalcin (OC), β-Cross-Laps Collagen (CTX), soluble receptor activator of NFkB (RANKL), osteoprotegerin (OPG) were measured by ELISA assays in blood samples of 22 patients at BM collection and at follow-ups (6, 12 and 24 weeks post-surgery).

Results: A significant relationship with age was found only at Visit 6, with an inverse correlation for CTX, RANKL and OC, and positive for OPG. BTM levels were not related to gender. As an effect of local regenerative process, some BTM showed significant changes in comparison to the starting value. In particular, the time course of BAP, PICP and RANKL was different in patients with a successful healing in comparison to patients with negative outcome. The BTM profile indicated remarkable bone formation activity after 12 weeks after surgery. However, the paucity of failed patients in our case series did not allow to prove statistically the role of BTM as predictors of the final outcome.

Conclusion: BTM related to bone cell function are useful to measure the efficacy of a regenerative approach based on expanded MSC.

Level of evidence: Diagnostic Level IV
Work supported by the EC, Seventh Framework Programme (FP7), through the REBORNE Project, grant agreement no. 241879

Notes:

LOW DOSES OF PROTEASOME INHIBITOR, BORTEZOMIB AS A NEW LOCAL TREATMENT AGAINST MULTIPLE MYELOMA-INVIVO

Seemun Ray[2], Ulrich Thormann[1,2], Ursula Sommer[2], Thaqif ElKhassawna[2], Marcus Rhonke[3], Anja Henns[3], Michael Gelinsky[4], Thomas Hanke[5], Reinhard Schnettler[1,2], Christian Heiss[1,2], Volker Alt [1,2]

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Introduction: Multiple Myeloma is a hematological malignancy of terminally differentiated plasma cells associated with increased osteoclast activity and decreased osteoblast functions. Systemic antiproliferative treatment includes proteasome inhibitors such as bortezomib, a clinical potent antimyeloma agent. Local delivery of biological active molecules via biomaterial composite implants to the site of the lesion has been shown to be beneficial for bone and implant-associated infections. In anticancer treatment local delivery of anticancer agents to the neoplasia via biomaterial carriers has never been reported before. The purpose of the current is to present the concepts and the first in vivo results for proteasome inhibitor composite biomaterials for local delivery of bortezomib to proliferative multiple myeloma bone lesions including concentration measurements at different anatomical regions in a rat model.

Methods: 80 female Sprague-Dawley rats were randomized into five different treatment groups (n=16/group): 1) Empty (2) Xerogel-granulat: XG (3) Xerogel-granulat+100mgbortezomib [b]: XG100b (4) Xerogel-granulat+500mgb:XG500b (5) Xerogel-granulat+2500mgb:XG2500b. A 2.5 mm drill hole was then created in the metaphysis of the left femur. The defect was then either filled with the previously mentioned substitutes or left empty to serve as a control. After 4 weeks femora were harvested followed by histological, histomorphometrical and immunohistochemical (BMP2;bone-morphogenic protein 2, OPG;osteoprotegerin, RANKL;Receptor activator of nuclear factor kappa-B ligand, ASMA;alpha smooth muscle actin, ED1;CD68 antibody).TOF-SIMS was used to assess the distribution of released strontium ions. Statistical analysis was done using SPSS software. Data was not found normally distributed and hence Mann-Whitney U with bonferroni correction was used. To avoid type I errors due to unequal variances and group sizes Games-Howell test was also performed.

OSTEOPOROSIS AFFECTS STEM CELL MIGRATION THAT IS AMELIORATED BY CXCR4

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Background: Osteoporosis and bone fractures lead to immobility, chronic pain and high patient care costs. Mesenchymal stem cells (MSCs) from postmenopausal women have a slower growth rate and osteogenic differentiation ability causing lower bone density and reduced fracture healing capacity compared to MSCs from premenopausal women. Cellular movement and relocalization are necessary for many physiologic properties. Local MSCs from injured tissues and circulating MSCs are involved in fracture healing. Cytokines and chemokines such as SDF-1 and its receptor CXCR4 play important roles in maintaining mobilization, trafficking and homing of stem cells from bone marrow to the site of injury. This study investigated the effect of CXCR4 over-expression on the migration of MSCs from ovariectomised, normal and young rats.

Methods: MSCs were harvested from femora of young, normal and OVX rats, genetically modified to over-express CXCR4and put in a Boyden chamber to establish their migration towards SDF-1. This was compared to the non-transfected stem cells.

Results: MSCs from OVX rats migrate less towards SDF1 compared to MSCs from normal and juvenile rats. When the MSCs were differentiated to osteoblasts their migration towards SDF1 reduced as well and this was not enhanced by over-expression of CXCR4. Cell transfected with CXCR4 migrated more towards SDF-1 compared to non-transfected cells irrespective of whether these cells were from OVX, young or normal rats.

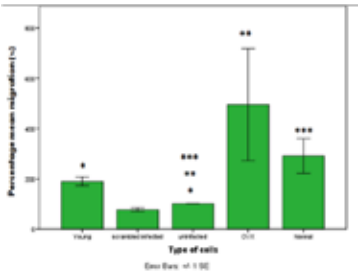

Figure 2: The percentage migration of infected cells normalised against uninfected cells. *, ** and *** represents significance p<0.05.

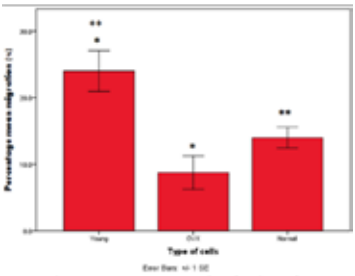

Figure 1: The mean percentage migration of uninfected MSCs from young, normal and OVX rats towards SDF1 in a Boyden chamber. * and ** represents significance p<0.05.

Conclusions: MSCs migration is impaired by age and osteoporosis explaining the significant reduction in bone formation in osteoporotic patients. The migration of stem cells can be ameliorated by up regulating the CXCR4 levels which could possibly enhance fracture healing in osteoporotic patients.

Level of Evidence: IIb

Notes:

ARE OSTEOCYTES INVOLVED IN IMPLANT DEGRADATION AND BONE - IMPLANT ANCHORAGE?

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Objectives: Osteoporosis and osteomalacia lead to increased fracture risk. Previous studies documented dysregulated osteoblast and osteoclast activity, leading to a high-turnover phenotype, reduced bone mass and low bone mineral content. Osteocytes, the most abundant bone cell type, are involved in bone metabolism by enabling cell to cell interaction.
Osteocytes presence and viability are crucial for bone tissue homeostasis and mechanical integrity. Osseo-integration and implant degradation are the main problems in developing biomaterials for systemically diseased bone. This study examines osteocyte localization, morphology and on the implant surface and at the implant bone interface. Furthermore, the study investigates ECM proteins regulation correlated to osteocytes and mechanical competence in an ovariectomized rat model with a critical size metaphyseal defect.

Methodology: After induction of osteoporosis, 60 female Sprague-Dawley rats were randomized into five groups: SrCPC (n=15), CPC (n=15), ScB30 (n=15), ScB30Sr20 (n=15) and empty defect (n=15). The left femur of all animals underwent a 4mm wedge-shaped metaphyseal osteotomy that was internally fixed with a T-shaped plate. The defect was then either filled with the above mentioned implants or left empty. After six weeks, histomorphometric analysis showed a statistically significant increase in bone formation at the tissue-implant interface in the SrCPC group compared to the other groups ($p<0.01$). Osteocyte morphology and networks were detected using silver and staining. ECM proteins were investigated through immunohistochemistry. Cellular populations were tested using enzyme histochemistry. Mineralization was assessed using time of flight secondary ion mass spectrometry (TOF-SIMS). Statistical analysis was performed using Mann Whitney U test with Bonferroni correction.

Results: In the SrCPC and compared to other test groups, osteocytes presence and morphology was enhanced. An increased osteocytic activity was also seen in ScB30Sr20 when compared to SCB30 alone. Local osteomalatic lesions characterized by the presence of excessive unmineralized osteoid as revealed by the VKVG staining in the intact bone was also seen. A regular pattern of osteocytes distribution reflecting a better bone maturation was also seen in case of the Sr substituted cements. Whereas in case of the ScB30 degenerated osteocytes with a comparatively irregular arrangement were seen. Nonetheless, ECM proteins indicating discrepant bone turnover (RANKL, OPG, BMP2, OCN; ASMA) were noticed to increase within these regions and were accompanied by the presence of apoptotic osteocytes. Interestingly, osteocytes were also localized near the blood vessels within the newly formed woven bone. On the other hand, osteocytes allocation at implant bone interface and on the implant surface

were qualitatively better in the Sr substituted groups when compared to the other test groups. Furthermore, this correlates with healing enhancement and implant retention results obtained from the histomorphometry (BV/TV and Osteoclasts count). The first qualitative results of the sclerostin visualization showed a lower expression in the Sr supplemented biomaterials compared to the Sr free ones.

Conclusion: Osteoblasts, osteoclast and osteocytes are the key players to bone metabolism through production and mineralization of ECM or resorption. The current study indicates the importance in therapeutically targeting osteocytes to regulate bone metabolism in osteoporotic /osteomalatic bone. Sr inhibits osteoclast activity which is important for implant degradation. However, in osteoporotic bone osteoclasts inhibition is crucial to enhance the healing. Our data suggest that osteocytes allocation at the bone implant interface and on the implant surface is aiding in implant degradation through osteocytes dependent resorption.
Currently, discrepancies in mechanosensitivity, proliferation and fibrotic tissue formation are being investigated together with several anchorage proteins to quench further effects of osteocyte presence at the implant bone interface

Notes:

EXPANDED AUTOLOGOUS MSCS /BIOMATERIALS IN NONUNIONS: A EUROPEAN CLINICAL TRIAL

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Keywords: MSCs, Long Bone Nonunion, Clinical Trial

Background: Definitive proof is lacking on mesenchymal stem cell (MSCs) cellular therapy to regenerate bone if biological potential is insufficient. High number of MSCs after GMP expansion may solve the progenitor insufficiency at the injury but clinical trials are pending.

Methods: A prospective, multicenter, multinational Phase I/IIa interventional clinical trial was designed under the EU-FP7 REBORNE Project to evaluate safety and early efficacy of autologous expanded MSCs loaded on biomaterial at the fracture site in diaphyseal and/or metaphysodiaphyseal fractures (femur, tibia, humerus) nonunions. The trial included 30 recruited patients among 5 European centres in France, Spain, Germany, and Italy. Safety endpoints (local and general complication rate) and secondary endpoints for early efficacy (number of patients with clinically and radiologically proven bone healing at 12 and 24 weeks) were established. Cultured MSCs from autologous bone marrow, expanded under GMP protocol was the Investigational Medicinal Product, standardized in the participating countries confirming equivalent cell production in all the contributing GMP facilities. Cells were mixed with CE-marked biphasic calcium phosphate biomaterial in the surgical setting, at an implanted dose of 20x106 cells per cc of biomaterial (total 10cc per case) in a single administration, after debridement of the nonunion.

Results: Of 30 recruited patients, 28 patients received the treatment and completed the protocol up to 24 weeks (one case pending at submission). No adverse effects related to cells were detected. Two superficial infections associated to musculoskeletal flaps were solved with antibiotics. Preliminary efficacy results at 3 months confirmed 14 consolidations (out of 27 cases, 52%). At 6 months, 20 consolidations (out of 26 cases, 77%) were confirmed. One failure underwent reoperation at 6 months. One case FU was pending at submission.

Conclusions: Preliminary results confirm safety, feasibility and efficacy at 3 and 6 months with the described procedure.

Level of evidence: II

Notes:

COL1A1, COL5A1 AND GDF5 POLYMORPHISMS, ASSOCIATED WITH ROTATOR CUFF DISEASE

PRESENTING AUTHOR: SONIA VIDAL RODRÍGUEZ.M.D

Background: Rotator cuff disease (RCD) is the most common cause of shoulder pain and limitation of activities in sports and in repetitive work. The aetiology of RCD is not well established. A number of gene pathways are altered in RCD. Polymorphisms in Col1A1, Col5A1 (encoding collagen) and GDF5 (TGF-beta superfamily) can be associated with RCD susceptibility.

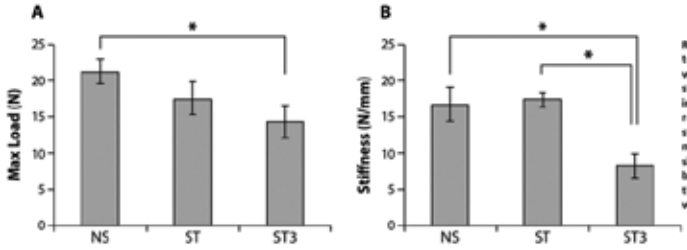
Materials and Methods: Single-nucleotide polymorphisms (SNPs) in Col1A1, GDF5 and Col5A1 were genotyped in a case-control study with 103 RCD patients and 104 controls in Caucasian and African populations who suffered from injuries in any other anatomical location. All patients provided signed informed consent. Sampling was carried out with a puncture of the pad of a finger using a sterile, single-use lancet. NSPs were determined by real-time polymerase chain reaction (PCR) using specific, unique probes with the analysis of the melting temperature of hybrids. The X2 test compared genotypes between groups. Multivariate logistic regression analysed the significance of many covariates and the incidence of RCD.

Results: We found significant differences in subjects who were exposed to heavy physical exertion involving the upper limbs ($p=0.002$). There was a significant difference in the distribution of the three polymorphisms in the GDF5 gene between the two races that were studied, with a higher frequency of TC heterozygotes in Caucasians and TT homozygotes in Africans ($p=0.05$). There were significant differences in the CC (rs143383) polymorphism in the GDF5 gene in patients with RCD ($p<0.04$).

Conclusions: Repeated dose of corticosteroids significantly weakens rat RC. Repeated MTA injections negatively affect bone quality and may deteriorate tendon to bone insertion site. However, data retrieved from animals must be scrupulously analyzed prior to extrapolation to humans. Despite the limitations, our results clearly show a significant detrimental effect of corticosteroid exposure on the injured rat RC tendon biomechanics. These effects should be well thought-out against any potential benefit prior to administering a subacromial corticosteroid injection.

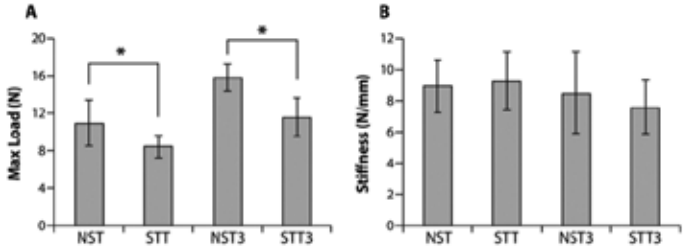
Notes:

Intact RC

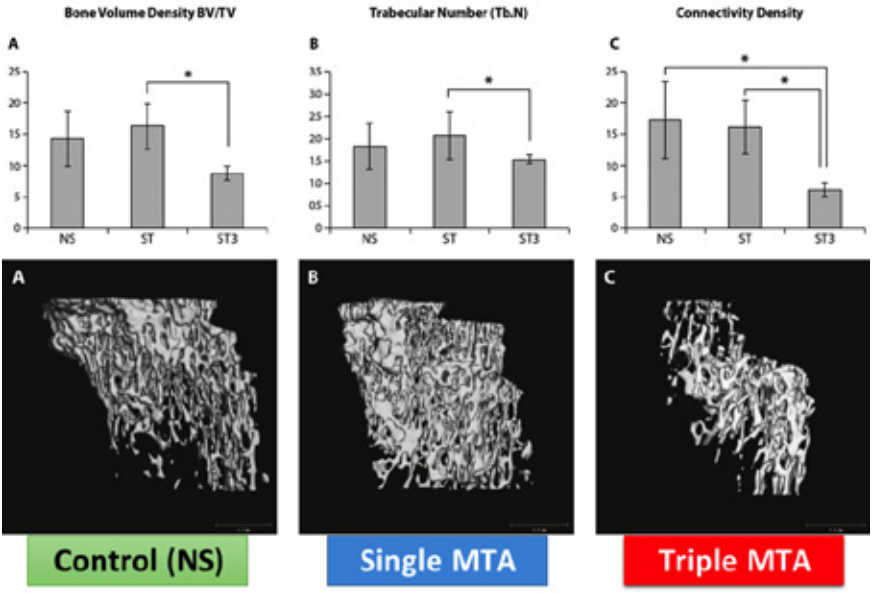


Results of intact RC biomechanical testing. No significant difference was observed between single steroid injection and triple steroid injection groups (p=.533) with regards to RC biomechanical strength. A slight decrease in the maximal load was observed . No significant difference in stiffness between the control groups and the single steroid injection group were observed

Single VS Triple MTA injection in Injured RC



Result of injured RC biomechanical testing. Mean maximal load to failure in the triple steroid injection group was slightly higher than in the single steroid injection group (11.65N VS 8.43N) . Stiffness was slightly lower in the steroids treated group at three weeks (p=0.1)



THE EFFECT OF SUBACROMIAL CORTICOSTERIDS INJECTIONS ON NORMAL AND INJURED ROTATOR CUFF: BIOMECHANICAL AND IMAGING STUDY IN RATS.

Primary Author: Oleg Dolkart
Additional Authors: Yehuda H, Zarfati Y, Brosh T, Chechik O, Maman E.
Abstract Presenter: Oleg Dolkart

Background: The effect of corticosteroids on tendon properties is poorly understood, and current data are insufficient and conflicting. The objective of this study was to evaluate the effects of corticosteroids injection on intact and injured rotator cuff (RC) through biomechanical and radiographic analyses in a rat model.

Methods: 70 rats were assigned to seven groups:1)control - saline injection;2) no tear + single methylprednisolone acetate (MTA) injection; 3) no tear + triple MTA injection; 4) tear + single saline injection; 5) tear + single MTA injection; 6) tear+ triple saline injections; 7) tear+ triple MTA injections. Triple injections were repeated once a week. Following unilateral supraspinatus (SSP) injuries, MTA was injected subacromialy. Rats were sacrificed 1 week after last injection. Shoulders were harvested, grossly inspected, SSP was evaluated biomechanically. Bone density at the tendon insertion site on the greater tuberosity (GT) were assessed with micro-computed tomography (CT).

Results: Exposure of the intact RC to the triple MTA injection resulted in significant decrease in maximal load and stiffness as compared to control group ($p<0.05$). In the injured tendons, at three week, steroids treated group presented with a significantly lower maximal load compared to the saline treated rats ($p<0.01$). Stiffness was slightly lower in the steroids treated group at three weeks ($p=0.1$). Micro-CT analysis showed significantly lower GT volume fraction and connectivity density in undamaged rats following triple MTA injection.

Conclusions: Repeated dose of corticosteroids significantly weakens rat RC. Repeated MTA injections negatively affect bone quality and may deteriorate tendon to bone insertion site. However, data retrieved from animals must be scrupulously analyzed prior to extrapolation to humans. Despite the limitations, our results clearly show a significant detrimental effect of corticosteroid exposure on the injured rat RC tendon biomechanics. These effects should be well thought-out against any potential benefit prior to administering a subacromial corticosteroid injection.

Notes:

TENDON REATTACHMENT USING DEMINERALIZED BONE MATRIX AND MESENCHYMAL STEM CELLS

Tanujan Thangarajah, Catherine J Pendegrass, Shirin Shahbazi, Simon Lambert, Susan Alexander, Gordon W Blunn.

Disclosures: Funded by IKC PoC grant awarded by the University of Leeds
Ethical approval: Granted by the study institution (University College London)

Background: Re-attachment of tendon to bone is challenging with surgical repair failing in up to 90% of cases. Poor biological healing is common and characterised by the formation of weak scar tissue. Previous work has demonstrated that decellularised allogenic demineralised bone matrix (DBM) regenerates a physiologic enthesis. Xenografts offer a more cost-effective option but concerns over their immunogenicity have been raised.

We hypothesised that augmentation of a healing tendon-bone interface with DBM incorporated with autologous mesenchymal stem cells (MSCs) would result in improved function, and restoration of the native enthesis, with no difference between xenogenic and allogenic scaffolds.

Methods: Using an ovine model of tendon-bone retraction the patellar tendon was detached and a complete distal tendon defect measuring 1 cm was created. Suture anchors were used to reattach the shortened tendon and xenogenic DBM + MSCs (n=5) and allogenic DBM + MSCs (n=5) were used to bridge the defect. Functional recovery was assessed every 3 weeks and DBM incorporation into the tendon and its effect on enthesis regeneration was measured using histomorphometry.

Results: By 12 weeks, DBM augmentation resulted in significantly improved functional weight bearing with no failures in either group. Compared to xenogenic DBM, allogenic DBM was associated with significantly higher functional weight bearing at 6 (P=0.047), 9 (P=0.028) and 12 weeks (P=0.009). This was accompanied by a more direct type of enthesis characterized by significantly more fibrocartilage and mineralized fibrocartilage. Xenograft was also associated with an immunogenic reaction despite preoperative decellularisation.

Conclusion: This study shows that DBM enhances tendon-bone healing and may reduce the high failure rates associated with surgery. An immunogenic reaction, and inferior biomechanical and histological results were also associated with the use of xenograft.
Allogenic DBM with autologous MSCs may be a suitable scaffold for the enhancement of tendon-bone healing in the clinical setting.

Notes:

THE EFFECT OF SCOLIOSIS IMPLANT DESIGN PARAMETERS ON WHOLE SPINE MECHANICAL BEHAVIOR

Arts JJ[1-2], Hazrati Marangalou J[1], Meijer G[3], Ito K[2], van Rietbergen B[2], Homminga JJ[3].

[1] Department of Orthopaedic Surgery, Research School CAPHRI, Maastricht University Medical Centre, the Netherlands
[2] Department Orthopaedic Biomechanics, Eindhoven University of Technology (TU/e), the Netherlands
[3] Department Biomechanical Engineering, Twente University, the Netherlands

Background: Finite element (FE) models have become a standard pre-clinical tool to study biomechanics of spine and are used to simulate and evaluate different strategies in scoliosis treatment: examine their efficacy as well as the effect of different implant design parameters. The goal of this study is to investigate, in a system of rods and laminar wires, the effect of the number of wires and their pre-stress on whole spine stiffness.

Methods: A generic FE model was developed to represent a full human spine, including vertebrae, intervertebral discs, ligaments, facet and costovertebral joints, and ribcage. Intervertebral discs were modeled with 3D rebar elements with linear elastic material properties. Vertebrae, ribs, sternum, facet joints, cartilage and endplates were modeled with brick elements, and costal muscles with shell elements with linear elastic properties. Furthermore, ligaments were modeled with truss elements with nonlinear hypo-elastic properties. The spine model was instrumented from T7 to T12 with rods and wires modeled as titanium. Nonlinear contact properties were defined for rib neck-vertebra, transverse processes-rib and facet joint sets. The FE model was loaded in flexion and the whole spine instantaneous stiffness was calculated for different wire pre-stressing levels (0.1 to 2 MPa). Similar analyses were performed with changed numbers of wires and whole spine stiffness was calculated.

Results: The results show that with increasing the pre-stress level the whole spine instantaneous stiffness increases by up to 6%. Reducing the number of wires decreases the whole spine stiffness almost linearly by 5%. These changes also alter center of rotation of the spine. The results suggest that pre-stressing and number of wires have an effect on whole spine stiffness.

Conclusions: In summary, the develop FE model can be used to simulate different treatment strategies and to improve implant designs used in surgical treatment of scoliosis.

Level of evidence: FEA study

Notes:

HIP 3

IMPACT AND PREFERENCE FOR TREATMENT OF INFECTION AFTER JOINT REPLACEMENT

Authors: Andrew Moore, Rachael Gooberman-Hill

Background: Around 1% of patients who have hip replacement have deep prosthetic joint infection afterwards. Infection is treated with antibiotics and revision surgery. We aimed to characterise the impact of deep joint infection and its treatment, to identify treatment preferences, and to describe surgeons' treatment decisions.

Methods: In a qualitative study in the UK we interviewed 19 patients who had infection after hip replacement and 12 orthopaedic surgeons specialising in infection. Face-to-face interviews with patients explored experience of infection, treatment and recovery. Interviews with surgeons explored treatment decisions. With consent, interviews were audio-recorded, transcribed and anonymised. Once imported into QSR NVivo software, data were analysed using constant comparison.

Results: Patients with deep joint infection described mobility loss, pain, loss of valued activities, changes to home environments/moving into care, negative impact on personal relationships and financial strain. Physical and psychological trauma was associated with revision surgery and antibiotic treatment. Patients had strong preferences for treatment options, emphasising impact of surgery, side effects of antibiotics and duration of treatment as key considerations. Although eradication of infection was important, patients felt that reducing impact of treatment was high priority and identified a need for more support. Surgeons' treatment decisions focused on patient characteristics and nature of infection to prioritise eradication of infection. During patients' recovery surgeons' were concerned about possible return of infection and patients' mobility and function.

Conclusion: Infection after joint replacement causes physical and psychological trauma. Balancing patients' preferences for reducing impact of treatment with surgeons' emphasis on eradication of infection should be an important consideration in care. There is also need to develop new interventions to support patients with infection.

Level of evidence: Level 3 – Qualitative Research

Funding statement: This paper presents independent research funded by the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research scheme (grant number: RP-PG-1210-12005). The views expressed in this publication are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

Ethics: This study has been given a favourable opinion for conduct in the NHS by the National Research Ethics Service Committee South West – Exeter 14/SW/0072

REST AND MOVEMENT PAIN HIP AND KNEE REPLACEMENT

Adrian Sayers[1*], Vikki Wylde[1*], Erik Lenguerrand[1], Andrew Beswick[1], Rachael Gooberman-Hill[1], Mark Pyke[2], Paul Dieppe[3], Ashley W Blom[1]
[1]Musculoskeletal Research Unit, School of Clinical Sciences, University of Bristol, Southmead Hospital, Westbury on Trym, Bristol, BS10 5NB, UK
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* Authors contributed equally to this work

Approvals: The APEX trials were registered as an International Standardised Randomised Controlled Trial(96095682), approved by Southampton and South West Hampshire Research Ethics Committee(09/H0504/94) and all participants provided informed written consent.

Objective: There is limited information about the extent to which the association between pre-operative and chronic post-operative pain is mediated via pain-on-movement or pain-at-rest. We explored these associations in patients undergoing total hip (THR) and total knee (TKR) replacement.

Methods: 322 and 316 patients receiving THR and TKR respectively were recruited into in a single centre UK cohort (APEX) study. Pre-operative, acute post-operative and 12-month pain severity was measured using self-reported pain instruments. The association between pre-operative / acute pain and chronic post-operative pain was investigated using structural equation modelling (SEM).

Results: Patients with high levels of pre-operative pain were more likely to report chronic pain after THR ($\beta=0.195$; $p=0.02$) and TKR ($\beta=0.759$; $p<0.0001$). Acute post-operative pain-on-movement was not associated with chronic pain after TKR or THR after adjusting for pre-operative pain, however acute pain-at-rest was associated with chronic pain after THR ($\beta=0.20$; $p<0.0002$) but not TKR after adjusting for pre-operative pain. Analysis of pain-at-rest and pain-on-movement highlighted differences between THR and TKR patients. Chronic pain after THR was weakly associated with pain-at-rest during the pre-operative ($\beta=0.11$; $p=0.068$) and acute post-operative period ($\beta=0.21$; $p<0.0001$). In contrast, chronic-pain after TKR was strongly associated with the severity of pain-on-movement during the pre-operative period ($\beta=0.51$; $p=0.001$).

Conclusions: SEM illustrated the different patterns of association between measures of pain over time in patients undergoing THR and TKR for osteoarthritis. These findings highlight the importance of future work which explore the mechanisms underlying pain-on-movement and pain-at-rest.

Level of Evidence: 2

Notes:

DO COBALT AND CHROMIUM PRODUCTS AFFECT THE FORMATION OF AN EXTRACELLULAR MATRIX?

Hayley Floyd[1] , Janet Lord[2], Edward Davies[3], Owen Addison[4], and Liam Grover[1]
[1]School of Chemical Engineering, University of Birmingham, UK,
[2]Centre for Translational Inflammation Research, University of Birmingham, UK
[3]Royal Orthopaedic Hospital, Birmingham, UK
[4]School of Dentistry, University of Birmingham, UK

Background: Investigations into the response to implant debris tend to concentrate on how a population of cells proliferate in the presence of implant material, and how the regulation of cytokines change. For the problem of cobalt-chromium (CoCr) implants this has been done for osteoblasts and osteoclasts to understand how bone resorption, leading to aseptic loosening, is occurring. However, investigating the formation of the extracellular-matrix (ECM) may give a better indication of the mechanisms occurring. ECM is excreted from cells and is important for adhesion, structure, signaling and growth. Type I collagen is the most abundant protein in the ECM and is known to direct tissue development and is therefore a key part of understanding the mechanism behind aseptic loosening.

Methods: 3T3-fibroblasts were seeded in Dulbecco's Modified Eagle Medium (DMEM) and supplemented with 100mM ascorbic acid. Every 48hours cells were fed with DMEM and doped with Co and Cr ions until fixation. Sirius Red dye was used to bind to the type I collagen, then removed using NaOH and analyzed using UV absorption to show relative amounts of collagen.
Type I collagen gel was formed in the presence of Co and Cr ions with and without DMEM and the fibers were imaged using AFM.

Results and Conclusions: Studies show a decrease in the collagen output of 3T3-fibroblasts with increasing concentration of Co ions, and low concentrations of Cr ions. Precipitation was also seen for Cr ions in the presence of DMEM which may explain the reduced effect of higher concentration of Cr ions in comparison to Co ions.
Co and Cr ions do influence the ECM which will affect the bone re-modelling process. Further work will be performed to link these results to mineralization mechanisms to quantitatively determine the impact of metal ion debris on the ECM and collagen fiber formation.

Notes:

SELF-REPORTED SYSTEMIC COMPLAINTS IN PATIENTS WITH METAL-ON-METAL HIP ARTHROPLASTY

J. Jelsma, R. Senden, M. Schotanus, N. Kort, B. Grimm, I. Heyligers

Background: The second generation metal-on-metal (MoM) prosthesis of the hip became a worldwide success in the 90s. However, after the placement of a MoM prosthesis the cobalt ion concentrations raise significantly. This may lead to systemic complaints and even cobalt toxicity.

Methods: Sixty-one patients (26F/35M) with both an unilateral and bilateral resurfacing or large-head MoM (LHMoM) hip prosthesis were included. At last follow-up (5.77 ± 1.57 yrs) cobalt concentrations in the blood were determined by ICP-MS. Based on the known cobalt toxicity symptoms we developed a non-validated questionnaire. Analysis was done on two groups; a low cobalt concentration group and a high cobalt concentration group. We used 170 nmol/L as the upper limit of well functioning prosthesis as defined by the Dutch Orthopaedic Society (NOV). Independent samples T test and Pearson correlation coefficient were done.

Results: In 61 patients, 70 prosthesis were implanted: 44 resurfacings and 26 LHMoM. Mean cobalt and chromium ion concentrations were 110 ± 138 (9 – 833) and 104 ± 138 (6 – 592) nmol/L. The low cobalt concentration group consisted of 52 patients, while the high cobalt concentration group consisted of 9 hips. With respect to the systemic complaints, the subjects in the high or low group reported no significant differences. A trend towards more complaints with visual problems (75% vs 51.9%, P = .089) and dizziness (62.5% vs 38.9%, P = .098) was notable in the high cobalt concentration group.

Conclusions: Metal on metal hip arthroplasty stays controversial for the possible side-effects. This study shows trends, but no significance, in systemic complaints from high cobalt ion concentrations. Complaints of neuro-ocular toxicity are most common. This is in correspondence with other literature, although the upper limit for cobalt ion concentrations remains uncertain.

Level of Evidence: 2b

Disclosure: no financial or nonfinancial relationships to disclose.

Notes:

STUDY OF BIOMECHANICAL SCREW PURCHASE PERFORMANCES OF FIVE TYPES OF CORTICAL SCREWS: AN INNOVATIVE MEASUREMENT METHOD

Ahmet Karakaşlı, Mehmet Hilal Özcanhan, Ahmet Karaaslan, Ramadan Özmanevra, Fatih Ertem, Didem Venüs Yıldız

Disclosure: The authors declare that no conflict of interests were associated with the present study.

Background: Femur fracture fixation systems depend on the stability of the supporting cortical screws, inside the host bone. Only a few works have studied the stability of cortical screws in femur shafts and compared their results with previous studies.

Methods: In present study, five different cortical screw types are assessed using artificial femurs, under equated testing conditions. The maximum force needed to cause screw-bone inter face failure was measured, for each screw type by pullout tests. The obtained results were normalized according to traditional methods and cross-compared. The best performer was searched for and the effect of screw dimensions on the screw performance was investigated. To make the pullout tests solely dependent on screw dimensions, the effect of the bicortical bone thickness was eliminated by equating the conditions of screw insertion.

Results: Evaluation of the test results proved that the non-locking screws with larger diameter and pitch depth required larger pullout forces to be extracted, thus showed statistically superior performance compared to locking screws with smaller dimensions. However, the observed statistical differences between the absolute pullout forces were diminished, after the traditional normalization of the results. But, traditional normalization was challenged due to its known short comings. A new normalization method was proposed based on a solid geometric reasoning, which is supported by true observations.

Conclusion:This novel approach showed that a screw type that appeared to show average performance; in fact, did not have significantly different results than the top performers. The outcome of the comparisons pointed out that surgeons are not obliged to prefer larger dimension screws, in small dimension host bones.

Level of Evidence: Level 5

Notes:

EFFECT OF HIP IMPLANT POSITIONING ON EDGE-LOADING OCCURRENCE AND SEVERITY

Oscar O'Dwyer Lancaster-Jones[1], Mazen Al-Hajjar[1], Jonathan Thompson[1,2], Graham Isaac[1,2], John Fisher[1]
[1]Institute of Medical and Biological Engineering, School of Mechanical Engineering, University of Leeds, Leeds, UK
[2]DePuy Synthes Joint Reconstruction, Leeds, UK

Background: Many factors contribute to the occurrence of edge-loading conditions in hip replacement; soft tissue tension, surgical position, patient biomechanical variations and type of activities, hip design, etc. The aim of this study was to determine the effect of different levels of rotational and translational surgical positioning of hip replacement bearings on the occurrence and severity of edge-loading and the resultant wear rates.

Method: The Leeds II Hip-Joint Simulator and 36mm diameter alumina matrix composite ceramic bearings (BIOLOX® delta, DePuy Synthes, UK) were used in this study. Different levels of mismatch between the reconstructed rotational centres of the head and the cup were considered (2, 3 and 4mm) in the medial-lateral axis. Two cup inclination angles were investigated; an equivalent to 45° and 65° in-vivo, thus six conditions (n=6 for each condition) were studied in total with three million cycles completed for each condition. The wear of the ceramic-on-ceramic bearings were determined using a microbalance (Mettler Toledo, XP205, UK) and the dynamic microseparation displacement was measured using a Liner Variable Differential Transformer.

Results: When a translational joint centre mismatch was coupled with a higher cup inclination angle, the severity of edge-loading increased when compared with the effect of those variables applied individually. Increasing the medial-lateral joint centre mismatch from 2 to 3 to 4mm resulted in increased wear rates under both cup inclination angles (Figure 1), with the 65° cup inclination angle having significantly higher wear rate than the cup inclination angle of 45° ($p=0.02$, $p=0.02$, and $p<0.01$ respectively).

Conclusion: The cups with a 45° inclination angle showed greater resistance to dynamic microseparation as a result of joint centre mismatch. This study demonstrated that optimal position should not only consider the rotational position of the acetabular cup but also the relative centres of rotation of the head and the cup.

Disclosure: John Fisher is a paid consultant to DePuy Synthes. Jonathan Thompson and Graham H. Issac are employees at DePuy Synthes.

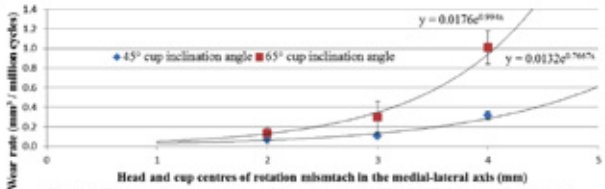

Figure 1: The mean wear rates (±95% confidence limits, n=6) of BIOLOX® delta ceramic-on-ceramic bearings under two cup inclination angle conditions (45° and 65°) for the different levels of mismatch between the centres of rotation of the head and the cup (2, 3 & 4mm).

Notes:

COMPARABLE BLOOD LOSS AFTER THA WITH DABIGATRAN, ENOXAPARIN AND RIVAROXABAN

Marcin Krzysztof Wasko, Konstancja Bobecka, Wesolowska, Ines Pokrzywnicka & Gajekn & Jacek Kowalczewski
Presented by Marcin Krzysztof Wasko

Background: Hitherto, no study has compared blood loss (BL) after different thromoprophylactic regimes (TR). The objective of this study was to quantify and compare BL in total hip arthroplasty (THA) under three different TRs.

Methods: Between September 2013 and July 2014, sixty primary, unilateral, same-implant THAs entered a randomized, double-blind clinical trial. The patients were randomized to receive manufacturers' recommended doses of enoxaparin, dabigatran or rivaroxaban. Complete blood counts were obtained preoperatively and on the third day postoperatively. BL was calculated according to the Nadler formula. We also evaluated the occurence of wound healing disturbances (WHDs). All data were analysed using R statistical software.

Results: The mean BL and standard deviations were 844 ± 222 ml for enoxaparin, 854 ± 205 ml for dabigatran and 806 ± 227 ml for rivaroxaban. The BL did not significantly differ between groups (Kruskall-Wallis, p=0.92). More WHDs occured in the rivaroxaban group (5/20), compared to enoxaparin (2/20) and dabigatran (3/20).

Conclusions: None of the chemical TR is superior to others in terms of reducing the BL. There seems to be more WHDs with the use of oral agents - this finding needs further studies.

Level of evidence: 1b (Centre for Evidence Based Medicine, Oxford)

Approval: This study was approved by The Medical Centre of Postgraduate Education Ethical Committee. Disclosure: The authors disclose no competing interests.

Notes:

LONG-TERM OUTCOME FOLLOWING ACETABULAR FRACTURES ASOSSICATED WITH POSTERIOR HIP DISLOCATION

Seng Juong Wong, J.Nicholson, I. Ahmed, A. Ning & J. F. Keating
Presented by Seng Juong Wong

Background: Acetabular fractures occur as a result of high-velocity trauma and are often associated with other life threatening injuries. Approximately one-third of these fractures are associated with dislocation of the femoral head but there are only few studies documenting the long term outcomes of this group of acetabular fracture.

Methods: This was undertaken at the Royal Infirmary of Edinburgh which provides the definitive orthopaedic treatment for all major trauma including all acetabular fractures for the South East of Scotland. We retrospectively reviewed patients who sustained an acetabular fracture associated with a posterior hip dislocation from a prospectively gathered trauma database between 1990 to 2010. Patient characteristics, complications and the requirement for further surgery were recorded. Patient outcomes were measured using the Oxford Hip score and Short Form SF-12 health survey.

Results: A total of 99 patients were treated over a 24 year period. The mean age was 41.3 years. The majority were male (75%). Road traffic accidents were the most common mechanism of injury (47%). The most common Letournal & Judet classification was a posterior wall fracture. Complications such as Sciatic Nerve Palsy was 12.1%, DVT 3%, Infection 5%, Heterotopic ossification 6.1%, Avascular necrosis at 11.1% and 19.2% went on to have a total hip replacement. The mean Oxford Score for Native hip was 34.7 and 31.8 for those who converted to hip replacement. SF12 Physical score was was 40.3 and 39 for the native hips and converted hips respectively. And the SF12 Mental score was 45.5 and 44.9 for the native hips and converted hips respectively.

Conclusions: This is the first study to present the long term outcomes following an acetabular fracture dislocation. Our study suggests there is considerable disability in this group of patients and the requirement for subsequent THR has inferior patient reported outcomes.

Level of Evidence: Cohort study, Level 2B

Notes:

INACCURACIES IN DATA SUBMITTED TO THE NATIONAL HIP FRACTURE DATABASE

Duncan Cundall-Curry, John E Lawrence
Orthopaedic department, Addenbrooke's Hospital, Hills road, Cambridge, UK. CB2 OQQ

Background: Since it's establishment in 2007, the National Hip Fracture Database [NHFD] has been the key driving force in improving care for hip fracture patients across the UK. It has facilitated the setting of standards to which all musculoskeletal units are held, and guides service development to optimise outcomes in this group of patients.
As with any audit, the ability to draw conclusions and make recommendations for changes in practise relies on the accuracy of data collection. This project aimed to scrutinise the data submitted to the NHFD from a Major Trauma Centre [MTC], focusing on procedure coding, and discuss the implications of any inaccuracies.

Method: The authors performed a retrospective analysis of all procedure coding data entered into the NHFD from July 2009 to July 2014 at Cambridge University Hospitals NHS Foundation Trust. We examined 1978 cases for discrepancies, comparing procedure codes entered into the NHFD with post-procedure imaging and operative notes.

Results: The procedure coding data submitted to the NHFD was highly inaccurate, with incorrect procedure codes in 24%of the 1978 cases reviewed. In particular, coding of cemented total arthroplasty and cemented bipolar hemiarthroplasty, with coding errors in registry data of 42% and 39% respectively. Of the 67 THRs performed only 52% were correctly coded for, and only 626 of the 915 hemiarthroplasties (68%). 16% of cannulated hip screws actually underwent primary arthroplasty.

Conclusions: This study highlights the inaccuracy of coding data entered into the NHFD from a Major Trauma Centre, with data on arthroplasty being particularly inadequate. The unreliability of procedure data leaves us unable to evaluate surgical treatment strategies using the NHFD. This has worrying implications for standard setting, service development and, consequently, patient care.

Level of evidence: 2c

Notes:

INSERTING FEMORAL STEMS SLOWLY GENERATES HIGH CEMENT PRESSURES FOR LONGER

Goubran, A. McHale, S. Steinlechner, CWB.

Background: Aseptic loosening of cemented femoral stems results from migration of wear particles along the bone-cement interface, producing a foreign body reaction. After cement insertion, blood back pressure can disrupt the bone-cement interface, enabling this spread of wear particles. Our study investigates whether altering timing and speed of stem insertion can reduce this risk.

Methods: We inserted mock "C-Stem" femoral components (De Puy-Synthes), using Smartset HV cement (De Puy-Synthes) into artificial femora, fitted with proximal and distal pressure transducers. Cement insertion began two, three or four minutes after mixing. Cement pressures were then allowed to settle for one minute and the stems were then inserted over durations of 25, 60 or 90 seconds.

Results: Quicker insertion led to high peak pressures; however insertion over 90 seconds at 4 and 5 minutes achieved more sustained pressures above blood back pressure. Slower insertion particularly improved proximal pressurisation. Furthermore when the stem was inserted over 90 seconds at 5 minutes then the cement pressures remained high after full insertion of the stem.

Conclusions: Commonly, femoral stems are inserted rapidly. Our study demonstrates that by inserting the femoral stem more slowly, cement pressure can be maintained above blood back-pressure for longer. We believe that after slower stem insertion, the higher cement viscosity enables the surgeon to maintain cement pressure, via the stem, sufficient to resist blood back pressure without inadvertently over inserting the stem. This safe and simple modification of cementing technique generates higher and more sustained cement pressures.

Level of evidence: 3

Disclosures: Depuy-Synthes kindly provided the equipment used in the study. None of the authors received any payment or other benefits.

Notes:

HOSPITAL VARIATION IN ALLOGENEIC TRANSFUSION AND LENGTH OF STAY IN PRIMARY ELECTIVE HIP AND KNEE ARTHROPLASTY

Authors: V.M.A. Voorn, P.J. Marang- van de Mheen, A. van der Hout, T.P.M. Vliet Vlieland, R.G.H.H. Nelissen, L. van Bodegom - Vos

Backgroud: Allogeneic transfusion rates after primary hip and knee arthroplasty are used as quality indicators for hospitals, but hospital comparisons may be hampered by low event rates. Extended hospital stay is often used and may be more suitable as an alternative. This study aims to assess whether transfusion rates and extended hospital stay can be used to reliably rank hospitals.

Methods: We used the baseline data from the LISBOA implementation trial, where data on patient characteristics and outcomes were collected in a sample of approximately 100 patients undergoing elective primary total hip or knee arthroplasty for each of the 23 participating hospitals. We calculated the reliability of ranking (Rankability) of transfusion rates and extended hospital stay (> 4 postoperative days), using fixed and random effects logistic regression analysis, by dividing the between-hospital variation to the sum of within and between-hospital variation. Rankability thus shows which part of the hospital differences are true differences and not due to random variation.

Results: 1163 total hip and 986 total knee procedures were assessed. After adjustment for patient characteristics the odds ratio (OR) of receiving a transfusion in a hospital after total hip ranged from 0.72 to 1.38 and from 0.30 to 3.30 in total knee. Rankability was 17% for hip and 36% for knee arthroplasty, meaning that only 17% and 36% are true hospital differences. Larger hospital variation was found for extended hospital stay (OR range [0.28-3.51] for hip and [0.10-9.95] for knee arthroplasty), and better rankability (see table).

Conclusion: Although allogeneic transfusion rates are useful for monitoring quality within hospitals, they should not be used for ranking hospitals. A large proportion of differences in transfusion rates between hospitals is due to random variation, suggesting that this outcome is not suitable for ranking hospitals contrary to extended hospital stay.

Level of evidence: Level 2

Financial disclosure: This study was funded by a grant from The Netherlands Organisation for Health Research and Development and by a grant from Sanquin Blood Supply

Conflict of interest: The authors declare that there are no conflicts of interest

Approval: The Medical Ethical Committee of the Leiden University Medical Center decided that ethical approval was not required under Dutch National law for this type of study

Indicator	Median hospital rate	Within-hospital difference	Between-hospital difference	Rankability
Transfusion in total hip	7.0%	0.80	0.16	17%
Transfusion in total knee	4.1%	1.09	0.61	36%
Extended hospital stay in total hip	24.4%	0.51	0.64	56%
Extended hospital stay in total knee	22.0%	0.58	1.17	67%

RAMAN SPECTROSCOPIC STUDY OF CANCEROUS AND IRRADIATED HUMAN MANDIBLE BONE

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Summary: In this preliminary study, the mineral and matrix composition were determined by using Raman microspectroscopy.

Background: Radiotherapy has contributed with a significant and impressive stride to the survival rates of oral cancer patients. However, quality and alterations in the biochemical composition of bones used for dental implantation after radiotherapy in cancer patients is always a critical and debatable factor. The aim of this study was to determine compositional alterations in human mandible bone after irradiation using Raman microspectroscopy.

Methods: A total of 36 bone biopsies (21-control, 4-cancer and 11-irradiated) obtained from 36 patients during implant surgery were used. Raman measurements were carried out using a Bruker Senterra LX200 dispersive Raman spectrometer. Data acquisition points were determined under pathological supervision. Three measurements from different locations were conducted with a spot size of 10 microns. Spectra were acquired for 60s and averaged over 5-accumulations. Both mineral and matrix constituents were analyzed by computing area associated with of phosphate (958 cm-1), carbonate (1070 cm-1), collagen (amide III) and matrix (amide I) bands using in-house MATLAB-based software. Unpaired student't' test was employed to measure level of significance.

Results: Absolute mineral contents (phosphate and carbonate) were higher in cancer specimens. Significant differences (p

Notes:

A META-ANALYSIS OF THE LONG-TERM OUTCOMES OF DISTAL RADIUS FRACTURES

Gouk, CJC. Rebgetz, P. Thomas, MJ.

Disclosures: this was the first author's, Dr CJC Gouk, Masters dissertation at the University of Edinburgh. No financial support was received.

Background: Distal radius fractures are among the most common fractures encountered in the clinical setting, with a reported incidence of 17%. Of these common fractures, it has been said 60% are intra-articular in nature. Intra-articular or unstable and comminuted fractures represent severe, high energy injuries. There is a considerable amount of controversy as to which fixation method is superior. Even the OA concludes; "comparing external fixation (EF) with open reduction and internal fixation (ORIF) for the treatment of intra-articular distal radius fractures described no consistent benefit of one treatment over another". There are only a few randomised control trials that go beyond one year to cover the long-term follow up (over two years). There has yet to be a meta-analysis of the long-term outcomes of open reduction internal fixation (ORIF) versus external fixation. We aim to show from this meta-analysis if there is any significant difference in the outcomes of either fixation method in the long-term.

Method: We pooled the data of all available randomised control trials that compare the long-term outcomes of ORIF against external fixation of distal radius fractures. We completed a systematic review of PubMed, embase, MEDLINE and the Cochrane Library, from inception to December 2014. We then preformed our meta-analysis using RevMan 5.3 software.

Results: We did not determine any significant difference in long-term outcomes when comparing ORIF with external fixation. However 6 of the 11 outcomes supported ORIF, as seen in Table 1.

Outcome	Reduction Method	p Value
Grip Strength	ORIF	0.59
Dorsal Tilt	ORIF	0.47
Ulnar Variance	ORIF	0.67
Radial Inclination	External Fixation	0.72
Total Complications	External Fixation	0.53
Infection	ORIF	0.36
Mal-union	External Fixation	0.96
Flexion/Extension Arc	ORIF	0.14
Supination/Pronation Arc	ORIF	0.08
Radial Deviation/Ulnar Deviation Arc	External Fixation	0.94

Table 1: Summary of the meta analysis results of the analysed outcomes, the favoured reduction method and their statistical significance

Conclusion: There is no significant difference in the long-term outcomes between ORIF and external fixation. No meta analysis to date, short or long term, has been able to determine which is the superior, yet the future treatment of these fractures looks to be ORIF in the form of volar plating. We recommend before this becomes universal, further research must be carried out.

Level of Evidence: Level 1

BRYAN DISC ARTHROPLASTY VERSUS ANTERIOR CERVICAL DISCECTOMY AND FUSION. A SYSTEMATIC REVIEW OF LEVEL I-II RTCS

Authors: María Aragonés, Eduardo Hevia, Alberto Caballero, Carlos Barrios.
Primary author: María Aragonés
Abstract Presenter: Eduardo Hevia MD

Background: The controversy concerning the benefits of unisegmental cervical disc arthroplasty (CDA) over anterior cervical discectomy and fusion (ACDF) is still open because some randomized clinical trial (RTC) comparing ACDF with CDA have been highly inconclusive. Most of these studies mixed disc prosthesis with dissimilar kinematic characteristics. To date, a compilation of the clinical and radiologic outcomes and adverse events of anterior cervical discectomy and fusion (ACDF) compared with a single cervical disc arthroplasty (CDA) design, the Bryan disc has partially accomplished.

Methods: This is a systematic review of RCTs with level I-II evidence. Only RCTs reporting clinical outcomes were included in this review. After a search on different databases including PubMed, Cochrane Central Register of Controlled Trials, and Ovid MEDLINE, a total of 10 RCTs out of total 51 studies were entered in the study. RTC's were searched from the earliest available records in 2005 to December 2014.

Results: Five studies were Level I, and five were Level II. Out of a total of 1101 patients, 562 patients were randomly assigned into the Bryan arthroplasty group and the remaining 539 patients into the ACDF group. The mean follow-up was 30.9 months. Patients undergoing CDA had lower Neck Disability Index, and better SF-36 Physical component scores than ACDF patients. Patients with Bryan CDA had also less radiological degenerative changes at the upper adjacent level. Overall adverse events were twice more frequent in patients with ACDF. The rate of revision surgery including both adjacent and index level were slightly higher in patients with ACDF, showing no statistically significant difference.

Conclusions: This review of evidence level I-II RCTs comparing clinical and radiological outcomes of patient undergoing Bryan arthroplasty or ACDF indicated a global superiority of the Bryan disc. The impact of both surgical techniques on the cervical spine (radiological spine deterioration and/or complications) was more severe in patients undergoing ACDF. However, the rate of revision surgeries at any cervical level was equivalent for ACDF and Bryan arthroplasty. These data suggest that even though the loss of motion has a determinant influence in the development of degenerative changes in ACDF cases, these kinematic factors do not imply a higher rate of symptomatic adjacent segment degeneration requiring surgery.

Level of Evidence: Level I

Notes:

SURGICAL CORRECTION OF AIS PATIENTS DOES NOT IMPROVE THE PREOPERATIVE LIMITED MAXIMAL EXERCISE TOLERANCE

Authors: Rafael Lorente, Luis Fernández-Pineda, Jesús Burgos, Luis M. Antón-Rodrigálvarez, Eduardo Hevia, Cristina Pérez-Encinas, Carlos Barrios
Primary author: Rafael Lorente MD
Abstract Presenter: Jesús Burgos MD

Background: After surgical correction of thoracic scoliosis, an improvement in the cardio-respiratory adaptation to exercise would be expected because of the correction of the rib cage associated with the spinal deformity. This work intended to evaluate the physiologic responses to incremental exercise in patients undergoing surgical correction of adolescent idiopathic scoliosis (AIS). The hypothesis of this study was that the exercise limitations described in patients with AIS could be related with the physical deconditioning instead of being linked to the severity of the vertebral deformity.

Methods: Cross-sectional study of the exercise tolerance in a series of patients with AIS type Lenke 1A, before and 2 years after surgical correction. Twenty patients with AIS and 10 healthy adolescents aged between 12 and 17 years old were evaluated. The average magnitude of the curves was 60.3±12.9 Cobb. Cardio-respiratory function was assessed before surgery and at 2-year follow-up by maximal exercise tolerance test on treadmill following a Bruce standard protocol. Maximal oxygen uptake (VO2), VCO2, expiratory volume (VE), and VE/VO2 ratio were registered.

Results: Before surgery, AIS patients showed lower values than healthy controls in all cardio-respiratory parameters. The most important restrictions were the VO2max in ml/kg/min. (30.3±5.4 vs 49.9±7.5), VE (43.2±10.3 vs 82.3±10.7) and VE/CO2 ratio (25.0±3.9 vs 29.6±4.2). Contrary to expectations, two years after surgery most of these parameters decreased but differences with preoperative data were no statistically significant. Besides the great correction of the deformity (coronal plane, 71.5%; axial rotation, 49.3%), the cardio-respiratory tolerance to the exercise was not modified by surgery.

Conclusions: Patients with moderate-severe AIS showed a limited tolerance to maximal exercise that does not change 2 years after surgery. This findings suggests that the reduced cardio-pulmonary function during exercise is not strictly associated to the spinal deformity, since great corrections of the spinal curves does not improve functional ventilatory parameters. In addition, the results point out a severe exercise deconditioning in AIS patients.

Level of evidence: Level IV

Notes:

RIB CAGE MODIFICATIONS FOLLOWING SURGERY IN ADOLESCENT IDIOPATHIC SCOLIOSIS

Authors: Carolina Hernandez, Jesús Burgos, Luis M. Antón, Vicente García, Eduardo Hevia, Carlos Barrios
Primary author: Carolina Hernandez
Abstract Presenter: Jesús Burgos MD

Background: The improvement of the rib cage deformity (RCD) after surgery correction has not been correlated in detail with the correction of vertebral axial rotation (AR). The loss of at the rib cage after correction has been never monitored. The hypothesis of this work was that the aesthetic improvement of RCD in adolescent idiopathic scoliosis (AIS) does not follow completely the reduction of thoracic AR after correction surgery. Moreover, lesser correction of thorax deformity could be expected in mature patients with more rigid curves.

Methods: Multicenter prospective study of the modifications of the rib cage deformity in 24 patients operated because of AIS Lenke type 1A. RDC was assessed in the preoperative MRI exams including the thoracic perimeter. Vertebral AR was quantified by the RaSac angle. Anterior and posterior rib hump, and the translation of the sternum were measured in mm according to standard protocols. All these parameters were assessed in the immediate post-op period and 2-years after surgery using CT-scan axial slides. In all cases, a vertebral derotation technique performed by asymmetric rod bending was used. Immature (Risser 0-2) and mature (Risser 3-4) patients were compared.

Results: Mean age of patients was 14±2 years. The preoperative curve magnitude was 56.2±8.3 Cobb degrees. RaSac at the apex was 27.2±2.8 degrees. There were 10 immature and 14 mature patients. There were no differences between the two groups in all the radiological measurements of the curves. Immature patients showed lesser posterior rib hump as compared to mature cases (14.9±4.1 mm versus 38.1±22.9; $p<0.001$). Postoperative vertebral AR was lesser in immature patients (2.0±1.2 versus 7.9±2.4 degrees) and increased slightly at 2-year check-up. The posterior rib hump showed also a slightly increased 2 years after surgery. In 18 cases (75%), a contralateral anterior rib hump less than 3 mm emerged after surgery that diminished but not disappeared at 2-year check-up.

Conclusions: The rib cage deformity showed a lesser correction than the vertebral axial rotation. Besides this finding, immature patients showed more rib cage plasticity showing both greater modifications after surgery, and higher loss of correction during follow-up.

Level of evidence: Level IV

Notes:

PREVALENCE OF ANAEROBIC INFECTIONS IN LUMBAR DISC HERNIATION. A SINGLE-CENTRE PILOT STUDY

Authors: Eduardo Hevia, Andrea Paniagua, Carlos Barrios, Alberto Caballero, Ana Chiaraviglio, Jesus Flores,
Primary author: Eduardo Hevia MD
Abstract Presenter: Eduardo Hevia MD

Background: Recently, some studies have focused attention on the possibility that anaerobic pathogens of low virulence could constitute an etiological factor in disc herniation. There have been isolated such strains, predominantly Propionibacterium acne, between 7 and 53% of patients undergoing surgery for disc pathology. According to these studies, patients with anaerobic infections of the disc are more likely to develop Modic changes in the adjacent vertebrae. The aim of this work was to test this hypothesis by growing in specific media the disc material extracted in a series of lumbar discectomy and relating this factor with the presence of pre-intervention Modic changes.

Methods: A total of 22 consecutive patients undergoing primary unisegmental discectomy for lumbar disc herniation (77.2% male, mean age 40.1 ± 9.1 years) were included. All patients were immunocompetent and none had previously received an epidural steroid injection prior surgery. MRI study confirmed the disc herniation. Following strict antiseptic protocols, the extracted disc material was sent for slow-growth anaerobic enriched culture (>10 days).

Results: In total, anaerobic cultures were positive in 7 cases (31.8%) all men. In 5 of these cases, the symptoms developed with an acute onset. The isolated germs were always unique: Propionibacterium acne (3), Streptococcus parasanguinis (1), Actinomyces naeslundii (1), Actinomyces meyeri (1) and methicillin sensitive Staphylococcus epidermidis. Only two (28.6%) of these 7 patients had Modic changes on MRI prior surgery (one type I, one type 2). None of the patients with negative cultures had Modic changes.

Conclusions: These findings support the theory that anaerobic infections of low virulence and slow growth may contribute to the pathogenesis of herniated discs. However, these cases do not necessarily develop type 1 Modic changes as previously speculated.

Level of evidence: Level IV

Notes:

PREVENTION OF LUMBAR PEDICLE SCREW MISPLACEMENT USING PEDICLE MID-TRACK STIMULATION

Authors: Luis M Antón-Rodrigálvarez, Jesus Burgos Flores, Lidia Cabanes, Carlos Barrios, Eduardo Hevia, Gema de Blas, Vicente García
Primary author: Luis M Antón-Rodrigálvarez
Abstract Presenter: Jesus Burgos Flores

Background: The overall incidence of neurological symptoms attributed to lumbar misplaced screws has been described to occur in 3.48% of patients undergoing surgery. These lumbar radicular neurological lesions are undetected with conventional intraoperative neurophysiological and radiological controls. The hypothesis of this study was that direct stimulation of the pedicle screw after placement in the lumbar spine may not work as well as for screws placed in the thoracic pedicles. A more suitable method for the lumbar spine could be the stimulation of the pedicle track with a ball-tipped probe.

Methods: Comparative observational study on the detection of malpostioned lumbar pedicle screws using two different techniques in two different periods: t-EMG screw stimulation (2011-2012) and track stimulation (2013-2014). A total of 1440 lumbar pedicle screws were placed in 242 patients undergoing surgery for vertebral deformities in the last four years (2011-2014). In the first two years, 802 lumbar screws were neuromonitored using t-EMG during. In the last two years, 638 screws were placed after probe stimulation of the pedicle track. Standardized t-EMG conventional registration and fluoroscopy were afterwards performed in all cases.

Results: Six patients (4.4%) in the t-EMG group without signs of screw misplacement developed radicular pain. After checking with CT scan, a caudal prominence of the screw at the inferior aspect of the pedicle was detected in 7 screws (0.9%) and they were removed. After removal, probe stimulation was performed at the middle track showing abnormal thresholds (3.9-9.7mA). In the second group (track stimulation), 11 cases (10.8%) had thresholds below 7 mA. In these cases, the intrapedicular route was changed. None of these 106 patients presented postoperative radiculopathy and CT scans showed that all screws were well positioned

Conclusions: The t-EMG stimulation of lumbar pedicle screws offer some false negatives cases. However, the record in the middle pedicle track is able to detect misplaced screws and prevent the development of lumbar radiculopathy. Therefore, systematic pedicle track stimulation is strongly recommended in the lumbar spine.

Level of Evidence: Level III

Notes:

VARIABLE BIOMECHANICAL BENEFITS OF SCREW AUGMENTATION IN PROXIMAL HUMERUS FRACTURES

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Background: Osteoporotic fracture fixation in the proximal humerus remains a critical challenge. While the biomechanical benefits of screw augmentation with bone cement are established, minimizing the cement volume may help control any risk of extravasation and reduce surgical procedure time. Previous experimental studies suggest that it may be sufficient to only augment the screws at the sites of the lowest bone quality. However, adequately testing this hypothesis in vitro is not feasible.

Methods: This study systematically evaluated the 64 possible strategies for augmenting six screws in the humeral head through finite element simulations to determine the relative biomechanical benefits of each augmentation strategy. Two subjects with varying levels of local bone mineral density were each modeled with a 2-part and 3-part fracture that was stabilized with a PHILOS plate. The biomechanical fixation was evaluated under physiological loads (muscle and joint reaction forces) that correspond to three different motions: 45° abduction, 45° abduction with 45° internal rotation, and 45° flexion.

Results: The higher risk cases (low bone quality or 3-part fracture) exhibited greater peri-implant bone strains and derived greater benefits from screw augmentation. When selecting four screws to augment, the biomechanical benefits ranged from a 25% reduction in bone strain to a 59% reduction in bone strain, depending on the choice of screws. Further, the relative benefits of each augmentation strategy varied between patients and under different loading conditions. Correlations between local bone mineral density and benefits of augmentation were not significant.

Conclusions: An optimal augmentation strategy is likely patient-specific and a larger cohort, modeled under a variety of conditions, would be required to elucidate any patient-specific factors (e.g. morphology or bone quality) that may dictate the relative benefits of each augmentation strategy.

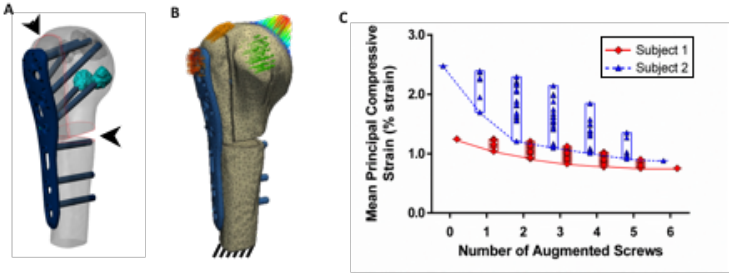

Figure 1. Two subjects were modeled with a 2- or 3-part fracture and a variable combination of humeral head screws were augmented (A) before evaluating the biomechanical fixation under physiological loads (B). The mean peri-implant bone strains decreased with an increasing number of augmented screws, but this benefit varied depending on the combination of screws chosen for augmentation. Note that Subject 2 was more osteoporotic and derived greater reductions in peri-implant bone strains upon augmentation. **EVALUATION OF JUNIOR DOCTOR HAND**

EXAMINATION SKILLS

W A K Al-Azzani, C.E. Hill, C. Passmore, A Czepulkowski, A. Mahon, A Logan.

Introduction: Patients with hand injuries frequently present to Emergency Departments. The ability of junior doctors to perform an accurate clinical assessment is crucial in initiating appropriate management.

Objectives: To assess the adequacy of junior doctor hand examination skills and to establish whether further training and education is required.

Methods: A double-centre study was conducted using an anonymous survey assessing hand examination completed by junior doctors (Foundation year 1 and Senior House Officer grades) working in Trauma & Orthopaedics or Emergency Departments. The survey covered all aspects of hand examination including assessment of: Flexor and Extensor tendons, Nerves (motor and sensory) and Vascular status. Surveys were marked against answers pre-agreed with a Consultant hand surgeon.

Results: 32 doctors completed the survey.
Tendons: 59% could accurately examine extensor digitorum, 41% extensor pollicis longus, 38% flexor digitorum profundus and 28% flexor digitorum superficialis.
Nerves – Motor: 53% could accurately examine the radial nerve, 37% the ulnar nerve, 22% the median nerve and 9% the anterior interosseous nerve.
Nerves – Sensory: 88% could accurately examine the radial nerve, 81% the ulnar nerve, 84% the median nerve and 18.8% digital nerves.
Vascular: 93% could describe 3 methods of assessing vascularity.

Conclusions: Tendon and neurological aspects of hand clinical examination were poorly executed at junior doctor level in this pragmatic survey. This highlights the need for targeted education and training to improve the accuracy of junior doctor hand injury assessment and subsequent improving patient treatment and safety. Recommendations include dedicated hand examination teaching early in Orthopaedic/A&E placements and introduction of an illustrated Hand Trauma Examination Proforma.

Level of evidence: III - Evidence from case, correlation, and comparative studies.

Notes:

INTRAMEDULLARY NAILING FOR DISTAL RADIUS FRACTURES: A SYSTEMATIC REVIEW

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Background: Distal radius fractures are common injuries but no clear consensus regarding optimal management of unstable fractures exists. Open reduction and internal fixation with volar plates is an increasingly popular but the associated complication rate can be 10%. Intramedullary nails are an alternative offering the potential advantages of reduced risk of tendon injury and intra-articular screw penetration. This article systematically reviews the published literature evaluating the biomechanics, outcomes and complications of intramedullary nails in the management of distal radius fractures.

Methods: A systematic review of Medline and EMBASE databases was performed for studies reporting the biomechanics, functional outcome or complications following intramedullary nailing of distal radius fractures. Critical appraisal was performed with respect to validated quality assessment scales.

Results: 16 studies were included for review. The biomechanical studies concluded that intramedullary nails had at least comparable strength to locking plates. The clinical studies reported that IM nailing was associated with comparable ROM, functional outcome and grip strength to alternative fixation techniques. However, the mean complication rate was 17.6% (range 0 to 50%) with the most common complication being neurapraxia of the superficial radial nerve in 9.5%.

Conclusion: This systematic review of pooled data from published series has shown that IM nailing can give comparable clinical results to current treatment modalities in extra-articular and simple intra-articular distal radius fractures. However the evidence is insufficient to determine whether IM nailing has any clinically important advantage over well-established alternatives. The complication rate reported is higher than that in contemporary studies for volar plating and this raises concerns about the role of this technique particularly when comparative studies have failed to show any major advantage to its use. Further adequately powered RCTs comparing the technique to both volar plates and percutaneous wire fixation are required.

Level of evidence: IIa – systematic review of cohort studies

Conflict of Interests: The authors confirm that they have no relevant financial disclosures or conflicts of interest. Ethical approval was not sought as this was a systematic review.

Notes:

FIXATION VERSUS REPLACEMENT FOR COMMINUTED RADIAL HEAD FRACTURES IN ADULTS

Background: Radial head fractures are the commonest fractures involving the elbow. The goals of treatment are to restore stability, preserve motion, and maintain the relative length of the radius. Fortunately, most simple uncomplicated fractures can be treated non-operatively. Choosing between fixation and radial head replacement for comminuted fractures remains difficult. Excision of radial head fractures is not an ideal option in unstable elbow injuries. The purpose of this systematic review was to search for and critically appraise articles directly comparing functional outcomes and complications for fixation (open reduction internal fixation, ORIF) versus arthroplasty for comminuted radial head fractures (Mason type 3) in adults.

Method: A comprehensive search of Medline, Embase and Cochrane databases using specific search terms and limits was conducted. Strict eligibility criteria were applied to stringently screen resultant articles. Three comparative studies were identified and reviewed.

Results: Three comparative studies were identified and reviewed: two studies found significantly better Broberg & Morrey functional scores after replacement compared with ORIF in Mason type 3 fractures. The third study found no significant differences in Mayo functional score or range of motion, but did find that grip strength was better after ORIF. Complication rates were too heterogenous for conclusion.

Conclusion: Fixation with good reduction may be attempted in unstable Mason type 3 fractures, and arthroplasty may be considered if this is not possible. Further randomised comparative trials are required to clarify the decision-making between fixation and replacement. Functional outcomes and complications were conflicting in the studies included here. Ideally, treatment decision should take into account elbow stability and degree of comminution.

Notes:

HISTONE LYSINE DEMETHYLASE KDM6A INHIBITOR ALLEVIATES OSTEOARTHRITIS

Yi-Chih Sun, Yu-Shang Chen, Feng-Sheng Wang

Background: Epigenetic regulation of gene transcription affects metabolism of chondrocytes and synovial fibroblasts and is associated with the prevalence of osteoarthritis (OA) of knees. Histone lysine demethylase (KDMs) reportedly modulates tissue homeostasis and deterioration. This study investigated whether KMD6a inhibitor treatment affected the joint injuries in the progression of OA.

Methods: Collagenase-induced OA knees in mice were intra-articular administered with KDM6a inhibitor GSK-J4. Walking patterns and footprints of affected animals were detected by Catwalk. Articular cartilage injury was quantified by OARSI scoring; and subchondral bone microstructure was analyzed by μCT imaging. Histopathology and mRNA expression of cartilage, fibrosis and bone matrices in joint micro-compartments were detected by histomorphometry and quantitative RT-PCR. Methylation states of chondrogenic transcription factor SOX9 promoter was detected by methylation-specific PCR and chromatin immuno-precipitation.

Results: Declined KDM6a expression and SOX9 gene transcription was associated with the pathogenesis of collagenase-induced joint injures. GSK-J4 administration dose-dependently improved gait profiles and footprint characteristics of affected feet and alleviated histopathology of severe cartilage degradation, synovial inflammation, fibrotic matrix accumulation and subchondral bone microarchitecture deterioration in injured joints. Treatment with GSK-J4 decreased expression of fibrogenic factor (TGF-β1, PLOD2 and TIMP) and restored expression of cartilage and bone matrices (collagen II, I, aggrecan, and osteocalcin). KDM6a inhibitor curtailed the hypomethylation of SOX9 promoter and lysine 27 of histone H3 (H3K27) and restored SOX9 mRNA and protein levels in joint tissues.

Conclusions: KDM6a enhanced SOX9 promoter and H3K27 hypomethylation that accelerated the progression of OA. KDM6a inhibitor had mitigated effects on SOX9 promoter demethylation thereby restored SOX9 signaling and stabilized homeostasis of cartilage, synovium and subchondral bone compartments in affected joints. This study sheds a new light on the KDM6a-mediated epigenetic dysfunction in OA joints and has a perspective that pharmaceutical KDM6a inhibitor has therapeutic potential for OA knee pathogenesis.

Level of evidence: II

Notes:

SOFT TISSUES INJURY & REPAIR

EXTREME FEMORAL VALGUS FOLLOWING LATERAL PLATE FIXATION OF FEMUR FRACTURE

Background: Plate fixation is one of several options available to surgeons for the management of pediatric femur fractures. Recent literature reports distal femoral valgus can be a complication following lateral plate fixation of femur fractures. We report on a case of extreme distal femoral valgus deformity and a lateral dislocation of the patella four years after having plate fixation of a left distal femoral fracture.

Method: A single case was anonymised and retrospectively reviewed through examination of clinical and radiographic data.

Results: A 15 year old male presented with 35 degree femoral valgus deformity, one inch leg length discrepancy, painful retained hardware and a lateral dislocation of the patella four years after undergoing lateral plate fixation of a left distal femur fracture. The fracture site healed after plate insertion, but later the patient reported worsening in alignment of lower extremity and complained of pain in the limb. Antero-posterior and lateral radiographs of the femur revealed 35 degrees of left distal femoral valgus. The previous femoral plate migrated proximally and was encased in bone. Due to plate migration, screws that were originally in the distal femoral metaphysis were protruding through the femoral shaft into soft tissues of the medial thigh. Successful treatment involved removal of prominent distal screws and use of a Taylor Spatial external fixator frame to correct the deformity. Lateral soft tissue release was performed to allow patellar relocation. At 12 weeks follow up leg alignment was restored, pain resolved and the patient was mobilizing.

Conclusion: Femoral valgus is a possible complication of lateral plate fixation in up to 30% of pediatric distal femur fractures. With this patient's combination of deformities as an example, we suggest early hardware removal after fracture union, preventing deformities developing. If plate removal is not chosen, then continued close monitoring of the patient is necessary until skeletal maturity.

Level of Evidence: Type 4 (case report)

Notes:

LAYERED STEM CELL DIFFERENTIATION BY A BIOMIMETIC OSTEOCHONDRAL DEFECT REPAIR SCAFFOLD

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Background: The gradient structure of osteochondral tissue, with bone, calcified and cartilage regions, challenges the design of biomaterials for defect repair. A novel biomimetic tri-layered collagen-based scaffold, designed to replicate these 3 anatomical layers, has been developed within our group(1) and has shown success as an off-the-shelf product in treatment of focal defects in several animal models (2, 3) by recruiting host cells and directing them to form bone and cartilage in the requisite layers (Fig. 1). This study aimed to elucidate the mechanism by which the extracellular matrix macromolecules in the scaffold directed stem cell differentiation in each layer.

Methods: Tri-layered scaffolds were divided into their three constituent layers. Each layer was individually seeded with rat mesenchymal stem cells (MSCs). Cell infiltration and proliferation, calcium production and sGAG formation were assessed up to 28 days.

Results: The scaffold allowed cell infiltration and proliferation through all layers. The collagen hydroxyapatite layer was found to be inherently osteogenic due to the hydroxyapatite. The collagen I/hyaluronic acid layer did not encourage osteogenesis and the collagen I/II layer demonstrated chondrogenesis even without the presence of chondrogenic supplements.

Conclusion: The biomaterial and microstructural properties within this tri-layered material thus show an ability to direct the response of native stem cells. The mechanisms demonstrated here explain the positive results previously observed in in vivo studies.

Level of Evidence: IIb

The senior author on this abstract serves on the Scientific and Medical Advisory Board and holds stock in SurgaColl Technologies for which he receives an honorarium

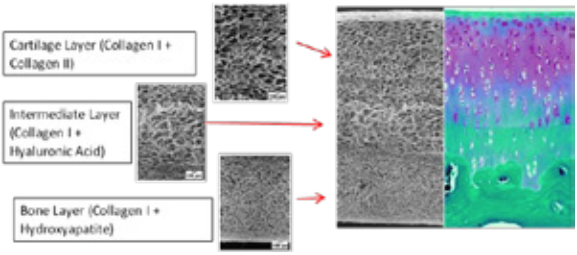

Fig 1. SEM imaging of the tri-layered scaffold demonstrating its integrated layered composition reflecting the cartilage, calcified cartilage and bone gradient in the native joint surface (extreme right).

1. Gleeson JP LT, O'Brien FJ, patent US 61/147006. 2009.
2. Levingstone TJ, et al. Acta Biomaterialia. 2014 May; 10(5):1996-2004.
3. Levingstone TJ et al ICRS; 2013 September 15-18; Izmir, Turkey.

DECELLULARIZED OSTEOCHONDRAL GRAFT : PROCESS DEVELOPMENT

Primary Author: Barnouin L.
Additional Author: Günzel E.
Abstract Presenter: Barnouin L.

Background: Based on decellularization and cleaning processes of trabecular bone and fibrocartilage, an osteochondral allograft has been developed.

Material: The chemical process, established thanks to bone and fibrocartilage data, included an efficient viroinactivation step. The raw material was a tibial plateau collected during knee arthroplasty, cut in cylinders strictly selected (>2mm cartilage height and total height between 10 and 16mm). The grafts were freeze-dried and gamma sterilized (figure 1).

Methods: Decellularization and structure integrity were validated based on histological analysis, before and after treatment. Mesenchymal Stem Cells (MSC) proliferation in contact with the graft was evaluated to validate the biocompatibility. Biomechanics of the cartilage was studied to determine the compressive resistance before and after treatment. Proof of concept has been completed on femoral condyles in a rabbit model: osteochondral allografts of rabbit were prepared from femoral condyles, processed like human allografts and implanted in 6 femoral condyle defects of 4mm diameter and compared to 3 sham-operated sites. Rabbits were sacrificed at 12 weeks. Macroscopic evaluation and histological stainings were carried out to determine bone and cartilage reconstruction.

Results: The stainings of processed grafts showed decellularization, cleaning of bone, porosity of cartilage tissue, decrease in the aggrecan rate and preservation of type II collagen (figure 2). MSC proliferated inside the trabecular bone and spread at the surface of the cartilage tissue after 3 weeks. Compressive resistance of cartilage before and after processing was similar to literature. Osteochondral rabbit defects were filled with bone and cartilage tissue, with total integration of bone and cartilage repair observed in two ways: cells spreading from lateral cartilage and MSC diffusing from subchondral plate

Figure 3: Processed, decellularized, viroinactivated, freeze-dried and sterilized osteochondral allograft

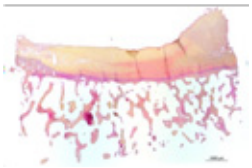

Figure 4 : Hematoxylin-Eosin-Saffron staining of the processed osteochondral

Conclusions: The decellularized biocompatible osteochondral allograft enhanced cartilage repair in an animal model. Two clinical trials are ongoing in talus and knee osteochondral lesions.

Notes:

AN ACELLULAR AND VIROINACTIVATED MENISCUS ALLOGRAFT

Primary Author: E. Günzel
Additional Authors: L. Barnouin, P. Delépine, F. Le Pape
Abstract Presenter: E. Günzel

Background: Meniscal tears are among the most common knee injuries. To preserve as much as possible the joint, partial and total meniscal replacements are necessary. To combine the biocompatibility and mechanical resistance of meniscus allograft with the disponibility of synthetic substitutes, an acellular, viroinactivated and sterile scaffold with well-preserved structure has been developed based on PHOENIX process.

Methods: Human menisci were collected from living donors undergoing total knee arthroplasty. They underwent chemical treatments, freeze-drying and gamma irradiation. Decellularization of menisci and preservation of the matrix structure were explored by histological studies. Meniscal scaffold ultrastructure was analyzed by scanning electron microscopy. Biomechanical studies were also conducted. Scaffold viroinactivation was investigated by viral clearance studies. Finally, the allografts were cultured for 4 weeks with Mesenchymal Stem Cells (CSM); cells viability and proliferation were assessed histologically and by confocal microscopy following stainings.

Results: Histological data evidenced that the process led to complete decellularization of the menisci, high porosity within the tissue and to the removal of glycosaminoglycans, present in the center of native menisci. The meniscal surface as well as collagen fibers were preserved as assessed by electron scanning microscopy (figure 1). Ultimate tensile strengths of native and processed menisci were similar. Viral clearance studies showed that each viral inactivation step induced a viral load reduction compliant with the reduction factor specified in the European guidelines. CSM exhibited great viability and proliferation at the surface of the allograft and partial penetration inside (figure 2).

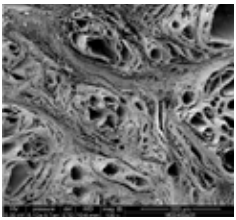

Figure 5: Radial fiber bundles of processed meniscus (cross section) - electron scanning microscopy

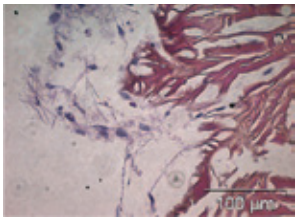

Figure 2: Hematoxylin-Eosin staining of a meniscal allograft colonized by CSM

Conclusions: Scaffold safety is conferred by decellularization and viroinactivation of the meniscus while preserving structure and mechanical resistance of the tissue, enabling cells to proliferate around and inside the allograft. Freeze-drying and gamma irradiation make it a ready-to-use product, with different sizes for partial and total meniscal replacement.

Notes:

PROCESSED MENISCUS ALLOGRAFT: PRELIMINARY RESULTS OF PHASE II STUDY

Primary Author: Barnouin L. Additional Authors: Ruiz N. , Robert H.
Abstract Presenter: Barnouin L.

Background: The objective was to evaluate the benefit that could be obtained in terms of pain and efficacy with processed segmental allografts on 20 patients in meniscal repair treatment.

Methods: Segmental meniscal allografts were extracted from tibial plateaux during total knee arthroplasties on lateralised osteoarthritis and selected on macroscopic integrity criteria. They underwent decellularization and deproteinization processes to obtain a sterile collagenous matrix with glycosaminoglycans removal. Under arthroscopy, the grafts (50mm length) were fixed at the posterior horn and at the meniscosynovial wall (figures 1 and 2). The main evaluation criterion was the IKDC subjective knee score evolution. Secondary criteria were the meniscus morphology (Magnetic Resonance Imaging after 12 months) and the recellularization (biopsy after 1 year).

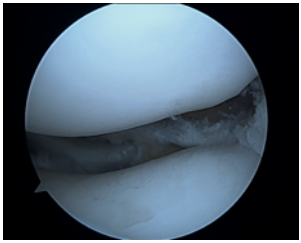

Figure 1 : Complete meniscectomy of the posterior and medial portion of the external meniscus

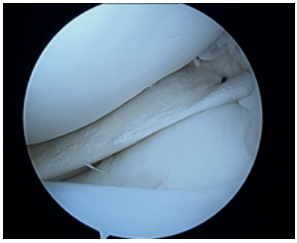

Figure 2 : Implantation of the meniscal allograft

Material: In this Phase II monocentric, prospective and open-label clinical trial, a total of 10 male patients (mean age: 39 years [24-50]) were enrolled. They were symptomatic (IKDC score < 70), did not suffer from osteoarthritis (Kellgreen-Lawrence score < Grade 2) and presented a meniscal tissue defect on the posterior and/or medium segment, respecting the posterior horn. Exclusion criteria were lax knees, significant frontal deviations, pre-osteoarthritis and obese patients.

Results: One patient dropped out. The mean IKDC score increased from 45 points [23 to 70] at the inclusion to 70 points [49 to 90] after 1 year. The MRI and biopsies results are currently being analysed. The first biopsies studied show that the allograft is cellularized with fibroblasts and chondrocytes (figures 3 and 4).

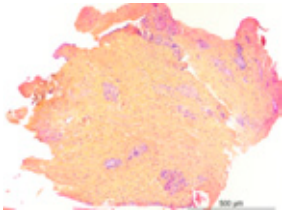

Figure 3 : HES staining of a meniscal allograft biopsy after 1 year

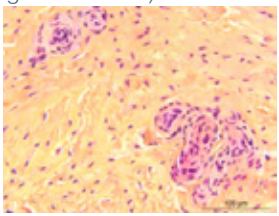

Figure 4 : Zoom of the figure 3

Conclusions: The functional results are encouraging, at least equivalent to the ones obtained for massive grafts. Indications for segmental allografts are difficult to prescribe early and the surgical technique is challenging; these two facts contribute to good outcome. The early clinical results are positive, while awaiting the morphological and histological outcomes in a few months.

Level of evidence: III

OPERATIVE VERSUS NON-OPERATIVE MANAGEMENT OF PARTIAL ANTERIOR CRUCIATE LIGAMENT TEAR: A SYSTEMATIC REVIEW

Background: Anterior cruciate ligament damage is a common sport-related injury due to sudden deceleration or repetitive landing and pivoting manoeuvres; has significant morbidity and affects the career prospects of athletes. ACL rupture is documented to cause mechanical knee instability and functional deficits. Literature suggests non-operative management returns over half of athletes to sport at original level, however operative management is usually the preferred option; with many recognised techniques of ACL reconstruction and augmentation for complete ruptures. Partial ACL tears constitute between 5 and 30% of cruciate ligament injuries. Treatment of these is more controversial and poorly documented than complete tears. There are no comprehensive reviews in the literature offering a consensus that operative or conservative management is more appropriate.

Objectives: To undertake a systematic review to determine whether outcomes of operatively managed partial ACL tears are significantly different to those treated non-operatively.

Methods: A review of the literature was undertaken using Medline, EMBASE and CINAHL, and the Cochrane Database of systematic reviews was searched for previous related reviews. Inclusion criteria were adult patients and partial rather than complete ACL tear. All other papers were excluded. Quality analyses using PRISMA for included studies were performed.

Results: 97 papers identified, 5 of these were deemed relevant for in depth analysis. 1 literature review regarding conservative management showed half of patients left with chronic pain and 52% return to usual sport. 3 papers comparing selective and standard repair show significant improvements in function postoperatively following selective repair. 1 study reviewed laxity and rotational stability post repair and found no significant differences.

Conclusions: Lack of literature exists to compare operative and conservative management of partial ACL tears, however in operative management, selective techniques are associated with improved functional outcomes. Further studies are required in order to assess whether non operative treatment has equivalent success.

Notes:

A PRELIMINARY PERSISTENT COMPRESSION DYNAMIC PLATE FOR TREATMENT OF LONG BONE FRACTURES: AN IN VITRO BIOMECHANICAL STUDY

Ahmet Karakasli, EyadSkiak, İsmail S Satoglu, Nihat D Demirkiran, Fatih Ertem, Hasan Havitcioglu

Background: Bothlimited-contact dynamic compression plate (LC-DCP) and locking compression plate (LCP) systems were designed to provide enhanced bone healing and to improve stability at fracture site. However, implant failure, delayed union, nonunion and instability are still frequently encountered complications. The purpose of this study was to determine the biomechanical characteristics of a novel persistent compression dynamic plate (PCDP) which provides a persistent compression to fracture edges, and to compare the biomechanical properties of such a novel plate with the commonly used LCP.

Methods: The novel persistent compression dynamic plate (PCDP) system is composed of a body, an inner compression spring and a distal mobile component. The body (proximal part) contains an adjustable screw and the distal part of the dynamic system can slide inside the body through a special tube. 12 (saw bone) artificial femoral bones were used. Transverse distal shaft fracture was created in all the saw bones at the same level, 6 femurs were fixed using the novel PCDP, whereas the other 6 femurs were fixed using the well-known LCP. All samples had undergone a nondestructive repetitive different forces (axial compression, bending and torsion), to evaluate the biomechanical differences between the two plating systems.

Results: Under axial load the mean stiffness value was 439,0 N/mm for the PCDP and 158,9 N/mm for the LCP. There was nosignificant difference in A-P (anteroposterior) ve P-A (posteroanterior) bending stiffness values between PCDP and LCP, P=0.37 and P=0.80 respectively. However LCP provided significantly stiffer fixation in medial and lateral bending tests than PCDP (P=0.037) and (P=0.016) , respectively. But no significant difference was detected between the two plating system in the torsional stiffness P=0.15.

Conclusion: These results do not show any significant biomechanical difference in the applied torsional and bending stresses between LCP and PCDP. However the remarkably increased persistent compression effect of the PCDP created a considerable stress on fracture edges which may accelerate bone healing.

Level of Evidence: Level 5

Notes:

THE ANTEROLATERAL LIGAMENT OF THE KNEE: MAGNETIC RESONANCE IMAGING EVALUATION

Mr Robert Hurley, Dr Conor Barry, Dr Diane Bergin, Mr Fintan Shannon

Background: The anatomy of the human body has been studied for centuries. Despite this, recent articles have announced the presence of a new knee ligament- the anterolateral ligament. It has been the subject of much discussion and media commentary. Previous anatomical studies indicate its presence, and describe its location, origin, course and insertion. Magnetic resonance imaging (MRI) is the best and most commonly used investigation to assess the ligamentous structure of the knee. To date, most MRI knee reports make no mention of the anterolateral ligament. The aim of this study was to assess for the presence of the anterolateral ligament using MRI, and to describe the structure if visualised.

Methods: All right knee MRIs performed on a Siemens Magnetom Espree 1.5 Tesla scanner in Merlin Park Hospital over a 4 year period were retrospectively analysed. Patients born before 1970, or with reported abnormalities were excluded. The normal MRIs were then analysed by a consultant radiologist specialising in musculoskeletal imaging. Measurements on origin, insertion, course and length were noted.

Results: 942 right knee MRIs were performed in the time period. 62 were classed as normal, and within the specified age range. 10 were randomly sampled. Of these the ligament was visible on all 10 MRIs, best viewed in the coronal plane. The average length (visible in 8/10) was 28.88mm +/- 5.14mm. The origin (visible in all 10) was 2.25mm +/- 0.39mm. The insertion (visible in 9/10) was 1.93mm +/- 0.424. The mid thickness was 1.87mm +/- 0.2mm.

Conclusions: This study indicates that the ALL is a discrete, visible structure on MRI. This furthers the evidence of the presence of the ALL and also provides information that may be beneficial in future studies, and assessment of knee injuries.

Level of evidence: 4

Notes:

DOES ACCURACY OF ULTRASOUND-GUIDED CORTICOSTEROID INJECTION PREDICT OUTCOME IN PAIN AND FUNCTION IN SUBACROMIAL IMPINGEMENT SYNDROME?

P Raval, R Ogollah, A Hall, N Foster, E Roddy

Introduction: Subacromial corticosteroid injection is widely used in the treatment of Subacromial Impingement Syndrome (SIS). There is increasing interest in using ultrasound (US) to improve the accurate placement of injections. This study investigated whether the accuracy of placement of US-guided subacromial corticosteroid injections influences patients' outcome of pain and function.

Method: Secondary analysis of data from a 2x2 factorial randomised controlled trial investigating exercise and corticosteroid injection for pain and function in SIS. US-guided injections were delivered according to a pre-defined protocol. Video images were reviewed to categorise accuracy of injection into the subacromial bursa into 3 accuracy groups using pre-defined criteria: 1) not in the subacromial bursa; 2) probably in the subacromial bursa; and 3) definitely in the subacromial bursa. The primary outcome measure was the self-reported Shoulder Pain and Disability Index (SPADI) total score, compared at 6 weeks and 6 months. Secondary outcomes included SPADI pain and function subscales and participant global rating of overall change from baseline. A mixed effects model was used to compare accuracy groups' outcomes at 6 weeks and 6 months, adjusted for baseline covariates.

Results: US-guided injection accuracy data were available for 114 participants; with 22 participants in group 1, 21 in group 2 and 71 in group 3. There were no significant differences in mean SPADI scores among the three injection accuracy groups at 6 weeks (group 2 vs. 1: 8.22 (95% CI -4.01, 20.50); group 3 vs. 1: -0.57 (-10.27, 9.13)) and 6 months (group 2 vs. 1: 12.38 (-5.34, 30.10); group 3 vs. 1: 3.10 (-11.04, 17.23)). Similarly, no differences between accuracy groups were seen in SPADI pain, SPADI function or participant global rating of change.

Conclusion: The accuracy of US-guided subacromial corticosteroid injection in SIS does not influence clinical response to the injection, questioning the need for guided injections. Larger, adequately powered studies are required to explore this further.

Notes:

REGENERATION OF "CRITICAL SIZE BONE DEFECTS" USING 3D-PRINTED SCAFFOLDS

Background: Large bone defects still challenge the orthopaedic surgeon. Local vascularity at the site of the fracture has an important influence on the healing procedure. Vascular endothelial growth factor (VEGF) and it`s receptor (VEGFR2) are potent inducer of angiogenesis during the fracture healing. Aim of the present study was the investigation of critical size fracture (CSF) healing in VEGFR2-luc mice using tailored scaffolds.

Methods: CSFs were performed and stabilized in mouse femur using an external fixator. The fracture was bridged using a synthetic 3D printed scaffold with a defined porosity to promote regeneration. The ß-tricalciumphosphate (ßTCP) and strontium doped ß-tricalciumphosphate (ßTCP+Sr) scaffolds were investigated for their regenerative potential. The expression levels of VEGFR2 could be monitored non-invasively via in vivo bioluminescence imaging for 2 months. After the longitudinal measurements the animals were euthanized for an in depth histological endpoint analysis. The different scaffold induced tissue regeneration was quantified for both, the ßTCP and the ßTCP+Sr group.

Results: Expression levels of VEGFR2 were significantly higher in the ßTCP+Sr group when compared to the ßTCP, control and sham group. Both types of scaffolds significantly enhanced new bone formation when compared to the sham group. The ßTCP+Sr scaffolds showed a significantly greater regenerative potential.

Conclusions: This standardized defect model mimics a clinically relevant situation to study the regenerative effects of biomaterials on bone. Moreover, the rate of regeneration correlates with the VEGFR2 expression levels, what affirms the usability of our method for longitudinal fracture healing studies. As in line with relevant literature, it could be shown that strontium does have an enhancing effect on bone regeneration. Consequently, strontium doped scaffolds might be a useful addition in the surgeon's spectrum of methods.

Level of Evidence: Experimental

Notes:

IMPLANT/SKELETAL CELL INTERFACE: HARNESSING IMPLANT TOPOGRAPHY TO IMPROVE OSSEOINTEGRATION

Background: Following endosteal uncemented orthopaedic device implantation, the initial implant/bone interface retains spaces and deficiencies further exacerbated by pressure necrosis and resultant bone resorption. This implant-bone space requires native bone infill through the process of de novo osteogenesis (1). New appositional bone formation on the implant surface is known as contact osteogenesis (2) and is generated by osteogenic cells, including skeletal stem cells (SSCs), colonising the implant surface and depositing the extracellular bone matrix (1). Surface nanotopographies provide physical cues capable of triggering SSC differentiation into osteoblasts, thus inducing contact osteogenesis (3), translated clinically into enhanced osseointegration and attainment of secondary stability. The current study has investigated the in vitro and in vivo effects of unique nanotopographical pillar substrates on SSC phenotype and function.

Methods: Adult human SSCs were immunoselected, enriched using STRO-1 antibody and cultured on control and test surfaces for 21 days in vitro. The test groups comprised Ti-coated substrates with planar or modified surfaces with nanopillar (Figure 1). Osteoinductive potential was analysed using qPCR and immunostaining to examine gene expression and protein synthesis.

Results: Following in vitro (n=5) culture on nanopillars, the expression of osteogenic genes (ALP, Collagen 1, OPN and OCN) and of Osteopontin protein (a bone matrix protein), on Ti pillars were both significantly enhanced when compared to control or Ti planar surfaces.

Conclusions: Discrete raised surface nanopillars modulate adult SSC populations in the absence of any chemical cues and enhance their osteogenic properties, an effect not observed on planar Ti constructs. Hence, these findings herald exciting opportunities to improve the implant surface design, implant osseointegration, and, ultimately, implant survival.

Level of evidence: Original experimental study.

References:

1. Davies JE. Understanding peri-implant endosseous healing. Journal of dental education. 2003;67(8):932-49.
2. Osborn JF, Newesely H. Dynamic aspects of the implant- bone interface. In: Heimke G, editor. Dental implants: mate- rials and systems. Munchen: Carl Hanser Verlag; 1980. p. 111-23.
3. Rupp F, Scheideler L, Rehbein D, Axmann D, Geis-Gerstorfer J. Roughness induced dynamic changes of wettability of acid etched titanium implant modifications. Biomaterials. 2004;25(7-8):1429-38.

Notes:

AN ANALYSIS OF PATIENT RADIATION EXPOSURE IN TRAUMA OPERATIONS

Mustafa S. Rashid*, Sheweidin Aziz, Syed Heydar, Simon Fleming, Amit Datta.
Broomfield Hospital, Mid Essex Hospital Services NHS Trust.

Background: Radiation exposure remains a significant occupational hazard for Orthopaedic surgeons. There are no references values for trauma procedures performed with Image Intensifier(II). We aimed to determine and compare reference values for patient radiation exposure for common trauma operations, and to analyse the effect of surgeon grade on II usage.

Methods: Data collected prospectively from 849 cases between 01/05/2013 and 01/10/2014 were analysed. Statistical analysis was performed to calculate reference values for dose area product (DAP), screening time (ST), and number of II images taken for common trauma procedures where n>9 (n=808).

Results: Dynamic hip screw (DHS) fixation required significantly less radiation than proximal femoral nail (PFN) for intertrochanteric hip fractures for median DAP (668mG/cm2 vs 1040mG/cm2, p<0.001), ST (00:36 vs 00:48, p<0.001), and number of II images (65 vs 110, p<0.001). Radiation exposure was statistically significantly less when Consultant Orthopaedic surgeons were first surgeon compared to Staff grade doctors and Orthopaedic trainees for DAP (90.55mGy/cm2 vs 175.5mGy/cm2 vs 366.5mGy/cm2), screening time (00:26 vs 00:32 vs 00:36), and number of II images (49 vs 59 vs 66).

Conclusions: We reported reference values for common trauma operations that are essential to enable monitoring of patient radiation exposure. PFN required greater radiation exposure than DHS for intertrochanteric hip fracture. Increased surgical experience lead to lower radiation exposure in trauma operations, which could be developed to assess trauma competence within surgical training.

Level of evidence: III

Notes:

ELEVATOR PITCH

DO YOU WANT TO IMPROVE UNCEMENTED STEM DESIGN FOR TOTAL HIP REPLACEMENT?

Primary Author Eduardo García-Rey
Additional Authors Eduardo García-Cimbrelo, Enrique Gómez-Barrena
Abstract Presenter Eduardo García-Rey

Background and aim: Recent proposals have been introduced to modify stem design and/or femoral fixation in total hip replacement (THR). New designs need to consider previous design features and their results. The aim of this study has been to evaluate the clinical and radiological results of six different designs of tapered uncemented stems implanted in our Institution.

Methods: 1918 uncemented hips were prospectively assessed from 1999 to 2011 (minimum follow-up of five years for the unrevised hips). All hips had a 28 or 32 mm femoral head and metal-on-polyethylene or alumina-on-alumina bearing surface. Six uncemented femoral designs that shared a femoral tapered stem incorporating a coating surface were included in the study. The different design features included the type of coating, metaphyseal filling, and sectional shape.

Results: Intra-operative proximal femoral crack was 6.7% in one of the designs ($p=0.01$), univariate analysis showing a lower risk of crack in the other designs. The position of the stem was neutral in 80% of the cases for all designs. Femoral canal filing was related to the stem design ($p<0.001$ at the three levels) and to the femoral level assessed (subset alpha=0.005). Twelve stems were revised for aseptic loosening (6 from two different designs). The survival rate for femoral aseptic loosening at 15 years was 96.6% (95% CI 93.8 to 99.4) for one of these two designs ad 97.4% (95% CI95.5 to 99.6) for the other. Regression analysis showed that stem design was the only factor related to aseptic loosening when adjusted for femoral canal filling (at the three levels) stem position (neutral or not) and femoral type (cylindrical or not).

Conclusion: Tapered uncemented stems consistently provide excellent bone fixation. New designs need to avoid changing successful features and concentrate on the less successful aspects.

Notes:

EPIDEMIC OF FRACTURES DURING A PERIOD OF SNOW AND ICE; HAS ANYTHING CHANGED 33 YEARS ON?

Waheeb A K Al-Azzani[1], Danial Adam Mak[2], Paul Hodgson[1], Rhodri Williams[1]
[1]University Hospital of Wales, Heath Park, Cardiff, CF14 4XW
[2]Cardiff University, Park Place, Cardiff, CF10 3XQ

Introduction: We reproduced a frequently cited study performed at our University Hospital that was published in the British Medical Journal in 1981 assessing the extent of "snow and ice" fractures during the winter period.

Methods: As per the original study, four days of snow and ice were identified as well as two control periods when snow and ice wasn't recorded; four days within the same year, with a similar amount of sunshine hours, and four days one calendar year later. The distribution of fractures according to age and sex in addition to the anatomical location were examined in relation to the presence of snow and ice as well as comparisons with the index study 33 years ago.

Results: A total of 293 patients with fractures were identified. Whilst the relative risk was not of the magnitude 33 years ago, we found a significant overall increase in fractures on snow and ice days in the age groups over 30 years old compared with both control periods. In addition, and consistent with the study 33 years ago, there was more than twice the number of forearm and wrist fractures than during the control periods.

Conclusion: A significant increase and similar distribution of fractures in relation to the presence of snow and ice continue to be identified. This appears to be despite preventative recommendations made 33 years ago.

Level of evidence: III - Evidence from case, correlation, and comparative studies

Notes:

MICRORNA-29 MITIGATES GLUCOCORTICOID-INDUCED BONE LOSS AND MARROW ADIPOSITY

Feng-Sheng Wang,Yi-Chih Sun, Yu-Shan Chen & Jih-Yang Ko

Background: Long-term glucocorticoid treatment increases incidence of osteoporotic or osteonecrotic disorders. Excessive bone loss and marrow fat accumulation are prominent features of glucocorticoid-induced osteoporosis. MicroRNA-29 (miR-29) family members reportedly modulate lineage commitment of stem cells. This study was undertaken to define the biological roles of miR-29a in skeletal and fat metabolism in the pathogenesis of glucocorticoid-induced osteoporosis.

Methods: Osteoblast-specific miR-29a transgenic mice (Tg) driven by osteocalcin promoter (C57BL/6JNarl-TgOCN-mir29a) or wild-type (WT) mice were given methylprednisolone. Bone mass, trabecular and cortical bone microarchitecture were assessed by μCT. Comparative mRNA and protein expression was quantified by RT-PCR and immunoblotting. Primary bone-marrow mesenchymal cells were isolated for elucidating ex vivo osteogenic and adipogenic differentiation capacity.

Results: Decremented miR-29a expression was associated with severe skeletal deterioration and excessive marrow adipogenesis in glucocorticoid-induced osteoporosis bone tissue. Tg mice had high bone mass, spacious trabecular bone and thick cortical bone microstructure. Tg mice also had modest responses to the deleterious actions of glucocorticoid on trabecular microstructure and histomorphological characteristics, mineral acquisition and attenuated marrow fat deposition and osteoclast resorption. Ex vivo, miR-29a overexpression promoted bone-marrow mesenchymal progenitor cells differentiation towards osteogenic cells and away from adipogenic lineage cells. Mechanistically, miR-29a via inhibiting histone deacetylase 4 (HDAC4) actions restored acetylation states of osteogenic regulators Runx2 and β-catenin and decreased osteoclastogenic factor RANKL and adipokine leptin expression in bone microenvironments.

Conclusions: Glucocorticoid suppression of miR-29a disintegrates the homeostasis between osteogenic and adipogenic activities, thereby impairs bone formation and skeletal integrity. By suppressing HDAC4, miR-29a stabilizes Runx2 and β-catenin signalling that counteracts the adverse effects of glucocorticoid on bone mass and marrow adiposity. This study unveils the anabolic roles of miR-29a in the progression of glucocorticoid-induced bone loss. Sustained miR-29a action is beneficial for protecting against osteoporosis and excessive marrow adipogenesis.

Level of evidence: I

Notes:

OSTEOBLAST-SPECIFIC MICRORNA-29A AMELIORATES ESTROGEN LOSS-INDUCED OSTEOPOROSIS

Yu-Shang Cheng, Feng-Sheng Wang, Yi-Chih Su & Jih-Yang Ko

Background: MicroRNAs are non-coding small RNAs that reportedly regulate mRNA targets or protein translation of various tissues in physiological and pathological contexts. This study was undertaken to characterize the contributions of microRNA-29a (miR-29a) to the progression of estrogen deficiency-mediated excessive osteoclast resorption and bone loss.

Methods: Osteoblast-specific transgenic mice overexpressing miR-29a driven by osteocalcin promoter (C57BL/6JNarl-TgOCN-mir29a) or wild-type mice were subjected to bilateral ovariectomy. Bone mineral density, trabecular microarchitecture and osteoclast distribution was quantified by μCT and histomorphometry. Primary CD11b+CSF-1R+ preosteoclasts were isolated for detecting ex vivo osteoclast differentiation. Gene expression and transcription factor-promoter interaction were quantified by RT-PCR and chromatin immunoprecipitation.

Results: Estrogen depletion deteriorated bone integrity in concomitant with decrement of miR-29a expression. Transgenic mice had increased bone mass and skeletal microstructure and mitigated responses to the deleterious effects of estrogen deficiency on bone mineral density, B.Ar/T.Ar, Tb.Th and Tb.No. miR-29a overexpression attenuated the estrogen loss-mediated histopathology of osteoclast number, surface and erosion surface. Ex vivo, miR-29a transgenic mice had decreased osteoclast differentiation, osteoclastogenic marker expression (osteoclastogenic transcription factor NFATc1, TRAP, MMP-9, cathepsin K, and V-ATPase), F-actin ring and pit formation of primary preosteoclast cells. miR-29a alleviated the estrogen deficiency-induced promotion of interleukin-17 (IL-17) expression and enrichment of suppressor of cytokine signaling 2 (SOCS2) and signal transducer and activator of transcription 4 (STAT4) on IL-17 proximal promoter regions.

Conclusions: Estrogen deficiency-mediated interruption of miR-29a expression exacerbates bone tissue resorption. miR-29a signalling via suppression of proinflammatory cytokine IL-17 action counteracts osteoclast differentiation and resorption reactions, thereby attenuates the deleterious effect of estrogen loss on bone integrity. This study highlights the skeletal-protective actions of miR-29a against excessive bone remodelling. Sustained miR-29a in bone tissue is beneficial for ameliorating osteoporosis.

Level of evidence: II

Notes:

KNEE MAL-ALIGNMENT AND HIP JOINT PATHOLOGY: AN OBSERVATIONAL STUDY

Authors: J Palmer (primary author and abstract presenter), A Palmer, L Jones, W Jackson, S Glyn-Jones, A Price
Nuffield Department of Orthopaedics Rheumatology & Musculoskeletal Sciences, Botnar Research Centre, Old Rd, Oxford OX3 7LD

Background: Since 2011, the knee service at the Nuffield Orthopaedic Centre has been offering a neutralising medial opening wedge high tibial osteotomy (HTO) to a group of patients presenting with early medial osteoarthritis of the knee, varus alignment and symptoms for more than 2 years. During development of this practice an association was observed between this phenotype of osteoarthritis and the presence of CAM deformity at the hip.

Methods: A retrospective cohort study. All patients who underwent HTO since 2011 were identified (n=30). Comparator groups were used in order to establish whether meaningful observations were being made:
Control group: The spouses of a high-risk osteoarthritis cohort recruited for a different study at our unit (n=20)
Pre-arthroplasty group: Patients who have undergone uni-compartmental arthroplasty (UKA) for antero-medial osteoarthritis (n=20)
All patients had standing bilateral full-length radiographs available for analysis using in house developed Matlab®-based software for hip measurements and MediCAD® for lower limb alignment measurements.

Results: A total of 140 limbs from 70 gender-matched subjects were studied. The HTO group had a significantly higher prevalence of CAM lesions defined by an Alpha angle >650. They also had a significantly greater mean alpha angle than both the pre-arthroplasty and control groups [HTO (Avg. 68.3 (±16.1)) vs Pre-arthroplasty (Avg. 59.5 (±15.5)) P=0.01; HTO vs Control (Avg. 58.2 (±13.9)) P=0.007].

Conclusions: The results of this study confirm that our HTO group have a significantly greater prevalence of CAM lesions. A feature not seen in either pre-arthroplasty or control subjects. This group demonstrate independent predictors for progression of OA in both the hip and the knee. To our knowledge this is a novel observation.

Level of evidence: Observational cohort study (III)

Notes:

SUCCES OF MASQUELET'S TECHNIQUE PERFORMED IN A CLINICAL REALITY

F. Gindraux,[1,2], K. Oudina[3], A. Nallet[4], B de Billy[5], H. Petite[3] and L. Obert[1,2]
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[2]Intervention, Innovation, Imagery, Engineering in Health (EA 4268), Medical and Pharmacology Section, SFR FED 4234, University of Franche-Comté, Besançon, France
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Previous clinical studies have shown the efficacy of a foreign body-induced membrane combined with bone autograft for the reconstruction of traumatologic or pathologic large bone defects or, bone non union. This membrane, rich in mesenchymal stromal cells (MSC), avoids bone autograft resorption and promotes consolidation by revascularisation of the bone and secretion of growth factors. Reconstruction requires two different surgical stages: firstly, insertion of a cement spacer in the defect, and secondly, removal of the spacer, preservation of the foreign body-induced membrane and filling of the cavity by bone autograft. The optimal time to perform the second surgical stage remains unclear.

So, we aimed to correlate bone healing and, phenotype and function of cells isolated from the induced membrane, in patients whose second surgery was performed on average after 6 months (i.e. beyond the recommended time of one month). Cell phenotype was determined by flow cytometry and cell function by: alkaline Phosphatase enzyme activity, secretion of calcium and von Kossa staining. Second, using histological and immunohistochemistry studies, we aimed to determine the nature and function of induced membrane over time. Seven patients were included with their consent. Results showed

Treated patients achieved in all cases bone union (except for one patient) and in in vitro and histology and immunohistochemistry gave some indications which need to be completed in the future. First, patient age seemed to be an indicator of bone union speed and recurrent infection, appeared to influence in vitro MSC osteogenic potential and induced membrane structure. Second, we reported, in bone repair situation, the commitment over time in osteogenic lineage of a surprising multipotent tissue (induced membrane) able of vascularisation/osteogenesis/chondrogenesis at a precocious time. Finally, best time to perform the second stage (one month) could be easily exceeded since bone union occurred even at very late times.

Notes:

A COMPARISON OF MORTALITY FOLLOWING DISTAL AND PROXIMAL FEMORAL FRACTURES

RW Jordan, G Chahal, M Davies, K Srinivas
Birmingham Heartlands Hospital

Introduction: Patients suffering a distal femoral fracture are at a high risk of morbidity and mortality. Currently this cohort is not afforded the same resources as those with hip fractures. This study aims to compare their mortality rates and assess whether surgical intervention improves either outcome or mortality following distal femoral fractures.

Methods: Patients over sixty-five admitted with a distal femoral fracture between June 2007 and 2012 were retrospectively identified. Patients mobility was categorised as unaided, walking aid, zimmer frame, or immobile. The 30-day, six-month, and one-year mortality rates were recorded for this group as well as for hip fractures during the same period.

Results: 68 patients were included in the study. 85% of the patients were female and the mean age was 84 years. 8 patients (12%) had an underlying total knee arthroplasty. 43 patients (63%) were managed non-operatively and of those treated surgically 7 had plate fixation (28%) and 18 had intramedullary nailing (72%). The mortality rate for all patients with distal femoral fractures was 7% at 30 days, 26% at six months, and 38% at one year, higher than hip fractures during the same period by 8%, 13%, and 18%, respectively. Patients managed surgically had lower mortality rates and higher mobility levels.

Conclusion: Patients suffering a distal femoral fracture have a high mortality rate and surgical intervention seems to improve both mobility and mortality. Currently this group of patients obtains less attention and resources than hip fracture patients. Further research assessing the impact of increasing resources on this group of patient is required.

Level of evidence: IV

Conflict of Interests: The authors confirm that they have no relevant financial disclosures or conflicts of interest. Ethical approval was not sought as this was a systematic review.

Notes:

FORMULATION OF CALCIUM PYROPHOSPHATE

Eirk Hughes, Richard Williams, Gurpreet Chouhan, Parastoo Jamshidi & Liam Grover
Presented by Eirk Hughes

Background: Calcium orthophosphates, such as hydroxyapatite (Ca5(PO4)3OH) (HA), have long been employed as bone graft materials. Recent work has suggested that calcium pyrophosphate (Ca2P2O7) (CaPy) may strongly stimulate bone deposition (Grover et al., 2013). In this study we compare calcium orthophosphate and pyrophosphate precipitates as suitable bone regeneration materials. As well as HA, two forms of pyrophosphate precipitate were compared in this work: amorphous calcium pyrophosphate (amCaPy) and star particle calcium pyrophosphate (stCaPy).

Methods: Briefly, 0.15M Na4P2O7·10H2O and 0.3M Ca2Cl·2H2O solutions of equivalent volume were combined and left to age before performing a series of filtration and re-suspension steps upon the precipitate. Drying yielded amCaPy powder. stAmPy was produced by the same procedure however the pH of the starting solutions were altered to pH7 before combination.

Results: We systematically investigated formulation parameters to produce powder and granular materials, which were characterised by means of XRD, mechanical testing, in vitro degradation, porosimitry, SEM. Our in vitro cellular studies have shown that CaPy exhibits greater osterogenic potential compared to HA through increased calcium deposition and alkaline phosphatase expression (See Figure 1).

Conclusions: The development of this material is an exciting avenue for the following reasons: - Pyrophosphate is a high potential bio-ceramic - Tuneable attributes (e.g. setting, mechanical, degradation, porosity etc.) - In vivo results demonstrate CaPy has better osteogenic potential compared to HA Level of evidence amCaPy and stCaPy particulates are both being investigated as potential bone regeneration materials both in vitro and in vivo.

References: GROVER, L. M., WRIGHT, A. J., GBURECK, U., BOLARINWA, A., SONG, J., LIU, Y., FARRAR, D. F., HOWLING, G., ROSE, J. & BARRALET, J. E. 2013. The effect of amorphous pyrophosphate on calcium phosphate cement resorption and bone generation. Biomaterials, 34, 6631-7.

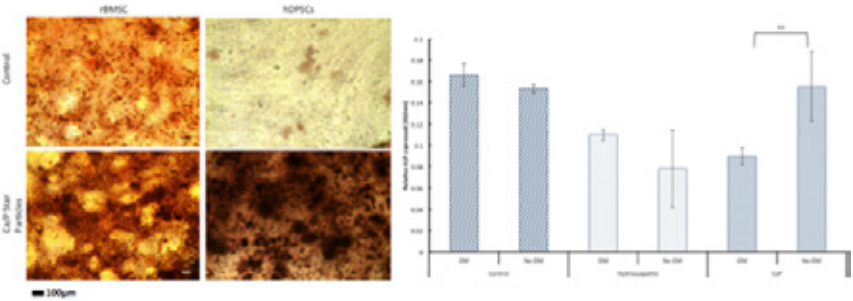


Figure 1. (Left) Alizarin red staining of rat bone marrow stem cells (rBMSC) and human dentinal pulp stem cells (hDPSC) with and without stCaPy present. (Right) Alkaline phosphatase (ALP) expression of rBMSC cells after 14 days (OM = osteogenic media, supplemented with ascorbic acid, β-glycerophosphate and dexamethasone; Control = no particles, CaP = stCaPy particles)

ARTHROSCOPY IS AN INADEQUATE GOLD STANDARD FOR DIAGNOSING BICEPS PATHOLOGY

RW Jordan, A Saithna
Southport and Ormskirk Hopsitals NHS Trust, Merseyside, UK

Background: Despite arthroscopy being the gold standard for long head of biceps pathology, the literature is seemingly lacking in any critical appraisal or validation to support its use. The aim of this study was to evaluate its appropriateness as a benchmark for diagnosis. The objectives were to evaluate whether the length of the tendon examined at arthroscopy allows visualisation of areas of predilection of pathology and also to determine the rates of missed diagnoses when compared to an open approach.

Methods: A systematic review of cadaveric and clinical studies was performed. The search strategy was applied to Medline, PubMed and Google Scholar databases. All relevant articles were included. Critical appraisal of clinical studies was performed using a validated quality assessment scale.

Results: Six articles were identified for inclusion in the review. This included both clinical and cadaveric studies. The overall population comprised 25 cadaveric specimens and 575 patients. Cadaveric studies showed that the use of a hook probe allowed arthroscopic visualisation of between 28% and 48% of the overall length of the LHB. In the clinical series the rate of missed diagnoses at arthroscopy when compared to open exploration ranged between 33% and 49%.

Conclusions: The standard technique of pulling the LHB tendon into the joint at glenohumeral arthroscopy provides only limited excursion and does not allow visualisation of areas of predilection of pathology. This is confirmed by an extremely high rate of missed diagnoses when comparing arthroscopy to open exploration. It is important that clinicians recognise that a “normal” arthroscopic examination of the LHB tendon does not exclude pathology and that published literature reporting sensitivities and specificities for physical examination and imaging tests based on arthroscopy as a gold standard are invalid.

Level of evidence: IIa – systematic review of cohort studies

Conflict of Interests: The authors confirm that they have no relevant financial disclosures or conflicts of interest. Ethical approval was not sought as this was a systematic review.

Notes:

COMPARISON OF GLENOID VERSION MEASUREMENT USING UNFORMATTED AND FORMATTED 2D AND 3D CT RECONSTRUCTIONS

A.I Simpson, R. Dattani and R.A. Sankey

Introduction: Radiological and clinical results of total shoulder arthroplasty are dependent upon ability to accurately measure and correct glenoid version. There are a variety of imaging modalities and computer-assisted reconstruction programmes that are employed with varying degrees of success. We have compared three freely available modalities: unformatted 2D CT; formatted 2D CT; and 3D CT reconstructions.

Methods: A retrospective analysis of 20 shoulder CT scans was performed. Glenoid version was measured at the estimated mid-point of the glenoid from unformatted 2D CT scans (Scapula body method) and again following formatting of 2D CT scans in the plane of the scapula (Friedman method). 3D scapula reconstructions were also performed by downloading CT DICOM images to OSIRIX 6 and plotting ROI points on Friedman's axis to most accurately define glenoid version. Both measurements taken from 2D CT were compared to those from 3D CT.
Eleven CT scans were of male patients, 9 female. Mean age was 55.2 years (Range: 23-77 years). Fourteen scans were performed for trauma, 6 for arthroplasty. Twelve scans were of the left shoulder.

Results: Mean glenoid version as measured on: unformatted 2D CT was -4.51° (-29.67° - 7.22°); formatted 2D CT was -2.04° (-36.96° - 9.72°); and on 3D reconstructions was -3.01° (-32.57° - 14.33° degrees).
Sixty percent of measurements taken on formatted 2D CT were within 3 degrees of those taken on 3D reconstructions, with 85% within 5 degrees. This proportion fell to 30% and 50% respectively on unformatted 2D CT.

Discussion: In this small study measurements of glenoid version taken on formatted 2D CT demonstrated greater accuracy than unformatted 2D CT when comparing to 3D reconstruction measurements as the gold standard. Although we demonstrated no significant statistical difference between measurements in this pilot study we believe significance will be obtained as we increase our sample size.

Notes:

STRUCTURAL AND MECHANICAL CHARACTERIZATION OF PERIPROSTHETIC TISSUE

A.E. Oostlander[1], A.M. Moerman[2], A.A. Zadpoor[2], M.A.E. Schoeman[1], R.G.H.H. Nelissen[1], E.R. Valstar[1,2],
[1]LUMC, Dept. of Orthopaedics
[2]Delft University of Technology, Dept. of Biomechanical Engineering

Background: Periprosthetic osteolysis is the most common long-term complication of a total joint arthroplasty, often resulting in aseptic loosening of the implant. As we aim at developing a safe and minimally invasive implant refixation procedure, thorough characterization of the properties of the periprosthetic tissue is needed.

Methods: In this pilot study, the periprosthetic tissue of eleven patients undergoing hip revision surgery due to aseptic loosening was obtained. Histology, confocal microscopy, atomic force microscopy (AFM) and nanoindentation were performed to structurally and mechanically characterize the tissue. The study was approved by the Medical Ethical Committee of the Leiden University Medical Center.

Results: Using a Sirius Red staining and Movat staining, samples were shown to contain collagen fibers and a ground substance consisting of glycosoaminoglycans and mucopolysaccharides. However, the relative proportions of these tissue components differed between as well as within samples. Confocal microscopy revealed differences in collagen fiber orientation and thickness between tissues. Certain samples showed increased collagen staining intensity as well as increased fiber directionality, indicating higher degrees of tissue maturation. Using AFM and nanoindentation, the Young's modulus of the tissue was determined, which is a measure of tissue stiffness. The ranges of Young's moduli observed (generally 0–250 kPa) were relatively low when compared to other collagen-rich soft tissues (e.g. 500 kPa in skin and even 25 MPa in pericardium). Since the periprosthetic tissue develops at a site of friction, cells at the bone-implant interface seem not able to produce a matrix with optimal strength and properties.

Conclusions: This study provides new insights on the structural organization and mechanical properties of the periprosthetic tissue. Large inter-patient as well as intra-patient variations in tissue characteristics at all levels studied were observed, which strengthens the need for further research and underscores the need for tailored solutions in the field of treating aseptic loosening.

Notes:

TRAJECTORIES OF SYMPTOMATIC RECOVERY AFTER LOWER LIMB PRIMARY ARTHROPLASTY

Erik Lenguerrand, Vikki Wylde, Rachael Gooberman-Hill, Adrian Sayers, Paul Dieppe, Ashley W Blom

Background: While many studies have investigated long-term outcomes after lower limb arthroplasty, rather less is known about the trajectory of short-term outcomes in the first post-operative year. It is difficult for a surgeon to know when, in terms of disease severity, it is best to operate, or to make an accurate prediction of the patient pattern of post-operative recovery. We explored the trajectory of change in pain and function following primary hip and knee arthroplasty and the influence of pre-operative self-reported symptoms on post-operative improvements.

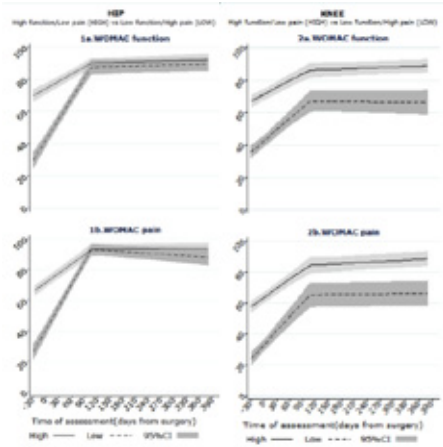
Methods: A prospective UK cohort study of 164 patients undergoing primary hip (n=80) or knee (n=84) arthroplasty. WOMAC pain and function measures were collected pre-operatively and at 3 and 12 months post-operatively. Hip and knee arthroplasties were analysed separately, and patients were split into two groups: those with high or low symptoms pre-operatively. Multilevel regressions were used for each outcome (pain and function), and the trajectory of change (0-3 months and 3-12 months) charted. The study was approved by Southwest 4 Research Ethics Committee (09/H0102/72) and all patients provided informed, written consent. The authors have no competing interests to disclose.

Results: Most improvement after hip arthroplasty occurred within the first 3 months post-operative. One year after surgery there was no difference in the outcomes between patients with high or low pain/function scores pre-operatively. Similarly, most improvement after knee arthroplasty occurred in the first 3 months. Improvement was greater for those patients with worse pre-operative functional disability and pain, although these patients never 'caught-up' with those with less severe pre-operative symptoms.

Conclusions: Earlier intervention may be warranted for patients undergoing knee arthroplasty compared to hip arthroplasty to achieve the best post-operative patient-reported outcomes.

Level of evidence: 2b, Individual cohort study.

Notes:



MANAGING ACUTE OSTEOMYELITIS AND SEPTIC ARTHRITIS IN CHILDREN: CLINDAMYCIN STILL FIRST-LINE?

Ezzat A, Lovejoy J, Alexander K

Background: North America is facing a rising epidemic involving strains of methicillin-resistant Staphylococcus aureus (MRSA) that, instead of being found almost exclusively in hospitals, are community-associated (CA-MRSA). These strains are aggressive, associated with musculoskeletal manifestations including osteomyelitis (OM), and septic arthritis (SA).
We aimed to establish novel management algorithms for acute OM and SA in children. We investigated S.aureus susceptibilities to current first-line antimicrobials to determine their local efficacy.

Methods: The project was conducted at Nemours Children Hospital in Florida, USA, following approval by the internal review board. A literature review was conducted. An audit of S.aureus antimicrobial sensitivities was completed over three years and compared against national standards. Susceptibilities of clindamycin, trimethoprim/sulfamethoxazole (TMP/SMX) and vancomycin were studied using local resistance ranges.

Results: Two algorithms for acute OM and SA management were created adopting a multidisciplinary team approach from admission to discharge whilst differentiating higher risk patients within fast-track pathways. We analysed 532 microbiology results for antibiotic susceptibilities from 2012 to 2014. Overall, 51% of S.aureus infections were MRSA versus 49% methicillin-susceptible S.aureus (MSSA). Surprisingly, clindamycin resistance rates rose compared to 2005 (MRSA 7% in 2005 vs 39% currently, MSSA 20% vs 31% and total S.aureus resistance rate of 8% vs 35%, respectively). MRSA and MSSA isolates were near 100% sensitive to Vancomycin and TMP/SMX. No appropriate national standards existed.

Conclusions: Multidisciplinary based algorithms were created for acute OM and SA treatment in children. Possible therapeutic roles for ultrasound guided aspiration and corticosteroids were highlighted in SA. Our audit revealed equal incidence of MSSA to MRSA, supporting national figures on falling MRSA. Interestingly, incresed resistance of MSSA and MRSA was found towards recommended first line clindamycin, raising concern over its efficacy.

Level of Evidence: 5

Notes:

TRIBOLOGICAL BEHAVIOUR OF THE "REVERSE" INVERSE SHOULDER PROSTHESIS

Reto Lerf[1], Isabel Reimelt[2], Frank Dallmann[2], Daniel Delfosse[1]
([1]: Mathys Ltd Bettlach, Bettlach, Switzerland; [2]: Mathys Orthopaedie GmbH, Moersdorf, Germany. Study financed by Mathys Orthopaedie GmbH)

Background: When reversing the hard-soft articulation in inverse shoulder replacement, i.e. hard inlay and soft glenosphere, the tribological behaviour of such a pairing has to be tested thoroughly. Therefore, two hard materials for the inlay, CoCr alloy and alumina toughened zirconia ceramic (ATZ) articulating on two soft materials, conventional UHMWPE and vitamin E stabilised, highly cross-linked PE (E-XLPE) were tested.

Methods: The simulator tests were performed analogue to standardised gravimetric wear tests for hip prosthesis (ISO 14242-1) with load and motion curves adapted to the shoulder. The test parameters differing from the standard were the maximum force (1.0 kN) and the range of motion. A servo-hydraulic six station joint simulator (EndoLab, Rosenheim) was used to run the tests up to 5*106 cycles with diluted calf serum at 37° C as lubricant.

Results: The wear rates measured in the simulator are summarised in the table below.

	Shoulder simulator study "reverse – inverse"	
Material pairing	Wear rate [mg/Mcycle]	Std Dev [mg/Mcycle]
CoCr – UHMWPE	32.50	3.48
CoCr – E-XLPE	10.65	2.36
ATZ – UHMWPE	20.34	1.14
ATZ – E-XLPE	5.99	0.79

Std Dev: standard deviation; Mcycle: 106 cycles

Conclusions: The simulator wear rate of the standard articulation CoCr – UHMWPE is similar to that found in the corresponding pairing for hip endoprosthesis. Replacing UHMWPE by E-XLPE, the wear rate is reduced to about 1/3 for both hard counterparts, CoCr and ZTA, respectively. Replacing the CoCr inlay by a part made from ZTA lowers wear by about 37 % in articulation against UHMWPE and about 44 % against E-XLPE. The lowest wear rate, with a reduction of about 80 % compared to the standard CoCr – UHMWPE, exhibits the pairing of both advanced materials, ZTA – E-XLPE. However, long-term clinical follow-up will confirm if this in-vitro wear reduction leads to longer in-vivo survival.

Level of evidence: Laboratory test on sample implants.

Notes:

TRIBOLOGICAL BEHAVIOUR OF THE "REVERSE" INVERSE SHOULDER PROSTHESIS

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Level of evidence: Laboratory test on sample implants.

ELEVATOR PITCH 2

DISTAL FEMORAL FRACTURES: THE NEED TO REVIEW STANDARDS OF CARE

James R.A. Smith, Ruth Halliday, Alexander L. Aquilina, Peter Hull, Michael B. Kelly, Collaborative - Orthopaedic Trauma Society (OTS)

Background: Hip fracture care has evolved, largely due to standardisation of practice, measurement of outcomes and the introduction of the Best Practice Tariff, leading to the sustained improvements documented by the National Hip Fracture Database (NHFD). The treatment of distal femoral fractures in this population has not had the same emphasis. This study defines the epidemiology, current practice and outcomes of distal femoral fractures in four English centres.

Methods: 105 patients aged 50 years or greater with a distal femoral fracture, presenting to four UK major trauma centres between October 2010 and September 2011 were identified. Data was collected using an adapted NHFD data collection tool via retrospective case note and radiograph review. Local ethics approval was obtained.

Results: Mean age was 77 years (range 50–99), with 86% female. 95% of injuries were sustained from a low energy mechanism, and 72% were classified as either 33-A1 or 33-C1. The mean Parker mobility score and Barthel Independence Index were 5.37 (0–9) and 75.5 (0–100) respectively. Operative management was performed in 84%, and 86% had their surgery within 36 h. Three quarters were fixed with a peri-articuar locking plate. There was no consensus on post operative rehabilitation, but no excess of complications in the centres where weight bearing as tolerated was the standard. 45% were seen by an orthogeriatrician during their admission. Mean length of stay was 29 days. Mortality at 30 days, 6 months, and 1 year was 7%, 16% and 18% respectively.

Conclusions: This study demonstrates that the distal femoral and hip fracture populations are similar, and highlights the current disparity in their management. The metrics and standards of care currently applied to hip fractures should be applied to the treatment of distal femoral fractures. Optimal operative treatment and rehabilitation remains unclear, and further research is in progress.

Level of evidence: 2b
Ethics: Local approval was obtained

Notes:

BIOMECHANICAL COMPARISON OF TITANIUM AND STAINLESS STEEL LOCKING SCREWS FOR INTRAMEDULLARY NAILING

Ahmet Karaaslan, Ahmet Karakaşlı, Fatih Ertem, Hakan Aycan

Background: Intramedullary nailing is a widely accepted treatment method for femoral fractures. Failure of locking screws is often a threatening complication, particularly on comminuted fractures. For comminuted fractures, the locking nails are load-bearing devices.The load transfer between fractured fragments is made through especially the locking screws for these load bearing situations. Nonunion, malunion, delayed union, shortening, and nail migration are the expected results if early failure of locking screws is present with comminuted fractures. In this study our aim was to compare the bending resistance of titanium and stainless steel locking screws.

Methods: We tested 60 locking screws in six groups (titanium, stainless steel, unthreaded, low threaded and high threaded) in a steel tube that has 30 mm inner diameter,which imitates the lesser trochanter level. We determined the yield points at three-point bending tests that permanent deformation started in the locking screws using an axial compression testing machine.

Results: The three-point bending resistance of 5 mm low threaded titanium locking screws (bending at 1413 N loading) was 46.5 % less than the three-point bending resistance of 5 mm low threaded stainless steel locking screws (bending at 2171 N loading) ($p < 0.001$). Five mm stainless steel locking screws are 29-57 % more resistant to three-point bending deformation than titanium ones.

Conclusions:Therefore, stainless steel locking screws instead of titanium ones must be preferred in comminuted femur shaft fractures.In intramedullary nailing of comminuted or long oblique femur fractures, a locking screw should be 5 mm low threaded or unthreaded stainless steel or 5 mm unthreadedtitanium. Five mm high threaded titanium or stainless steel screws must not ever be used as a locking screw.

Disclosure: Authors declare that there is no conflict of interest related to the present study.
Level of Evidence: 5
Key Words:Femur fractures; femur nail, locking screw; three-point bending test.

Notes:

INVESTIGATING PATIENT REPORTED OUTCOMES IN FOOT AND ANKLE SURGERY

Background: Patient reported outcomes measures are a fundamental part of the NHS. Since 2009, they have been used to measure quality from the patient's perspective. PROMS2.0 is a semi-automated web based system, which allows collection and analysis of outcome data. This study looks at the factors, which can influence PROMS. These include looking at general trends which affect reported outcomes such as surgeon, age and gender. We also look to assess the reasons for non-uptake in the study.

Methods: Data was collected from October 2012 to March 2015. Scores used to asses outcome measures included EQ-5D VAS, EQ-5D Health Index, and MOxFQ, collected pre-operatively and post-operatively.

Results: 97/350 (27.8%) (69F+28M) patients consented and provided pre-op and post op scores. Average age was 57.2 years (Range-19-89). 69 Rt Vs 36 Lt. Surgeon A-51, B-31, C-8 procedures. MOxFQ- all three domains improved on average- Pain- 51.2 to 28.2. Walking/standing- 53.5 to 30.4 and Social interaction- 46.1 to 27.3. EQ5D scores also improved. VAS- 76.0 to 79.7, Index- 0.70 to 0.74. Patients over 70 showed the greatest improvement in MOxFQ, over 70s and under 50s did the same in EQ5D. Male patients reported better outcomes overall in both scores. All statistically significant. No significant patterns found between different surgeons. Left sided procedures did slightly better than right. Non-participation reasons- 20/30 lack of time, 7/30- reduced internet access, 3/30- non specified

Conclusions: Our results suggest improvement in PROMS. Better outcomes are linked to increased age, male sex, left sided procedures but not individual surgeons. Non-responding patients placed forgetfulness/time and lack of Internet access as reasons for non-participation
Simplification and integration of PROMS will be key to increased participation.

Level of evidence: Prospective case-series- Level 3

ASSESSMENT OF PHYSICAL FUNCTION FOLLOWING THA REQUIRES MORE THAN PROMS

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Background: Assessment of functional outcome after total hip arthroplasty (THA) often involves subjective patient-reported outcome measures (PROMs) whereas analysis of gait allows more objective assessment. The aims of the study were to compare longitudinal changes of WOMAC function score and ambulatory gait analysis after THA, between patients with low and high self-reported levels of physical function.

Methods: Patients undergoing primary THA (n=36; m/f=18/18; mean age=63.9; SD=9.8yrs; BMI=26.3 SD=3.5) were divided in a high and low function group, based on their preoperative WOMAC function score. Patients were prospectively measured preoperatively and 3 and 12 months postoperatively. WOMAC function scores (range 0-100) were compared to inertial sensor based ambulatory gait analysis.
Findings: WOMAC function scores significantly improved in both low and high function groups at 3 months postoperatively whereas gait parameters only improved in patients with a low pre-operative function. Between 3 and 12 months postoperatively, WOMAC function scores had not significantly further improved whereas several gait parameters significantly improved in the low function group. WOMAC function scores and gait parameters were only moderately correlated (Spearman's r = 0.33-0.51).

Interpretation: In routine longitudinal assessment of physical function following THA, ambulatory gait analysis can be supplementary to WOMAC. As gait significantly improved during the first 3 months and following 9 months after THA in patients with a low preoperative level of physical function only, assessment of more demanding tasks than gait may be more sensitive to capture functional improvement in patients with high preoperative function.

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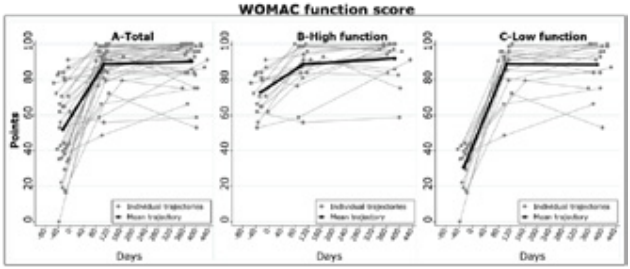
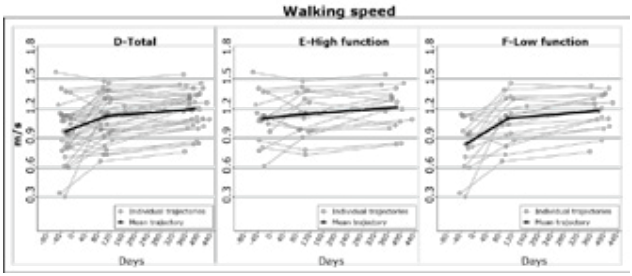
Notes:

Averaged change per month		Pre-operative – 3 months			Low vs High	3 months – 12 months			Low vs High
		Mean	CI (95%)	P-value	P-value	Mean	CI (95%)	P-value	P-value
WOMAC function score (0-100)	Total	8.45	6.36 - 10.54	<0.001		0.17	-0.26 - 0.59	0.44	
	Low function	13.31	11.08 - 15.55	<0.001		-0.039	-0.62 - 0.54	0.89	
	High function	3.59	2.10 - 5.08	<0.001	<0.001	0.37	-0.25 - 1.00	0.24	0.34
Speed (m/s)	Total	0.035	0.016 - 0.055	<0.001		0.008	0.004 - 0.012	<0.001	
	Low function	0.060	0.030 - 0.091	<0.001		0.008	0.003 - 0.013	0.001	
	High function	0.011	-0.009 - 0.030	0.28	0.007	0.008	0 - 0.014	0.28	0.86
Cadence (steps/min)	Total	1.50	0.39 - 2.60	0.008		0.24	-0.01 - 0.49	0.056	
	Low function	2.64	0.71 - 4.58	0.007		0.35	-0.03 - 0.73	0.069	
	High function	0.35	-0.48 - 1.17	0.41	0.03	0.13	-0.19 - 0.45	0.42	0.39
Step time (s)	Total	-0.010	-0.002 - -0.019	0.02		-0.001	-0.002 - 0	0.11	
	Low function	-0.019	-0.035 - -0.003	0.02		-0.001	-0.004 - 0.001	0.19	
	High function	-0.002	-0.003 - 0	0.48	0.039	-0.001	-0.003 - 0.001	0.35	0.67
Step length (m)	Total	0.013	0.006 - 0.02	<0.001		0.003	0.001 - 0.004	<0.001	
	Low function	0.023	0.013 - 0.033	<0.001		0.002	0.001 - 0.004	0.001	
	High function	0.004	-0.005 - 0.014	0.37	0.009	0.003	0.001 - 0.006	0.012	0.57
ROM (°)	Total	0.31	0.16 - 0.45	<0.001		0.046	0.015 - 0.108	0.14	
	Low function	0.43	0.25 - 0.62	<0.001		0.059	-0.012 - 0.129	0.10	
	High function	0.18	-0.04 - 0.40	0.10	0.08	0.034	0.068 - 0.137	0.51	0.70
Step irregularity log(cv)	Total	-0.015	-0.08 - 0.05	0.65		-0.015	-0.04 - 0.01	0.26	
	Low function	-0.049	-0.164 - 0.066	0.40		-0.012	-0.043 - 0.019	0.44	
	High function	0.019	-0.051 - 0.088	0.60	0.32	-0.018	-0.062 - 0.026	0.42	0.82
Step asymmetry log(%)	Total	-0.086	-0.263 - 0.091	0.34		0.003	-0.062 - 0.068	0.93	
	Low function	-0.118	-0.334 - 0.098	0.28		-0.005	-0.069 - 0.059	0.88	
	High function	-0.055	-0.341 - 0.232	0.85	0.73	0.011	-0.104 - 0.125	0.85	0.81





ASSESSING PATIENT RESPONSIVENESS USING PATIENT REPORTED OUTCOME MEASURES AFTER SURGERY

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Approvals: The APEX trials were registered as an International Standardised Randomised Controlled Trial(96095682), approved by Southampton and South West Hampshire Research Ethics Committee(09/H0504/94) and all participants provided informed written consent.

Background: This article reviews four commonly used approaches to assess patient responsiveness to a treatment or therapy [Return To Normal (RTN), Minimal Important Difference (MID), Minimal Clinically Important Difference (MCID), OMERACT-OARSI (OO)], and demonstrates how each of the methods can be formulated in a multi-level modelling (MLM) framework.

Methods: Data from the Arthroplasty Pain Experience (APEX) cohort study was used. Patients undergoing total hip and knee replacement completed the Intermittent and Constant Osteoarthritis Pain (ICOAP) questionnaire prior to surgery and then at 3, 6 and 12 months after surgery. We compare baseline scores, change scores, and proportion of individuals defined as “responders” using traditional and multi-level model (MLM) approaches to patient responsiveness.

Results: Using existing approaches, baseline and change scores are underestimated, and the variance of baseline and change scores overestimated in comparison to MLM approaches. MLM increases the proportion of individuals defined as responding in RTN, MID, and OO criteria compared to existing approaches. Using MLM with the MCID criteria reduces the number of individuals identified as responders.

Conclusion: MLM improves the estimation of the standard deviation of baseline and change scores by explicitly incorporating measurement error into the model, and avoiding regression to the mean when making individual predictions. Using refined definitions of responsiveness may lead to a reduction in misclassification when attempting to predict who does and does not respond to an intervention, and clarifies the similarities between existing methods.

Notes:

ACETABULAR INCLINATION IN TOTAL HIP ARTHROPLASTY

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Background: Positioning of the acetabular component in total hip arthroplasty has profound effects on the biomechanics, stability and wear of the prosthesis. Normal anatomical position in females is 57o (50o -67o) inclination with 19o (9o-32o) of anteversion, whilst in males 56o of inclination (48o-66o) with 19o (9o-32o) is normal. In total hip arthroplasty, inclination recommendation ranges from 30 – 50°. The aim of this study was to radiographically measure acetabular component position in total hip arthroplasty and compare to normal values.

Method: The Widmer method was used by two independent observers to radiographically measure inclination in 522 patients using standard AP radiographs. Primary measures and variables were statistically analysed as was inter and intra observer reliability. All patients included within the study received total hip arthroplasty for age related degenerative changes to the hip. Operations were undertaken by 17 separate consultants or senior registrars under their care.

Results: Overall mean inclination was measured at 45.27o with a range of 26o - 68o. Statistically significant differences were observed between cemented 45.9o and non-cemented hips 43.9o (p= 0.018), Simple 45.5o vs complex 42.1o (p=0.003) and Male 44.3 o vs Female 46.2o (p=0.0198). No statistical difference was seen between consultant and registrar (p=0.211) and right vs left (p=0.768). Inter observer reliability was seen to be 0.91 whilst intra observer reliability 0.96

Conclusion: Although a large range of outcomes were observed, 95% of radiographs reviewed fell within a range of 33.6o- 56.9o Variables such as surgical positioning, patient anatomy/body habitus, surgical technique, instrumentation likely influenced abnormal results. Abnormal positioning may have effects such as eccentric wear and dislocation, however, and such findings are yet to be observed in the study group.

Notes:

THE EFFECT OF PREVIOUS ARTHROSCOPY ON OUTCOME IN KNEE REPLACEMENTS

V.N Gibbs, H.G.R Lowdon, T. Barlow

Background: Multiple randomised controlled trials have demonstrated that arthroscopy provides little benefit in patients with knee osteoarthritis1. In 2008, NICE released guidelines to reflect this evidence2. Implementation has been sporadic, and arthroscopy for knee osteoarthritis is commonly performed with an annual incidence of 9.9 per 10,000 in England3. Our aim was to establish whether previous arthroscopy affects Patient Reported Outcome Measures (PROMs) in Total Knee Replacement (TKR) patients.

Methods: Data was retrospectively collected from 2010-2012 from a University hospital. Pre-operative and one-year post-operative PROMs were collected on patients who had undergone arthroscopy and then TKR, or only TKR. The change in PROMs score over TKR was then compared between groups.

Results: Complete data was available for 85 patients: 36 had arthroscopy prior to TKR, with 49 receiving only TKR. There was no difference between the groups with regard to age and gender. Oxford Knee Score (OKS) before TKR for both groups were similar (arthroscopy group 41.9, non-arthroscopy 40.8). At arthroscopy 81% of patients had grade IV arthritis, with 19% demonstrating grade III.
Patients who had arthroscopy before TKR had a worse response to TKR compared to those who did not have an arthroscopy (respective mean change of 23.79%, 38.4%, $p < 0.001$).

Conclusion(s): Although this exploratory study is small and subject to selection bias, our data suggest that arthroscopy may have a detrimental effect on patient function after TKR. This may be due to psychological factors, as there is growing evidence to suggest stress and anxiety negatively affect PROMs4. Medicalisation of patients through arthroscopic procedures may contribute to poor PROMs. This study offers a potential pre-operative factor that may explain some of the variability in outcome seen with TKR. This relationship requires confirmation and exploration in larger studies with correction for confounding factors.

Level of evidence: III

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Notes:

DIAGNOSTICS OF THE HETEROTOPIC OSSIFICATION IN PATIENTS WITH SPINAL CORD INJURY

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Aim: The aim of the study was to define the peculiarities of bone remodeling and identify specific parameters to development to heterotopic ossification.

Materials and methods: Markers of bone formation (Osteocalcin, serum type 1 procollagen (N-terminal) (tP1NP)) and bone resorption (serum collagen type 1 cross-linked C-telopeptide (β-CTx)) were determined by the electrochemiluminiscence immunoassay "ECLIA" for Elecsys user cobas immunoassay analyzer.
In the study were included 23 patients with spinal cord injury – first group (average age 26.8 ± 3.9, duration of spinal cord injury from 3 to 12 months) and 23 healthy people's appropriate age and gender (average age 30.6 ± 6.0, years). In the first group included 11 patients with spinal cord injury with the presence of heterotopic ossification – subgroup I and 12 patients with spinal cord injury without heterotopic ossification – subgroup II.

Results: The results of examination showed that patients of first group had significantly higher bone markers than control group: P1NP (256.7±48.2 ng/ml vs 49.3±5.1 ng/ml, $p<0.001$), serum β-CTx (1.47±0.23 ng/ml vs 0.45±0.04 ng/ml, $p<0.0001$), osteocalcin (52.2±9.8 ng/ml vs 24.9±2.08 ng/ml, $p<0.001$). There were obtained that levels of bone remodeling markers in patients with HO were significantly higher in comparison with patients without HO: P1NP (404.9±84.9 ng/ml vs 133.2±15.7 ng/ml, $p<0.001$), serum β-CTx (1.75±0.23 ng/ml vs 0.28±0.14 ng/ml, $p<0.0001$), osteocalcin (87.1±18.9 ng/ml vs 29.4±3.7 ng/ml, $p<0.001$).

Conclusion: The bone formation and bone resorption markers in patient of first group were significantly higher than in healthy individuals of appropriate age. The rate of bone turnover markers in patient with HO was considerably higher than in patient without HO and the process of formation dominated over the resorption in patient with HO.

Notes:

POSTOPERATIVE BLEEDING EPISODES AFTER PRIMARY TOTAL KNEE REPLACEMENT

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Introduction: The incidence of bleeding following primary TKR has increased with the use of chemical thromboprophylaxis. Our aim was to compare Clexane, Apixaban and Rivaroxaban in terms of frequency and volume of bleeding episodes, need for blood transfusion, return to theatre and incidence of VTE events.

Methods: Between February and May 2014, a consecutive series of 132 primary TKRs were studied prospectively. The wound dressings of these patients were assessed daily to look for signs of bleeding and classified into: Mild (< 50p size coin), moderate (> 50p size coin) or Severe (blood seeping through the dressing). Follow up was up to minimum of 30 days post discharge.

Results: Apixaban, Rivaroxaban & Clexane were used in 64, 23 and 45 patients respectively. Eleven patients had at least 1 day of mild bleeding, 8 had at least 1 day of moderate bleeding and 11 had at least 1 day of severe bleeding. Ten patients had 1 or more doses omitted because of bleeding. However, there was no statistical significance in distribution of bleeding episodes or doses omitted due to bleeding amongst the three drugs (chi squared test). There was also no correlation between number of severe bleeding episodes and the need for blood transfusion. There were two VTE events recorded; 1 PE each in the Apixaban and Rivaroxaban groups. Two cases in the Apixaban group and 1 case in the Clexane group returned to theatre for washout of haematoma.

Conclusion: There was an 8% incidence of severe bleeding in our study group. The incidence of bleeding problems following TKR was similar in the Apixaban, Rivaroxaban & Clexane groups.

Level of evidence: III - Evidence from case, correlation, and comparative studies.

Notes:

IMPACT OF BMI AND ASA GRADE ON LENGTH OF STAY FOLLOWING PRIMARY TOTAL KNEE REPLACEMENT

Waheeb A K Al-Azzani, H J Iqbal, Y Al-Soudaine, A J Thayaparan, M I M Suhaimi, S Masud, S P White

Introduction: Increasing number of studies investigating surgical patients have reported longer length of stay (LOS) in hospital after an operation with higher ASA grades. However, the impact of Body Mass Index (BMI) on LOS in hospital post Total Knee Replacement (TKR) remains a controversial topic with conflicting findings in reported literature. In our institution, we recently adopted a weight reduction program requiring all patients with raised BMI to participate in order to be considered for elective TKR.

Objectives: This has prompted us to investigate the impact BMI has on LOS compared to the more established impact of ASA grade on patients following Primary TKR.
Methods: A retrospective analysis was conducted on all elective primary TKR patients between November 2013 and May 2014. LOS was compared in BMI groups <30, 30-40 and >40 and ASA grades 1-2 and 3-4. ANOVA and independent t-test were used to compare mean LOS between BMI groups and ASA grades, respectively.

Results: Two hundred and thirty six TKR were analysed. Mean LOS in BMI groups <30, 30-40 and >40 were 6.0, 6.4 and 6.0 days, respectively ($p = 0.71$). Mean LOS in ASA groups 1-2 and 3-4 were 5.8 and 7.6, respectively ($p < 0.01$).

Conclusions: In patients undergoing primary TKR, ASA grade is a better predictor of LOS than BMI. Our data further adds to the evidence that high BMI alone is not a significant factor in prolonging LOS after a primary TKR. This should be taken into account when allocating resources to optimise patients for surgery.

Level of evidence: III - Evidence from case, correlation, and comparative studies.

Notes:

PHOTOACTIVE TIO2 ANTIBACTERIAL COATING ON SURGICAL EXTERNAL FIXATION PINS

Stephane Descamps, G.Villatte, C.Massard ,C. Forrestier & K.O.Awitor
Presented by Stephane Descamps

BACKGROUND: External fixation is a method of osteosynthesis currently required in traumatology and orthopedic surgery. Pin tract infection is a common problem in clinical practice. Infection occurs after a bacterial colonization of the pin due to its contact with skin and local environment. To prevent such local contamination, one way to handle this issue is to create a specific coating using method which could be applied in the medical field. In this work we develop a surface coating for external fixator pins based on photocatalytic TiO⊠ properties, producing a bactericidal effect with sufficient mechanical strength to be compatible with surgical use.

METHOD: The morphology and structure of the sol-gel coating layers were characterized using, respectively, scanning electron microscopy and X-ray diffraction. Resistance properties of the coating were investigated by mechanical testing. Photo-degradation of acid orange 7 in aqueous solution was used as a probe, to assess the photo-catalytic activity of titanium dioxide layers under UV irradiation. The bactericidal effect induced by the process was evaluated against 2 strains: a Staphylococcus aureus and a multiresistant Staphylococcus epidermidis.

RESULTS: The coated pins showed good mechanical strength and efficient antibacterial effect after 1 hour of UV irradiation.

CONCLUSION: Our study allowed to develop an antibacterial coating for stainless steel commonly used in surgical practice. The process using photoactive TiO2 exposed to UV irradiation is actually well known and applied in many disinfection fields, and exhibited efficiency against the two main bactericidal strains involved in pin tract infections. Mechanical tests confirmed the coating's ability to resist to important stresses. Moreover, this kind of coating created by sol-gel dip-coating techniques is not expensive and quite easy to do. As a consequence, we can hope that this new option would treat preventively pin tract infection, even if there is an important optimization task to be done in order to amplify bactericidal properties.

LEVEL OF EVIDENCE: II

Notes:

OUTCOME OF FIXATION OF VALGUS UNSTABLE PROXIMAL HUMERAL FRACTURES WITH A NOVEL HYBRID FIXED ANGLE BLADE PLATE DESIGN

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Background: Functional outcomes of conservatively managed, valgus impacted proximal humeral fractures are poor. Operative fixation can improve results but can be technically challenging. We prospectively assessed outcomes following fixation of valgus unstable proximal humeral fractures with a novel hybrid fixed angle blade plate, at a minimum of 12 months follow up.

Methods: A new hybrid fixed angle blade plate design (Fx Plate, Exactech, Gainesville, USA) was used by the senior author to treat patients with displaced and potentially valgus unstable proximal humeral fractures, at our institution between November 2012 and March 2014. The study was approved by the research and development department. Outcomes were prospectively assessed using the Oxford and Constant shoulder scores and quality of life was assessed using the SF-36 questionnaire. Radiographs were taken at regular intervals to assess fracture healing.

Results: In total 12 patients were identified and included in the study. All patients had comminution of the medial calcar, with potentially valgus unstable fracture patterns. Six of the patients had two-part displaced fractures, whereas six had three and four-part fractures. One patient died for reasons unrelated to surgery and three others were lost to follow up. Average follow up after surgery was 15.4 months (Range 12-20 months). At final follow up the average Oxford Shoulder Score was 41 (35 to 48) and Constant Score 73 (60 to 87), indicating a good functional outcome of the operated side. The average physical and mental component scores of the SF-36 questionnaire were 49 and 52 respectively, suggesting a good overall quality of life. Radiographs, taken at final follow up, confirmed fracture union in all cases. No significant complications occurred following surgery.

Conclusions: Patients with displaced, potentially valgus unstable, proximal humeral fractures remain a challenging cohort to treat. Our results, however, indicate good functional and radiographic outcomes when using a novel hybrid fixed angle blade plate.

Notes:

DISTAL FEMORAL FRACTURES - 5-YEAR MORTALITY AND SECULAR TRENDS

Piers Turner, Nameer Choudhry, Robert Nicholas Green, Narasimha Murty Aradhyula

Background: Distal femoral fractures are 10 times less common than hip fractures. 12-month mortality has been reported as 25-30% but there is no longer-term data. In Northumbria hip fractures have a 5-year mortality of 68%.

Objectives: To analyse 5-year mortality in distal femur fractures in the Northumbrian NHS trust, and identify risk factors for mortality. To compare the results to literature standards and Northumbrian hip fracture data.

Methods: This retrospective observational study included patients admitted with distal femur fractures (AO type 3.3), including periprosthetic fractures, between 01/01/05 and 31/12/07. Patient information, which included age, gender, co-morbidities and date of death, was collected through hospital coding and analysis of notes. Co-morbidity data was only available for 53 patients. Mortality rates were calculated, and stratified according to age, gender and co-morbidities. The results were analysed using backwards-multivariate linear regression to determine the significance.

Results: 83 patients (74 female) were identified and the population had a mean age of 80 years (range 60-102). The overall 5-year mortality was 72%. Mortality increased with age and being female may be a risk factor. Dementia and COPD were the only statistically significant predictors of mortality.

Conclusions: This study shows a 5-year mortality of 72% in patients over 60 with distal femur fractures. 1-year mortality rates (20%) are lower than the defined literature standards, showing the trust is performing well. 5-year mortality was higher than that of hip fractures in Northumbria, highlighting the vulnerability of this patient group.

Notes:

ASSESSMENT OF FINGER SWELLING AFTER SHOULDER ARTHROSCOPY

C.Kocialkowski, N.Philips C.Peach,
Shoulder and Elbow Unit, University Hospital of South Manchester

Aim: Prospectively assess the degree of finger swelling after shoulder arthroscopy, to determine whether rings should be routinely removed prior to surgery.

Method and Results: Patients undergoing shoulder arthroscopic procedures had finger diameters measured prior and post surgery, over a three month period. The study was approved by our Research and Development department. Measurements were taken using a finger circumference gauge (Southpointe, Florida, USA) and were all performed by one researcher in a standard technique, to eliminate inter observer variability. Control measurement, using the contralateral hand, were taken. Statistical analysis was performed, using the Mann Whitney U test.
31 patients undergoing shoulder arthroscopy were included in the study and had finger diameters assessed. The median amount of finger swelling on the operated side was 2.8 mm (IQR 4.6) per digit, compared to 0 mm on the contralateral side (IQR 1.6), which was significantly greater ($p=0.0003$). There was no statistical difference in the amount of finger swelling when patients undergoing short procedures (less than 30 minutes operating time) were compared to patients undergoing long procedures (greater than 60 minutes).

Conclusions: These results suggest that patients undergoing shoulder arthroscopy have a significant degree of finger swelling post-operatively and that the amount of swelling cannot be accurately predicted based on the length of procedure alone. This indicates that rings should be routinely removed, prior to shoulder arthroscopy, even if this necessitates cutting of rings for removal.

Notes:

FIBRIN SEALANTS AND TRANEXAMIC ACID IN PRIMARY TOTAL KNEE ARTHROPLASTY

Jad Bou Monsef, Tom Schmidt-Braekling, Alejandro Gonzalez Della Valle,

Background: Tranexamic acid (TXA) and fibrin sealants have gained widespread use in total knee arthroplasty. They can decrease bleeding, drainage volume, hematoma formation, and incidence of blood transfusion. However, they are costly and carry a theoretical risk of infection transmission and thrombosis. This study compares the two pharmacologic interventions to preoperative autologous blood donation as well as no intervention.

Methods: This prospective study evaluated a process change within our blood management program over the last five years. The program began initially with a comparison of only routine hemostasis compared to routine preoperative autologous blood donation (PABD) for all patients (Group 1), which then evolved into a targeted PABD protocol where only anemic patients predonated (Group 2). Subsequently, patients received topical fibrin sealant for a year (Group 3), after which the topical TXA protocol was introduced and is still in place (Group 4).

Results: 838 patients went through the blood management protocols. 86 patients (10%) received allogeneic blood: 6 (5%) in Group 1; 18 (9%) in Group 2; 18 (14%) in Group 3; 20 (7%) in Group 4, and 24 (26%) in the control group. No significant difference was observed between the fibrin sealant group and the TXA group with regard to the need for transfusion, but both were significantly lower than controls. The TXA group registered the lowest volume of blood loss, shortest length of stay, and lowest cost. These results were more pronounced in anemic patients.

Conclusion: Both TXA and fibrin sealants were effective in reducing transfusion risk compared to control as well as PABD in primary unilateral total knee arthroplasty. Given the equivalent effects of both pharmacologic interventions in this study, together with the cost considerations and theoretical harms from the use of blood-derived products, it would seem prudent to use tranexamic acid in preference to fibrin sealants.

Notes:

ONE- OR TWO-STAGE SURGICAL REVISION OF INFECTED HIP PROSTHESIS: A META-ANALYSIS

Setor K Kunutsor, Michael R Whitehouse, Ashley W Blom, Andrew D Beswick

Background: The two-stage revision strategy has been claimed as being the "gold standard" for treating prosthetic joint infection. The one-stage revision strategy remains an attractive alternative option, however, its effectiveness in comparison to the two-stage strategy remains uncertain. A systematic review and meta-analysis was conducted to compare the effectiveness of one- and two-stage revision strategies to prevent re-infection after prosthetic hip infection.

Methods: Cohort studies (prospective or retrospective) conducted in unselected patients with infection treated exclusively by one- or two-stage revision and reporting re-infection outcomes within two years of revision were retrieved from MEDLINE, EMBASE, Web of Science, Cochrane databases, manual search of bibliographies to March 2015, and email contact with investigators. Data were extracted by two independent investigators and a consensus was reached with involvement of a third. Rates of re-infection were aggregated using random-effect models after arcsine transformation, and were grouped by study and population level characteristics.

Results: In 38 one-stage studies, the rate (95% confidence intervals) of re-infection was 8.2% (6.0-10.8). The corresponding re-infection rate for 60 two-stage studies was 7.9% (6.2-9.7). Re-infection rates remained generally similar when grouped by several study and population level characteristics. There was no evidence of publication bias among contributing studies.

Conclusion: Among unselected populations, evidence from aggregate published data suggest similar re-infection rates after one- or two-stage revision. More detailed analyses under a broader range of circumstances and exploration of other sources of heterogeneity will require collaborative pooling of individual participant data, which is ongoing within our Global Infection Orthopaedic Management (INFORM) collaboration.

Level of evidence: Level 2a - Systematic reviews of cohort studies

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Notes:

OUTCOME OF THE UNAFFECTED CONTRALATERAL HIP IN UNILATERAL SCFE

Primary Author: Atanu Bhattacharjee
Additional Authors: R Freeman, A Roberts, NT Kiely
Abstract Presenter: Atanu Bhattacharjee

Methods: A retrospective review of 80 patients with unilateral slipped capital femoral epiphysis from 1998-2012 was undertaken to determine the outcome of the unaffected hip. All patients were treated with either prophylactic single Richards screw fixation or observation of the uninvolved hip and were followed up for at least 12 months. The unaffected hip of 44 patients (mean age 12.6 years, range 9-17) had simultaneous prophylactic fixation and 36 patients (mean age 13.4 years, range 9-17.4) were managed with observation.

Results: Sequential slip of the unaffected hip was noted in 10 patients (28 per cent) in the observation group and only in 1 patient (2 per cent) in the group managed with prophylactic fixation. A Fisher's exact test showed significantly high incidence of sequential slip in unaffected hips when managed with regular observation (p-value 0.002). Only 3 cases had symptomatic hardware on the unaffected side after prophylactic fixation with one requiring revision of the metal work; one had superficial wound infection treated with antibiotics. No cases had AVN or chondrolysis.

Conclusion: Simultaneous prophylactic fixation of the unaffected hip significantly reduces the incidence of sequential slip in unilateral SCFE with minimal complications.

Level of evidence: III

Notes:

RESEARCH ROCKET 2

NEW PROTOCOLS FOR EVALUATION OF ORTHOPAEDIC BIOMATERIALS COMPATIBILITY

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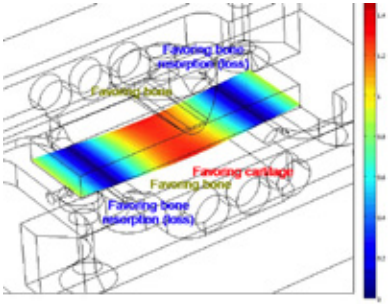
For evaluation of orthopaedic biomaterials the closest hostile-like in vitro environments are desirable with relevant control of chemical, biological, mechanical etc. parameters. For faster screening and reduction of time and costs, combination of different critical key parameters in minimal tests is needed. New trends also favour minimization of in vivo (2010/63/EC, towards replacement technology) and clinical tests (2001/20/EC, 2005/28/EC) for new products yet not compromising risks. Biomaterials manufacturers also are interested in shortening of the time-to-market keeping conformity to essential requirements and withstanding the simulated "worst case" conditions (2003/94/EC).
Here we show the new approach of the creation of conditions closest to real life and applications, based on scientifically designed and optimized models, aiming on predictive outputs. With new device and designed protocols, several biomaterials for orthopaedic applications were analysed: titanium, biodegradable fibrous scaffolds and hydrogels. The example of the figure shows creation of several favourable conditions for different tissues type formation on the surface of porous titanium specimen. Such conditions could be designed for measurement of the cells proliferation and e.g. simultaneous bacterial adhesion with rather high precision. The method has been compared in independent laboratories for hydrogels with other measuring techniques and shown the benefits of the method especially in more precise control of biomechanical cues. It was observed that significant amount of data are containing in the recorded signals which underlines the importance of correct and holistic data post-processing.
The protocols can be furthermore tailored to simulate different conditions, such as for specific positions in tibia, or humeral etc., and combined with patient-specific biomechanics (soft tissues) for customized implant design.



The financial support from the Finnish Agency of Innovation (Tekes) is gratefully acknowledged.
Author has no competing financial or conflicting interests.

CARBON REINFORCED CARBON: ITS POTENTIAL AS MATERIAL FOR ORTHOPAEDIC APPLICATIONS

Reto Lerf[1], Carolin Witt[2], Daniel Delfosse[1]
([1]: Mathys Ltd Bettlach, Bettlach, Switzerland; [2]: Mathys Orthopaedie GmbH, Moersdorf, Germany. Study financed by Mathys Ltd Bettlach)

Background: Simply stated, carbon reinforced carbon (C/C) may be considered as fibre reinforced pyrocarbon. Pyrocarbon is used e.g. in finger joints and artificial heart valves. Aim of the present study was to evaluate if C/C could broaden the field of orthopaedic applications compared to pyrocarbon. Technically, C/C is used e.g. for brakes of F-1 race cars.

Methods: The mechanical strength of the C/C material was characterised by a biaxial flexural bending test according ISO 6474-1.
Three C/C shoulder heads articulating against vitamin E stabilised, highly cross-linked UHMWPE (E-XLPE) underwent a shoulder simulator study up to 106 cycles.
The Coefficient of Friction (CoF) of C/C disks (Ra: 0.045 µm) against cartilage was analysed by a reciprocal cartilage wear tester. The test was conducted in cell culture medium for 4 h and 12 h using bovine cartilage.
All test data is compared to the corresponding test results with Al2O3 ceramic.

Results: All test results are summarised in the table below.

	Biaxial Flexion		Shoulder simulator study		Reciprocal cartilage wear test			
Material	Flex strength [MPa]	Std Dev [MPa]	Wear rate [mg/ Mcycle]	Std Dev [mg/ Mcycle]	CoF 4h	Std Dev	CoF 12h	Std Dev
C/C	294	22	13.6	2.7	0.74	0.01	0.72	0.06
Al_2O_3	422	36	9.97	0.95	0.35	0.05	n.a.	n.a.

Std Dev: standard deviation; Mcycle: 106 cycles n.a.: not available

Conclusions: The strength of C/C is 30 % lower than that of Al2O3 ceramic. Its wear rate measured in the shoulder simulator against E-XLPE is in tendency higher than that of ceramic heads. The CoF against cartilage is double compared to the same test with Al2O3. - C/C seems to have limited a potential as material for orthopaedic application. However, more investigations and optimisation of the C/C type and quality are necessary.

Level of evidence: Laboratory test on material samples.

Notes:

IN VIVO KINEMATIC EVALUATION OF PRIMARY TOTAL KNEE ARTHROPLASTY: FLUOROSCOPIC ANALYSIS OF ADL

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Ghent University Hospital, Belgium

Introduction: Better functional outcomes, lower pain and better stability have been reported with knee designs which restore physiological knee kinematics. Also the ability of the TKA design to properly restore the physiological femoral rollback during knee flexion, has shown to be correlated with better restoration of the flexor/extensor mechanism,which is fundamental to the function of the human knee. The purpose of the study is to compare the kinematics of three different TKA designs, by evaluating knee motion during Activities of Daily Living. The second goal is to see if there is a correlation between the TKA kinematics and the patient reported outcomes.

Methods: Ten patients of each design, who are at least 6 months after their Total Knee Replacement, will be included in this study. Seven satisfied and 3 dissatisfied patients will be selected for each design. In this study 5 different movements will be analysed: flexion/extension; Sitting on and rising from a chair, Stair climbing, descending stairs, Flexion and extension open chain and squatting. These movements will be captured with a fluoroscope. The 2D images that are obtained, will be matched with the 3D implants. This 3D image will be processed with custom-made software to be able to analyse the movement. Tibio-femoral contactpoints of the medial and lateral condyles, tibio-femoral axial rotation, determination of the pivot-point will be analysed and described. After this analysis, a correlation between the kinematics and the KOOS and KSS will be investigated.

Results: (The results of the first six patients are shown, more patients are currently being tested.) The average weight-bearing ROM of the implants is 108,48° +/- 19,68°. In

Notes:

TEKSCAN PRESSURE MEASUREMENT ACCURACY FOR ORTHOPAEDIC BIOMECHANICAL JOINT CONTACT MEASUREMENTS

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Background: Biomechanical joint contact pressure distribution measurements have proven to be a very valuable tool in orthopaedic research to investigate the influence of surgical techniques such as total knee arthroplasty (TKA) on the human knee joint. Quantification of the in vitro tibiofemoral and patellofemoral contact pressure distribution before and after the intervention are an important measure to evaluate the impact of the surgery. The K scan pressure sensor from Tekscan (South Boston USA) is a commonly reported device for these in vitro pressure measurements. Despite the large interest in the sensor, the effective measurement accuracy for in vitro biomechanical joint contact measurement still remains a big question and therefore the reliability of these measurements should be questioned.

Methods: Reliable contact pressure measurements can only be done if the sensor behaviour is fully understood. Therefore, a tailored multi-axial testing machine (see Figure 1) has been designed to profoundly investigate and characterize the sensor behaviour. This test setup is unique through its ability to apply a predefined tangential force or sliding velocity to the sensor's interface next to a normal force. Dynamic effects occurring in knee joint motion can thus be simulated while evaluating the effect on the contact pressure measurements.

Results: The change in contact friction coefficient by insertion of the sensor in the joint is quantified. Different interface conditions (dry, lubricated with PTFE spray, lubricated with surgical lubricant) have been evaluated to obtain the best sliding conditions and to minimize the undesired sensor accuracy deteriorating effects.

Conclusion: An optimal calibration procedure is put forward and side-effects that deteriorate the measurement accuracy are quantified. The provided knowledge facilitates orthopaedic biomechanics researchers to optimally perform joint contact measurements and to estimate the effective measurement accuracy. In addition, the presented rig provides the opportunity to study the inherent knee kinematics and prosthesis shape optimisation through the inherent degrees of freedom in the rig.

Figure 1: Schematic of the multi-axis testing device

EARLY ULTRASONOGRAPHY VERSUS LATE X-RAY'S IN OCCULT SCAPHOID FRACTURES

Introduction: We investigated whether grey scale early ultrasonography could be used for the accurate initial diagnosis of non displaced occult scaphoid fractures.
Methods: This is a prospective blind clinical study that includes 36 patients that came to the emergency room with suspected clinical symptoms for scaphoid fracture but negative initial X-ray's. After that, a high resolution ultrasonography (without Doppler) was performed. Both wrists of each patient were examined, for comparison. After 14 days, new X-rays were performed, which compared to the early sonographic results of the patients.

Results: 25 out of the 36 patients that were included in the study found with subperiosteal hematoma, while 11 of them had also cortical discontinuity. Besides, follow-up X-rays were diagnostic of fracture in 22 patients. 7 patients were ultrasound-positive for fracture but their late X-ray's remained negative, while 4 patients were ultrasound-negative with positive X-ray's. We performed a CT scan on these 11 patients, where we found early ultrasound's sensitivity: 87.5%, specificity: 75%, positive prognostic value: 84% and negative prognostic value: 72%. On the other hand, late X-ray's had sensitivity: 87.5%, specificity: 91%, positive prognostic value: 95% and negative prognostic value: 78% in the detection of occult fractures.

Conclusion: The use of early scaphoid ultrasound in the E.R. is valuable in the hands of the orthopaedic surgeon and decongests the radiology department and the national health system from further specific and expensive imaging studies. So, this examination offers the possibility to reduce the time of diagnosis of these occult fractures, so as to provide early and correct treatment.

Level: II

Notes:

A NEW ULTRASOUND SCALE GRADING CARPAL TUNNEL SYNDROME

Background: We searched -in transverse ultrasound view- the value of the difference (Delta) between -proximal to the tunnel- CSA (a) and -in the tunnel's inlet- CSA (b) for separating normal from abnormal median nerves.

Methods: 51 patients –suspicious for CTS- underwent Phalen and Tinnel tests. After that, we used a high frequency ultrasound to measure CSAa, CSAb and Delta CSA in both hands. 33 of our 51 patients did not experience any clinical symptoms at the contralateral hand, so that we could perform a comparative study of normal and pathological median nerves (on the same patients). Then, all of them completed a Q-DASH questionnaire and a visual analogue scale (VAS 100/100) and they carried through with a nerve conduction study (NCS).

Results: We found that a CSAb more than 0,010 and a Delta CSA > 0,003 are both very sensitive findings for CTS, but only DeltaCSA has good specificity. Comparing to NCS the Delta CSA>0,003 had no statistical difference in sensitivity, specificity, true negative and true positive results. Furthermore, patients with Delta CSA>0,009 were suffering from heavy CTS according to NCS, Q-DASH and VAS. On the other way, a Delta CSA between 0,003 and 0,006 suggests a mild or moderate CTS.

Conclusion: Delta CSA could be the golden standard for the detection of CTS in patients that feel uncomfortable to undergo NCS. We propose a grading scale that distinguish mild or moderate syndromes (where we could try a conservative treatment) from heavy syndromes and help as on decision-making.

Notes:

EFFECT OF ANTIBIOTIC-LOADED SBA-15 CERAMIC ON STAPHYLOCOCCUS AUREUS BIOFILM

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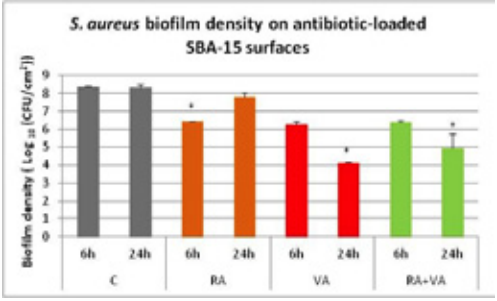
Background: Staphylococcus aureus is a human pathogen involved in implant-related infections. In these diseases, biofilm production is the key pathogenic event, and it increases antibiotic resistance of the organism. Because this phenomenon, local delivery of antibiotics could allows reaching high concentrations in the infected tissue without the secondary effects linked to systemic administration. Here we report the use of a ceramic biomaterial (SBA-15) as a carrier of antibiotics in order to deliver them directly in the infected tissue.

Material and methods: SBA-15 discs were loaded with vancomycin, rifampin and a combination of both according to the protocol described by Molina-Manso et al. Loaded discs were introduced in a 0.5 McFarland suspension of S. aureus 15981(Valle et al.) and incubated during 6 and 24 hours in order to develop a biofilm. After incubation, samples were sonicated during 5 minutes and 1:10 serial dilutions were performed in order to count viable bacteria. All experiments were performed in triplicate.

Results: A statistically significant decrease in the number of viable bacteria was detected for all antibiotics at 6 hours, and also for vancomycin and the combination. Rifampin showed an increase in the number of viable bacteria at 24 hours. No differences were detected between vancomycin and the combination of antibiotics.

Conclusion: SBA-15 can carry antibiotics that have effect on bacterial biofilm. The use of rifampin alone showed a loss of the effect after 24 hours of incubation, probably due to the selection of resistant mutants that nullify the effect of the antibiotic. No differences have been detected between vancomycin alone and its combination with rifampin in this experiment.

Notes:



PELVIC RADIOGRAPHS FOR DIAGNOSIS OF NECK OF FEMUR FRACTURES

Background: The anterior-posterior (AP) pelvis radiograph is crucial for diagnosis of neck of femur (NOF) fractures, especially as this is one of the commonest fractures in the elderly population. Anecdotally we found that initial AP pelvis radiographs for these suspected fractures did not always exhibit the bones sufficiently. Repeat radiographs were needed, leading to delays in diagnosis, treatment, and repeated radiation exposure. Missed diagnoses can have significant consequences for this patient group. We assessed how many initial AP pelvis radiographs taken for suspected NOF fracture fitted criteria for adequate diagnostic imaging.

Methods: A retrospective study was carried out assessing the initial AP pelvis radiograph done for each patient presenting to our dedicated NOF unit with suspected NOF fracture for 1st June - 31st July 2014. European Guidelines for Diagnostic Imaging were used as the benchmark. Each radiograph was scored out of six, one for each criteria fulfilled. Guidelines deemed images scoring ≤3 as inadequate.

Results: 76 images were assessed with mean patient age 85 years. 51.3% of images scored ≤3 and mean score was 3.59. The least-met criterion was “sharp reproduction of sacrum and vertebral foramina” (26.3%). Crucially only 52.6% achieved “visually sharp reproduction of spongiosa, trochanters and corticalis of both femurs”, important in diagnosis of NOF fractures.

Conclusion: More than half initial AP pelvis radiographs taken for suspected NOF fracture were inadequate based on European Guidelines at a dedicated NOF unit. Part of the difficulty can be attributed to challenging patient demographics, however adequate initial radiographs should be aimed for, as repeat radiographs can lead to delays in diagnosis and treatment as well as repeated radiation exposure. Missed diagnoses can have significant consequences for this patient group; we particularly recommend care to be taken to sharply visualise the trochanters and proximal femora to avoid missing subtle fractures.

Notes:

ANTIBIOTIC RELEASE FROM FLUORIDE-TIO2 NANOSTRUCTURED ANODIC LAYERS ON TI6AL4V ALLOY

John Jairo Aguilera-Correa[1], Antonio L. Doardrio[2], Ana Conde[3], Maria-Angeles Arenas[3], Juan J. de Damborenea[3], Concepción Pérez-Jorge[1], Maria Vallet-Regí[2,4], Jaime Esteban[1].
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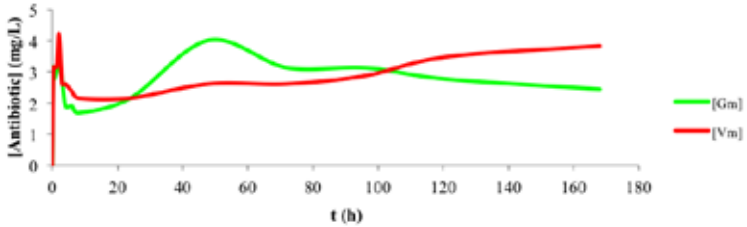
Introduction: Prosthetic joint infections (PJI) occur infrequently, but due to its increased clinical use represent the most devastating complication with high morbidity and substantial cost1. Staphylococcus aureus and coagulase-negative staphylococci are the most common infecting agents associated with PJI2. A possible therapeutic approach could be the local antibiotic by fluoride-TiO2 nanostructured anodic layers in order to prevent surface colonization during the early moments after surgery. Here we describe the first results of this model using two common antibiotics.

Methods: Fluoride-TiO2 nanostructured anodic layers on Ti6Al4V alloy were produced as described previously by Arenas et al3. Discs shaped pieces of Ti6Al4V alloy were loaded with a solution of 150 mg antibiotic (vancomycin or gentamicin)/20 ml sterile distilled water. Samples were immersed in this solution during 24 hours at room temperature with agitation, and then were dried during 48 hours at 20ºC. Antibiotic release was studied by introducing both discs in sterile PBS and samples were taken at different times. Samples were then frozen at -80ºC until HPLC measurements and biological activity tests using Bacillus subtilis ATCC 6051 (vancomycin) and Escherichia coli ATCC 25922 (gentamicin) were performed.



Results:Release kinetic constant was not be obtained by HPLC-UV due to chemical degradation, therefore it was needed to prove biological activity. Acording to biological activity test, vancomycin and gentamicin estimated concentration mean and standard deviation were 2,9±0,61 and 2,71±0,64 mg/L over time respectively (Figure 1).
Conclusions: Fluoride-TiO2 nanostructured anodic layers on Ti6Al4V alloy could be considered as promising vector of antibiotics for the prevention of PJI during early moments after surgery.

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2J. Barberan. Clin Microbiol Infect, 2006, 12(3): 93-101.
3 MA. Arenas et al. Colloids Surf B Biointerfaces. 2013, 1:105:106-12.

FRACTURE MANAGEMENT IN THE FRACTURE CLINIC: SIMPLE MANIPULATION AND MOULDED CAST BY ORTHOPAEDIC PLASTER TECHNICIANS AVOIDS NEED FOR FURTHER INTERVENTION

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Background: Patients presenting to fracture clinic who have had initial management of a fracture performed by Accident and Emergency (A+E) often require further intervention to correct unacceptable position. This usually takes the form of booking a patient for a general anaesthetic to have manipulation under anaesthesia (MUA) or open surgery.

Methods:Prospective data collection over a 6-month period. Included subjects were those that had initial management of a fracture performed by A+E, who went on to require re-manipulation in fracture-clinic. Manipulations were performed by trained plaster technicians using entonox analgesia followed by application of moulded cast. Radiographs were reviewed immediately post-manipulation by treating surgeon and patient managed accordingly. A retrospective review of radiograph images was performed by two doctors independently to grade the outcomes following manipulation.

Results: 38 patients with 39 fractures included in study. Sites of fracture included 32 distal radius, 2 ankle, 1 spiral distal tibia and fibula, 3 metacarpal and 1 proximal phalanx of finger. 22 patients had anatomical/near-to anatomical reduction at post fracture-clinic manipulation of fracture and was theas well as definitive management (satisfactory outcome). 13 patients had a outcome 2 (minimally displaced butand satisfactory reduction of the fracture) at post fracture-clinic reduction. . 12 of these were deemed acceptable went onto outcome 1 for definitive management with 1 going to outcome 2 (requiringed further manipulation). 4 patients had unsatisfactory reduction of fractureoutcome 3 at post fracture-clinic reduction and all of these patients went onto outcome 3 (required surgery)

Conclusions: This study supports the practice of possible primary reduction and if required, re-manipulation and cast moulding using only entonox analgesia, of selected patient casesfractures by trained plaster technicians. Without this intervention, almost all of these cases will have required an MUA or additionally Kirscher wire or open fixation. There is potential to utilise a plaster technician in A+E, reducing the need for further fracture clinic appointments, being more acceptable to patients and having a resultant cost-saving implication.

Level of evidence: Level 3.

Notes:

INVESTIGATING PATIENT REPORTED OUTCOME AND EXPERIENCE FOR FIRST METATARSAL SCARF+/- AKIN OSTEOTOMY FOR HALLUX-VALGUS

Background: Patient reported outcomes/experience measures have been a fundamental part of the NHS since 2009. Osteotomy procedures for hallux valgus produce varied outcomes due to their subjective nature. We used PROMS2.0, a semi-automated web-based system, which allows collection and analysis of outcome data, to assess what the patient reported outcome/experience measures for scarf+/- akin osteotomy for hallux valgus are at UHSM.

Methods: Prospective PROMS data was collected from November 2012 to February 2015. Scores used to asses outcomes included EQ-5D VAS, EQ-5D Health Index, and MOxFQ, collected pre-operatively and post-operatively. Patient Personal Experience (PPE-15) was collected postoperatively.

Results: 40 patients (35F/5M) (19LT +21RT) had undergone an osteotomy. Average age was 60.7 years (Range 29-88). No bilateral procedures. The pre-op average MOXFQ scores for pain, walking and social interaction were: 51.6 (range 5-100), 51.4 (range 0-96) and 48.8 (range 0-100) respectively. Post operatively these improved to 24.4 (range 0-100), 22.9 (range 0-86) and 23.1 (range 0-88). All statistically significant. EQ5D score showed an improvement; with pre-op index average of 0.70. Post-op index average was 0.80. 11 patients were under 54 years old, 15 between 55-64, and 14 over 65. The greatest improvement was in the over 65s for MOxFQ and in the under 55s in EQ5D. 27/35 women showed improvement in all three MOxFQ domains, in contrast to all men. EQ5D also showed similar results. 65 patients filled out a PPE questionnaire. The results show overall average satisfaction of 72.9%

Conclusion: The overall data suggests that scarf+/- akin osteotomy procedures for hallux valgus are a success. Data suggests that higher success rates are found in those over 65 and male patients.

Level of evidence: Prospective case series- Level 3

Notes:

HOW DOES OUTCOME PREDICTION IN KNEE REPLACEMENTS AFFECT PATIENT DECISION-MAKING?

Timothy Barlow, Pat Scott, Damian Griffin, Alba Realpe

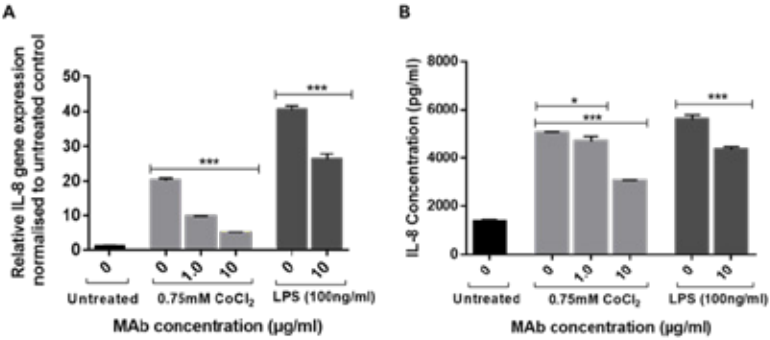
Background: There is a 20% dissatisfaction rate with knee replacements. Calls for tools that can pre-operatively identify patients at risk of being dissatisfied postoperatively have been widespread. However, it is unclear what sort of information patients would want from such a tool, how it would affect their decision making process, and at what part of the pathway such a tool should be used.

Methods: Using focus groups involving 12 participants and in-depth interviews with 10 participants, we examined the effect outcome prediction has by providing fictitious predictions to patients at different stages of treatment. A qualitative analysis of themes, based on a constant comparative method, is used to analyse the data. This study was approved by the Dyfed Powys Research Ethics Committee (13/WA/0140).

Results: Our results demonstrate several interesting findings. Firstly, patients who have received information from friends and family are unwilling to adjust their expectation of outcome down (i.e. to a worse outcome), but highly willing to adjust it up (to a better outcome). This is an example of the optimism bias, and suggests the effect on expectation of any poor outcome prediction would be blunted. Secondly, patients generally wanted a "bottom line" outcome, rather than lots of detail. Thirdly, patients who were earlier in their treatment for osteoarthritis were more likely to find the information useful, and for it to affect their decision, than patients later in their pathway.

Conclusion: An outcome prediction tool would have most effect targeted towards people at the start of their treatment pathway, with a "bottom line" prediction of outcome. However, any effect on expectation and decision making of a poor outcome prediction is likely to be blunted by the optimism bias.

Level of evidence: 4



Notes:

THE CLINICAL OUTCOME FOLLOWING PRIMARY TOTAL KNEE REPLACEMENT IN THE NONAGENARIAN POPULATION – A RETROSPECTIVE COMPARATIVE COHORT ANALYSIS

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Edward Bray, MBBS, Junior Surgical Fellow, Elective Orthopaedic Centre
Baha John Tadros, MBBS, MRCS, Junior Surgical Fellow, Elective Orthopaedic Centre
Mohamed Elsherbiny, BPharm, MPH, Research Project Leader, Elective Orthopaedic Centre
Giles Stafford, MBBS, BSc (Hons) FRCS, Consultant Orthopaedic Surgeon & Deputy Director of Research, Elective Orthopaedic Centre

Background: Despite an ageing population and a rise in the number of joint replacements being performed, the mean age of patients undergoing surgery remains static. One explanation for this is continued concern over the risks of performing surgery on the very elderly. We aim to investigate the outcome of Total Knee Replacement (TKR) in a nonagenarian population.

Methods: The Elective Orthopaedic Centre, Epsom has an established patient reported outcome measures (PROMs) programme into which all patients are routinely enrolled. We retrospectively reviewed our data set for a cohort of nonagenarians undergoing primary TKR, between April 2008 and October 2011. Post-operative complications, mortality rates and functional outcomes were compared to those of a time matched 70-79 year old cohort. Only patients with a primary diagnosis of osteoarthritis were included whereas an exclusion criterion consisted of patients undergoing revision surgery, simultaneous bilateral replacements or conversion from a Unicompartmental Knee replacement.

Results: We identified 31 nonagenarian patients, with a mean age of 91.0 (90-96) and the control group consisted of 36 patients, with a mean age of 74.5 (70-79). Following a TKR, the nonagenarian cohort achieved a lower mean Oxford Knee Score (OKS) at 1 year (31.7+/-9.5) (p=0.15), but no difference existed by 2 years (p=0.157), and a mean outcome satisfaction of 85.2% (+/- 22.75) at 1 year, which was similar to the younger group. The nonagenarians had a greater risk of requiring a blood transfusion following a TKR (p=0.0373; CI 1.08 to 16.65), and a longer length of stay than their younger counterparts (p=0.001) .Mortality rates were higher in the nonagenarian cohort, but these were in keeping with the life expectancy projections identified by the Office for National Statistics.

Conclusion: In conclusion, we identified that over a 2 year period, nonagenarians achieved the same functional outcome and satisfaction rates following a TKR as 70-79 year olds.

Level of Evidence IV

Notes:

PREVENTING THE INFLAMMATORY RESPONSE TO COBALT IONS

Amy Mawdesley, Sami Anjum, Helen Lawrence, David Deehan, John Kirby, Alison Tyson-Capper

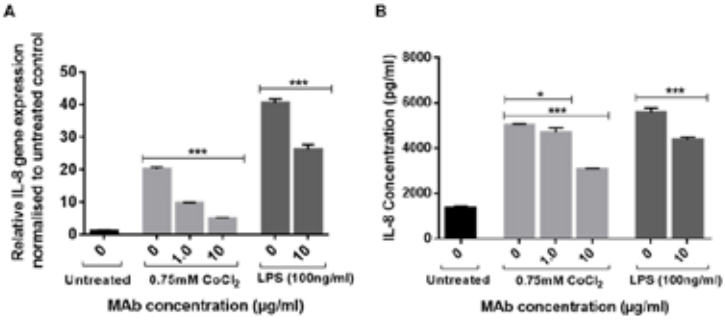
Background: Increased revision rates and early failure of Metal-on-Metal (MoM) hip replacements are often due to adverse reaction to metal debris (ARMD). ARMD describes numerous symptoms in patients such as pain, osteolysis and soft tissue damage. Cobalt is a major component of MoM joints and can initiate an immune response via activation of the innate immune receptor Toll-like receptor 4 (TLR4). This leads to increased secretion of inflammatory cytokines e.g. interleukin-8 (IL-8). This study investigates whether TLR4-specific antagonists inhibit the inflammatory response to cobalt using IL-8 gene expression and protein secretion as a marker of TLR4 activation.

Methods: MonoMac 6 (MM6) cells, a human macrophage cell line, were treated with TLR4-specific antagonists followed by 0.75mM of cobalt chloride. Lipopolysaccharide (LPS), a known TLR4 agonist was used as a positive control. Enzyme-linked immunosorbent assay (ELISA) was used to assess IL-8 protein secretion and real time-polymerase chain reaction (RT-PCR) allowed quantification of IL-8 gene expression.

Results:
MM6 cells treated with cobalt and LPS up-regulate IL-8 gene expression and protein secretion (n=3). The addition of TLR4-specific antagonists significantly inhibits this up-regulation suggesting the observed effects are TLR4-mediated. MM6 cells stimulated with cobalt (0.75mM) for 16 hours demonstrated a 27-fold increase in IL-8 gene expression (p-value = < 0.0001). When pre-treated with 10µg/ml of a TLR4-specific antagonist fold increase decreased to 6-fold (p-value = < 0.0001). IL-8 secretion decreased from 5000pg/ml to 3000pg/ml (p-value = < 0.0001).

Conclusion:
TLR4-specific antagonists inhibit cobalt-mediated IL-8 gene expression and protein secretion in MM6 cells. This finding demonstrates the potential to exploit this inhibition in the context of MoM joint replacements by contributing to the development of novel therapeutics designed to improve MoM implant longevity, reduce the incidence of ARMD and prevent subsequent revision surgery.

Notes:



DAMAGE-CONTROL ORTHOPAEDICS AND ACUTE LUNG INJURY: IS THERE A BENEFIT?

Background: Polytrauma patients are at high risk of systematic inflammatory response syndrome (SIRS) due to an exaggerated unbalanced immune response that can lead to multiple organ failure and increased mortality. This response is often heightened following acute surgical management as a result, damage-control orthopaedics (DCO) was born. This allows the patient to be stabilised using external fixation allowing physiology to improve.
This systematic review aims to compare DCO against early total care (ETC) (<24hrs intramedullary nailing) in polytraumatised patients with femoral shaft fractures using a diagnosis of acute lung injury (ALI) as the primary outcome measure.

Method: A systematic review of MEDLINE, EMBASE, CENTRAL and AMED was carried out to identify all English language studies comparing ETC versus DCO using ALI as the primary outcome measure. Two authors independently screened the studies and performed data extraction. Risk of bias was assessed using the Cochrane risk of bias tool and the Risk-of-Bias Assessment Tool for Non-randomized Studies.

Results: Three studies were selected for final inclusion. One multicentre RCT demonstrated a significantly higher odds ratio (6.69) of ALI in the subgroup receiving ETC compared to DCO. The two other studies were retrospective case series with one reporting no significant difference and the second study reporting a significant reduction in ARDS when a DCO approach was used (7.8% vs 15.1%). Meta-analysis was not possible due to heterogeneity.

Conclusions: This review supports evidence that in the more unstable patients (Injury Severity Score≥30) treated surgically for femoral shaft fractures in the first 24 hours, DCO may have a protective effect over ETC for ALI. However further studies with large sample sizes are needed to provide clarity on the subject area.

Ethics: No approval required given the nature of this study (systematic review)
Level of evidence: 1

Notes:

SURGICAL TOURNIQUET AND CEREBRAL EMBOLI: AN EXPLORATORY OBSERVATIONAL STUDY

V.N Gibbs, P.D Wall, A.P Sprowson, C.E Hutchinson, E. Ngandwe, A. Price

Approval: Protocol approved by NRES Committee Yorkshire & The Humber, Leeds West and The Research, Development & Innovation Department University Hospitals Coventry & Warwickshire

Background: Traditionally, a Surgical Tourniquet (ST) is used during Total Knee Replacement Surgery (TKRS) to prevent blood flow to the leg and improve the surgical field of view. The use of a ST is known to increase the risk of venous thromboembolism[2]. Echogenic material, suggestive of emboli has been observed in the brain following ST deflation in TKRS despite the absence of a patent foramen ovale, likely through pulmonary shunts[3]. The aim of this study was to assess whether cerebral emboli result from tourniquet use in TKRS and the sequelae of any emboli.

Methods: 11 subjects from a single centre undergoing routine TKRS with a ST gave informed consent. Each participant had diffusion weighted MR brain imaging prior to, and within 48 hours after TKRS and completed pre and post-operative mini-mental state examinations (MMSE).

Results: Pre and post-operative MR imaging were assessed by a senior radiologist and the results were reported according to Age and Cognitive Performance Research Centre (ACPRC) rating scale[4] Table.1. There were no changes from pre and post-operative MR scans. 4 participants (36%) had no change in MMSE scores. These participants had a score of 1 or 0 in both MR scans. 7 participants (63%) had a score of 2 or 3. These participants had mean 2.8 point (9.5%) drop on MMSE (IQR = 1) within 48 hours.

Conclusions: In this small, exploratory study we found no evidence of discrete cerebral emboli occurring with the use of ST in TKRS. Interestingly, participants noted to have minimal or no pre-operative ischaemic change appeared to maintain more cognitive function post-operatively than those with higher levels of pre-existing ischaemia. Subtle changes in ischaemic load in patients with pre-existing ischaemia may lead to impaired cognitive function, however further evidence is required to confirm this theory.

Table.1.

SCORES	WHITE MATTERS LESIONS
0	No lesions
1	Focal lesions
2	Beginning confluence of lesions
3	Diffuse involvement of the entire region with or without involvement of U fibres

The rating scale is applied to left and right hemispheres: frontal, parieto-occipital, temporal, infratentorial/cerebellum, basal ganglia.

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COMPARISON CLAMPING DRAINAGE AND NON-CLAMPING DRAINAGE AFTER TOTAL KNEE REPLACEMENT

Primary Author: Jimena Llorens de los Ríos
Additional Authors: Manuel Ángel Sandoval, Iván Pérez Coto, Susana Iglesias Fernández, Ana Escandón Rodríguez, Daniel Hernández Vaquero.
Abstract Presenter: Jimena Llorens de los Ríos

Background: Total Knee Replacement (TKR) is one of the most common surgeries in our speciality, with a high risk of significant blood loss and consequent transfusion. The drain clamping is usually applied to reduce both blood loss and transfusion in this procedure. However, this method is still somewhat controversial too.

Method: We performed a prospective randomized study of 74 patients with advanced knee osteoarthritis. All were treated in our centre with TKR. The patients were randomly assigned into two groups. In group A we included patients whose drainage system was clamped temporarily (during the first 6 postoperative hours). Group B includes those patients in who we use traditional system, with continuous suction drain that was placed after surgery.

Results: A statistically significant difference in haemoglobin loss after surgery was found, with 0.83 g/dl less decline in patients with temporary clamping drains. The decrease of haematocrit levels, the blood loss or the number of transfusions were lower in the temporary clamping group, but without statistic significance. No cases with wound infection neither clinical venous thromboembolism were detected in our group.

Conclusions: These results suggest that drainage clamping during the first 6 postoperatative hours reduces the postoperative anaemia, without increasing morbidity after TKR.

Notes:

EFFECTIVENESS OF SURGICAL INTERVENTION FOR ADOLESCENT HALLUX VALGUS

Oliver Beaumont, Aveek Mitra, Matthew Chichero & Sarah Irby

Background: In the adolescent population, operative management of hallux-valgus is controversial. Operations may be less successful than in adults and post-operative recurrence is more common before full skeletal maturity. This study assesses the radiographic, functional and qualitative outcomes of surgical Hallux Valgus correction in adolescents.

Methods: Three independent reviewers retrospectively analysed pre and post-operative radiological markers of hallux valgus severity for 44 operations on patients age 13-18. The patient cohort were also asked the Manchester-Oxford foot questionnaire (MOXFQ) to assess functional outcome via telephone interview and patient notes were reviewed for any evidence of complications.

Results: There was no evidence of NICE recognised complications from any of the operations performed, however there was persistence or recurrence in 20.8%, requiring a second operation in 10.3%. Radiologically, all operations performed resulted in a reduction in hallux valgus severity. The hallux valgus angle showed a mean reduction of 18.0 degrees (16.3-19.7) and the inter-metatarsal angle by 7.3 degrees (6.55-8.14). 93% of operations resulted in a good MOXFQ outcome score of less than 20 out of a possible 80 negative functional outcome points. This score worsened with age in a statistically significant manner ($p=0.03$) but had no significant correlation with BMI.

Conclusion: Surgical correction of adolescent hallux valgus reduces the radiographic severity, which correlates with good long term outcome. This surgery provides beneficial results to the patient, however there is a high recurrence rate, correlating with younger age and this must be taken into account.

Notes:

DAILY SENIOR REVIEW AND DOCUMENTATION IN TRAUMA AND ORTHOPAEDIC SURGERY

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LAS Orthopaedic Clinical Fellow[1]/Consultant Orthopaedic Surgeon[2]
University Hospital Aintree NHS Foundation Trust, Liverpool, UK

Background and Aims: Daily senior review is of paramount importance to provide optimal clinical care and facilitate timely discharge. Also, the General Medical Council state in Good Medical Practice 2013 that "work should be recorded clearly, accurately and legibly…containing relevant clinical findings, decisions made and actions agreed". This audit aims to evaluate whether all trauma and elective Orthopaedic patients at one unit receive a daily senior review, which is fully documented in the case-notes, and whether a Comprehensive Unit-based Safety Programme (CUSP) toolkit can better facilitate this?

Methods: Case-notes for all patients admitted under Trauma and Orthopaedics on three separate non-consecutive days during a two-week period were scrutinized, examining them for the presence of CUSP toolkits and whether these were adequately completed.

Results: 71 case-notes containing 291 CUSP toolkits were analysed. 46.4% had a completed toolkit for everyday since admission; however for those that did not, over half (55.2%) did not have a senior review documented elsewhere for the missing days. Only 1.4% of case-notes had a full complement of up-to-date CUSP toolkits completed entirely correctly. For patients on Orthopaedic wards, most common errors were failure to document date and time (69.7% incorrect), ward and bed number (30.7% incorrect), patient alerts (70.7% incorrect) and overall compliance in documentation of required parameters such as MRSA status, investigations, observation and fluid charts (23% incorrect).

Conclusion: In conclusion, better education for clinical staff is needed to improve compliance both with daily senior review, CUSP toolkits and overall documentation to provide optimum patient care.

Notes:

POSTOPERATIVE CHANGE IN THE SIZE OF THE MEDIAL MENISCUS

Takayuki Furumatsu, Hiroto Inoue, Shinichi Miyazawa, Takaaki Tanaka, Masataka Fujii, Toshifumi Ozaki
Department of Orthopaedic Surgery, Okayama University Graduate School, 2-5-1 Shikatacho, Kitaku, Okayama 700-8558, Japan
Postoperative Change in the Size of the Medial Meniscus by Takayuki Furumatsu, Hiroto Inoue, Shinichi Miyazawa, Takaaki Tanaka, Masataka Fujii & Toshifumi Ozaki
Presented by Takayuki Furumatsu

Background: Meniscus repair can restore the function of torn meniscus in anterior cruciate ligament (ACL)-reconstructed knees. However, few reports investigate the relationship between concurrent meniscus repair with ACL reconstruction and postoperative meniscal position. This study aimed to evaluate the size of the medial meniscus in patients who underwent ACL reconstruction and concomitant all-inside medial meniscus repair.

Methods: This study received the approval of our Institutional Review Board. Twenty patients underwent ACL reconstruction and concurrent medial meniscus repair of a peripheral longitudinal tear using the FasT-Fix meniscal repair device. Medial tibial plateau length (MTPL) and width (MTPW) were determined by radiographic images. We evaluated the Lysholm score, anteroposterior instability (difference in KT-2000 arthrometer measurement), meniscal healing, and magnetic resonance imaging (MRI)-based medial meniscal length (MML) and width (MMW). The healing status of repaired medial meniscus was assessed by 2nd-look arthroscopy.

Results: ACL reconstruction improved the Lysholm score and anteroposterior instability. All the patients showed complete healing of the repaired meniscus in 2nd-look arthroscopic evaluation. Significant increase of MML and MML percentage (100 × MML/MTPL) was observed after concurrent all-inside medial meniscus repair with ACL reconstruction. However, MMW and MMW percentage (100 × MMW/MTPW) were not affected.

Conclusions: Concurrent all-inside medial meniscus repair with ACL reconstruction had satisfactory clinical results. Anteroposterior length of the medial meniscus increased after surgery. Our results suggest that medial meniscus repair associated with ACL reconstruction may affect the biomechanical function of the medial meniscus.

Level of evidence: Case-control study, Level IV
Disclosure: The authors have no conflicts of interest.

Notes:

POSTOPERATIVE CHANGE IN THE SIZE OF THE MEDIAL MENISCUS

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Level of evidence: Case-control study, Level IV

Notes:

ABSORBABLE POLYDIAXONONE DUTURE PROVIDES LESSER COMPLICATIONS IN TENDO-ACHILLES RUPTURE REPAIR

Muhammad Baig & Robert Dinn

Absorbable Polydiaxonone suture provides lesser complications in Tendo-Achilles rupture repair MN Baig, M Ismail, R Din. Department of Orthopaedics, Kerry General Hospital, Ireland.

Background: We prospectively studied achilles tendon acute rupture cases operated over 2 years and reviewed the causes, treatment options, outcome and complications. Our Aim of the study was to look at the different suture materials used and to observe for their complications.

Method: Fifty three 53 consecutive patients who came to our hospital with acute Achilles rupture were included. We prospectively collected their data, including medical history, causes , mode of treatment and complications.We followed them up to 6 months to measure their outcome using Boyden score and observe any complications.

Results: We randomized the fifty three 53 patients into two groups according to admitting consultant. Out of fifty three 53 Achilles tendon ruptures nineteen 19 were repaired using Polyester (Ethibond) and thirty four 34 were repaired using Polydiaxonone (PDS). There were 6 surgical infections of the operative site and one DVT.

Conclusion: In majority of patients the functional outcome results were good to excellent according to Boyden score .We observed that all of them who got infection were repaired using non-absorbable polyester (ethibond).We also observed that DVT prophylaxis should be regularly given in the patients.

Notes:

AN UNUSUAL CASE OF HIP PAIN IN A FOUR YEAR OLD CHILD

Backgroud: We herein report a case of isolated hip pain in a four year old boy. The unique aspect of this case study is the unusual history, presentation, ultrasonography, MRI and blood culture results, which lead to the diagnosis and treatment of adductor pyomyositis with a rare organism (Streptococcus Mitis) in a temperate country. The objectives of this case study is to discuss the key learning outcomes with respect to assessment and management of this case.

Methods: The patient presented with a one day history of malaise, fever, left groin pain and inability to weight bear on the left leg. There was no history of any trauma, predisposing infections or recent travel. A working diagnosis of transient synovitis / septic arthritis of the hip was made on clinical examination.

Results: Plain radiograph and ultrasound of the hip was normal with no effusion. Two consecutive blood cultures suggested Streptococcus Mitis bacteriaemia and MRI scan confirmed pyomyositis of the left hip adductors that was too small to drain. Streptococcus Mitis is a normal commensal organism of the oral cavity however it can lead to opportunistic infections particularly endocarditis. Echocardiogram revealed no cardiac complications, in particular no endocarditic vegetation. Patient was treated with intravenous benzylpenicillin for a week followed by oral phenoxymethylpenicillin for a week.

Conclusion: Adductor pyomyositis must be considered as a differential diagnosis in a child with unusual presentation of hip pain. When an ultrasound is normal, MRI scan is warranted to confirm diagnosis. Septic screen should include blood cultures. The commonest causative organisms are the Staphylococcus family. However if Streptococcus Mitis is isolated, cardiac sources of infection resulting in septic emboli must be investigated. Repeated MRI scans are required particularly if the patient does not respond to medical management.

Level of Evidence: IV

Notes:

MECHANICAL PROPERTIES OF NANOTEXTURED TITANIUM ORTHOPEDIC SCREWS FOR CLINICAL APPLICATIONS

BACKGROUND: Medical applications of nanotechnology are promising because it allows the surface of biomaterial to be tailored to optimize the interfacial interaction between the biomaterial and its biological environment. Such interfaces are of interest in the domain of orthopedic surgery as they could have anti-bacterial functions or could be used as drug delivery systems. The development of orthopedics is moving towards better integration of biology in implants and surgical techniques, but the mechanical properties of implanted materials are still important for orthopedic applications. During clinical implantation, implants are subjected to large mechanical stresses. In order to obtain the best performance during clinical use, mechanical properties of implants need to be investigated and understood.

METHOD: We modified the topography of commercial titanium orthopedic screws using electrochemical anodization in a 0.4 wt% hydrofluoric acid solution to produce titanium dioxide nanotube layers. The morphology of the nanotube layers were characterized using scanning electron microscopy. The mechanical properties of the nanotube layers were investigated by screwing and unscrewing an anodized screw into several different types of human bone while the torsional force applied to the screwdriver was measured using a torque screwdriver. The range of torsional force applied to the screwdriver was between 5 and 80 cN·m. Independent assessment of the mechanical properties of the same surfaces was performed on simple anodized titanium foils using a triboindenter.

RESULTS: The fabricated nanotube layers can resist mechanical stresses close to those found in clinical situations.

CONCLUSION: The mechanical characteristics of this surface treatment appear to be sufficiently robust to withstand realistic clinical operating conditions that our in vitro experiments were designed to simulate. These results show that the nanotube layers remain intact after the implantation process. This may allow for the exciting possibility of nanotubes being loaded with molecules.

LEVEL OF EVIDENCE: II

Notes:

VARIABILITY OF EXTRACTION CORKSCREWS: A BIOMECHANICAL STUDY

James W A Fletcher[1], Sam L Evans[2]
[1] Orthopaedic Registrar, Musgrove Park Hospital, Taunton
[2] Professor of Engineering, Cardiff University

Background: Devices are frequently used to gain sufficient purchase in a bone so that the bone itself can be manipulated to move or rupture soft tissue attachments. During hip surgery, several different extraction corkscrews are available to remove the femoral head, each with a different screw design with no evidence to suggest which is most effective. Additionally during the use of corkscrew devices, often due to the low bone density, stripping of the screw threads out of the femoral head can occur prior to its extraction, thus requiring reinsertion. The aims of this project were to measure the primary pullout and reinsertional forces of five commercially available corkscrews.

Methods: Polyurethane bone models covering a spectrum of osteoporotic to normal bone densities (0.08 gcm^{-3}, 0.16 gcm^{-3} and 0.32 gcm^{-3}) were used in axial tensile testing at two insertional depths to assess the maximum pullout force of these corkscrews (Zimmer, Stryker, Medacta, JRI, Depuy).

Results: There are significant differences between the pullout forces produced throughout the different densities at both insertional depths; 0.08gcm^{-3} ($p=0.002$), 0.16 gcm^{-3} ($p<0.001$) and 0.32 gcm^{-3} ($p=0.006$). Reinsertional testing on all corkscrews demonstrated a reduction in the pullout force of approximately 70%, underlining the benefit of effective insertion and extraction on the first attempt.

Conclusion: In all bone model densities, consistent differences in the pullout forces generated were identified. All the corkscrews generate forces greater than the estimated forces required to yield the soft tissues attached to a femoral head. Further work into optimising the corkscrew design, especially regarding the torque generated during insertion, will improve the efficacy of future corkscrew use. This information should be transferable to other situations where manipulation of a bone is needed at the temporary or permanent expense of the attached soft tissues.

Level of evidence: V: Biomechanical study

Notes:

AUDIT OF TRANSFUSION RATES IN HIP FRACTURES

Nastaran Sargazi, E. Adamson & G.Cheung
Audit of transfusion rates in hip fractures N.Sargazi, E.Adamson, G.Cheung Department of Trauma and Orthopaedics, Royal Liverpool and Broadgreen University Hospitals, Liverpool, UK
Corresponding Author: Nastaran Sargazi Email: nastaran08@hotmail.co.uk

Background Hip fractures are one of the leading causes of hospital admissions. Surgical treatment is often associated with significant blood loss, requiring post-operative erythrocyte transfusion. Aim To assess post-operative erythrocyte transfusion rates for hip fractures and evaluate the effect of tranexamic acid (TXA).

Method All patients undergoing surgical repair of a hip fracture at RLBUHT between 1st April 2013-30th April 2014 were selected. Data regarding transfusion status and peri-operative TXA use was collected from electronic databases and case notes.

Results 450 patients were admitted with a hip fracture, of whom 441 underwent surgery. Modalities of hip fixation included total hip replacement (THR, n=39), hemiarthroplasty (n=145), dynamic hip screw (DHS, n=116), cannulated hip screw (CHS, n=17) and long (n=71) and short (n=53) intramedullary hip screw (IMHS). 44.2% received a post-operative erythrocyte transfusion, with an average of 2.5 units per patient (range 1-9 units). With all study subjects included, the average transfusion rates for THR, hemiarthroplasty, DHS, CHS, long IMHS and short IMHS were 0.44 units, 0.78 units, 0.97 units, 0.47 units, 1.55 units and 1.19 units respectively. Data regarding intra-operative TXA administration was available for 318 (72.1%) patients, sixty-one of whom received TXA. 27.9% given TXA required a post-operative transfusion (range 0-6 units), compared to 35.4% of patient with no intra-operative TXA (range 0-11 units), p=0.142.

Conclusion 44.2% of patients required an erythrocyte transfusion, with an average of 2.5 units per patient of those transfused. This is higher than rates quoted by other studies including Shokoohi et al who had a transfusion rate of 32.6%. Adherence to local transfusion protocols must be reviewed. There is a tendency for TXA to reduce post-operative transfusion requirements, however in this study, this did not reach statistical significance (p=0.142). A larger, randomised controlled trial is required to assess the role TXA in hip fracture surgery.

Notes:

TEMPORIZING EXTERNAL FIXATION OF CALCANEUS FRACTURES PRIOR TO PLATE FIXATION

Primary Author: Brian M. Farrell, MD, Cedars Sinai Medical Center
Additional Authors: Carol A. Lin, MD, Cedars Sinai Medical Center
Charles N. Moon, MD, Associate Director, Orthopaedic Trauma, Cedars Sinai Medical Center
Abstract Presenter: Brian M. Farrell, MD, Cedars Sinai Medical Center

BACKGROUND: Surgical management of calcaneus fractures is demanding and has a high risk of wound complications. Traditionally these fractures are managed with splinting until swelling has subsided. We describe a novel protocol for the management of displaced intra-articular calcaneus fractures utilizing a temporizing external fixator and staged conversion to plate fixation through a sinus tarsi approach. The goal of this technique is to allow for earlier treatment with open reduction and internal fixation, minimize the amount of manipulation required at the time of definitive fixation and reduce the wound complication rate seen with the extensile approach.

METHODS: The records of patients with displaced calcaneus fractures from 2010-2014 were retrospectively reviewed. A total of 10 patients with 12 calcaneus fractures were treated with this protocol. All patients underwent ankle-spanning medial external fixation within 48 hours of injury. Patients underwent conversion to open plate fixation through a sinus tarsi approach when skin turgor had returned to normal. Time to surgery, infection rate, wound complications, radiographic alignment, and time to radiographic union were recorded.

RESULTS: The average Bohler's angle improved from 13.2 (range -2 to 34) degrees preoperatively to 34.3 (range 26 to 42) degrees postoperatively. The average time from external fixation to conversion to internal fixation was 4.8 (range 3 to 7) days. There were no immediate post-surgical complications. The average time to weight bearing was 8.5 weeks. The average time to radiographic union was 9.5 (range 8 to 12) weeks. There were no infections or wound complications at the time of last follow-up.

CONCLUSIONS: Early temporizing external fixation for the acute management of displaced calcaneus fractures is a safe and effective method to reduce and stabilize the foot and may decrease the time to definitive fixation. In our series there were no complications related to the use of the external fixator.

LEVEL OF EVIDENCE: IV Retrospective case series

Notes:

THE ROLE OF CT IN ASSESSING THE ACUTE ELBOW DISLOCATION

RW Jordan, A Jones, S Malik. Worcester Royal Hospital

Introduction: The stability of the elbow joint following an acute elbow dislocation is dependent on associated injuries. The ability to identify these concomitant injuries correctly directs management and improves the chances of a successful outcome. Interpretation of plain radiographs in the presence of either a dislocation or post-reduction films with plaster in-situ is difficult. This study aimed to assess the ability of orthopaedic registrars to accurately identify associated bony injuries on initial plain radiographs using CT as the gold standard for comparison.

Methods: Patients over the age of 16 years undergoing an elbow CT scan within one week of a documented elbow dislocation between 1st June 2010 and 1st June 2014 were included in the study. Three orthopaedic registrars independently reviewed both the initial dislocation and immediate post reduction plain radiographs to identify any associated bony injuries. This radiograph review was repeated by each registrar after two weeks. The incidence of associated injuries as well as the inter- and intra-observer variability was calculated.

Results: 28 patients were included in the study. 54% of the patients were female and the mean age was 45 years (range 16 to 90 years). The incidence of a radial head fracture was 54%, coronoid fracture 43% and epicondyle avulsion 18% on CT. The inter-observer reliability was only shown to be fair amongst registrars and the intra-observer variability moderate.

Conclusion: Computerised tomography is a useful adjunct in the assessment of associated osseous injuries following an elbow dislocation due to the presence of a high number of injuries. Plain radiographs alone have been shown to have only a fair and moderate inter and intra-observer variability respectively, therefore a low threshold to obtain further 3D imaging should be practised.

Level of evidence: IV

Notes:

ACUTE CORRECTION OF INR FOR PATIENTS REQUIRING URGENT ORTHOPAEDIC SURGERY

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LAS Orthopaedic Clinical Fellow[1]/Consultant Orthopaedic Surgeon[2]
University Hospital Aintree NHS Foundation Trust, Liverpool, UK

Background and Aims: Many orthopaedic patients admitted to hospital who require urgent surgery are also on Warfarin. Patients with an INR>2 have an increased risk of bleeding complications during surgery; however delay to surgery due to a high INR has both clinical and financial implications. This audit evaluates whether the appropriate management for correction of INR is employed as per local guidelines and, if not, whether this results in significant delay to operative treatment.

Methods: A retrospective and prospective audit was performed analysing all Orthopaedic trauma admissions admitted to University Hospital Aintree in a 5 month period. Only those solely on warfarin, who were not acutely bleeding and required surgery in <24 hours were included.

Results: A sample of 17 patients was obtained of which only 35.3% had correct INR reversal as per local guidelines. Errors that occurred included 81.1% not being given further Vitamin K at reassessment, 18.2% given too much Vitamin K, 9.1% given too little Vitamin K, 18.2% given Octaplex incorrectly and 9.1% not given Octaplex when indicated. Only 1 patient had a delay to their surgery directly resulting from incorrect INR reversal (total time to surgery - 33 hours 45 minutes).

Conclusion: Better education for clinical staff on the local policy for INR reversal in patients requiring urgent orthopaedic surgery is needed. Local policy guidelines have since been redesigned in light of these results and a completion audit cycle has been performed showing significant improvement with 50% of the patient sample given correct INR reversal.

Notes:

RESEARCH ROCKET 2

FINITE ELEMENT ANALYSIS AND ITS USES IN COMPLEX TIBIAL FRACTURES.

Mr Robert Hurley, Mr Jamie Concannon, Dr Nicola Lally, Mr John P McCabe

Background: Comminuted fractures involving the tibia are associated with a high level of complications including delayed healing and non-union, in conjunction with dramatically increased healthcare costs. Certain clinicians utilise a Pixel Value Ratio (PRV) of 1 to indicate such fracture healing. The subjectivity of this method has led to mixed outcomes including regenerate fracture. The poor prognosis of complex load bearing fractures is accentuated by the fact that no quantitative gold standard currently exists to which clinicians can reference regarding the definition of a healed fracture. The aim of the current study is to use patient specific finite element analysis of complex tibial fractures treated with Ilizarov frames to demonstrate callus maturation and to determine the optimum frame removal time.

Methods: 3 patients (2 males, 1 female) were analysed following presentation with complex tibial fractures treated with Ilizarov frames. Patient specific computational analysis was performed according to radiographic data, incorporating maturing material properties to analyse the callus response to weight bearing over the healing timeframe. Computational results were compared to the PVR method to evaluate its efficacy in determining the optimum Ilizarov frame removal time.

Results: All fractures were observed to clinically heal at a mean of 25.4 (±2.404) weeks. Following computational analysis however, the mean optimum Ilizarov frame removal time was seen to be 23.5 (±2.323) weeks. When compared with the PVR method, the suggested removal time presented a mean PVR of 1.025 (±0.017).

Conclusion: Computational models of patient specific tibial fractures has shown promising correlations with the PVR method and has shown efficacy in predicting callus strength and subsequent optimum frame removal time.

Level of evidence: Level 4

Notes:

CALCIUM PHOSPHATE/CARBON CLOTH HYBRID MATERIALS FOR BONE REGENERATION

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Background: Due to their tailored porous texture, breathability and flexibility, carbon cloths (CCs) are good scaffolds for biomedical application. However, biocompatibility of CCs depends on their physic-chemical properties. Calcium phosphate ceramics (CaP) are well known for their use in orthopaedic field. So, carbon cloth-reinforced CaP composites are promising bioceramic materials for bone regeneration.

Methods: CaP coating are performed using sono-electrochemical deposition method [1]. The electrolyte consisted in an aqueous solution of calcium and phosphates precursors. CC was used as work electrode in three-electrode system. SEM, TEM, XRD, ^{1}H and ^{31}P MAS NMR and FTIR spectroscopies were performed to characterize the deposits. In vitro biocompatibility of CCs with and without coatings is tested with human osteoblasts.

Results: The current density influences the morphology and the chemical composition of deposit: it consists mainly in carbonated hydroxyapatite with plate-like shape for lower current densities and needle-like shape for the highest (Figure 1). A hydrophobic surface of CC with due to small amount of oxygenated functions leads to a poor biocompatibility.

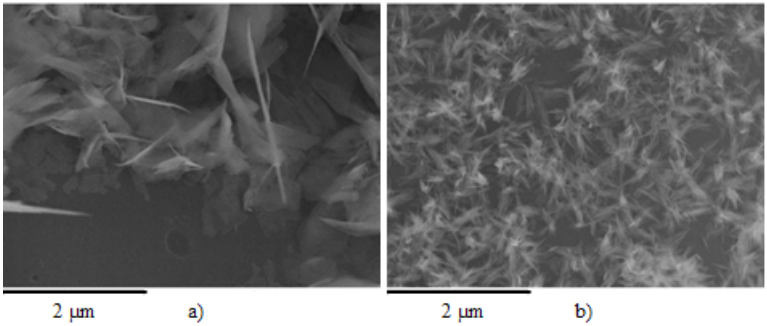

Figure 1: SEM images of plate-like (a) and needle-like (b) deposits

Conclusion: The wettability of CCs is an important parameter of biocompatibility. Biomimetic CaP deposits obtained by sono-electrodeposition present a microstructure and a chemical composition close to the mineral phase of natural bone.

References:
1. Han HM. et al., New Carbon Materials (2007), 22:121-125

Acknowledgments:
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EFFECTIVENESS OF THE COBB-STAINSBY FOREFOOT ARTHROPLASTY

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The Cobb Stainsby forefoot arthroplasty for claw and hammer toes combines excision arthroplasty (Stainsby) with extensor tendon transfer to the metatarsal head (Cobb). We present a retrospective, three surgeon case series of 218 toes in 128 patients over four years.

Clinical notes were reviewed for all patients and 77 could be contacted for a telephone survey. Follow up ranged from 12-82 months.

All patients presented with pain and shoe wear problems from dislocated metatarsophalangeal joints either from arthritis, hallux valgus, Freiberg's disease or neurological disorders. Ipsilateral foot procedures were performed simultaneously in 24 (30%) patients. Seventy-two patients (94%) were satisfied, 72 (94%) reported pain relief, 55 (71%) were happy with toe control, 61 (79%) were pleased with cosmesis, 59 (77%) returned to normal footwear and 56 (73%) reported unlimited daily activities. Minor complications occurred in 17 (13%) and 3 (2%) developed complex regional pain syndrome. Four (5%) developed recurrent clawing.

The Stainsby procedure permits relocation of the plantar plate under the metatarsal head for cushioned weight-bearing but can create a floppy, unsightly toe. By combining this with the Cobb procedure, our case series demonstrates improved outcomes from either procedure alone with benefits over alternatives such as the Weil's osteotomy.

Oxford Level 4 evidence – retrospective case series.

Notes:

INTERNAL FIXATION OF INTRACAPSULAR NECK OF FEMUR FRACTURES - TWO-HOLE SLIDING HIP SCREW OR CANNULATED HIP SCREWS?

A 5-year Retrospective study of practice and outcomes

Woods,S: Vidakovic, I; Alloush, A; Mayahi, R

Background: Intracapsular neck of femur fractures are one of the most common injuries seen in Orthopaedics. When the fracture is amenable to internal fixation there are 2 main treatment options, namely multiple cannulated hip screws (MCS) and 2-hole sliding hip screws (SHS). In this retrospective study we examine the outcomes associated with these two methods of internal fixation. At present there is little consensus regarding which treatment should be used

Methods: 161 patients were found to have suffered intracapsular neck of femur fracture treated with either SHS or MCS fixation over a 5 year period from April 2009 to April 2014, allowing at least 1 year follow up following injury. The patients imaging and clinical notes were then reviewed to ascertain the outcome of their treatment and any complications.

Results: 93 patients were treated with a sliding hip screw compared to 68 that had been treated with cannulated screws. To ensure the fractures in each group were comparable in terms of fracture severity they were classified using gardens and pauwels score. The mean age of the group treated with SHS was 75.15 years, 7.69 years higher than those treated with MCS. The mean length of inpatient stay was 4.7 days longer for patients treated with sliding hip screws than those treated with cannulated screws, which is significantly more than would be predicted by age difference alone.
Further patients were excluded for analysis of failure rate if they had not been sufficiently followed up, leaving 122 patients, 58 treated with MCS and 64 with SHS. A significantly higher (p=0.0136) proportion of patients treated with SHS (32%) suffered failure of their fixation compared to those treated with MCS (10%). The SHS group was further classified by whether or not a permanent derotation screw was employed. The use of a derotation screw provided protection against failure with a number needed to treat of 3.82, decreasing the failure rate to 14% which was not significantly more than the failure rate for MCS.

Conclusions: We recommend that the first choice treatment for intracapsular neck of femur fractures amenable to internal fixation should be cannulated screws due to a lower rate of failure and shorter length of inpatient stay. If a surgeon has a strong preference for sliding hip screw we strongly recommend inserting a permanent derotation screw.

Notes:

A COMPARATIVE STUDY OF ULTRASOUND-GUIDED INJECTIONS IN PALMAR APONEUROSITIS

Malahias, Babis, Kaseta, Chytas, Kazas, Nikolaou

Introduction: We compared ultrasound guided methylprednizolone-lidacaine infiltrations around inflammatory area of plantar aponeurosis with systematic use of NSAID'S. Also, we investigated the reliability of the sonographic criteria (a. swelling of aponeurosis more than 20% in comparison to the healthy foot, b. effusion around aponeurosis, c. calcium deposits) most used to identify plantar fasciitis in clinically suspicious patients.

Methods: A prospective randomized controlled clinical trial, including 28 patients (mean age: 47 years, range: 36-65 years, 85% females) with typical clinical symptoms of plantar fasciitis. All of these patients undertook a soft tissue ultrasonography of the plantar aponeurosis, without Doppler. Then, we randomly divided our sample in 2 groups, group A (14 patients) and group B (14 patients). In group A patients we performed an ultrasound guided injection –in transverse view- around the swollen part of aponeurosis, while we managed group B patients with per os NSAID's treatment (meloxicam 15 mg, once per day) for 2 weeks.

Results: From the 28 suspicious patients we found 20 (71.4%) matching at least in one of our sonographic criteria. Swelling in comparison to the contralateral foot was the most usual found on these patients (14/20: 70% of the -ultrasound positive- patients). In group A patients the mean visual analogue scale (VAS) 100/100 after 1 month reduced –from 69/100 prior to injection- to 34/100, while 6 patients (42.85%) declared free of symptoms and 4 had poor or no improvement. In group B patients, the mean VAS decline was 21/100 (from 66/100 prior to injection, to 45/100 1 month later) , but only 1 patient reported pain free.

Conclusion: High frequency ultrasound of the foot is a good standing -but not excellent- diagnostic tool for plantar aponeurositis. Ultrasound guided methylprednisolone injections seems to have better short-term results than per os anti-inflammatory treatment on these patients.

Notes:

COMPARING GUIDED TO BLIND DISSOLUTION OF SUPRASPINATUS CALCIFIC DEPOSITS

Background: To determine if double needle ultrasound-guided hydrodissolution and aspiration of intratendinous calcification is more effective treatment than blind subacromial corticosteroid injection.

Methods: A prospective randomised comparative clinical study of 32 patients suffering from chronic symptomatic calcific tendinosis of the supraspinatous tendon. Group A (16 patients) received a double needle ultrasound-guided aspiration of the calcification, while group B (16 patients) underwent a blind subacromial betamethazone injection. As far as group A, we attached a syringe in the first needle, including 10cc. of normal saline (N/S), that we injected targeting the calcium deposit. Then we tried to achieve consecutive aspirations through the second needle.

Results: Patients were evaluated by an idependent researcher who measured the visual analogue scale (VAS) 100/100 and the range of motion (ROM): a. before, b. 10 days and c. 6 months after the injection. In most cases of group A, we observed a noticeable amount of aspirated milky or mixed white-red coloured fluid at the bottom of the syringe. This fact proves right and effective guidance of the ultrasound. After six months, we documented full –or almost full- decline (VAS: 0-20/100) of the symptoms in 62.75 % of the group A patients and in 43.75% of the group B patients. The 6 month's mean VAS fall rate was 45/100 in group A and 33/100 in group B. Corticosteroid injected patients proved to have better outcome inside the first 10 days. The mean abduction of the humerus in the 6 month's follow-up was 110 degrees (from 77.5 degrees prior to aspiration) for the group A and 85 degrees for group B (from 72.5 degrees -prior).

Conclusion: Double needle dissolution -and aspiration- with N/S represents better long-term results (regarding ROM and pain release) than blind corticosteroid injection in the treatment of chronic symptomatic calcific tendinosis.

Level I

Notes:

PATIENT-REPORTED OUTCOME AND EXPERIENCE MEASURES FOR HALLUX-RIGIDUS. CHILECTOMY VS FUSION

Background: PROMS and PREMS are a fundamental and essential part of the NHS. Chilectomy and fusion procedures for hallux rigidus produce varied outcomes due to their subjective nature. PROMS2.0, a semi-automated web-based system, which allows collection and analysis of outcome data, to compare what PROMS/PREMS for chilectomy/fusion for hallux rigidus are at UHSM including variance across osteoarthritis grades.

Methods: Data was collected from March-2013 to December-2014. Scores used to assess outcomes included EQ-5D-VAS, EQ-5D Health-Index, and MOxFQ, collected pre-operatively and post-operatively. Patient-Personal-Experience (PPE-15) was collected postoperatively. Data was compared.

Results: 10 patients (4F, 6M) (9R, 1L) had a 1st MTPJ chilectomy. Average age- 47.3 (range 34-70). 16 patients (12F, 4M) (9RT, 7LT) had a 1st-MTPJ fusion. Average age- 60.3yrs (range19-83)
Chilectomy pre-op average MOXFQ scores for pain, walking and social interaction: 33.5 (range 5-70), 27.6 (range 0-64) and 24.9 (range 0-75) respectively. Post operatively these improved to 25.0 (range 0-70), 24.3 (range 0-68) and 21.9 (range 0-50). EQ5D scores showed a regression; pre-op index average of 0.72 and post op 0.70. Pre-op VAS score average of 86.8 with post-op 80.4.
Fusion pre-op average MOXFQ scores for pain, walking and social interaction: 50.7 (range 25-75), 49.1 (range 4-75) and 48.4 (range 25-75) respectively. Post-operatively improved to 9.7 (range 0-57), 16.1 (range 0-57) and 20.1 (range 0-50). EQ5D scores showed improvement; with pre-op index average of 0.68 and post-op 0.83. Pre-op VAS score average of 72.5 and post-op 83.6. Higher grades of OA responded better to fusion and lower grades better to chilectomy.
17 patients (10 fusion/7 chilectomy) filled PPE-questionnaires. Results show overall satisfactory experience for both sets of patients.

Conclusion: Both procedures show improved outcomes. Fusions have greater improvements than chilectomy based on reported outcomes. Higher grades of OA do better with fusion.

Level of evidence: Prospective case series- Level 3

Notes:

FID119: HYALURONAN PHOTOCROSSLINKED HYDROGEL FOR ARTICULAR CARTILAGE DEFECTS

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Background: Hyaluronic acid (HA) hydrogels are becoming an increasingly attractive choice for the creation of new biomaterials useful in wound care, tissue engineering and regenerative medicine, because of their high level of biocompatibility and biodegradability, and for their ability to imitate the environment of the extracellular matrix (ECM).[1] Due to the poor biomechanical properties of native hyaluronan, a variety of chemical modifications have been devised to provide mechanically and chemically stiffer materials.[2]

Methods: In this work, 200 kDa hyaluronic acid was modified with coumarin moieties via a functional linker (FID119) and photo-polymerized into networks through a [2+2] cycloaddition reaction using near-UV light (l_{max}=365 nm).[3] This method allows to obtain "wall-to-wall" hydrogels starting from moderately viscous solutions. FID119 can therefore be deposited in the cartilage defect as an aqueous solution and can be polymerized in situ after UV irradiation.

Results: With a HA molar derivatization ranging from 10% to 40% and a concentration varying from 10 mg/mL to 40 mg/mL, hydrogels exhibited a wide range of physical properties. When a suspension of human dermal fibroblasts was photo-encapsulated within the hydrogels, cells retained a rounded morphology throughout the period of culture and showed no spreading. Cells remained viable after 48 hours encapsulation, confirming that their viability was affected neither by the polymerization process nor by UV irradiation. In this study we have also evaluated the proliferation of fibroblasts encapsulated in HA-hydrogels at different degree of reticulation, concentrations and polymerization time. By means of the resazurin reduction assay (Alamar Blue®) it has been shown that encapsulated fibroblasts showed overall lower metabolic activity compared to fibroblasts cultured in traditional 2D tissue culture plastic dishes, in all the tested conditions.

Conclusions: This work represents a first step towards the development and characterization of new HA-based advanced biomaterial to be used as scaffolds in cartilage regeneration. The screening of the different FID119 preparations led to the selection of three prototypes representing the best compromise between physical-chemical properties and biocompatibility.

Level of evidence: III.

Notes:

INTRAMEDULLARY NAILING OF ADOLESCENT CLAVICLE FRACTURES

Background Clavicle development occurs before the age of 9 in females and 12 in males. Children below the age of 10 with displaced midshaft clavicle fractures recover well with conservative management. However adolescents are more demanding of function and satisfaction following clavicle fractures and may benefit from operative management. Study aims:
1-Perform a systematic review of the current evidence supporting intramedullary fixation of adolescent clavicle fractures.
2-Review current management in a major trauma center (MTC) with a view to assess feasibility for a randomised controlled trial (RCT).

Methods
1. The MEDLINE, EMBASE and AMED databases were searched in October 2014 to identify all English language studies evaluating intramedullary fixation in children aged 10-18 years using MeSH terms. Data was extracted using a standardised data collection sheet and studies were critically appraised by aid of the PRISMA checklist.
2. All patients aged 9-15 attending an MTC receiving clavicle radiographs in 2014 were retrospectively reviewed for type of fracture, management and outcome.

Results. Literature search identified 54 articles. After application of exclusion criteria 3 studies were selected for final review. 47 adolescent patients received intramedullary clavicle fixation from a prospective and two retrospective case series.
61 adolescents presented to our unit with a clavicle fracture in 2014, 2 were lost to follow-up, 54 were managed non-operatively, 3 received titanium-elastic nailing, 1 plate osteosynthesis and 1 bone suture. 0 and 19 patients reported a palpable lump, mean time to pain resolution was 4 and 6 weeks and time to full range of motion was 4 and 5 weeks following operative and conservative management respectively. All patients reached radiographic union.

Conclusion. Current evidence supporting intramedullary fixation of clavicle fractures in adolescents is poor. There remains clinical equipoise on the best management of these patients, however they are predominantly treated conservatively. A future multi-center RCT may be feasible.

Level of evidence: 1

Notes:

3D MODELLING OF UGENT KNEE SIMULATOR

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Introduction A new knee simulator has been developed at Ghent University. This simulator provides the unique opportunity of evaluating the knee kinematics during activities of daily living. The simulator therefore controls the position of the ankle in the sagittal plane while keeping the hip at a fixed position. This approach provides full kinematic freedom to the knee. To evaluate and validate the performance of the simulator, the development of and comparison with a numerical simulation model is discussed in this paper.

Methods Both a two and three dimensional simulation model have been developed using the AnyBody Modelling System (AMS). In the two dimensional model, the knee joint is represented by a hinge. Similarly, the ankle and hip joint are represented by a hinge joint and a variable amplitude quadriceps and hamstrings force is applied (Figure 1a). In line with this simulation model, a hinge model was created that could be mounted in the UGent knee simulator to evaluate the performance of the simulated model. The hinge model thereby performs a cyclic motion under varying simulated muscle loads while recording the ankle reaction forces.
In addition to the two dimensional model, a three dimensional model has been developed (Figure 1b). More specifically, a model is built of a sawbone leg holding a posterior stabilized single radius total knee implant. The physical sawbone model contains simplified medial and lateral collateral ligaments. In line with the boundary conditions of the UGent knee simulator, the simulated hip contains a single rotational degree of freedom and the ankle holds four degrees of freedom (three rotations, single translation). In the simulations, the knee is modelled using the force-dependent kinematics (FDK) method built in the AMS. This leaves the knee with six degrees of freedom that are controlled by the ligament tension in combination with the applied quadriceps load and shape of the implant. The physical sawbone model goes through five cycles in the UGent simulator using while recording the kinematics of the femur and tibia using a set of markers rigidly attached to the femur and tibia bone. The position of the implant with respect to the markers was evaluated by CT-scanning the sawbone model.

Results and Discussion In a first step, the reaction forces at the ankle in the 2D model were evaluated. The difference between the simulated and measured reaction force is limited and can be explained from a slight variation of the attachment point of the simulated muscle loads. For the 3D model, the kinematic patterns have been evaluated for both the simulation and physical model using Grood & Suntay definitions. The kinematic parameters display realistic trends, however, no exact match has been obtained for all parameters so far. The latter might be attributed to a number of simplifications in the simulation model as well as elastic deformation of the physical sawbone model.

Conclusion A three dimensional model of a knee implant in the UGent Knee Simulator has been developed. The simulated kinematic patterns appear realistic though no exact match with the measured patterns has been obtained. Future research will therefore focus on the development of a more realistic experimental and numerical model.

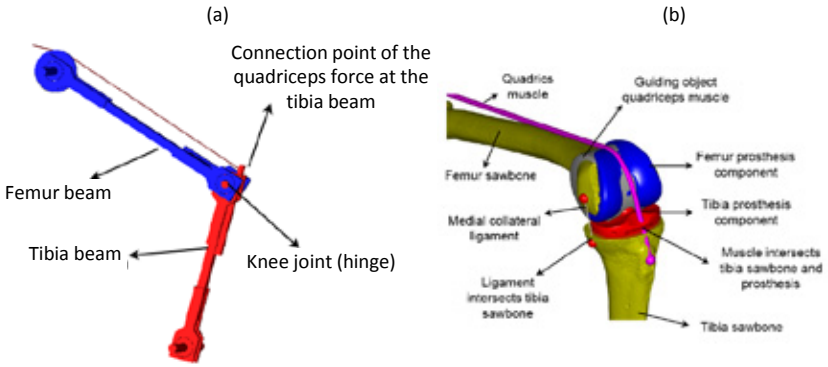

Figure 1: Numerical model of UGent Knee Simulator:
2D model of hinge with quadriceps load (a)
and 3D model of total knee implant (b)

Notes:

ANATOMICAL CONSIDERATIONS OF THE POSTERIOR INTEROSSEOUS NERVE IN LATERAL SURGICAL APPROACHES TO THE RADIAL HEAD – A CADAVERIC STUDY

Fucai Han, Jia Chen Lim, Chin Tat Lim, Bryan Hsi Ming Tan, Liang Shen, V Prem Kumar

Background: The traditional Kocher approach for lateral elbow exposure is often complicated by injury to the posterior interosseous nerve (PIN) and the lateral ulnar collateral ligamentous (LUCL). Kaplan approach is less commonly used, due to its known proximity to the PIN. Extensor Digitorum Communis (EDC) splitting approach allows possible wide surgical exposure and low risk of LUCL damage. The comparison of PIN injury during surgical dissection among these 3 common lateral approaches was not previously evaluated. We aim to determine the anatomical proximity of the PIN in these 3 common lateral elbow approaches and to define a safe zone of dissection for the surgical exposure.

Methods: Cadaveric dissections of 9 pairs of fresh frozen adult upper extremities were performed using EDC splitting, Kaplan and Kocher approach to the radial head sequentially in a randomized order. The radial head and PIN were exposed. A mark was made on the radial head upon the initial exposure during dissection. Measurements from the marked point of the radial head to the PIN were made. Study has been approved by the ethics committee.

Results: The EDC splitting approach is associated with a significantly lower chance of encountering the PIN along the entry of dissection to reach the radial head as compared to the Kaplan approach. The Kocher approach has a lower chance of encountering the PIN along the entry of dissection to reach the radial head as compared to both Kaplan and EDC splitting approach.

Conclusions: The EDC splitting approach provides adequate exposure without injury to the lateral ligamentous complex nor need to elevate or retract the EDC and ECU muscle mass that could risk injuring the PIN. The Kaplan approach should be done by experienced surgeons who are familiar with the anatomy in this region, with extreme caution due to proximity of the point of entry to the PIN.

Level of evidence : IV

Notes:

AUDIT ON THE SAFETY AND EFFECTIVENESS OF THE TARGON FN PLATE IN THE FIXATION OF HIP FRACTURES

Background: The Targon FN plate is a combination of the sliding hip screw and multiple cancellous screws. It is used in the fixation of intracapsular fractures of the neck of femur. The aim of this prospective audit was to assess clinical and radiological outcomes of Targon FN.

Method: All patients who had a Targon FN fixation over a period of 18 months at a district general hospital were included. A pro forma was completed using medical records, including x-ray images.

Results: Thirty-five patients were identified. Median (IQR) age was 73 (57-82). Median (IQR) waiting time for surgery was 27 hours (17-51). Median (IQR) operating time was 58 (50-65) minutes. The patients were followed up at 6, 12 18 and 24 months.
Three cases of avascular necrosis were reported and two cases of non-union. Seven cases were found where the Targon FN was not used correctly. No cases of implant failure were reported where the Targon FN was used according to manufacture guidelines. Five revision surgeries took place or were being planned for cases of avascular necrosis, non union and symptomatic hardware. One case was identified which would have been better treated with a hemiarthroplasty than Targon FN.

Conclusion: We recommend that the Targon FN plate continue to be used in our department. The success rate of the implant could be improved by educational workshops in our department to ensure that all surgeons adhere strictly to the operating technique described by the manufacturer. We recommend continuing careful selection of patients for Targon FN and to continue a follow up to 24 months.

Notes:

FRACTURE IN THE ELDERLY MULTIDISCIPLINARY REHABILITATION (FEMUR) FEASIBILITY STUDY

Jessica Roberts PhD[1], Nafees Ud Din MSc MFDS RCS[1], Claire Hawkes PhD[1], Val Morrison PhD[2], Andrew Lemmey PhD[4] and Nefyn H Williams PhD FRCGP[1,3] on behalf of the FEMuR team

Background: Proximal femoral fracture is a common, major health problem resulting in loss of functional independence and a high cost burden on society. Rehabilitation can potentially maximise functional recovery, but evidence of effectiveness is lacking. An enhanced rehabilitation intervention designed to improve self-efficacy and increase the amount and quality of practice of physical exercise and activities of daily living has been developed consisting of patient held workbooks and extra therapy sessions in the community. This study aims to define characteristics of the cohort of individuals this intervention is targeted to, assess acceptability of the intervention and feasibility of recruiting participants for a larger scale trial.

Methods: An anonymous cohort study of all proximal femoral fracture patients admitted to three acute hospitals will provide details on residence pre-admission, type of fracture, type of surgery, adverse events and subsequent readmissions. A separate randomised feasibility study recruiting participants from this cohort will assess acceptability and feasibility of the study in terms of eligibility, recruitment, reasons for decline, retention and outcome measure completion. The success rate of identifying patients for the feasibility study and whether the recruited participants are representative of the cohort population will be evaluated by comparison of the feasibility participant screening and background data with that of the cohort.

Results: 541 patients were screened for the feasibility study between June 2014 and February 2015 (ongoing). 298 were ineligible, 243 were eligible and 53 (22%) have been recruited to date. Lack of capacity is the leading cause of ineligibility and burden of taking part is perceived as a significant block to participation. Completion rate of outcome measures is high at baseline and follow up.

Conclusions: Recruitment from the acute setting is challenging. However, study processes, outcome measurement and intervention is well tolerated by participants.

Level of Evidence: I-Well conducted Randomised Trial (Pilot)

Notes:

BIOMECHANICAL ASSESSMENT OF A NOVEL EXPANDABLE HIP SCREW VERSUS DYNAMIC HIP SCREW

Fatih Ertem, Çağrı Havıtçıoğlu, Mehmet Erduran, Hasan Havıtçıoğlu

Background: The advantages of treatment by open reduction and internal fixation for intertrochanteric fractures of the proximal femur have been well known for several decades. Failure of fixation can result in revision surgery, prolonged inpatient stay and has major socio-economic consequences. There are many new devices on the market to help deal with this problem. Expandable hip screw (EHS) is one such device, which is an expanding bolt that may offer superior fixation in osteoporotic bone compared to the standard dynamic hip screw (DHS) type device.

Methods: Static axial compression tests with elastic deformation of the specimens were performed with a crosshead speed of 10 mm/min to determine stiffness of testing was performed with 3 cycles from 0 N to 250 N, 3 cycles from 0 N to 500 N, 3 cycles from 0 N to 750 N and 3 cycles from 0 N to 1000 N with a holding time of 10 s per test cycle. Displacement control was apply the pullout strength with a velocity of 1mm/sec. The ability to resist rotation about the axis of a lag screw is of critical importance particularly when the fracture line is perpendicular, or nearly perpendicular, to the femoral neck. Implants were subjected to a rotation of 1°/sec and peak torque values were recorded.

Results: The mean axial cyclic loading DHS showed higher stiffness value than EHS. The mean stiffness achieved at pullout test in the EHS and DHS groups were 587.8N/mm and, 334.1N/mm respectively ($p<.05$). The peak torque for the EHS device was significantly greater than the torque for the DHS with torque values of 4.56 Nm/°and 2.97 Nm/°, respectively ($p<.05$).

Conclusions: The EHS device demonstrated superior resistance to pullout and torsion greater loads compared to the DHS in an unstable fracture model. However, axial cyclic loading demonstrate lower strength, by optimizing the size of device will perform.

Level of Evidence: Level 5

Notes:

TRUNNIONOSIS AND ADVERSE REACTION TO METAL DEBRIS IN UNCEMENTED METAL-ON-POLYETHYLENE TRIDENT-ACCOLADE TOTAL HIP REPLACEMENTS – A CASE SERIES AND REVIEW OF RECENT LITERATURE

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Adverse reaction to metal debris (ARMD) is well recognised as a complication of large head metal on metal total hip replacement (THR) leading to pain, bone and tissue loss and the need for revision surgery. An emerging problem of trunnionosis in metal on polyethylene total hip replacements leading to ARMD has been reported in a few cases. Increased metal ion levels have been reported in THR's with a titanium stem and a cobalt chrome head such as the Accolade-Trident THR (Stryker).
We present 3 cases of ARMD with Accloade-Trident THR's with 36mm cobalt chrome head and a polyethylene liner. Metal ion levels were elevated in all three patients (cobalt 10.3 - 161nmol/l). Intraoperative tissue samples were negative for infection and inflammatory markers were normal. Abnormal fluid collections were seen in all three cases and bone loss was severe in one patient leading to a proximal femoral replacement. Histology demonstrated either a non-specific inflammatory reaction in a case which presented early or a granulomatous reaction in a more advanced case suggesting a local foreign body reaction. All patients had improved symptoms post-operatively. 1 patient who had staged bilateral Accolade-Trident THR's required revision of both THR's.
ARMD in metal on polyethylene THR's with a titanium stem represents a potential emerging problem. Further studies are required to assess whether these occurrences are rare or represent the tip of an iceberg.

Notes:

TRAUMA AND ORTHOPAEDICS (T&O) SMARTPHONE APPLICATIONS: A SYSTEMATIC REVIEW

Elgindi A, Jaafar M, Lazizi M

Aim: Smartphone applications have a great scope for revolutionising the medical field and are becoming increasingly utilised in clinical practice. They are advantageous as they are timesaving and readily available at the touch of a button. We reviewed all the T&O clinically relevant applications available for doctors on Apple's 'App Store'.

Methods: A search was performed using the following terms: Trauma, Orthopaedics, Ortho, Musculoskeletal and Fracture. Applications that were in any language other than English were excluded. The applications were subsequently categorised into: 'clinical', 'learning and reference', 'hospital guidelines' and 'patient education'.

Results: 136 of the 575 were relevant to T&O from the search conducted using the above terms. 18 of these applications were aimed at patient education and 118 were designed for use by doctors. 91 applications were for learning and referencing purposes, 4 were local hospital guidelines and only 23 were designed for use in clinical practice. 2/23 clinical applications were validated by official bodies and only 1/23 was rated by users.

Conclusion: It is clear that smartphone use is becoming more popular in clinical practice; however there is a need for developers to create more validated applications of higher quality for T&O surgeons.

Notes:

ONLINE CURVES: A QUALITY ANALYSIS OF SCOLIOSIS VIDEOS ON YOUTUBE.

Peter Staunton, Joseph F Baker, James Green, Aiden Devitt.

Background The internet is an increasingly utilised resource for accessing information regarding a variety of heath conditions. YouTube is a popular video sharing platform used to both seek and distribute information online.

Materials & Methods A search for 'scoliosis' was carried out using YouTube's search engine and data was collected on the first fifty videos returned. A JAMA score (to determine currency, authorship, source and disclosure) and scoliosis specific score (that measures the amount of information on the diagnosis and treatment options as devised by Mathur et al in 2005; scored 0-32) was recorded for each video to measure quality objectively. Additionally the number of views, number of comments and feedback positivity was documented for each. Data analysis was conducted using R 3.1.4/R Studio 0.98 with control for the age of each video in analysis models.

Results The average number of views per video was 71,152 with an average length of 7 minutes 32 seconds. Thirty six percent of the videos fell under the authorship category of personal experience. The average JAMA score was 1.32/4 and average scoliosis specific score was 5.38/32. There was a positive correlation between JAMA score and number of views P=0.003. However in contrast there was a negative correlation between scoliosis specific score and number of views P=0.01.

Conclusions Online health information has historically been poor and our study shows that in an environment like YouTube which lacks a peer review process, the quality of scoliosis information is low. Further work is needed to determine whether accessing information on YouTube can play a role in patient care other than simple education pertaining to the disease and its management.

Level of Evidence: Health Services Study Level 3

Notes:

EVALUATION OF ULTRASOUND-GUIDED HYDRONEUROLYSIS IN CARPAL TUNNEL SYNDROME

Background: To investigate the new theory of hydroneurolysis and hydrodissection in the treatment of carpal tunnel syndrome (CTS). Independently of the fluid hydrodissolution works due to mechanical forces and it may have some positive effects in patients with ischemic damage caused by scar tissue pressure at the nerve's surface.

Methods: A prospective blind clinical study of 31 patients suffering from carpal tunnel syndrome, established by nerve conduction studies and clinical tests. 14 patients (out of 29), who refused to undergo an open operation as a treatment to their disease at this point of time, were treated with a simple ultrasound-guided injection at the proximal carpal tunnel. In order to exclude the biochemical influence of the fluid in the treating disease we choosed to infiltrate 3 cc. of normal saline 0,9%. In the follow-up period our group was asked to answer to a new Q-DASH score and visual analogue scale (VAS) 100/100 in 2, 4 and 8 weeks.

Results: At the end of the second month we found only 2 out of 14 patients of the infiltration's group with clinical improvement. As far as the control group (17 patients), there was just one patient with recovery of the symptoms at the end of the second month who avoided operation. The rest 16 patients experienced insistence or worsening of CTS while they were waiting to be operated (mean time till operation in our department's waiting list: 2 months) and underwent a surgical decompression of the median nerve. Comparing the two groups in Q-DASH score, VAS 100/100 and ultrasound cross sectional area measurements we found no statistical difference between the two groups at the endpoint of our follow-up period.

Conclusion: As far as nerve entrapment syndromes we proved that normal saline hydrodissolution appears to be non effective as a conservative treatment. The mechanical way of action seems to have only very short term effects.

Level of Evidence: II

Notes:

ANTEGRADE VS. RETROGRADE FEMORAL NAILING: AN AUDIT OF CLINICAL PRACTICE

Raj R. Thakrar, Krupali Patel, Yaser Ghani, Amit Kotecha and Manoj Sikand

BACKGROUND The approach to Intramedullary (IM) fixation of long bone fractures remains a controversial issue. Early reports demonstrated less favourable results of retrograde nailing as compared with antegrade options due to higher non-union rates. The aim of this audit was to evaluate the outcomes of practice within the Trauma and Orthopaedic department with relation to IM nail fixation of diaphyseal femur fractures.

METHODOLOGY The Trauma database between February 2010 and September 2013 was used to identify all femur IM nailing procedures. Picture Archiving and Communication System (PACS) software was used to classify the fractures according to the Muller AO classification. All 3-2 (Diaphyseal femur fractures) were included in the audit.
PACS imaging together with outpatient documentation was evaluated for radiological and clinical outcome.

RESULTS A total sample size of 23 patients was identified (13 antegrade vs. 10 retrograde approach fixations). Mean patient age was 67 years and male to female ratios were similar (11M vs. 12F).
Antegrade nailing was performed in a younger population as compared to retrograde nailing (mean age 60 vs. 73 respectively). Mean time to union was somewhat more protracted in the retrograde group (7 vs. 5 months), although all fractures united. The most common complication with relation to antegrade nailing was due to distal locking screws backing out. I case of infection was reported in the retrograde nail group, which was treated successfully with antibiotic therapy. There were 2 cases of nonunion observed in the antegrade group.

CONCLUSIONS The results of our practice were comparable to those published in recent literature. Overall, union rates for the two groups of fixation were similar. Each fixation technique is associated with its own specific set of complications. As a general rule antegrade nailing was reserved for a younger population so as to prevent trauma to the native knee joint.

Notes:

EVIDENCE-BASED MEDICINE: A DECADE APART SURVEY OF SURGEONS

Background: This survey was conducted to gain information about how surgeons use scientific literature and how this is influenced by their knowledge of evidence-based medicine. The results were compared to a survey conducted 10 years previously. Where appropriate, the same questions as in the 2003 survey were used.

Methods: We administered a voluntary questionnaire to participants at the AO Foundation courses in Davos, Switzerland, in December 2013. We surveyed, amongst other topics, the surgeons' levels of education in Evidence-Based Medicine (EBM), how they implement EBM in daily practice and their publication record.

Results: A total of 330 surgeons completed the 27 question survey. 49% (159/322) had learned about EBM in medical school. However, 69% (110/159) of those with EBM education had taken only one semester or less on the subject. 54% of participants (170/317) correctly identified a definition of EBM in surgery. This compares to 45% in the 2003 survey (130/288 respondents) of a subset who said they have previously heard of evidence-based orthopedic surgery. When it came to applying EBM in their daily work, 45% of respondents (143/320) claim to always practice it (2003 figure: 28%, 113/404), while 26% (84/320) only use EBM for difficult or controversial cases (2003 figure: 26%, 104/404). 27% (88/323) have never published a manuscript as an author or co-author (2003 figure: 14%, 121/453), 53% (170/323) have been involved in 1-10 publications (2003 figure: 59%, 269/453), and 20% (65/323) have published more than 10 times (2003 figure: 27%, 63/453).

Conclusions: While at face value there appears to be a greater understanding and utilization of EBM among AO course participants who completed the 2013 survey compared to the 2003 study, several outcomes do not show any great variation in the intervening decade.

Level of evidence: professional survey

Notes:

THE IMPACT OF THE ECONOMIC CRISIS ON THE ORTHOPAEDIC RESEARCH IN GREECE.

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Background: The economic crisis has significantly altered the quality of life in Greece. The obvious negative impact on the offered social and health services has been adequately analyzed. We aimed to determine whether the economic crisis has influenced the quantity and quality of Orthopaedic research in Greece, as mirrored from the papers presented at the annual meetings of Hellenic Association of Orthopaedic Surgery between the years 2008-2014.

Methods: The abstracts of the papers (oral and posters) presented in these meetings have been examined. Details regarding the department of origin were registered. We determined the level of evidence (according to the AAOS classification system), found the amount of papers that were published in PubMed journal and noted if a department of another country participated.

Results: Through the years 2008-2014 the papers concerning clinical and basic orthopaedic research that were presented were 146, 207, 304, 331, 318, 234 and 191 respectively. The percentage of those that were level 1 studies was approximately 2%, 3%, 2%, 3%, 2%, 4% and 4% respectively. The percentage of level 2 studies was 2%, 1%, 2%, 3%, 1%, 3% and 0%. Level 3 studies were the 10%, 9%, 7%, 7%, 7%, 9% and 6%. The percentage of level 4 studies was 75%, 74%, 60%, 59%, 61%, 65% and 64%. Level 5 studies were the 10%, 17%, 31%, 27%, 28%, 19% and 26%. Each year, the papers that were published in PubMed were 7%, 21%, 13%, 7%, 6%, 6% and 9%. A department of another country participated in 18%, 17%, 18%, 16%, 16%, 21% and 13% of the total of papers.

Conclusion: As the economic crisis deepens, the quantity of the presented papers has been reduced. More importantly, the percentage of level 1 and 2 studies has been remained steadily low. Also, we could remark a reduction on the published studies in PubMed journals. These results raise concerns about the potential impact of the crisis in the future.

Level of Evidence: IV

Notes:

CHANGING TRENDS IN THE FIXATION OF EXTRACAPSULAR HIP FRACTURES

Piers R.J. Page (presenting author)
Conrad Lee, Benedict A. Rogers

Introduction: Fractures of the femoral neck occurring outside the capsule of the hip joint are assumed to have an intact blood supply and hence their conventional management is by fixation rather than arthroplasty. The dynamic hip screw and its variants have been used over many years to fix such fractures but have inherent vulnerabilities; they require an intact lateral femoral cortex, confer a relatively long moment arm to the redistribution of body weight and may cause a stress riser due to the plate with which they are fixed to the femur. Intramedullary devices for fixation of proximal femoral fractures have a shorter moment arm, can be distally locked with reduced perforation of the femoral cortex and are believed to be inherently more stable. For these reasons, a number of surgeons believe them to be superior to the DHS for all extracapsular fractures and their use is now widespread. In this study, we present the usage trends of both devices in extracapsular fractures over the last five years and set these results in the context of patient demographics.

Methods: Our departmental electronic patient management system was used to identify all patients undergoing surgery coded as either DHS or its variants or intramedullary fixation of hip fracture. The patients' age, sex and American Society of Anaesthesiologists grading were recorded. Comparison between groups was made using appropriate tests in SPSS.

Results: Our unit has seen a steady move towards the use of intramedullary fixation of extracapsular fractures over five years, from 28.2% to 45.2% of operations, without a change in demographics of the population or a change in surgical outcomes at the most basic level.

Conclusion: The move towards intramedullary fixation without evidence of improved outcomes, given the significantly higher cost, requires urgent research.

Level of evidence: IV

Notes:

TOURNIQUET USE FOR TOTAL KNEE REPLACEMENT SURGERY: A SURVEY OF PATIENT PERSPECTIVES

I Ahmed, P Wall, L Fraser, A Sprowson

Background: Tourniquets are routinely used in total knee arthroplasty (TKA) with an estimated use by up to 93% of surgeons. Advantages include the ability to provide a bloodless field of view to facilitate cement application and increase the success of the procedure. Overall reduction in blood loss is another perceived advantage, however recent research has demonstrated no measurable reduction and conversely a substantial increase in complications such as deep vein thrombosis and systemic emboli. Given the significant complications of tourniquet use we aim to identify patients' views on tourniquets and of emphasis their awareness of the possible risks involved prior to the procedure.

Method: A questionnaire-based study was carried out on 35 patients attending an elective orthopaedic centre for TKA surgery. Ethical approval was granted by NRES committee – East of England (REC Ref: 14/EE/1265). Patients were provided with an information sheet detailing the reasons for the tourniquet use and the associated risks and benefits. They were then provided with a questionnaire to ascertain their views and previous understanding of the subject. Simple statistical measures were implemented to analyse the data.

Results: Only 32% of patients were aware of the use of tourniquets during the operation. 19% were aware of the benefits prior to reading the information sheet provided with 29% understanding the risks involved prior to their procedure. Finally we found 97% of patients would like more information on the use of tourniquets preoperatively.

Conclusion: Tourniquets are widely used in TKA surgery, however, they carry significant risks which are not clearly relayed preoperatively to all patients. Given that 91,000 TKA operations are performed per year we believe it is of paramount importance that all patients are appropriately counselled on the risks and benefits of its use and fully informed consent, including risks of tourniquet use, should be obtained prior to the procedure.

Level of Evidence: Level 3

Notes:

THE IN VIVO RESPONSE OF CALCIUM SULFATE OF DIFFERENT PURITY

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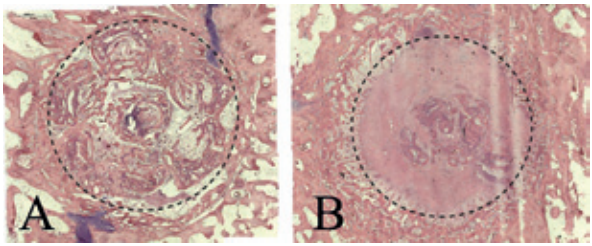
Background: Calcium sulfate and phosphate have a long clinical history of use as bone-void fillers (BVF) with established biocompatibility and resorption profiles. It has been widely reported that the addition of 'impurity' elements such as Silicon, Strontium and Zinc to calcium phosphate is advantageous, resulting in an improved bone healing response.

Methods: This study examined the in vivo response of two formulations of calcium sulfate, as 3mm diameter hemispherical beads, in critical sized defects created in cancellous bone of distal femur and proximal tibia (10mm diameter x 13mm depth) in adult sheep; beads prepared from recrystallised pharmaceutical grade calcium sulfate (RPCS, Stimulan, Biocomposites Ltd, UK) and a lower purity medical grade material containing 1% strontium (SrCS). The animals were sacrificed at 3, 6 and 12 weeks post implantation and the surgical sites analysed using microCT and decalcified histology.

Results: Radiographic analysis showed a slower resorption for SrCS compared to RPCS. Radiographic analysis for both materials confirmed little residual beads at three weeks post implantation. Radiographs at sacrifice confirmed no adverse reactions at any sites at 3, 6 and 12 weeks. Radiographic data alone was not adequate to determine the status of the bone formation and the implant resorption at the implant site.
Histological analysis confirmed little or no adverse tissue reactions to either material. However, RPCS outperformed the modified material in terms of new bone formation at all time points post implantation. At 3 weeks histology for RPCS confirmed that residual beads were still visible with active new bone growth appearing to penetrate centripetally into the defect with some resorption of the implant material. By 6 weeks significant new bone was present throughout the defect. In comparison, absorption of the modified material was slower, and penetration of new bone into the defect was less progressed.

Conclusions: The rapid bone regenerative ability of the recrystallised pharmaceutical grade calcium sulfate was demonstrated. The presence of 1% Strontium impurity acted to delay implant absorption and bone healing in this model.

Notes:



6 weeks post implantation. Paraffin histology, Mag x25, H&E Stain, Composite

EX-VIVO ORGAN CULTURE OF THE PORCINE FEMORAL-TIBIAL JOINT

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Institute of Medical & Biological Engineering, [a]Schools of Biomedical Science and [b]Mechanical Engineering, University of Leeds, UK.

The ability to pre-clinically evaluate new cartilage substitution therapies in viable physiological biotribological models, such as the femoral-tibial joint would be advantageous. Methods for osteochondral (OC) plug culture have been developed and the aim of this study was to extend these methods to organ culture of whole femoral condylar and tibial osteochondral tissues.

Porcine femoral condyles and tibial plateau were aseptically dissected. The majority of cancellous bone was removed leaving intact cartilage and a layer of cortical bone. OC plugs were from porcine knee condyles. “Whole joint” tissues and OC plugs were cultured in defined medium and the viability of the cartilage at day 0, 8 or 14 days of culture assessed by XTT assay and LIVE/DEAD staining. Histological analysis (H&E; alcian blue staining) was used to determine cell number and visualise glycosominoglycans (GAGs). GAG levels were quantified in the cartilage using the dimethylene blue assay.

XTT conversion by OC plug cartilage reduced significantly between day 0 and day 8 with no further change between day 8 and 14. GAG levels did not change. “Whole joint” tissue behaved similarly with reduced XTT conversion between days 0 and 8 (femoral only) and days 0 and 14 (femoral and tibial). LIVE/DEAD staining showed the majority of cells remained alive in the mid and deep cartilage zones. There was a band of mainly dead cells in the surface zone, from day 0.There was no change in the GAG levels over the 14 day culture period..

In conclusion, large cuts of femoral and tibial osteochondral tissues were maintained in organ culture for extended periods. Surface zone chondrocytes rapidly lost membrane integrity ex-vivo whereas mid- and deep zone chondrocytes remained viable. . It is hypothesised that physiological loading in a novel physically interactive bioreactor will improve the viability and will be the focus of future studies.

Notes:

TIME TO THEATRE: AN AUDIT OF BEST PRACTICE TARIFF ATTAINMENT IN NECK OF FEMUR FRACTURES

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Background: Best practice tariff (BPT) for hip fracture was introduced in April 2010, offering financial incentive to encourage trusts to implement best practice and improve quality of care. This equates to £1335. An early indicator of a patient's outcome is the time to operation from admission, with best practice targets of <36hours as a key marker of quality. As well as being detrimental to patient experience, delays in the time to operation have clear links to increased mortality rates.

Method: We performed a retrospective audit of neck of femur fracture patients from 01.01.14 for 12 months, investigating time to theatre, other BPT targets, and attainment of BPT. A cost analysis was also performed from financial data.

Results: Of 471 patients, 461 operations were performed. Our median time to surgery was 24.9 hours. 140 (30%) of patients were not operated on within 36 hours. 134 of these (96%) would have met the BPT had they been operated on within the 36 hour target i.e. all other BPT targets were met. This equates to a loss of £178,890.

Conclusions: We achieved time to theatre target for 70% of patients (compared to 71.7% reported nationally), which is suboptimal. A solution is to dedicate more theatre time to hip fractures on theatre lists or lengthened daily trauma lists. However, at £1200 per hour running theatre, this on its own would not be cost effective. Improved theatre utilisation by 10% can potentially save the trust £3,960,000 in a year.
We have put forward plans to audit our current theatre usage, potentially improving utilisation and efficiency (e.g. planned hip fracture first on list from previous day to avoid start delay). Additionally we have introduced a "Time of breach" onto our trauma board to concentrate attention on this part of best practice.

Level of evidence: Level 3.

CUSTOM ANATOMICAL 3D PRINTED PATIENT SPECIFIC ACL FEMORAL TUNNEL GUIDE FROM MRI A PROOF OF CONCEPT STUDY

Frame M
NHS University Hospital Southampton

Aim: The aim of this study is to outline the steps and techniques required to create a patient specific 3D printed guide for the accurate placement of the origin of the femoral tunnel for single bundle ACL reconstruction.

Introduction: Placements of the femoral tunnels for ACL reconstruction have changed over the years. Most recently there has been a trend towards placing the tunnels in a more anatomic position. There has been subsequent debate as to where this anatomic position should be. The problem with any attempt at consensus over the placement of an anatomic landmark is that each patient has some variation in their positioning and therefore a fixed point for all has compromise for all as it is an average. Our aim was to attempt to make a cost effective and quick custom guide that could allow placement of the center of the patients' newly created femoral tunnel in the mid position of their contralateral native ACL femoral footprint.

Materials & Methods: We took a standard protocol MRI scan of a patient's knee without ACL injury transferred the DICOM files to a personal computer running OsiriX (Pixmeo, Geneva, Switzerland.) and analyzed it for a series of specific anatomical landmarks. OsiriX is an image processing software dedicated to DICOM images.
We marked the most posterior edge of the articular cartilage on the lateral wall of the notch (1), the most anterior edge of the articular cartilage of the lateral wall of the notch (2), the most inferior edge of the articular cartilage of the lateral wall of the notch (3) and the center of the femoral footprint of the native ACL. Distances were then calculated to determine the position relative to the three articular cartilage points of the center of the ACL footprint.
These measurements and points were then utilized to create a 3D computer aided design (CAD) model of a custom guide. This was done using the 3D CAD program 123Design (Autodesk Ltd., Farnbourgh, Hampshire). This 3D model was then exported as an STL file suitable for 3D printing. The STL file was then uploaded to an online 3D printing service and the physical guide was created in transparent acrylic based photopolymer, PA220 plastic and 316L stainless steel. The models created were then measured using vernier calipers to confirm the accuracy of the final guides.

Results:

	Point 1 (AP)	Point 2 (distal-ACL)	Point 3 (Ant-ACL)	Point 4 (Post-ACL)
MRI	59.83	15	45.8	13.9
3D CAD Model	59.83	15	45.8	13.9
PA220	59.86	14.48	45.85	13.79
316L	59.79	14.67	45.64	13.48
Photopolymer	59.86	14.2	45.4	13.69

MRI/CAD Vs. PA220		p=0.3753	
MRI/CAD Vs. 316L		p=0.0683	
MRI/CAD Vs. Photopolymer		p=0.3450	

The models produced were accurate with no statistical difference in size and positioning of the center of the ACL footprint from the original computer model and to the position of the ACL from the MRI scans. The costs for the models 3D printed were £3.50 for the PA220 plastic, £15 for the transparent photopolymer and £25 for the 316L stainless steel. The time taken from MRI to delivery for the physical models was 7 days.

Discussion: Articles regarding the creation of 3D printed custom ACL guides from the patients contralateral knee do not feature in current literature. There has been much research on custom guides for other orthopaedic procedures such as in total knee arthroplasty for the accurate placement of implants. There has also been research published on the creation of custom cutting jigs from CT for complex corrective osteotomy surgery.
This study serves as the first step and a proof of concept for the accurate creation of patient specific 3D printed guides for the anatomical placement of the femoral tunnel for ACL reconstruction. The guides were easy to create and produce taking only a week and with a cost of between £3.50 and £25.
The design of the guides was to allow the tip of a standard Chondro Pick (Arthrex inc., Naples, Florida.) (3mm) used to mark the starting point of the femoral tunnel to enter through the guide.
The next step for this research is to create guides from cadaveric matched knees and utilize the guides to carry out the creation of the femoral tunnels and to analyze of the placement of the tunnel in relation to the contralateral knee.

References:

Notes:

AN OPEN-SOURCE MULTI-SOLVER VALIDATED FEMUR MODEL

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Background Numerical modelling using Finite Element (FE) Analysis has become ubiquitous in orthopaedic biomechanics, with both commercial and freely available packages widely used. Three FE packages in particular have gained popularity: Abaqus (Simulia); Ansys (ANSYS, Inc.) and FEBio (University of Utah). Although FEBio is now well established, its developers advise that comparisons should be made against more extensively tested software before trusting its results for specific problems. The aim of the study to conduct a comparison of mesh convergence and to provide validated open-source models of the femur for use all three FE packages.

Methods Three-dimensional FE models of the femur were created in Abaqus. To ensure that all aspects of the models were identical, custom scripts were developed to import the models into other packages. Mesh convergence studies were conducted for each solver using seven mesh densities for linear tetrahedral elements (up to 2 million). Experimental validation used fourth generation Sawbones® composite femurs (n=8) with surface strains measured at four locations. The loading applied at the hip was the averaged peak joint reaction force during walking (Bergman et al); experimentally, this loading vector was used for a reduced load of 500N.

Results The three solvers produced excellent agreement in load-displacement predictions at corresponding locations, being within 0.7% of each other (R^2=0.99). The surface strains at matching locations were found to be within 5% for the two commercial software, with FEbio presenting slightly larger differences. For the optimised model, using 450,000 elements, vertical and horizontal displacement predictions for all solvers matched experimental tests closely (R^2=0.96), and strains at four locations around the femur were within a median error of approximately 30%.

Conclusions All three FE packages were able to produce consistent results that matched experimental data. An open source, finite element model of the femur is presented which has been experimentally validated for the three software packages. As far as the authors are aware, this is the first comparison of this kind for the three FE solvers considered.

Level of evidence IIb - Evidence from at least one well designed experimental trial.

Notes:

HIP 4

A PATHWAY FOR THE REFERRAL OF HIP METASTASES TO THE ORTHOPAEDIC TEAM AT GUY'S AND ST THOMAS' HOSPITALS: A CLINICAL AUDIT AND SERVICE EVALUATION

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Guy's and St Thomas' NHS Foundation Trust, London, UK

Background A dedicated referral pathway for patients with bony metastases was introduced at Guy's and St Thomas' Hospitals (GSTT) in 2009. The aim was to facilitate prompt, consultant-led decision-making and intervention for patients at risk of pathological fracture of long bones.

Methods We performed a clinical audit and service evaluation of the referral pathway through retrospective review of referrals over 3.5 years.

Results 75 patients referred from 7 different specialties, (34:41 male:female), mean age 64. 16 different types of primary cancer identified, the most common being breast (22/75). Location of metastasis was most commonly the femur (59/75). 24 patients underwent surgery, with femoral nail the most common procedure (13/24). Patients in the surgery group were younger, with higher Mirel's score, less visceral metastases and survived longer after surgery than patients treated non-operatively. Median referral-clinic time was 10 days and referral-surgery time was 14 days.

Conclusions Our data demonstrate the importance of this service and the growing demand. We have updated trust guidelines and improved our referral process through GSTT's Electronic Patient Record system. We have presented this data at local level to improve awareness and intend to reduce referral-clinical review time and have recently established a multidisciplinary meeting to improve patient outcome.

Level of evidence: 3

Notes:

LARGE KEYHOLES IMPROVE TORSIONAL RESISTANCE OF THR ACETABULAR CEMENT MANTLES

Background: It is hypothesised that good torsional resistance of the acetabular cement mantle can increase the stability and longevity of cemented THR. Surgeons aim to achieve this by drilling keyholes (KH) in the acetabulum for the cement to penetrate. This study aims to reduce the surgical variability by investigating the influence of KH diameter on torsional resistance for a range of acetabular diameters.

Methods: Three most common diameters of acetabula were tested (50, 54 and 58 mm) to compare three types of KHs:
3 x 12 mm diameter, 120° apart, 6 mm deep blind holes
6 x 6 mm diameter, 60° apart, 6 mm deep blind holes
6 x 6 mm diameter, 60° apart, through holes
An anatomically accurate experimental rig to simulate the implanted acetabulum was used, it allowed the torque strength of a cement mantle to be measured. The cups were cemented into the rig to create a 4 mm mantle and left to cure for 24 h at room temperature. Each sample was tested in the torque rig by applying a ramp displacement at 1.5 °/min until failure. The test was repeated four times for each acetabulum-keyhole combination. Peak torque was used for quantifying torsional resistance.

Results
Figure 1 Peak Torque (Nm)
Mann-Whitney test detected significant differences only between A and B groups at 54 mm (p = 0.021) and 58 mm (p=0.021). The torsional resistance increased with acetabular diameter only for the A keyholes (Kruskal Wallis Test, p = 0.01).

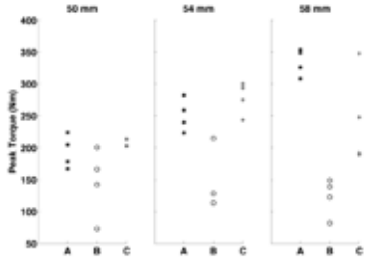


Table 1 – Peak Torque (Nm) – Mean and SD

Acetabular Diameter	A – 3 x 12 mm blind Mean (SD)	B – 6 x 6 mm blind Mean (SD)	C – 6 x 6 mm through Mean (SD)
50 mm	194 (25.7)	146 (54.0)	208 (6.0)
54 mm	251 (25.3)	143 (48.6)	278 (25.5)
58 mm	334 (20.9)	123 (29.5)	244 (74.1)

Conclusions: The larger keyholes provided more consistent and substantially higher peak torque values (Fig. 1). The difference was more evident with the increasing acetabular diameter. The large variability in the B keyholes (Table 1) was caused by poor cement penetration, this could potentially be the case clinically. C keyholes were an improvement, yet there were still consistency issues for the larger acetabulum. The limiting factor was the cement-cup interface, which is also where the failure occurred (except for most of the B keyholes and 58 mm acetabulum C keyholes).

Level of evidence: II b

THE INFLUENCE OF PHYSICAL ACTIVITY ON METAL ION CONCENTRATIONS IN HIP RESURFACING

J. Jelsma, R. Senden, M. Schotanus, N. Kort, I. Heyligers, B. Grimm

Background: Metal-on-metal hip implants can produce adverse tissue reactions to wear debris. Increased metal ion concentrations in the blood are measured as a proxy to wear and the complications it can trigger. Many studies have examined various factors influencing the metal ion concentrations. This is the first study to investigate the effect of physical activity level, as objectively measured in daily life, on blood ion levels, expecting higher concentrations for higher patient activity.

Methods: Thirty-three patients (13F/20M, 55.8 ± 6.2 years at surgery) with a unilateral resurfacing hip prosthesis were included. At last follow-up (6.8 ± 1.5 yrs) cobalt and chromium concentrations in the blood were determined by inductively coupled plasma mass spectrometry. Physical activity was measured during 4 successive days using a 3D-acceleration-based activity monitor. Data was analyzed using validated algorithms, producing quantitative and qualitative parameters. Acetabular cup position was measured radiographically. Correlations were tested with Pearson's r'.

Results: Wide ranges in cobalt (10-833nmol/l) and chromium (16-592nmol/l) concentrations were measured. No correlations were found between metal ion concentrations and patient characteristics. The mean time of walking per day of was 5475 ± 2730 seconds (≈ 91 minutes) per day, with 6953 ± 3104 steps made during the day. The cadence, the number of steps per minute, was 99.5 ± 7.4. The subjects performed 41 ± 13 sit-stand transfers per day. The number of peak intensity declines when peaks where more intense. No correlations were found between quantitative or qualitative parameters and metal ion concentrations

Conclusions: Higher metal ion concentrations were not correlated with higher activity levels contrary to original expectations. Based on the results the orthopaedic surgeons is able to reassure his or her patients that physical activity in daily living is presumably safe en does not influence metal ion concentrations

Level of Evidence: 2b

Approval: the ethics committee of the Atrium MC, Heerlen approved this study.

Notes:

HOW WELL DO WE CONTROL ACUTE PAIN FOLLOWING TOTAL HIP REPLACEMENT?

Salhab M, Macdonald DA, Kimpson P , Freeman J Stewart T, Stone MH. Abstract

Background: Hip arthroplasties are associated with high postoperative pain scores. In some reports, moderate to severe pain was 58% on the first day postoperatively in total hip replacements (THRs) (Wylde 2011, Beswick AD 2012). Several techniques are currently used at our institution to tackle acute pain following THRs. These include: 1) Spinal anaesthetic (SA) with Diamorphine only; 2) General anaesthetic (GA) only; 3) SA with local infiltration anaesthetic mixture 1 (LIA1,). Mixture 1 consisted of ropivacaine, adrenaline, and ketorolac; 4) SA with LIA mixture 2 (LIA2). Mixture 2 consisted of bupivacaine and adrenaline; 5) SA with LIA1 and PainKwell pump system. In this study we report on the techniques of acute pain control following THR at our regional centre for elective primary THRs.

Methods: Between June 2011 and July 2014, 173 consecutive patients undergoing primary THR using the posterior approach were prospectively followed up. Group 1. GA only. 31 patients, Group 2. SA only. 37 patients, Group 3. SA plus LIA1 only. 38 patients, Group 4. SA plus LIA2 only, 34 patients, Group 5. SA plus LIA1 plus PainKwell Pump System for 48 hours. 33 patients.

Results: Fewer patients required opiate analgesia when LIA plus PainKwell pump system was used compared to the other groups. The highest significance was at 0-12 hrs for patients requiring up to 20mg morphine usage ($\chi2(2) = 46.713$, $p = 0.000$); and 0-12hrs for patients requiring 30mg morphine usage ($\chi2(2) = 46.310$, $p = 0.000$). There were no infections, DVTs or PEs in any group. One patient in group 3 suffered a stroke (ASA 4). A Kruskal-Wallis H test also showed that there was a statistically significant difference in morphine usage across groups 1, 2, 3, 4, and 5.

Conclusion: We recommend the use of LIA with PainKwell pump system continuous infusion as an efficacious method to control pain following THR.

Notes:

OUTCOMES 1

A PROSPECTIVE RANDOMISED NON-INFERIORITY CONTROLLED TRIAL ON FIFTH METATARSAL FRACTURES

Background. Avulsion fractures of the base of the fifth metatarsal are some of the commonest foot injuries. The robust scientific evidence on the optimal non-operative treatment of these fractures is scant. We designed and conducted a prospective randomised non-inferiority controlled trial of symptomatic treatment versus cast immobilisation with the null hypothesis that cast immobilisation gave substantial benefit over the symptomatic treatment in terms of patient reported outcome measures(PROMs). The alternative hypothesis was that symptomatic treatment was not inferior.

Methods. The primary outcome was the validated Visual Analogue Scale Foot and Ankle (VAS FA) score ranging from 0 to 100. The non-inferiority boundary was set at -10 points. Power sizing determined a minimum of 12 patients per group. Anticipating a significant loss to follow up, 60 patients of 16 years of age or older were randomised to receive either below knee walking cast immobilisation (n = 24) or symptomatic double- elasticated bandage (n = 36) for 4 weeks. Secondary outcome measures were EuroQol-5D, and American Orthopaedic Foot and Ankle Society scores. Data was analysed at the baseline, 4 weeks, 3 months and 6 months post injury by a clinician blinded to a treatment arm.

Results. Symptomatic treatment proved to be non-inferior to cast immobilisation treatment in terms of VAS FA at baseline, 4 weeks and 6 months. Secondary outcomes showed similar comparative values between two treatment groups. Loss to follow up reached 43% at 6 months. The imputation of missing data was done and confirmed the non-inferiority of symptomatic treatment.

Conclusions. Cast immobilisation does not appear to give benefits over symptomatic treatment of these injuries in terms of validated PROMs in adults. A significant loss to follow up should be expected with these fractures in medium term. Level of evidence: II Approval: NRES Yorkshire and the Humber reference: 11/YH/0297

Disclosure: This study was supported with a small research grant from a British Orthopaedic Foot and Ankle Society.

Notes:

THE EFFECT OF USING ENHANCED VISUAL REPRESENTATION (EVR) OF PROCEDURE BASED ASSESSMENT (PBA) ON THE PROCESS OF SURGICAL TRAINING AND FEEDBACK

Introduction: Visual representation help make the ever-increasing data more attractive, thought provoking and informative.
In the field of surgical training, Procedure Based Assessment is a structured method of assessing surgical performance and skills of trainees in the UK and is a valuable tool for trainers in the Annual Review of Competence Progression.
Trainers can view PBA's on the online-based Intercollegiate Surgical Curriculum Programme individually in a long-form format with no visual representation.

Aim: To assess the effect of an originally devised EVR tool of PBA's in the context of ARCP on 10 aspects including speed of assessment, assimilation of data, ease of interpretation and identification of trainees' weaknesses and strengths.

Methodology:

1) ISCP PBA data collected for three volunteered specialty trainees (ST4, ST5 & ST6) enrolled in Warwick Trauma and Orthopaedic training programme, for a six-month period from 1st July 2013 till 31st December 2013.
2) An EVR was generated using Tableau® Desktop software (Figure 1), and two other EVR's originally devised to visually represent the trainees' PBA's (Figure 2 & 3) and integrated into three interactive PDF files.
3) Twelve trainer consultants participated in a mock ARCP and rated their experience in assessing the trainee's using the new EVR method compared to the ISCP website on three surveys.
4) A mock ARCP was set up for 12 consultants. To minimize bias, six assessors were randomized into two equal groups. Groups A were asked to use the ISCP website to formulate an ARCP decision and then use the EVR interactive tool. Group B used the EVR tool followed by browsing the ISCP website.
5) Assessors rated their experience after using each method and also at the end of the mock ARCP on three surveys. Responses recorded on a Visual Analogue Scale and statistically analyzed using non-parametric a two-tailed Mann Whitney U test.

Results: Comparing responses to the EVR and ISCP surveys shows that users thought that using the EVR tool is more useful, accessible, easy to learn and use, time efficient and appealing. It also allowed them to better identify trainees' areas of strengths and weaknesses and formulate a final ARCP outcome decision in relation to PBA's ($p < 0.001$). Strong agreement to develop the EVR tool and have incorporated into the current ISCP website have been demonstrated ($p < 0.001$). Comparison of total responses to the EVR and ISCP surveys between group A and group B showed no significant statistical difference

Conclusion: The project shows that Enhanced Visual Representation tool has the potential to be a positive addition to the ISCP website to improve the process of surgical training and feedback.

Figure 1

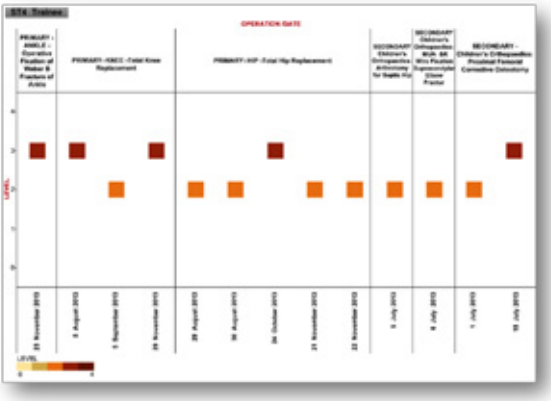
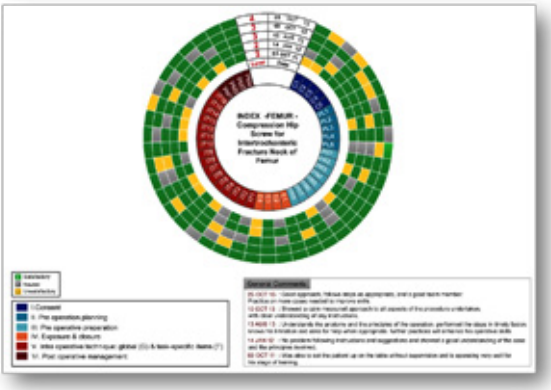


Figure 2

Figure 3



CAN RUNNING BE RELIABLY QUANTFIED IN PATIENT ACTIVITY MONITORING?

Milad Alizai, Matthijs Lipperts, Rob Houben, Ide C. Heyligers, Bernd Grimm

Introduction: To complement subjective patient-reported outcome measures, objective assessments are needed. Activity is an objective clinical outcome which can be measured with wearable activity monitors (AM). AM's have been validated and used in joint arthroplasty patients to count postures, walking or transfers. However, for demanding patients such as after sports injury, running is an important activity to quantify.
A new AM algorithm to distinguish walking from running is trialed in this validation study.

Methods: Test subjects (n=9) performed walking and running bouts of 30s duration on a treadmill at fixed speeds (walking: 3, 4, 5, 7km/h, running: 5, 7, 9, 12, 15km/h) and individualy preferred speeds (slow, normal, fast, maximum, walk/run transition). Flat and inclined surfaces (8%, 16%), different footwear (soft, hard, barefoot) and running styles (hind/fore-foot) were tested. An AM (3D accelerometer) was worn on the lateral thigh. Previously validated algorithms to classify all gait as walking were adapted to differentiate running from walking, the main criterium being vertical acceleration peaks exceeding 2g within each subsequent 2s-interval. Indepependently annotated video observation served as reference.

Results: A total of 312 events had to be classified. Walking bouts (162) were correctly identified in 158 cases resulting in 97.5% detection accuracy. Running bouts (150) were correctly identified in 146 cases (97.3%). In 8 walking bouts (5.0%), an additional running event was falsely detected. These happened at 7km/h and maximum (>8.6km/h) walking speed and during continuous walk/run transitions at individual transition speeds. In 12 running bouts (8.2%), an additional walking event was falsely detected. These happened during slow running (<7km/h). Timing event duration and step counts were >95% accurate.

Conclusions: Thigh-worn AM and a simple algorithm can distinguish walking from running at high accuracy and thus can serve doctors, therapists or coaches to objectify outcomes, decisions about effective and safe exercise intensities or return-to-play.

Notes:

ONLINE VERSUS PAPER FOLLOW-UP OF PATIENT-REPORTED OUTCOMES - RESPONSE, COMPLETION RATE AND RELIABILITY

Jeannot Mijnes, Ide C. Heyligers, Bernd Grimm

Introduction: Complete and reliable outcome assessment is important for clinical quality control and research evidence. Online questionnaires offer the opportunity to perform follow-up at distance and desired frequency saving efforts and cost to patients and hospitals increasingly not reimbursed for this service.
Patients in this unique study have been invited by mail (not at visit or by phone) and were asked to complete both methods (online, paper) instead of only one option. For the first time, response, completion and reliability of the HOOS, KOOS-PS and New-KSS, popular patient-reported outcomes (PROM's) in TJA were measured.

Methods: Patients (n=107) were invited pre-operative by mail to register at atriumproms.nl (Interactive Studios, Netherlands) and complete PROM's online, followed by a second invitation three days later to complete the same on paper. THA patients (n=48) completed EQ-5D-3L, VAS pain and HOOS. TKA (n=59) questionnaires consisted of KOOS-PS, VAS pain and New-KSS. Reliability was assessed using intraclass correlation coefficient (ICC). ICC was considered excellent >0.75 according to literature.

Results: Overall response rate was 77.6% (83/107) with no difference between THA (77.1%) and TKA (79.3%). Paper had a higher response rate (70.1% vs. 34.9%, $p<0.01$, Fisher Exact test). However, completion rate was higher online (95%) than on paper (54%, $p<0.01$). Age had a significant influence on online response rates (<70yrs: 43%, >=70yrs: 23%, $p=0.03$).
Reliability was excellent in the THA group (ICC: 0.84 - 0.95) except for the EQ-5D-3L (ICC: 0.72). The TKA group showed excellent reliability for VAS-pain (0.92). However, for New-KSS reliability was only good (0.60) or poor for KOOS-PS (0.39).

Conclusions: A high response rate shows patient cooperation making distance follow-up by mail feasible. Online PROM's were only half as popular as paper questionnaires but achieve twice the completion rate. Taking scores online has excellent reliability. Only when conversions are performed (KOOS-PS, EQ-5D) reliability suffers.

Notes:

THA PATIENTS ARE NOT MUCH LESS ACTIVE THAN HEALTHY CONTROLS BUT AVOID SPECIFIC EVENTS AND INTENSITIES

Matthijs Lipperts, Rachel Senden, Ide C. Heyligers, Bernd Grimm

Introduction: The goal of total hip arthroplasty (THA) is to reduce pain, restore function but also activity levels for general health benefits or social participation. Thus evaluating THA patient activity can be important for diagnosis, indication, outcome assessment or biofeedback.

Methods: Physical activity (PA) of n=100 primary THA patients (age at surgery 63 ±8yrs; 49M/51F; 170 ±8cm, 79.8 ±14.0kg) was measured at 8 ±3yrs follow-up. A small 3D accelerometer was worn for 4 successive days during waking hours at the non-affected lateral upper leg. Data was analyzed using validated algorithms (Matlab) producing quantitative (e.g. #steps, #transfers, #walking bouts) and qualitative (e.g. cadence, temporal distribution of events) activity parameters. An age matched healthy control group (n=40, 69 ±8yrs, 22M/18F) served as reference.

Results: Daily steps were only 13% lower (n.s) for patients (avg. ±SD: 5989 ±3127) than controls (6890 ±2803). However, the Nr. of walking bouts (187 ±85 vs 223 ±78, -16%) and sit-stand transfers (35 ±14 vs 48 ±15, -27%) were sign. less in patients ($p<0.05$, Mann-Whitney).
Patients showed equal amounts of walking bouts in medium duration (30-60s, 1-5min) but sign. less (-25%) short (<10s, 10-30s) and less (-43%) long events (>5min). This corresponds with sign. less (-32%) short sitting periods (>10min) in patients. Also cadence was sign. lower in patients (93.8 ±11.7 vs 98.9 ±7.3 steps/min).

Conclusions: PA varies widely in patients with a substantial proportion (35%) being more active than average controls. Thus, THA must not per se reduce or limit PA.
Only 17% of controls and 11% of patients reached the WHO target (10,000 steps/day) suggesting that the THA related drop in activity may inflate the risks for cardiovascular, metabolic or mental disease associated with low activity.
Patients avoided short and long activities, both associated with effort. Targeted interventions may address this behaviour.

Notes:

HABITUAL ACTIVITY OF KNEE ARTHROPLASTY PATIENTS LESS THAN HEALTHY CONTROLS MAINLY FOR DEMANDING TASKS

Sonia Ahmadinezhad , Matthijs Lipperts , Rachel Senden , Ide C. Heyligers, Bernd Grimm

Introduction: In total knee arthroplasty (TKA), patient reported outcome on pain, function or satisfaction fails to differentiate treatment options. Activity, a consequence of pain-free, well functioning TKA and a satisfied patient, may be a discriminative surrogate metric, especially when objectively measured.

Methods: Habitual activity was measured in TKA patients (n=32, F/M=20/12, age: 72 ±8yrs) at long-term follow-up (9 ±1yrs) and compared to healthy, age matched controls (n=32, F/M=20/12, age: 71 ±9yrs) using a popular questionnaire (SQUASH) and accelerometry. A small 3D accelerometer (X16-mini, GCD Dataconcepts) was worn for 4 successive days during waking hours at the non-affected lateral upper leg. Data was analyzed using validated algorithms (Matlab) counting and timing walking bouts, steps, sitting periods and transfers. Stair climbing events or similar activities such as walking steep slopes were classified using the higher mean hip flexion angle as a feature.

Results: SQUASH scores were not sign. different between TKA (mean ±SD: 4551 ±3426) and controls (3659 ±2720, p>0.1). With accelerometry, differences between patients and controls (Median [IQR]) increased from -13% for Time Standing (3.7h [2.6-5.1] vs 4.3h [2.9-5.0], p=0.69), to -26% for Daily Steps (4939 [3796-7910] vs 6731 [5539-8270], p=0.019] and -31% for Sit-Stand Transfers (31.2 [22.1-37.0] vs 45.3 [34.9-58.4], p>0.001). For stair-up events, the difference increased to -74% (6.2 [2.8-22.4] vs 23.9 [10.8-39.1], p>0.001).

Conclusions: Self-report activity could not discriminate between patients and controls. With accelerometry, sign. differences increased with rising levels of effort and difficulty. In TKA, walking alone, either by accelerometry or as the major component of self-report may not serve as powerful outcome measure in orthopaedics were energy expenditure from walking is less relevant than functionally demanding but rarer tasks such as transfer or stair climbing.

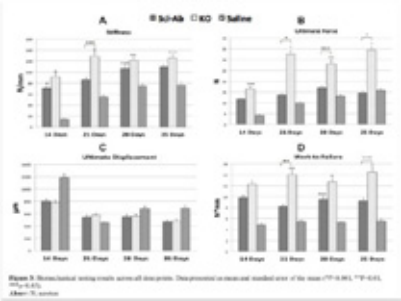
Notes:

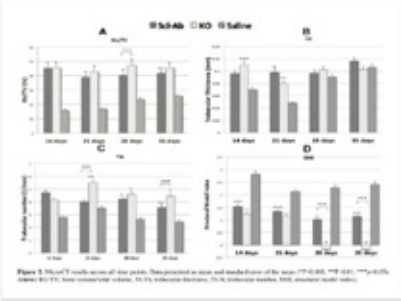
FRACTURE HEALING AND SCLEROSTIN DEPLETION

Purpose: Sclerostin is a secreted glycoprotein that inhibits the intracellular Wnt signaling pathway, which when inactivated bone formation is stimulated. This stimulation has been proven in fracture studies, showing larger and stronger calluses with accelerated fracture healing, both in sclerostin knockout and sclerostin antibody injection models. The effects of these two mechanisms have not been compared to assess the accurate effect of the Scl-Ab injections. Therefore we designed a study to compare the effect of sclerostin depletion (sclerostin knockout) and inhibition (Scl-Ab injection).

Methods: 10-week-old male SOST knockout (KO) (N=20) and Wild-type (WT) (N=40) mice underwent insertion of a tibial intramedullary pin after which a mid-shaft tibial osteotomy was performed. The mice were divided into three groups: SOST KO (N=20), WT with Scl-Ab injection "intravenous dose of 100mg/kg weekly" (N=20) and WT with saline injection (N=20). Each group was managed and sacrificed according to the specified protocol (Fig.1).

Figure 1: Fracture model protocol.

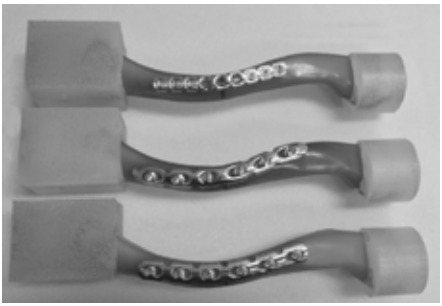




Results: Both Scl-Ab and KO groups showed significantly increased trabecular bone volume/ total volume at the fracture site compared to the saline group at all time points and also showed no significant difference between them (except at 28 days postoperative) (Fig.2). On biomechanical testing the Scl-Ab and KO groups showed significant increased strength in stiffness at days 14, 28 and 35 compared to the saline group (Fig.3).

Discussion and Conclusion: Scl-Ab injections showed promising results, which were comparable to the complete depletion of sclerostin, especially at earlier stages of the healing process and thus completing the process of healing at an earlier time point.

Notes:



BIOMECHANICAL EVALUATION OF 2.7MM VERSUS 3.5MM PLATING CONSTRUCTS FOR AO/OTA TYPE B CLAVICLE FRACTURES (LEVEL 5)

Purpose: Open reduction and internal fixation using plate osteosynthesis for midshaft clavicle fractures is often associated with hardware prominance. Although clinical studies have suggested a role for the use of thinner 2.7mm plates as a means of increasing cosmetic acceptability this still remains an area of controversy. We investigated the effect of plate size (2.7mm vs. 3.5mm), plate treatment (annealed vs. cold worked) and number of screws on the stiffness and yield point.

Methods: Twenty-four synthetic clavicles were randomly divided into four treatment groups - Synthes (Synthes, Paoli, PA) 2.7mm cold-worked calcaneal reconstruction plate with six or eight bicortical screws; 3.5mm LCP reconstruction plate (RP) and 3.5mm LCP pre-contoured superior-anterior clavicle plate (PCSA). After measuring the baseline stiffness of the intact specimens, all clavicles were plated, a wedge-shaped inferior defect was created and testing performed using a cantilever-bending model. Statistical analysis was performed using one-way ANOVA with Tukey's multiple comparison test with significance set at a P value <0.05.

Results: The 3.5mm RP construct was significantly stiffer than both of the 2.7mm CR constructs ($P < 0.0001$). The yield point for the 3.5mm PCSA construct was greater than the other three constructs ($P < 0.0001$), while the yield point for the 2.7mm CR plate with 6 screws and with 8 screws was higher than the 3.5mm RP construct ($P = 0.0002$ and $P = 0.0023$ respectively). The amount of displacement required to reach the yield point was highest for the 2.7mm CR plate with six screws and this was significantly higher than the values for the other three constructs.

Conclusion: The 3.5mm plates demonstrated increased bending stiffness compared to the 2.7mm plates. Despite the lower resistance to bending forces, the cold worked 2.7mm plate exhibited a significantly higher yield point and required significantly more superior to inferior displacement to deform.

Notes:

CARTILAGE THICKNESS AND BONE DENSITY ARE RELATED IN HEALTHY TIBIAS

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Background: Some models of knee osteoarthritis (OA) suggest that the properties of knee tissues are adapted in healthy joints, and that OA development is due to a breakdown in the equilibrium among tissue properties. Cartilage thickness and bone density are particularly important properties in this regard because both are related to the mechanical environment. This study tested the hypothesis that locations of thickest cartilage are associated with locations where bone density is the highest in non-OA tibias.

Method: CT-arthrography was performed on six non-OA subjects (2 males; 58± 15 years old). Images were segmented to build 3D models of the bone and cartilage structures. Maps of cartilage thickness were calculated for the medial and lateral subchondral bone areas by measuring the distance between bone and cartilage structures. Bone density maps were calculated based on the intensity of the CT-arthrography signal in the first 3mm of bone. The location of thickest cartilage and most dense bone were measured in the medial and lateral compartments. These locations were then normalized, and paired t-tests and linear regressions were performed to compare the thickness and density locations.

Results: In the medial compartment, the location of highest bone density was significantly more medial than the location of thickest cartilage ($p=0.03$) (Fig. 1). Additionally, the location of both features were highly correlated along the anterior-posterior direction ($R^2=0.92$). In the lateral compartment, the location of highest bone density was correlated with the location of thickest cartilage along the medial-lateral direction ($R^2=0.64$).

Conclusion: This study showed that the location of highest bone density is correlated with the location of thickest cartilage in non-OA tibias, thus supporting the idea that knee tissues are adapted in healthy knees.

Notes:

AUTOLOGOUS BONE PLUG WITH ACI IN OSTEOCHONDRAL DEFECTS IN KNEE

Primary Author: Atanu Bhattacharjee
Additional Authors: HS McCarthy, B Tins, JH Kuiper, S Roberts, JB Richarson

Background: Structural and functional outcome of bone graft with first or second generation autologous chondrocyte implantation (ACI) in osteochondral defects has not been reported.

Methods: Seventeen patients (mean age of 27±7 years, range 17-40), twelve with osteochondritis dissecans (OD) (ICRS Grade 3 and 4) and five with isolated osteochondral defect (OCD) (ICRS Grade 4) were treated with a combined implantation of a unicortical autologous bone graft with ACI (the Osplug technique). Functional outcome was assessed with Lysholm scores. The repair site was evaluated with the Oswestry Arthroscopy Score (OAS), MOCART score and ICRS II histology score. Formation of subchondral lamina and lateral integration of the bone grafts were evaluated from MRI scans.

Results: The mean defect size was 4.5±2.6SD cm^2 (range 1-9) and depth was 11.3±5SD mm (range 5-18). The pre-operative Lysholm score improved from 45 (IQR 24, range 16-79) to 77 (IQR 28, range 41-100) at 1 year (p-value 0.001) and 70 (IQR 35, range 33-91) at 5 years (p-value 0.009). The mean OAS of the repair site was 6.2 (range 0-9) at a mean of 1.3 years. The mean MOCART score was 61 ± 22SD (range 20-85) at 2.6 ± 1.8SD years. Histology demonstrated generally good integration of the repair cartilage with the underlying bone. Poor lateral integration of the bone graft on the MRI scan and a low OAS were significantly associated with a poor Lysholm score and failure.

Conclusion: Osplug technique shows significant improvement of functional outcome for up to 5 years in patients with a high grade OD or OCD. This is the first report describing association of bone graft integration with functional outcome after such a procedure. It also demonstrates histological evidence of integration of the repair cartilage with the underlying bone graft.

Level of evidence: III

Notes:

MICROFRACTURE VERSUS AUTOLOGOUS CHONDROCYTE IMPLANTATION IN KNEE CARTILAGE REPAIR

Federica Francesca Masieri and Natalie Byles
University Campus Suffolk, Department of Science and Technology, Ipswich, UK

Background: Microfracture (MF) and Autologous Chondrocyte Implantation (ACI) are used to repair symptomatic condylar cartilage defects (grade II-IV Outerbridge). Superiority of ACI to MF is still debated. The aim of the study was to conduct a systematic literature review, compare superiority of ACI versus MF in a meta-analysis and investigate the correlation between patient age and outcome of both treatments.

Methods: Extended literature search was conducted (papers from January 2001 to present), looking at patient characteristics, pre- and post-operative scores and cartilage repair assessment evaluation. Methodological quality was verified through modified Coleman score and assessment bias. A fixed-effect meta-analysis was conducted, comparing post-operative standardised mean differences between ACI and MF. Pearson correlation coefficient between post-operative score and age was calculated against ACI and MF.

Results: of 490 studies systematically analysed, 8 met the inclusion criteria, accounting for 255 patients treated with ACI and 259 with MF. Overall mean postoperative scores were 81.38±8.31 for ACI and 74.9±7.0 for MF, with no significant difference (P=0.13). The average modified Coleman score of the studies was 82.6, with low bias among them. The meta-analysis displayed an overall effect estimate of 0.3 favouring ACI treatment versus MF (95%CI=0.12-0.48, P=0.001). Significant heterogeneity was although observed (I^2>70%). Pearson correlation coefficient calculated between mean post-operative score and mean age, surprisingly failed to indicate clear correlation for ACI (r=0.11) and MF (r=0.18) respectively.

Conclusions: Minor statistically significant superiority of ACI intervention versus MF in knee cartilage repair was found, together with high levels of heterogeneity, halting the possibility to make full recommendation of ACI versus MF.

Level of evidence: Ia (systematic review and meta-analysis).

Notes:

CHEMOKINE RECEPTOR DARC IS ASSOCIATED WITH ASEPTIC LOOSENING OF TOTAL JOINT ARTHROPLASTY

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Background: Inflammation and chemokines play a pivotal role in aseptic loosening (AL) and prosthetic joint infection (PJI) of total joint arthroplasty (TJA). Recently, the Duffy antigen receptor for chemokines (DARC) on erythrocytes was identified as a potent chemokine receptor able to bind and carry without deactivating a wide range of CXC and CC chemokines from circulation to tissues. The role of DARC and its functional polymorphism (SNP) influencing the number of the DARC molecules on the erythrocytes in AL/PJI has not been studied yet.

Methods: We genotyped functional polymorphism in the DARC gene (rs12075) using MassArray technology (Agena Bioscience) in 354 patients with TJA (hip and knee arthroplasties). Patients were further subdivided into those with a complication (AL, n = 110; PJI, n = 126) and a control group without complications for at least 10 years (n = 118). Statistics was performed by Plink 1.07 and relative entropy.

Results: Among our TJA patients, the rs12075 *G allele was more frequent in patients with a failure (46.6%) compared to those without complications (36.0%, P = 0.007, OR = 1.55, 95%CI = 1.13-2.14). The rs12075 *G allele was overrepresented mainly in patients with AL (49.5%, P = 0.004, OR = 1.74, 95%CI = 1.20-2.54), a trend was observed in PJI (44.0%, P = 0.071, OR =1.40, 95%CI = 0.97-2.01). This SNP is located in a coding region in the DARC gene, and the *G allele is associated with more DARC molecules on erythrocytes, thus able to bind and transport more CCL2, CCL5, CCL18 involved in the pathogenesis of AL/PJI from circulation to the periprosthetic tissue.

Conclusions: Our data nominate erythrocyte DARC as a novel molecule in pathogenesis of aseptic loosening of TJA. The hypothesis that DARC may serve as a chemokine reservoir and shuttle chemokines from circulation to the joint surroundings should be investigated in future studies.

Level of evidence IV: Evidence from well-designed case-control and cohort studies.
The study was approved by the Ethical Committee of Palacky University and Faculty

Notes:

THE EFFECT OF COBALT ON INFLAMMATORY CYTOKINE AND ADHESION MOLECULE EXPRESSION

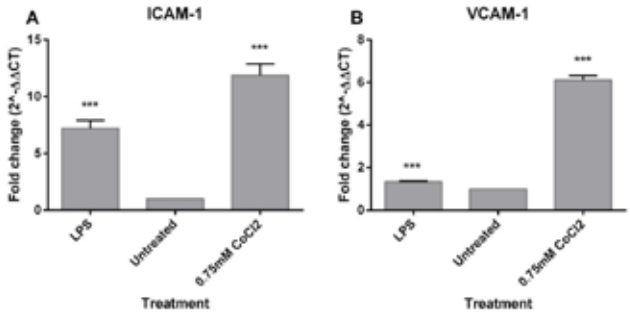
Sami Anjum, Amy Mawdesley, Helen Lawrence, David Deehan, John Kirby, Alison Tyson-Capper

Background: Adverse reactions to metal debris are implicated in the failure of metal-on-metal hip arthroplasty. The peri-implant tissues are often infiltrated by leukocytes which may cause observed immunological effects, including soft tissue necrosis and osteolysis.
Cobalt ions from orthopaedic implants aberrantly activate the innate immune receptor human toll-like receptor-4 (TLR4), leading to inflammatory cytokine release including interleukin-8 (IL-8). IL-8 has been shown to increase expression of intercellular adhesion molecule-1 (ICAM-1) and vascular cell adhesion molecule-1 (VCAM-1). These factors are essential for leukocyte adhesion to endothelium, which is required for leukocyte migration into tissues.
This study investigates cobalt's effect on gene and protein changes in IL-8, ICAM-1 and VCAM-1 to determine their potential role in immune cell infiltration of peri-implant tissues.

Methods: TLR4-expressing human dermal microvascular endothelial cells (HMEC-1) were treated with a range of clinically relevant cobalt ion concentrations. IL-8 protein secretion was measured by enzyme-linked immunosorbent assay (ELISA). Gene expression changes were quantified by TaqMan-based real time polymerase chain reaction.

Results: Stimulation with cobalt ions significantly increases IL-8 secretion (n=3) in HMEC-1 cells. This is a TLR4-specific effect as a small molecule TLR4 antagonist inhibited cobalt-induced IL-8 secretion. Following cobalt treatment (0.75mM cobalt chloride) there is a 12-fold increase in ICAM-1 (p-value=0.0004) and a 6-fold increase in VCAM-1 (p-value<0.0001) gene expression. Work will be undertaken to determine the role of TLR4 in these responses.

Conclusion: Cobalt increases IL-8 secretion and adhesion molecule gene expression in HMEC-1 cells. This in vitro finding demonstrates the potential for cobalt ions to increase leukocyte adhesion to the endothelial surface. This may contribute to leukocyte infiltration of peri-implant tissues in metal-on-metal hip arthroplasty failure.



BONE REACTION & REPAIR

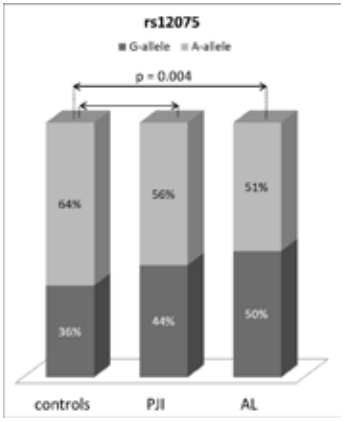
RELATIONSHIP OF VITAMIN D WITH BONE MINERAL DENSITY, FRACTURE TYPE AND SOCIAL DEPRIVATION IN NECK OF FEMUR FRACTURES

Emma Formoy, Ekemini Ekpo, Timothy Thomas, Cezary Kocialkowski, Anand Pillai
Department of Trauma and Orthopaedics, University Hospital of South Manchester

Background: Reduced bone mineral density is recognised as a risk factor for hip fractures and fragility fractures in general. Vitamin D is important in maintaining healthy bone mineral levels and can therefore affect risk of hip fracture. We investigated the correlation between vitamin D levels and bone mineral density, as well as fracture type, in neck of femur fractures and also assessed the relationship of vitamin D and social deprivation.

Method: We included all patients admitted to our department, with a neck of femur fracture over one year (October 2013 to October 2014). We analysed vitamin D levels for all patients during admission and compared these to bone mineral density scores, based on DEXA scan results; hip fracture type & comminution, based on admission radiographs; and levels of social deprivation, based on the patient's address.

Results: In total 360 patients were admitted over the study period, with a neck of femur fracture, of which 298 had vitamin D assessed and 76 had DEXA scans. Of these cohorts, 71% were found to be vitamin D deficient and 7% had osteoporosis. No significant correlation was found between vitamin D scores and bone density, or with level of vitamin D deficiency and fracture type or comminution. A significant correlation was however identified, between low vitamin D levels and decreasing levels of social deprivation (R=0.11, p=0.04).



Conclusion: No relationship was identified between vitamin D levels and hip fracture type, suggesting that vitamin D cannot be used to predict patients at risk of more comminuted fractures. Although no relationship was also identified for bone mineral density and vitamin D, this may be because the sample size of DEXA scans was relatively small. Interestingly the relationship between vitamin D and social deprivation was the reverse of what was expected and suggests that affluent individuals may be at greater risk of low vitamin D.

RELATIVE FRACTURE RISK FOR PLATING AND NAILING IN DISPLACED TRONCHANTARIC FRACTURES

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Background: A large proportion of the expense incurred due to hip fractures arises due to secondary factors such as duration of hospital stay and additional theatre time due to surgical complications. Studies have shown that the use of intramedullary (IM) nail fixation presents a statistically higher risk of re-fracture than plating, which has been attributed to the stress riser at the end of the nail. It is not clear, however, if this situation also applies to unstable fractures, for which plating has a higher fixation failure rate. Moreover, biomechanical studies to date have not considered newer designs of IM nails which have been specifically designed to better distribute weight-bearing loads. This aim of this experimental study was to evaluate the re-fracture risk produced by a newer type of nailing system compared to an equivalent plate.

Methods: Experimental testing was conducted using fourth generation Sawbones® composite femurs and X-Bolt® IM hip nail (n=4) and fracture plate (n=4) implants. An unstable pertrochanteric fracture pattern was used (AO classification: 31-A1 / 31-A2). Loading was applied along the peak loading vector experienced during walking (Bergman et al., 2001), up to a maximum load of 500N. The risk of re-fracture was evaluated from equivalent strains measured using four rosette strain gauges on the surface of the bone at known stress riser locations.

Results: Strain gauge readings determined that the equivalent strains in the femoral diaphysis were approximately 25% larger for the nail than the plate ($p < 0.005$). The strain levels at the location coinciding with the end of the plate were also larger for the nail, but not significantly ($p > 0.26$).

Conclusions: Although the risk of re-fracture for displaced tronchantaric fractures was found to be larger for nailing than plating, measured strains were substantially lower than the failure strain of cortical bone (even when scaled for full weight-bearing loads of 1800N). This indicates that fracture risk is not present in either implant for bone of healthy quality, but may still become problematic in highly osteoporotic patients.

Level of evidence: IIb - Evidence from at least one well designed experimental trial.

Notes:

BIOACTIVE GLASS CAN POTENTIALLY REINFORCE LARGE BONE DEFECTS

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Introduction: Bio-Active Glass (BAG) is a promising bone graft substitute for large bone defect reconstruction because of its favourable osteoconductive, antibacterial and angiogenic properties [1] [2]. Potentially, it could also mechanically reinforce the defect, thus making it suitable for load-bearing defects. However, the mechanical properties of the reconstructive layer consisting of BAG/bone allograft mixtures are unknown.
The goals of this study therefore were, first, to measure the mechanical properties of different BAG/bone graft mixtures and, second, to investigate to what extent such mixtures could reinforce distal tibial defects using micro-FE analysis and high-resolution CT scans.

Materials and Methods: Four different BAG/bone graft mixtures were impacted in a cylindrical holder, mechanically tested in confined compression and scanned with micro-CT. From these images, bone graft material and glass were segmented using two different threshold values. The interface between bone and BAG was modelled separately by dilating the glass phase (Fig. 1). Micro-Finite-Element (FE) models of the composites were made using a Young's modulus of 2.5 GPa for bone and 35 GPa for BAG. The Young's modulus for the interface region was determined by fitting experimental and micro-FE results for the same specimens.
(82 µm resolution) CT scans of a 9 mm region of the distal tibia of 3 subjects were used. Micro-FE models of this region were made to determine its stiffness in the original state, with a simulated cortical defect and after a mixture of BAG/bone was modelled in the defect.

Figure 1. Cross-section of a micro-CT scan showing bone grafts (white), BAG granules (red) and the interface layer (yellow).

Results: The confined compression tests showed a strong dependence of the modulus of the BAG/bone composite on the amount of BAG, ranging from 116.7 ± 18.2 to 654.2 ± 35.2 MPa. The micro-FE results could well reproduce these measured moduli, when using a stiffness of 25 MPa for the interface layer (Fig. 2).
The micro-FE analyses of the cortical defect demonstrated that the stiffness of the tibial segment would be reduced by 13 ± 3 % with the defect. Treatment with the BAG/bone composite could restore the stiffness to 101 ± 6 % of its original value.

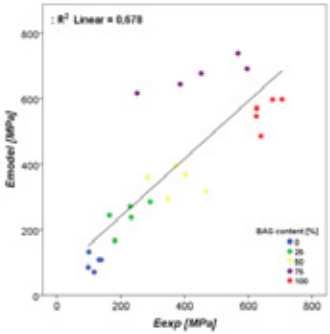

Figure 2. The Young's Modulus measured in the experiment versus predicted by the model after fitting the interface stiffness, for the different BAG contents.

Discussion: The experiments demonstrate that BAG/bone mixtures have a composition-dependent stiffness, in the range of that of trabecular bone, which can be well estimated from micro-FE analyses. Furthermore, the tibial micro-FE analyses demonstrate that these mixtures potentially can restore the stiffness of large bone defects at this site. Future development of the model may predict mechanical behaviour of BAG/bone mixtures patient specifically.

References

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Notes:

RADIOLOGICAL ASSESSMENT OF BONE REMODELING AROUND THE UNCEMENTED TRITANIUM ACETABULAR COMPONENT

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Introduction: Implant stability and is an important factor for adequate bone remodelling and both are crucial in the long-term clinical survival of total hip arthroplasty (THA). Assessment of early bone remodeling on X-rays during the first 2 years post-operatively is mandatory when stepwise introduction of an new implant is performed. Regardless of fixation type (cemented or cementless), early acteabular component migration is usually the weakest link in THA, eventually leading to loosening. Over the past years, a shift towards uncemented cup designs has occurred. Besides the established hydroxyapatite (HA) coated uncemented cups which provide ongrowth of bone, new uncemented implant designs stimulating ingrowth of bone have have increased in popularity. These cups initiate ingrowth of bone into the implant by their open metallic structure with peripheral pores, to obtain a mechanical interlock with the surrounding bone, thereby stabilizing the prosthesis in an early stage after implantation.
This retrospective study assessed bone remodelling, osseointegration and occurrence of radiolucency around a new ingrowth philosophy acetabular implant.

Methods: In a retrospectively, single centre cohort study all patients whom underwent primary THA with a Tritanium acetabular component in 2011 were included. Bone remodelling, osseointegration and occurrence of radiolucency were determined by two reviewers from X-ray images that were made at 6 weeks, 3-6-12 and 24 months post-operatively. Bone contact % was calculated based on the origibal Charnely and DeLee zones.
According to Charnley and DeLee the outer surface of an actebaular cup is divided into 3 zones (1-2-3). For our analysis the original 3 zones were further divided into 2 producing 6 zones 1A to 3B. Each of these 6 zones were then further divided into 4 equal sections. We attributed 25 points per section in which complete bone contact without lucency was observed. If lucency was observed no points were attributed to the section. A fully osteointegrated cup in all 24 sections could therefore attain 600 points .The total of each section and zone was subsequently tallied and recalculated to produce the percentage of bone contact on a 1-100% score.

Results: In 2011 131 patients; 54 male and 76 female with average age of 60.83 (SD 12.42) and 60.57 (SD 12.11) year respectively underwent primary THA at our institution and all where included in our study cohort. Majority of this cohort underwent primary THA due to osteoarthrosis and most patients were classified ASO I (18%) or ASA II (65%).
At two year clinical follow-up two revision were performed. One constituted a femur and acetabulum revision due to leg length difference and a snapping hip phenomenon. Complications included 3 dislocations (all treated policlinic), 4 deep infections (all treated with Genta PMMA beads with prosthesis in situ and healed) and 1 removal of hematoma.
In another patient the femoral component was revised due to a peri-prosthetic fracture. Mean bone contact % values for all Charnley and DeLee zones combined were calculated and improved from 68,18% (SD 22,36) at 6 weeks to 73,61% SD (16,26) at 3 months to 84,21% (SD 19,02) at 6 months to 86,90% (SD 16,0) at 1 year to 92,19% (SD 12,74) at two year follow-up. When analysing the bone contact % per individual

zone a remarkable difference was found for zones 2A-B. In contrast to zone 1A-B and 3A-B the initial bone contact % was clearly although not significantly lower until two year follow-up.

Conclusions: In this study, the bone apposition around Tritanium actebular component was retrospectively assessed until two year clinical. Our results show excellent bone apposition that continues to improve over time (at least until two year clinical follow-up) suggesting that the open trabecular Ti structure of the Tritanium has a positive effect on cup osseointegration.
However, some recent reports have shown the development of reactive lines around cups with porous/trabecular metal surfaces, of which the meaning is still unclear. Our analysis indicated that especially acetabular zone 2A-B according to Charnley&DeLee needs time to establish a direct contact of the implant surface and the surrounding bone tissues. Perhaps this might be explained by reaming technique (underreaming vs line to line reaming) resulting in suboptimal seating of the cup. Therefore, careful follow-up of this new implant technology will remain necessary and continued in this study. We aim to improve cohort size and establish results at longer follow-up times. Furthermore we aim to correlate these results to RSA component migration analysis.

Notes:

DOES BONE REMODELLING PROTECT A FEMORAL IMPLANT: FINITE ELEMENT ANALYSIS

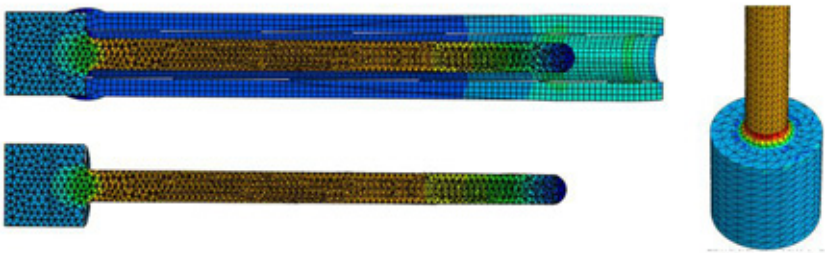
By Jacob Koris, Gordon Blunn, Melanie Coathup

Background: Children suffering from primary bone cancer necessitating resection of growth plates, may suffer progressive leg length discrepancy, which can be attenuated with extendable prostheses. A serious complication is catastrophic implant failure. Over time, bone will remodel, altering the stress pattern in the implant. By using finite element analysis we can model different bone remodeling conditions to ascertain the effect that this will have on stress distribution and magnitude. A finite element analysis was performed. Simplified computer generated models were designed of a cemented femoral Stanmore growing massive endoprosthesis. Three scenarios were designed, modelled on post-operative radiographs. Scenario 1 had a gap between the end of the femur and the implant collar, scenario 2 had no gap, but with no bone attachment into the collar, and scenario 3 had growth of the bone over the length of the collar with attachment. Physiological loading conditions were applied. The resultant stress in the implant for each scenario was measured, and compared to the strength of the material. Peak stresses were recorded at the stem-collar junction. The maximum stress recorded in the implant in scenario 1 was 3104.2Mpa, compared to 1054.4Mpa in scenario 2, and 321.2Mpa in scenario 3. The strength of the implant material was exceeded in scenarios 1 and

Conclusions: Both accurate reduction and bone growth with attachment to the stem of a massive endoprosthesis will greatly reduce the resultant stress in the implant under loading conditions. The load is redistributed throughout the length of the bone. This may help to prevent catastrophic failure in the implant under loading conditions. Further investigations of patient findings are needed to ensure the model findings are verified.

Level of Evidence: IIb (Theoretical)

Graphic 1. Resultant stress shown in the implant after loading conditions applied



Notes:

LOCAL TISSUE REACTION IN TOTAL HIP ARTHROPLASTY WITH TITANIUM MODULAR NECK

Dalila De Pasquale [1], Alina Beraudi[1,2], Susanna Stea[1], Massimiliano Baleani[1], Giovanni Guerra[3], Aldo Toni[1,3]
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Modular femoral stems for total hip arthroplasty (THA) were introduced to allow additional options for surgeons in controlling leg lengths, offset, and implant stability. This option is widely used in Region Emilia Romagna, Italy, where the study was conducted, having a modular neck stem nearly 35% of primary THA in 2013. Great majority of modular neck is made of Titanium alloy.

The study was designed as a retrospective descriptive case series of 67 hips in patients who underwent revision of a THA. All had a Titanium modular neck. In 44 cases revision was due to breakage of the neck, in the remaining 23 it was due to different reasons unrelated to modular neck such as bone fracture, breakage of a ceramic component, cup loosening.
Mean follow up was 3.5 yrs. For all patients excised capsule and surrounding tissue were graded for presence of necrosis, inflammatory exudate, lymphocytes, and wear particles using light microscopy of routine paraffin sections stained with hematoxylin and eosin. The retrieved modular neck-body and head-neck junctions were examined for evidence of fretting and corrosion. For some patient dosage of circulating Titanium was obtained. Approval was obtained from institutional review board.

It resulted that a variable amount of wear was observed in the first group of patients, with no evidence of lymphocytic reaction, but with variable notes of necrosis. Broken necks showed different patterns of damage, with different degree of corrosion, beside the fatigue fracture. In the second group wear was less evident or absent and negativity of lymphocyte reaction was substantially confirmed. Circulating Titanium ions were one order of magnitude higher in first group (mean 35 micrograms /liter).

It can be concluded that fracture of Titanium modular necks occurs progressively, wear does not induce lymphocytic reaction and circulating ions increase.

Level of evidence: III retrospective, comparative study
ACKNOWLEDGMENTS
The research was funded by Ministry of Health, grant 'Early diagnosis of pending failure…'RF 20091472961

Notes:

ROUGHENED SURFACE IMPROVES FIXATION IN UNCEMENTED ALUMINA-ON-ALUMINA TOTAL HIP REPLACEMENT

Primary Author: Eduardo García-Rey
Additional Authors: Enrique Gómez-Barrena, Eduardo García-Cimbrelo
Abstract Presenter Eduardo García-Rey

Background: Although the tribological characteristics are excellent, cup fixation has been one of the limitations in alumina-on-alumina total hip replacement (THR), so different types of materials and surfaces have been developing. We analysed the clinical and radiological outcome of two different uncemented cups for the same alumina-on-alumina THR.

Methods: 679 hips were prospectively followed for at least 5 years. 342 had a hydroxyapatite (HA)-coated relatively smoothed tri-radius cup, implanted between 1999 and 2005 (group 1), and, 337 had a HA-coated macotextured tri-radius implanted between 2006 and 2009 (group 2). Dysplastic hips were more frequently observed in group 2. We compared screw use in both groups as primary fixation, the clinical results, and the radiological appearance of cup loosening.

Results: Multivariate analysis showed that group 1, osteopenic and dysplastic acetabulae and women had a higher risk of screw use ($p=0.004$, HR: 1.68,95% CI: 1.18 to 2.41; $p<0.001$, HR: 2.25 95%, CI: 1.55 to 3.38; $p<0.001$, HR: 4.95, 95% CI: 2.83 to 8.64; $p=0.011$, HR: 1.58, 95% CI: 1.11 to 2.25, respectively). Although the pre-operative clinical score was worse in group 2, the post-operative results were better ($p<0.001$). There were no complications related to alumina. 15 cups were revised for loosening in the group 1 and 2 in the group 2. The cumulative probability of not having a revision for cup loosening at 15 years for the whole series was 93.3 % (95% CI: 89.6 to 96.9). The probability of not having cup loosening was 93.3% (95% CI: 89.7 to 96.9) in group 1 and 97.5% (95% CI: 93.5 to 100) in group 2.

Conclusions: Despite worse pre-operative conditions, the macrotextured surface of the cup in the second group improved bone fixation in this series. Continued follow-up will be required to determine if reduction in wear between the alumina-on alumina bearings results in less osteolysis and loosening.

Notes:

HYPERGLYCEMIA INCREASES SERUM SCLEROSTIN LEVELS AND EXPRESSION BY OSTEOBLASTS IN-VITRO

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[1]Royal Veterinary College, London, UK; [2]Institute of Orthopaedics & Musculoskeletal Science, Stanmore UK, [3]University College London, UK, [4]Kings College London, UK.

The increased incidence of type 2 Diabetes Mellitus is associated with an impaired skeletal structure and a higher prevalence of bone fractures. Sclerostin is a negative regulator of bone formation produced by osteocytes and there is recent evidence that its expression in serum is elevated in diabetic patients compared to control subjects. In this study, we test whether hyperglycemia affects serum and bone sclerostin levels in a rat model of type 2 Diabetes as well as sclerostin production by osteoblasts in culture. We used Zucker diabetic fatty (ZDF) male rats (n=6) that spontaneously develop obesity and frank diabetes around 8-9 weeks of age and Zucker lean rats as controls (n=6) to examine sclerostin expression in serum at 9, 11 and 13 weeks using a specific ELISA. Sclerostin expression in bone tibiae was examined at 12 weeks using immunocytochemistry. Rat osteoblast-like cells UMR-106 were cultured in the presence of increasing concentrations of glucose (5, 11, 22 and 44 mM) during 48 hours and sclerostin mRNA expression and release in the supernatant determined by quantitative PCR and ELISA, respectively. Our results show that serum sclerostin levels are higher in the diabetic rats compared to lean rats at 9 weeks (+ 140%, $p<0.01$). Our preliminary results using immunocytochemistry for sclerostin did not show any major difference in sclerostin expression in tibiae of diabetic rats compared to lean ones, although we observed many osteocytic empty lacunae in cortical bone from diabetic rats. Glucose dose-dependent stimulated sclerostin mRNA and protein production in mature UMR106 cells while it had no effect on osteocalcin expression. Altogether, our data suggest that sclerostin production by mature osteoblasts is increased by hyperglycemia in vitro and enhanced in serum of diabetic rats. Furthers studies are required to determine whether sclerostin could contribute to the deleterious effect of Diabetes on bone.

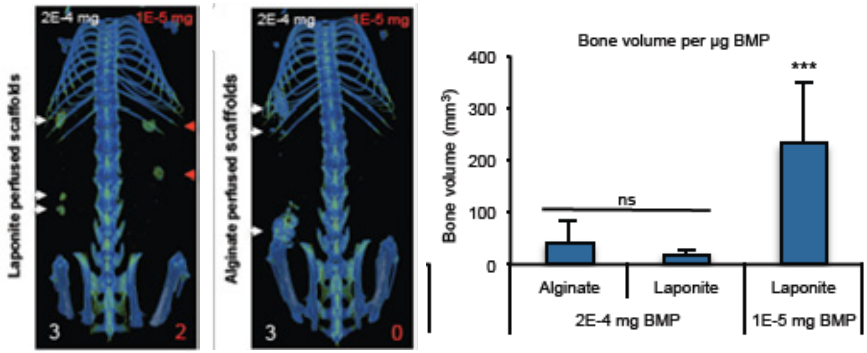
Notes:

CLAY GELS REDUCE THE EFFECTIVE DOSE OF BONE MORPHOGENIC PROTEIN

Background: Bone Morphogenetic Protein (BMP) has been used in clinical practice to stimulate fracture healing and spinal arthrodesis. Difficulty in localising and maintaining BMP at the target site has resulted in the use of large doses of BMP, and has been associated with significant adverse effects. We have previously shown clay hydrogels can bind growth factors for localised efficacy. We hypothesised that localisation of BMP within clay gels would reduce the dose required to mediate bone formation.

Methods: $2x10^{-4}$mg and $1x10^{-5}$ mg BMP were mixed in Laponite and applied to collagen sponge. 3 sponges containing high dose, and 3 containing low dose BMP were implanted subcutaneously in a mouse. This process was repeated in 8 mice, for controls, alginate hydrogel was used in a further 8 mice, and 1 mouse received 6 blank collagen scaffolds. Micro Computed Tomography was used to assess bone formation fortnightly; at 8 weeks the mice were culled and underwent histological analysis.

Results: Mean Bone Volume formed within collagen per µg BMP was significantly greater with Laponite and low dose BMP compared to Alginate and Laponite with high dose BMP ($p<0.0001$). No bone formation was observed with Alginate and low dose BMP.



Conclusions: We have demonstrated that Laponite is able to reduce, by several orders, the effective dose of BMP required to mediate ectopic bone formation compared to current gold standard methods of BMP delivery. Clinical translation of this finding offers, potentially, great significance to orthopaedic surgery.

Level of Evidence: In vivo study.
Approval: Our study received ethical approval complied with Home Office licensing.
Acknowledgments: Funded by grants from EU(FP7) Biodesign, Rosetrees Trust, BBSRC and EPSRC

Notes:

PROSTHETIC JOINT INFECTION: THE INFORM PROGRAMME

Simon Strange, Andrew Beswick, Michael Whitehouse, Ashley Blom, INFORM study group

Background In the UK, over 160,000 total joint replacements are performed annually. About 1% of patients subsequently develop a deep bacterial infection and, if untreated, this can result in severe pain, disability, and death. Costs to the NHS are substantial. The INFORM (Infection Orthopaedic Management) programme aims to address gaps in knowledge relating to treatment of deep prosthetic joint infection through six work packages. The programme is supported by a patient forum and patient-partners working on oversight groups.

Methods Literature reviews and meta-analysis of individual patient data from cohort studies of patients treated for prosthetic hip infection
Analysis of the National Joint Registry to observe trends in infection rates, and identify risk markers for infection and effective treatments
Qualitative interviews with patients and health professionals exploring the impact of infection and its treatment
A multicentre randomised controlled trial to compare patient-centred outcomes after one- or two-stage revision for prosthetic hip infection
An economic evaluation to assess cost-effectiveness of treatments
A survey of patients to explore individuals' preferences for treatments

Results Individual patient data has been provided by UK and international centres
Data on over 1.4 million procedures is available from the National Joint Registry
Interviews conducted with 19 patients with prosthetic hip infection and 12 treating surgeons. Information has advised randomised controlled trial methodology
Seven major UK centres recruiting patients to the INFORM randomised controlled trial
Methods for assessment of costs from a health service and societal perspective developed for the randomised controlled trial
Qualitative studies have contributed to the design of a discrete choice questionnaire

Conclusions Findings from INFORM will establish how patient care and outcomes can be optimised after prosthetic joint infection. Guidance on best clinical practice will be developed.
Level of evidence 1–3
Funding statement This abstract presents independent research funded by the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research scheme (grant number: RP-PG-1210-12005). The views expressed in this abstract are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

Notes:

TIBIO-POPLITEUS IMPINGEMENT AFTER TKA: IS NORMALSIZED ACTUALLY OVERSIZED?

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Background The goal of this study was (1) to investigate the relationships between the bony contours of the knee and the popliteus tendon before and after TKA and (2) to analyse the influence of implant sizing.
Our hypothesis was that an apparently well-sized prosthesis, will modify the position or the tracking of popliteus tendon.

Methods 4 fresh frozen cadavers were selected. The popliteus tendon was injected with contrast dye and a CT-scan was performed from full extension to full flexion with increments of 20°. Afterwards a total knee arthroplasty (TKA) was performed. Each cadaver received either a normal-sized, oversized, undersized or mobile bearing prosthesis. After TKA the limb was scanned again using the same protocol as before. 3D-reconstructions were created using Materialise Mimics® software. These 3D-models were then imported into custom made Matlab® software to measure and compare the deviation of the popliteus tendon before and after TKA.

Results
TKA resulted in significant postero-lateral displacement of the tendon from full extension to 100° flexion in both normal- and oversized prosthesis. In normal-sized prosthesis in full extension the mean posterior deviation was 6.2 mm (SD: 1.2). For oversized prosthesis the mean posterior deviation was 16.7mm (SD: 0.6). For the undersized prosthesis mean posterior deviation was -0.8mm (SD: 0.3). Finally for the mobile bearing prosthesis mean posterior deviation was -3.1mm (SD: 1.3).

Conclusions
To our knowledge, this is the first investigation which analyses the relationships between implants and soft tissues after TKA. The main finding is that surgeons must approach sizing in terms of volume rather than in terms of surface. The current study seems to indicate that it may be advantageous to aim at undersizing implants, both in the mediolateral dimension and in the anteroposterior dimension.

Level of evidence: 4

30-DAY MORTALITY STRATIFIED BY THE NOTTINGHAM HIP FRACTURE SCORE

Background: The Nottingham Hip Fracture Score (NHFS) is a risk stratifying score that estimates the 30-day and 12-month mortality rates of hip fracture patients. To date, it has only been validated in few centres in the UK(1, 2). Our study aims to see how our mortality rates compare with those predicted by the NHFS.

Methods: The Nottingham Hip Fracture Database was reviewed for patients presenting to our unit from August 2012 - March 2013 with a neck of femur fracture. Patient information was obtained from the database and our online electronic patient records for NHFS calculation. Patients with incomplete data were excluded.

Results: 285 patients were identified, 11 were excluded. 69 (24%) were male. The average age was 82 years. The highest mortality was in those with a NHFS=9 (50%). The high-risk (NHFS≥5) patients had a higher mortality rate (n=19, 13%) compared to the low risk group (NHFS≤4) (n=7; 5%).

Conclusions: Our study shows that most of our patients had a NHFS 4 - 6, which is comparable to other units(2). Mortality rates increased steeply from 5% to 16% from NHFS 5-6. A validation study of the NHFS showed that a score of greater than 6 was more closely correlated with high mortality(1).
For NHFS=2, the mortality was 20%. The patient who died was a 48-year old female with breast cancer and 2 previous pulmonary emboli. The published co-morbidities for NHFS doesn't include PEs and may underestimate a patient's morbidity(3). Large-scale nationwide studies to determine the validity of the NHFS are needed.

Level of evidence: 4

References

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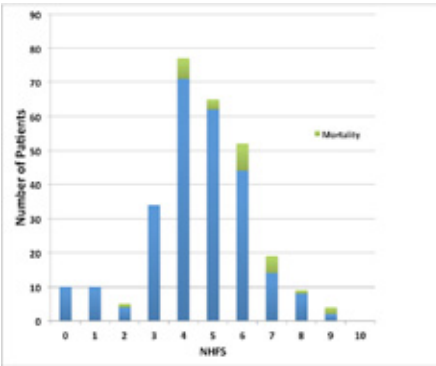

NHFS	Number of patients identified	Number included	Observed 30-day mortality (%)	Original NHFS 30-day mortality	New NHFS 30-day mortality
0	10	10	0 (0%)	0.9	0.7
1	10	10	0 (0%)	1.5	1.1
2	5	5	1 (20%)	2.4	1.7
3	34	33	0 (0%)	3.8	2.7
4	77	74	6 (8%)	6.2	4.4
5	65	63	3 (5%)	9.8	6.9
6	52	49	8 (16%)	15	11
7	19	17	5 (29%)	23	16
8	9	9	1 (11%)	33	24
9	4	4	2 (50%)	47	34
10	0	0	0 (0%)	57	45

Table 1: Observed 30-day mortality rates stratified according to the NHFS
Figure 1: Distribution of the NHFS in our population with mortality rates

TAYLOR SURGERY ON SURVIVAL ESTIMATION. COMPARISON OF THREE INTERNATIONAL PATIENTS

Background: Metastatic bone patients who require surgery nedds to be evaluated in order to maximize quality of life and avoiding functional impairment, minimizing the risks connected to the surgical procedures. The best surgical procedure needs to be tailored on surivival estimation. There are no current available tool or method to evaluate survival estimation with accuracy in patients with bone metastasis. We recently developed a clinical decision support tool, capable of estimating the likelihood of survival at 3 and 12 months following surgery for patients with operable skeletal metastases. After making it publicly available on www.PATHFx.org, we attempted to externally validate it using independent, international data.

Methods: We collected data from patients treated at 13 Italian orthopaedic oncology referral centers between 2008 and 2012, then applied to PATHFx, which generated a probability of survival at three and 12-months for each patient. We assessed accuracy using the area under the receiver-operating characteristic curve (AUC), clinical utility using Decision Curve Analysis DCA), and compared the Italian patient data to the training set (United States) and first external validation set (Scandinavia).

Results: The Italian dataset contained 287 records with at least 12 months follow-up information. The AUCs for the three-month and 12-month estimates was 0.80 and 0.77, respectively. There were missing data, including the surgeon's estimate of survival that was missing in the majority of records. Physiologically, Italian patients were similar to patients in the training and first validation sets. However notable differences were observed in the proportion of those surviving three and 12-months, suggesting differences in referral patterns and perhaps indications for surgery.

Conclusions: PATHFx was successfully validated in an Italian dataset containing missing data. This study demonstrates its broad applicability to European patients, even in centers with differing treatment philosophies from those previously studied. Level of evidence: IV None of the authors have financial disclosures or conflicts of interest to declare. The study presented did not need the approval by ethics committee.

Notes:

PREOPERATIVE WIDESPREAD PAIN SENSITIZATION AND CHRONIC PAIN AFTER JOINT REPLACEMENT

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Approvals: The APEX trials were registered as an International Standardised Randomised Controlled Trial(96095682), approved by Southampton and South West Hampshire Research Ethics Committee(09/H0504/94) and all participants provided informed written consent.

Background: Chronic pain after joint replacement is common, affecting approximately 10% of patients after total hip replacement (THR) and 20% of patients after total knee replacement (TKR). Heightened generalized sensitivity to nociceptive input could be a risk factor for the development of this pain. The primary aim of this study was to investigate whether preoperative widespread pain sensitivity was associated with chronic pain after joint replacement.

Methods: Data were analyzed from 254 patients receiving THR and 239 patients receiving
TKR. Pain was assessed preoperatively and at 12 months after surgery using the Western Ontario and McMaster Universities Osteoarthritis Pain Scale. Preoperative widespread pain sensitivity was assessed through measurement of pressure pain thresholds (PPTs) at the forearm using an algometer. Statistical analysis was conducted using linear regression and linear mixed models, and adjustments were made for confounding variables.

Results: In both the THR and TKR cohort, lower PPTs (heightened widespread pain sensitivity) were significantly associated with higher preoperative pain severity. Lower PPTs were also significantly associated with higher pain severity at 12 months after surgery in the THR cohort. However, PPTs were not associated with the change in pain severity from preoperative to 12 months postoperative in either the TKR or THR cohort.

Conclusions: These findings suggest that although preoperative widespread pressure pain sensitivity is associated with pain severity before and after joint replacement, it is not a predictor of the amount of pain relief that patients gain from joint replacement surgery, independent of preoperative pain severity.

Level of Evidence: 2

Notes:

AN ANALYSIS OF PATIENT-REPORTED OUTCOME MEASURES IN TRAUMA AND INFLUENCES ON RETURN TO WORK IN TRAUMA PATIENTS

Introduction: We used patient reported outcome measures (PROMS) to evaluate qualitative and societal outcomes of trauma.

Methods: We collected PROMs data between Sept 2013 and March 2015 for 92 patients with injury severity score (ISS) greater than 9. We enquired regarding return to work, income and socioeconomic status, dignity and satisfaction and the EQ-5D questionnaire.

Results:
Return to work: Of patients working at admission 15/58(26%) anticipated returning to work within 14 days of discharge. Work plans at discharge did not correlate with ISS scores overall (r=-0.05, ns), or when stratified by working group. Increased physicality of work showed a trend towards poorer return to work outcomes (not significant in Spearman's rank analysis: r= 0.14, p= 0.32).

Income and socioeconomic status: No significant difference was demonstrated between the comparative incomes of patients with the best and worst return to work outcomes (ANOVA n=61, t=0.63, ns). Lowest quartile earners (n=19) were more likely to complete the open questions (79%) than higher income patients (62%).

Dignity and satisfaction: Prominent positive themes were: care, staff, professionalism, and communication. Prominent negative themes were: food, ward response time, and communication. %). Patients 'mostly' or 'always' satisfied with their care did not have significantly different incomes (ANOVA, t=0.13, ns).

EQ-5D: Self-rated health status correlated with perceived likelihood of return to work (r=0.25, p=0.0395). Correlation was demonstrated between EQ-5D scores and perceived dignity preservation (r=0.38, p=0.0004), and overall satisfaction (r=0.46, p< 0.0001). There was no correlation between EQ-5D and ISS score.

Conclusion: EQ5D correlated with work plans, dignity, and satisfaction. Planned return to work did not correlate with ISS score or socioeconomic status. Unlike previous studies we demonstrated that lower socioeconomic groups have best engagement with PROMS. This study highlighted the value of qualitative PROMS analysis in leading patient-driven improvements in trauma care.

Notes:

THA/TKA PATIENTS ARE MORE PHYSICALLY ACTIVE THAN THE GENERAL POPULATION

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Additional Authors: W.F.H. Peter, I. Gorissen, Dr. S. Cannegieter, C. Tilbury, R. Wolterbeek, S.H.M. Verdegaal, H.M. Vermeulen, H.M.J. van der Linden, J. Dekker, R. Tordoir, R. Onstenk, M. Benard, V.E.H. Meijer, P. Slagboom, R.G.H.H. Nelissen, T.P.M. Vliet Vlieland.
Abstract Presenter: J.M.T.A. Meessen

Objective: Total Hip Arthroplasty (THA) and Total Knee Arthroplasty (TKA) bring relief of pain and functional disability to patients with end stage osteoarthritis, however the literature on their impact on patients' level of physical activity (PA) is scarce.

Design: Cross-sectional study, performed in 2012, in 515 patients who underwent THA/TKA surgery in 2010-2011 and a random sample of persons aged >40 years from the Dutch general population participating in a national survey in the same period. PA in minutes per week (min/week) and adherence to the Dutch recommendation for health enhancing PA was measured by means of the Short QUestionnaire to ASsess Health enhancing PA (SQUASH) Additional assessments included socio-demographic characteristics, the presence of comorbidities, BMI and Short Form-12. Multivariable linear (total min/week) and logistic regression analyses (meeting PA recommendation), adjusting for confounders, were performed for THA and TKA separately.

Results: 258 THA patients (64% female, mean age 70.0 (SD9.2)), 221 TKA patients (67% female, mean age 70.2 (SD8.9)) and 4373 persons from the general population sample (52% female, age 59.0 (SD12.0)) were included.
In both regression analyses, the presence of joint arthroplasty was statistically significantly associated with more total min/week spent on PA (THA 7.0% increase, 95%-CI (2.0%-12.6%); TKA 7.4% increase, 95%-CI (1.6%-13.4%)) and a higher chance of adherence with PA recommendations (THA OR 1.90, 95%-CI (1.12-3.03); TKA OR 1.94, 95%-CI (1.19-3.15)).

Conclusion: 6-18 months after surgery, THA/TKA patients were more physically active than a random sample of persons >40 years from the Dutch general population.

Notes:

SPINE & UPPER LIMB 2

F.E. MODELLING TO PREDICT NON-LINEAR FRACTURE BEHAVIOUR OF VERTEBRAL

P.Mahmoodi, S.Gheduzzi, H.S.Gill

Background: Understanding vertebral fracture is important in order to reduce fracture risk. Previous studies have used FE to investigate mechanical behaviour, typically using a linear material response. This study aimed to establish a novel model that could represent the plastic behaviour leading to fracture.

Method: Porcine vertebrae were mCT scanned and they were loaded to failure in a material test machine (Instron 5965). The specimens were then rescanned. From the first scan, specimen specific FE models were created (ScanIP, Simpleware, UK). Mesh convergence was studied and tetrahedral elements with an approximate element size of 0.7 were used for computational simulations. The relationship between greyscale values (GS) and Young's modulus (E) was optimised to match the experimental load displacement data using Ansys. Further, a plastic material response was modelled.

Results: The experimental data showed an initial toe region followed by a linear response, which then displayed plastic deformation prior to failure (Fig1). The following relationship was stablished for greyscale values of images and E: E=0.98GS+50.836 MPa. The following yield parameters, yield stress=2.2E/227.63 MPa and tangent=6.64E allowed FE prediction of the non-linear part of the experimental data.

Conclusion: A mathematical relationship between E and greyscale values combined with plastic response allowed for the first time an FE model to fully represents the actual response of vertebral prior to failure.

Level of evidence: 3b: Individual case-control study.

Notes:

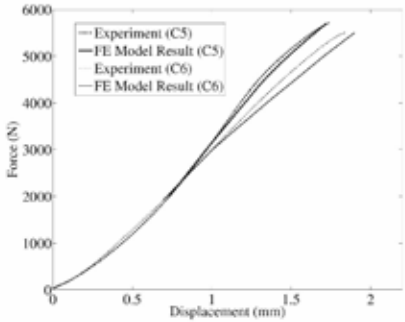


Fig1. Load-displacement curves of experimental data and FE data.

THE PORO-ELASTIC BEHAVIOUR OF THE INTERVERTEBRAL DISC: A NEW PERSPECTIVE ON DIURNAL FLUID FLOW

Pieter-Paul A. Vergroesen, Albert J. van der Veen, Kaj S. Emanuel, Jaap H. van Dieën, Theodoor H. Smit

Daytime spinal loading is twice as long as night time rest, but diurnal disc height changes due to fluid flow are balanced. A direction-dependent permeability of the endplates, favouring inflow over outflow, has been proposed to explain this; however, fluid also flows through the annulus fibrosus. This study investigates the poro-elastic behaviour of entire intervertebral discs in the context of diurnal fluid flow. Caprine discs were preloaded in saline for 24 hours under different levels of static load. Under sustained load, we modulated the disc's swelling pressure by replacing saline for demi-water and back again to saline, both for 24h intervals. We measured the disc height creep and used stretched exponential models to determine the respective time constants. Reduction of culture medium osmolality induced an increase in disc height, and the subsequent restoration induced a decrease in disc height (Figure 1). Creep varied with the mechanical load applied. No direction-dependent resistance to fluid flow was observed. In addition, time constants for mechanical preloading were much shorter than for osmotic loading, suggesting that outflow is faster than inflow. However, a time constant does not describe the actual rate of fluid flow: close to equilibrium fluid flow is slower than far from equilibrium. As time constants for mechanical loading are shorter and daytime loading twice as long, the system is closer to the loading equilibrium than to the unloading equilibrium. Therefore, paradoxically, fluid inflow is faster during the night than fluid outflow during the day (Figure 2).

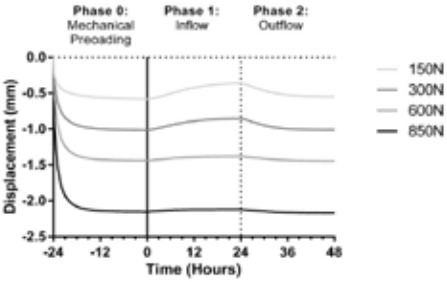
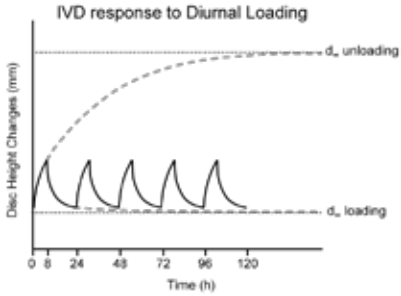


Figure 1. Results



Fufure 2. Hypothesis

Notes:

INFLUENCE OF VERTEBRAL DEFORMATION ON THE VERTEBRAL PAIN SYNDROME

Vladyslav Povoroznyuk, Tetiana Orlyk
D.F. Chebotarev institute of gerontology NAMS Ukraine

The aim of our study is to investigate the relation between the intensity of pain in the thoracic and lumbar spine and morphometric parameters of vertebrae in postmenopausal women.
Materials and methods. We have examined 250 postmenopausal women aged 50-79 years divided into two groups: 171 women without vertebral deformations and 79 women with confirmed vertebral fractures. The duration of pain syndrome after fracture was over 6 months.
The presence and intensity of pain syndrome in the thoracic and lumbar spine were assessed using a visual analog scale (VAS). Morphometric analysis of the vertebral parameters was carried out using the VFA software of the dual-energy X-ray densitometer «Prodigy» (GE Medical systems, Lunar, model 8743, 2005).
Results. The intensity of pain syndrome in the lumbar spine significantly correlates with L1 vertebral indices: A/P (r=-0.37, p=0.01) and M/P (r=-0.29, p=0.03) in women with normal BMD. The intensity of pain in the thoracic region correlates with Th10 vertebral indices: A/P (r=-0.45, p=0.0004) and M/P (r=-0.35, p=0.01) in women with osteopenia. We have not determined any significant relationship between the level of back pain and vertebral body size index in women with osteoporosis and without vertebral fractures.
In 11% patients with confirmed wedge and compression vertebral fractures chronic pain syndrome is absent, and the presence of other fractures does not increase the frequency of back pain syndrome (14%).
The presence of vertebral fractures significantly increases the risk of pain in the thoracic spine (RR=1.32; 95% CI: 1.09-1.60, p= 0.004).
In patients with vertebral fractures the intensity of pain in the thoracic spine significantly correlates with indices of Th11-Th12vertebrae, and relates to the number and localization of vertebral fractures. The level of pain in the lumbar region does not depend on the location and number of damaged vertebrae.

Conclusion. In postmenopausal women without osteoporosis and vertebral fractures level of pain may be associated with initial vertebral deformation, limiting the spine transition zone. The presence of vertebral fractures increases the risk of pain syndrome in the thoracic region depending on the location and number of damaged vertebrae.

Notes:

LUMBAR SAGITTAL ALIGNMENT AFTER OBLIQUE IMPLANTED TOTAL LUMBAR DISC REPLACEMENT

Eduardo Hevia, Juan Solaz, Carlos Barrios, Alberto Caballero, Jesús Burgos
Primary author: Eduardo Hevia MD
Abstract Presenter: Eduardo Hevia MD

Background: Oblique implantable total disc replacements (TDR) have been developed in an attempt to partially resect the anterior longitudinal ligament (ALL), together with additional partial resection of lateral annulus fibers. To date, the literature has not addressed the impact of the TDR oblique implantation on the lumbar spine sagittal alignment. The hypothesis of this study was that TDR at the L4-L5 level does not change the sagittal alignment and the range of motion of the lumbar spine when the implant is placed in accurate position.

Methods: Prospective single-center radiological investigation of L4/5 TDR inserted through an oblique approach for the treatment of disc disease. A series of 52 patients with a minimum of 2-year FU after oblique TDR at L4/L5 level was analyzed for radiological changes in sagittal alignment and range of motion of the lumbar spine. The total sagittal lumbar lordosis (TSLL), the segmental sagittal lumbar lordosis (SSLL) of the operated level, and the range of motion of the TDR implant were determined in pre- and postoperative functional X-rays. The accuracy of the implant position was also evaluated.

Results: A total of 52 patients (mean age, 42.7) were available. There were no revision surgeries for general and/or device-related complications. Only a 28.8% of cases (n=15) showed a satisfactory position. Off-center lateralized implants were the most common misplacements. Axial malrotated TDR accounted for the 28.1% of cases. From 3 to 24 months of FU, differences in range of motion were found in the total L1-S1 flexion, and in the mean range of motion of the implant both improving significantly. TDRs showing unsatisfactory implantation in the radiological studies (71,8%) demonstrated similar lumbar and segmental range of motion in comparison to properly implanted TDRs.

Conclusions: Oblique implanted L4/L5 TDR significantly increases total lordosis while retaining segmental lordosis, independently of the accuracy of its intervertebral position. Oblique TDR maintains antero-posterior segmental and total balance in most cases. Further studies should evaluate whether this finding has any implication for the long-term outcome.

Level of Evidence: Level III

Notes:

PULLOUT STRENGTH OF DIFFERENT DISTAL TERMINAL FIXATION CONSTRUCTS IN THORACOLUMBAR SPINE SURGERY. AN IN-VITRO BIOMECHANICAL STUDY

Ahmet Karakasli, Eyad Sekik, Ahmet Karaaslan, Fatih Ertem, Ceren Kızmazoğlu, Hasan Havitcioglu

Disclosure: The authors declare that no conflict of interests were associated with the present study.

Background: While the biomechanical properties of trans-pedicular screws have proven to be superior in the lumbar spine, little is known concerning pullout strength of trans-pedicle screws in comparison to different distal terminal constructs like sublaminar hooks alone, trans pedicular screws with sublaminar hooks and clow hooks alone in the thoracolumbar spine surgery. In vitro biomechanical pullout testing was performed to evaluate the axial pullout strength of four different distal terminal constructs in thoracolumbar spine surgery.

Methods: 32 fresh-frozen lamb spines were used. The lamb spines were divided into four groups, each group is composed of eight lamb spine cadevers with a different distal fixation pattern was used to terminate the construct at L1. (Group 1) trans-pedicular screws alone, (Group 2) sublaminar hooks alone, (Group 3) trans-pedicular screws augmented with a sublaminar hooks via a domino connector and (Group 4) clow hooks alone.

Results: The avarage pullout strength of group 1 was 927N, group2 was 626N, group 3 was 988N and group 4 was 972N. Group 3 and 4 showed the most significant pullout forces when compared to group 1 and group 2. However Group 3 and group 4 didn't show any significant statistical difference when compared to each others.

Conclusion: Our study thus suggests that the strongest construct that may reduce the pullout phenomina in the distal fixation constructs are the trans-pedicular screw with laminar hooks. It is strongly adviced to be used in osteoporotic bones and in conditions where pullout strength is required to be enhanced. But farther prospective clinical studies are needed to clearly demonstrate the beneficial effect of a trans-pedicular screw augmented with a laminar hooks in reducing the risk of distal instrumentation pullout.

Level Of Evidence: Level 5

Notes:

A NOVEL EXPERIMENTALLY SCOLIOSIS MODEL INDUCED BY TEMPORARY INTERPEDICULAR TETHERING

Carlos Barrios MD, Rafael Llombart MD, Borja Maruenda MD, Juan Alonso MD, Jesús Burgos MD, José M. Lloris MD.
Primary author: Carlos Barrios MD
Abstract Presenter: Jesús Burgos MD

Background: Using flexible tethering techniques, porcine models of scoliosis have been previously described. These scoliotic curves showed vertebral wedging but very limited axial rotation. In some of these techniques, a persistent scoliotic deformity was found after tether release. The possibility to create severe progressive true scoliosis in a big animal model would be very useful for research purposes, including corrective therapies.

Methods: The experimental ethics committee of the main institution provide the approval to conduct the study. Experimental study using a growing porcine model. Unilateral spinal bent rigid tether anchored to two ipsilateral pedicle screws was used to induce scoliosis on eight pigs. Five spinal segments were left between the instrumented pedicles. The spinal tether was removed after 8 weeks. Ten weeks later the animals were sacrificed. Conventional radiographs and 3D CT-scans of the specimens were taken to evaluate changes in the coronal and sagittal alignment of the thoracic spine. Fine-cut CT-scans were used to evaluate vertebral and disc wedging and axial rotation.

Results: After 8 weeks of rigid tethering, the mean Cobb angle of the curves was 24.3° ± 13.8°. Once the interpedicular tether was removed, the scoliotic curves progressed in all animals until sacrifice. During these 10 weeks without spinal tethering the mean Cobb angle reached 50.1° ± 27.1° (Fig.1). The sagittal alignment of the thoracic spine showed loss of physiologic kyphosis. Axial rotation ranges from 10 to 35° (Fig. 2). There was no auto-correction of the curve in any animal. A further pathologic analysis of the vertebral segments revealed that animals with greater progression had more damage of the neurocentral cartilages and epiphyseal plates at the sites of pedicle screw insertion. Interestingly, in these animals with more severe curves, compensatory curves were found proximal and distal to the tethered segments.

Conclusions: Temporary interpedicular tethering at the thoracic spine induces severe scoliotic curves in pigs, with significant wedging and rotation of the vertebral bodies. As detailed by CT morphometric analysis, release of the spinal tether systematically results in progression of the deformity with development of compensatory curves outside the tethered segment. The clinical relevance of this work is that this tether release model will be very useful to evaluate both fusion and non-fusion corrective technologies in future research.

Level of evidence: Not apply for experimental studies

Notes:

MAGNETIC RESONANCE ARTHROGRAPHY VERSUS ARTHROSCOPY FOR ASSESSMENT OF SHOULDER DISLOCATIONS

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Birmingham Heartlands Hospital

Introduction: The highest incidence of recurrent shoulder instability is in young patients, surgical repair can reduce recurrent instability and improve shoulder function. This has led to an increasing rate of stabilisation and use of MRI to identify associated injuries in first time dislocations. MRA has the benefit of distending the joint and is becoming increasingly used. The aim of this study is to establish the sensitivity and specificity of MRA in the investigation of patients with traumatic anterior shoulder dislocations.

Methods: A retrospective analysis of patients undergoing both magnetic resonance arthrography and arthroscopy after a traumatic anterior shoulder dislocation between January 2011 and 2014. Images were interpreted by eight musculoskeletal radiologists and arthroscopic findings were obtained from surgical notes and used as a reference. The sensitivity, specificity and positive predictive value for the different injuries were calculated.

Results: 60 patients were reviewed; 88% were male, mean age was 28 years (range 18 to 50) and 27% were primary dislocations. The overall sensitivity and specificity of MRA to all associated injuries was 0.9 (CI 0.83-0.95) and 0.94 (CI 0.9-0.96) retrospectively. The lowest sensitivity was seen in osseous Bankart 0.8 (CI 0.44-0.96) and SLAP lesions 0.5 (CI 0.14-0.86).

Conclusion: MRA has a high sensitivity when used to identify associated injuries in shoulder dislocation although in 8 patients (13%) arthroscopy identified an additional injury. The overall agreement between MRA and arthroscopic findings was good but identification of GHL and rotator cuff injuries was poor.

Level of evidence: IV

Conflict of Interests: The authors confirm that they have no relevant financial disclosures or conflicts of interest. Ethical approval was not sought as this was a systematic review.

Notes:

KNEE 3

A 15-YEAR FOLLOW UP OF THE KINEMAX TOTAL KNEE REPLACEMENT

Background: There is a paucity of long term data concerning the pre and postoperative patient reported function of total knee replacement. The aim of this study was to determine the mortality, implant survivorship, patient reported function and satisfaction in a cohort of 114 patients, from a single centre, who received a Kinemax total knee replacement more than 15 years ago.

Methods: Patients completed a questionnaire incorporating validated disease- and joint-specific scores, patient satisfaction and overall health preoperatively, at 3 months, 1 year, 2 years and a minimum of 15 years following surgery. NHS National Strategic Tracing Service, hospital and primary care records were used to establish mortality and for implant survivorship in deceased patients.

Results: 45 patients were alive at final follow up. The survivorship of the cohort with revision of the TKR as the endpoint was 84%. Four cases were revised for wear, three for loosening and one for peri-prosthetic fracture. There was a significant improvement in WOMAC Pain, Function and Stiffness Scores, Oxford Knee Score and Self-Administered Patient Satisfaction Scale between pre-operative and all post-operative time points, although patient satisfaction had decreased significantly by the time of final follow up.

Conclusion: In this cohort, the Kinemax TKR showed satisfactory long term survivorship with functional scores demonstrating a high level of patient satisfaction at all follow up time points.

Level of evidence: 2

Notes:

SMOKING STATUS AND PROSTHETIC JOINT INFECTION FOLLOWING TOTAL JOINT ARTHROPLASTY

Gonzalez A, Uçkay I, Hoffmeyer P, Lübbeke A

Background: Smoking has been associated with poor tissue oxygenation and vascularisation, predisposing smokers to a higher risk for postsurgical infections. The aim of this study was to estimate and compare the incidence of prosthetic joint infection (PJI) following primary total joint arthroplasty (TJA) according to smoking status.

Methods: A prospective hospital-registry based cohort was used including all primary total knee and hip arthroplasties performed between 03/1996 and 12/2013 and following them until 06/2014. Smoking status at time of surgery was classified in never, former and current smoker. Incidence rates and incidence rate ratios (IRR) for PJI according to smoking status were assessed within the first year and over the whole study period. Adjusted IRRs were obtained using cox regression model. Adjustment was performed for the following baseline characteristics: age, sex, BMI, ASA score, diabetes, arthroplasty site (knee or hip) and surgery duration.

Results: We included 8,559 TJAs, 3,361 knee and 5,198 hip arthroplasties. Mean age was 70 years, 61% were women, mean follow-up time was 77 months. 5,722 were never (group 1), 1,315 former (group 2) and 1,522 current (group 3) smokers. Over the study period, 108 PJI occurred. Incidence rates of infection within one year were for group 1, 2 and 3, respectively: 4.7, 10.1 and 10.9 cases/1000 person-year. Comparing ever- vs. never-smokers, the adjusted IRR was 1.84 (95% CI 1.05-3.2). Incidence rates for infection over the whole study period were 1.5, 3.1 and 2.7 cases/1000 person-years for group 1, 2 and 3, respectively. Adjusted IRR for ever- vs. never-smokers was 1.46 (95% CI 0.97-2.19).

Conclusions: Smoking was associated with an about 1.5 times higher incidence rate of PJI following TJA. The difference was established already in the first year after surgery and remained thereafter.

Level of evidence: prospective registry based comparative cohort study (level II).

Notes:

THE CLINICAL OUTCOME OF UNICOMPARTMENTAL KNEE REPLACEMENT IN OCTOGENARIANS –A RETROSPECTIVE ANALYSIS

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Daniel Skinner, MBChB, BSc (Hons) Junior Surgical Fellow, Elective Orthopaedic Centre
Mohamed Elsherbiny, BPharm, MPH, Research Project Leader, Elective Orthopaedic Centre
Roy Twyman, MBBS, FRCS, FRCS (ORTH), Consultant Orthopaedic Surgeon, Elective Orthopaedic Centre

Background: In the United Kingdom (UK), the fastest growing population demographic is the over 85 years of age but despite this, outcomes achieved in the octogenarian population with a unicompartmental Knee replacement (UKR) are underrepresented in the literature. The Elective Orthopaedic Centre, Epsom, has an established patient reported outcome measures (PROMs) programme into which all patients are routinely enrolled. We aim to investigate the outcome of medial UKR using the oxford phase 3 implant in octogenarians.

Methods: We retrospectively reviewed our database for patients aged 60-89 years, who underwent a medial unicompartmental Knee Replacement (UKR) using the oxford phase 3 implant, between June 2007-December 2012 (N=395). The patients were stratified into 3 groups based on age, 60-69 (N=188), 70-79(N=149), and 80-89(N=58).Oxford Knee Scores (OKS), Euro-quol (EQ-5D) scores, revision rates, and mortality were compared.

Results: We found that the octogenarian group achieved considerable improvement at 1 year with a mean OKS of 39.2 (+/-7.193) and EQ-5D score of 0.791(+/-0.241). And this improvement remained significant at 2 years. There was no difference in functional outcome when the 3 groups were compared. Revision rates for the 3 groups from youngest to oldest were, 8.5%, 4.5%, and 6.9% respectively. Odds ratio and survival analysis showed no significant difference between the groups.

Conclusion: In conclusion, we found that octogenarians over a 2 year period achieved similar functional outcome as their younger counterparts,

Level of Evidence: IV

Notes:

PAEDIATRIC ELBOW: A CROSS-SECTIONAL STUDY OF TROCHLEA AND OLECRANON OSSIFICATION CENTERS

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Bretton Gate, Peterborough, UK

Introduction: The pattern of appearance of secondary ossification centers in the elbow has been based on historical studies and is popularly referred to with the mnemonic CRITOL. However the six secondary ossification centers can be variable in their presentation and pose a challenge in assessment of children with elbow injuries. Furthermore limited studies available in the current literature have reported an aberration to the sequence of appearance especially with the ossification centers of trochlea and olecranon.

Aims: The aim of the study was to evaluate the relative sequence of appearance of secondary ossification centers for the trochlea and olecranon.
Methods: Children between 8 and 10 years of age who had radiographs of elbow following trivial trauma between July 2013 and Feb 2015 were identified using the hospital PACS database. Cases with radiographic markers of significant trauma ie. fat pad sign, displaced fracture were excluded. Anteroposterior and lateral views of elbow were reviewed for the presence of the six ossification centers.

Results: A total of 114 radiographs were reviewed of which 51 were boys and 63 were girls with a mean age of 9.03 years (±0.59). 60 radiographs were of right elbow and 54 were of the left elbow. The capitulum, radial head and medial epicondyle ossification centers were present in all patients. Both trochlea and olecranon ossification centers were noted in 51/114 (44.7%) children. 12/114 (10.5%) of the children were noted to have trochlea ossification center with no olecranon ossification center. Of these 12 children 7 were boys and 5 were girls. On the other hand 19/114 (16.7%) of the children had an olecranon ossification center but without a trochlea ossification center. Amongst these 7 were boys and 12 were girls.

Discussion and Conclusions: The results of this limited cross sectional study demonstrate that the CRITOL sequence may not followed in 16.7% of cases and more so in girls. Historical studies were based on conventional radiographs. However the current digital radiographs with image enhancement tools help in accurate identification of relatively small ossification centers which may not be apparent on conventional radiographs. The current study has helped to quantify the violators to CRITOL sequence.

Level of evidence: Level III (Cross-sectional study among non-consecutive patients)

Notes:

LOCAL INFILTRATION ANAESTHIA (LIA) PLUS PAINKWELL FOLLOWING TOTAL KNEE ARTHROPLASTY

Salhab M, Kimpson P , Freeman J , Stewart T, Stone MH .

Background: Pain control following knee replacement (TKR) surgery is often poor. Moderate to severe pain is often reported in the first 48 hours following surgery requiring opiate analgesia. The Local Infiltration Anaesthetic (LIA) technique has been described as a method to reduce post operative pain (Kerr DR 2008). In this study we report on our experience using LIA in addition to the PainKwell system (Peak Medical) of continuous infusion intra-articularly, of 0.25% bupivacaine at 4-5 mls/hour for 48 hours post surgery. The PainKwell catheter is placed in the knee joint during surgery.

Methods: Between the June 2012 and Sep 2012, 62 patients undergoing primary TKR were prospectively followed up. All patients studied had spinal anaesthesia (SA) with diamorphine. Group 1. GA. No LIA and no PainKwell. 20 patients. Group 2. SA plus LIA plus PainKwell for 48 hours post operatively with catheter placed anteriorly under the patella. 21 patients. Group 3. SA plus LIA plus PainKwell for 48 hours post operatively with catheter placed posteriorly in the knee joint. 21 patients.

Results: The patients without LIA or PainKwell required more morphine in the first 12 hours postoperative period than the other groups. Seventy percent (n=14) of these group 1 patients required 10mg morphine following TKR compared to only 2% (n=1) of patients requiring 10mg of morphine when LIA and PainKwell as used. The increased morphine requirement continued for 48 hours postoperatively in group 1, whereas none of the patients in groups 2 or 3 required morphine after 36 hours. Fewer patients suffered from nausea and vomiting or urinary retention in the group with LIA and PainKwell (p-value

Notes:

TRANEXAMIC ACID DECREASES BLOOD LOSS IN TOTAL KNEE ARTHROPLASTY WITHOUT TOURNIQUET, USING RIVAROXIBAN AS THROMBO-EMBOLIC PROPHYLAXIS

Background: There are multiple documented advantages of undertaking total knee arthroplasty (TKA) without tourniquet, however, increased rates of blood loss and transfusion are often cited as contraindications to this approach. The aim of this study was to examine the effect of intra-operative TA administration on blood loss and transfusion rates in TKA without pneumatic tourniquet, using Rivaroxaban as thrombo-embolic prophylaxis.

Method: 120 patients split into two continuous data sets, (A+B), underwent TKA without application of above knee tourniquet, receiving a post operative dose of oral Rivaroxaban within 8 hours. Group B patients received an intra-operative dose of 1 gram of Tranexamic Acid intravenously before the first cut , whilst those in group A did not. Haemoglobin and haematocrit levels were recorded peri-operatively. A revised Gross formula was used to calculate blood loss. Four patients were excluded from the study for incomplete data.

Result: 58 patients (M34F24) in Group A, average age 6, had a mean haemoglobin drop of 33gram/litre, haematocrit drop of 0.097litre/litre (9.7%), with an average calculated blood loss of 1393ml. 58 (M34,F24) patients in group B, average age 67, had a haemoglobin drop of 25.2gram/litre, haemotocrit drop of 0.076litre/litre (7.6%) with an average calculated blood loss of1079ml. Thus Group A patients were seen to sustain significantly more blood loss without TA administration, with a 29.1% larger calculated blood loss, a 25.5% larger drop in haemoglobin and a 27.6% larger fall in haematocrit. Transfusion rate was 5.2%(3 patients) per group.

Conclusion: TA was shown to be effective in reducing blood loss in TKA without tourniquet using Rivaroxaban. Transfusion rates of 5.2% across both groups is close to 1/10th of the transfusion rate reported for some major studies of TKA using Rivaroxaban with tourniquet application, and 1/8th of the transfusion rate in studies of TKA with administration of TA and use of tourniquet.

Level of Evidence: Level-III

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The authors report there are no relevant disclosures to make.
Ethical approval was granted for the study.

Notes:

TIMING OF PROPHYLACTIC ANTIBIOTICS IN TRAUMA AND ORTHOPAEDIC PATIENTS

Primary Author Waheeb A K Al-Azzani
Additional Authors E Harris, J Wells, S Shah, S Mahbouba, S P White
Abstract Presenter Waheeb A K Al-Azzani

Introduction: Perioperative antibiotic prophylaxis use in modern orthopaedic procedures is well established. Studies have shown significant reduction in risk of post-operative infections. However, as effectiveness of these antibiotics is dependent on achieving high serum and tissue concentrations that exceed the minimum inhibitory concentrations of infective organisms for operation duration, the timing of prophylaxis is crucial. Although, optimal timing for administering prophylaxis varies in the literature, 30 to 60 minutes prior to skin incision or inflation of tourniquet is considered best standards.

Objectives: To audit our practice of timing of administration of perioperative prophylactic antibiotics in trauma and orthopaedic procedures.
Methods: A double-centre prospective analysis was conducted over a period of 2 week (trauma) and 2 months (elective). Centre A involved trauma cases where centre B involved elective Total Knee Arthroplasty cases. Patients were excluded if they were already on regular antibiotics or when prophylaxis was not indicated. Prescription charts and anaesthetic charts were reviewed along with electronic theatre database.

Results: A total of 109 patients were included (52 elective and 57 trauma). Only 21% of patients received prophylactic antibiotics within 30 to 60 minutes of knife to skin time or inflation of tourniquet. Two third of patients received prophylaxis earlier than recommended with 28% receiving prophylaxis between 5 to 10 minutes and 33% between 15 to 20 minutes prior to knife to skin time or inflation of tourniquet.

Conclusions: Our audit highlights an important deviation from standard best practice. To address this problem we recommend a multidisciplinary team approach including anaesthetic, ward and theatre teams.

Level of evidence: III - Evidence from case, correlation, and comparative studies.

Notes:

KNEE OSTEONECROSIS: A CASE SERIES WITH 6 YEAR FOLLOW UP

RW Jordan, P Aparajit, C Docker, M El-Shazly
The Droitwich Knee Clinic

Introduction: Osteonecrosis of the knee encompasses three conditions; spontaneous osteonecrosis of the knee, secondary osteonecrosis (ON) and post-arthroscopic ON. Early stage lesions can be managed by non-operative measures that include protected weight-bearing and analgesia. The aim of this study was to report the experience of the authors in managing early stages of knee ON by analysing the functional outcome and need for surgical intervention.

Methods: All patients treated for osteonecrosis of the knee between 1st August 2001 and 1st April 2014 were prospectively collected. Treatment consisted of touch-down weight bearing for four to six weeks. The cases were retrospectively reviewed. MR imaging was evaluated for the stage of disease according to Koshino's Classification system, the condyles involved and the time taken for resolution. Tegner Activity Scale, VAS pain, Lysholm, WOMAC and IKDC scores were recorded at presentation and final follow up.

Results: 51 cases were treated for knee ON at our centre; 40 cases of SONK, seven secondary ON and four post-arthroscopic ON. Of the seven cases of secondary osteonecrosis; 5 were secondary to self-reported high ethanol intake and two secondary to corticosteroid treatment. The mean age of the group was 56.9 years and 68.7% were male. The medial femoral condyle was the most commonly affected (54.9%). 86% reported resolution of clinical symptoms and a statistically significant improvement was reported in all functional outcome measures. Four patients required total knee arthroplasty; three in the post-arthroscopic group within 15 months and one following ON secondary to corticosteroids performed at 5 months.

Conclusion: Early stage spontaneous osteonecrosis of the knee can be managed successfully without surgery if diagnosed early. Although secondary and post-arthroscopic ON seem to be more resistant. Larger studies are required to confirm or refute this.

Level of evidence: IV – a case series
Conflict of Interests: The authors confirm that they have no relevant financial disclosures or conflicts of interest. Ethical approval was not sought as this was a systematic review.

Notes:

GENERAL & TRAUMA

CENTRAL PAIN SENSITISATION AND RADIOGRAPHIC OSTEOARTHRITIS AFTER TOTAL JOINT REPLACEMENT

Vikki Wylde[1], Adrian Sayers[1], Adekoyejo Odutola[2], Rachael Gooberman-Hill[1], Paul Dieppe[3], Ashley Blom[1]
[1]Musculoskeletal Research Unit, School of Clinical Sciences, University of Bristol, Learning and Research Building, Southmead Hospital, Bristol, BS10 5NB, UK
[2]North Bristol NHS Trust, Brunel Building, Southmead Hospital, Bristol, BS10 5NB, UK
[3]Medical School, University of Exeter, The Veysey Building, Salmon Pool Lane, Exeter, EX2 4SG, UK

Approvals: The APEX trials were registered as an International Standardised Randomised Controlled Trial(96095682), approved by Southampton and South West Hampshire Research Ethics Committee(09/H0504/94) and all participants provided informed written consent.

Background: To investigate whether the interaction between pre-operative widespread hyperalgesia and radiographic osteoarthritis (OA) was associated with pain severity before and after total hip replacement (THR) and total knee replacement (TKR).

Methods: Data were analysed from 232 patients receiving THR and 241 receiving TKR. Pain was assessed pre-operatively and at 12 months post-operatively using the WOMAC Pain Scale. Widespread hyperalgesia was assessed through forearm pressure pain thresholds (PPTs) measured using an algometer. The severity of radiographic OA was evaluated using the Kellgren and Lawrence scheme. Statistical analysis was conducted using linear regression and multilevel models, and adjusted for confounding variables.

Results: Pre-operative: In knee patients, there was weak evidence that the effect of PPTs on pain severity was greater in patients with more severe OA compared to patients with less severe OA (Grade 3 OA: ß=0.96 vs Grade 4 OA: ß=4.03). However, in hip patients, the effect of PPTs on pain severity did not differ with the extent of radiographic OA (Grade 3 OA: ß=3.95 vs Grade 4 OA: ß=3.67).
Post-operative: Patients undergoing TKR with less severe OA who had lower PPTs (greater widespread hyperalgesia) benefitted less from surgery than patients with higher PPTs (Grade 3 OA: ß=2.28). Conversely, patients undergoing THR with more severe OA who had lower PPTs benefited more from surgery than patients with higher PPTs (Grade 4 OA: ß=-2.92).

Conclusion: Central sensitisation may be a determinant of how much patients benefit from joint replacement, but the effect varies by joint and severity of structural joint changes.

Level of Evidence: 2

EVALUATION OF NAPROXENSODIUM AND CODEINEPHOSPHATE COMBINATION IN OSTEOARTHRITIS

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[1]Department of Orthopedics andTraumatology, Goztepe Training and Research Hospital, Turkish Ministry of Health Medeniyet University, Istanbul-TURKEY.

Background: Osteoarthritis (OA) pain treatment has limitations in terms of serious adverse effects and low efficacy. We aimed to evaluate efficacy and safety of naproxen sodium/codeine phosphate combination in these patients.

Methods: In this prospective, randomized, double blind, placebo controlled clinical trial, 135 patients with osteoarthritis, who were 40-65 years; applied to our institution's orthopaedics outpatient clinic; had grade 1, 2, or 3 primary osteoarthritis diagnosed in last 1 year; and had Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score≥40, and Visual Analogue Scale score≥40, were enrolled. Subjects were randomized (1:1) to placebo (n= 67) or combination (n= 68) arms, in which 550 mg naproxen sodium/30mg codeine phosphate was given orally twice a day for 7 days. Rescue medicine was 500 mg paracetamol (max= 6 tablets/day). Demographic characteristics, medical history, adverse events, VAS and WOMAC scores were collected in study visits performed within 10days.The study was approved by local institutional ethics committee and written informed consents were obtained from all participants.

Results: Patients were evenly matched in both arms. The mean age was 52.3±6.6 years (89.7% female). WOMAC and VAS scores decreased significantly within each group (p<0.001 for all) (Table). WOMAC score was decreased more in combination group (p= 0.044). Changes in VAS scores between visits were significantly different (more in combination receivers) between groups (p= 0.018).

	VAS Score (3)	VAS Score (1)
	Mean+SD	Med (min-max)
Study Group	-29,8±21,0 n=43	-30 (-70-0)
Control Group	-16,1±24,4 n=36	-12,5 (-65-40)
P value	0,018	

Ratio of patients requiring no rescue medicine was higher among combination receivers than controls (64.8% vs. 35.2%, respectively). Most common adverse events were constipation, dyspepsia, and somnolence; no fatality was encountered.

Conclusions: Naproxen sodium/codeine phosphate combination is effective and safe in osteoarthritis patients.

Level of evidence: Level 1

PREDICTING LENGTH OF STAY IN ARTHROPLASTY ENHANCED RECOVERY PROGRAMS

Vaughan AJC; Arunachalam H; Harold; Ayres B; Eitel C; Rao M

Background: Predicting length of stay (LOS) is key to providing a cost effective and efficient arthroplasty service in an era of increasing financial constraint. Previous studies predicting LOS have not considered enhanced recovery protocols in elective hip and knee arthroplasty.
Our study aims to identify patient variables in the pre and peri-operative period to predict increased LOS on patients enrolled into the standardised Chichester and Worthing Enhanced Recovery Programme (CWERP).

Methods: All patients undergoing elective hip and knee arthroplasty were enrolled into CWERP using standardised anaesthetic, surgical and analgesic protocols. A data analyst prospectively collated data over 6months from anaesthetic charts and daily ward review from 663 patients between Dec 2012 and June 2013.
An independent statistician undertook statistical analysis (program R, version 3.1.1). 80% of the 6months consecutive data (530 patients) were analysed, and predictive variables identified. These variables were tested against the remaining 20% of data (133 patients) predicting a LOS greater or less than our median of 4 days.

Results: 663 patients were enrolled into CWERP over this period, 54% in hip arthroplasty. Statistical analysis was performed using Chi-squared test for association between actual and predicted (dichotomised) LOS being significant ($p<0.0000000017$). In the initial 80% (530 patients), this identified the following statistically significant variables in predicting LOS > 4 days: Age > 80 yrs, ASA 4, failure to mobilise on day of surgery, urinary catheterisation and need for blood transfusion. The statistical model when applied to the remaining 20% (133 patients) correctly categorised LOS in 101 (76%) of the patients.

Conclusions: Identifying patients who fulfil our variables in the preoperative period affords better planning, maximising resources, bed efficiency and discharge planning. This also provides opportunities for financial remuneration for higher risk patients.

Evidence Level 4

Notes:

HYALURONIC ACID EFFECT ON ADIPOSE-DERIVED STEM CELLS. BIOLOGICAL IN VITRO EVALUATION

Objectives: To evaluate the in vitro effects of hyaluronic acid (HA) on adipose-derived stem cells (ASC) in order to consider the possibility of their combined used in the treatment of knee arthrosis.

Material and methods: The ASC cells were grown both in the presence and absence of AH, and several studies were carried out: proliferation (WST8) and cell viability studies (Alamar Blue® and Trypan Blue), possible chondrogenic differentiation (collagen type 2 expression) by RT-PCR, AH receptor expression (CD44) by flow cytometry and RT-QPCR, and expression of inflammatory and anti-inflammatory factors (IL-6, TGFß, IL-10) by RT-QPCR.

Results: The number of ASC significantly increased after 7 days with HA (158±39%, $p < .05$). Additionally, the cell viability of the ASC treated with HA after 1, 3, 5 and 7 days was similar to that of the control cells, being considered non-toxic. There were no changes observed in the expression of CD44 and chondrogenic differentiation. TGFß expression was not modified after AH treatment, but there was a 4-fold decrease in IL-6 expression and IL-10 expression increased up to 2-fold compared to control cells.

Conclusions: Hyaluronic acid favours ASC proliferation without causing cellular toxicity, and inducing an anti-inflammatory profile in these cells. Hyaluronic acid appears to be a suitable vehicle for the intra-articular administration of mesenchymal stem cells.

Notes:

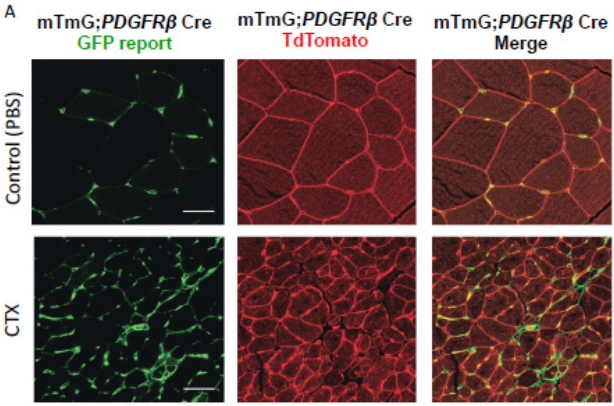
αV INTEGRIN DEPLETION ON PDGFRB+ CELLS REGULATES SKELETAL MUSCLE FIBROSIS

Iain R Murray, Zaniah Gonzalez, John Iredale, Hamish Simpson, Bruno Peault, Neil C Henderson

BACKGROUND: There are currently no effective treatments for skeletal muscle fibrosis. Myofibroblasts are the major cellular effectors of fibrosis but their origin in muscle is unknown. We report that PDGFRβ (platelet derived growth factor receptor beta) Cre inactivates genes in murine PDGFRβ+ cells and myofibroblasts in muscle with high efficiency. We used this system to delete the integrin αv subunit because of the suggested role of multiple αv integrins as central mediators of fibrosis in multiple organs.

METHODS: Muscle fibrosis was induced by intramuscular cardiotoxin (CTX) injection. The contribution of PDGFRβ+ cells to fibrosis was assessed in double-flourescent reporter (mTmG) mice under PDGFRβ-Cre control. Itgav$^{flox/flox}$;PDGFRβ-Cre mice were used to investigate whether loss of αv integrins on PDGFRβ+ cells influences fibrosis development. A small-molecule inhibitor of αv integrins (CWHM12) was used to determine whether pharmacological blockade of αv integrins could attenuate fibrosis.

RESULTS: At 21 days following injury PDGFRβ+ cells in mTmG;PDGFRβ-Cre mice were distributed in a manner characteristic of myofibroblasts (Fig.1A). PDGFRβ+ cells sorted from injured muscles of mTmG;PDGFRβ-Cre mice showed induction of genes associated with myofibroblastic transition (Fig.1B). Itgav$^{flox/flox}$;PDGFRβ-Cre mice were protected from CTX induced fibrosis, as determined by picrosirius red staining for collagen ($p<0.01$). Sorted and culture activated αv-null PDGFRβ+ cells demonstrated significant reduction in collagen1 over controls ($p<0.05$). CWHM12 significantly reduced muscle fibrosis when delivered from the time of injury (prophylactic model: $p<0.01$) and from day 10 post injury (therapeutic model: $p<0.01$)(Fig.3). Furthermore, CWHM12 inhibited collagen1 expression by PDGFRβ+ cells ex-vivo ($p<0.05$).



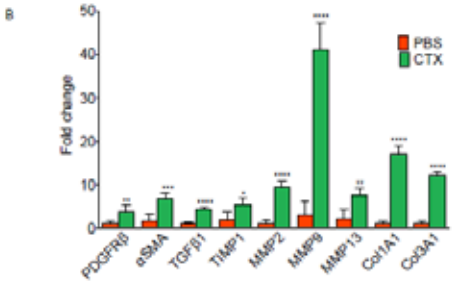


Figure 1. PDGFRβ+ cells transition to a myofibroblast phenotype following CTX-induced muscle injury (A-B).

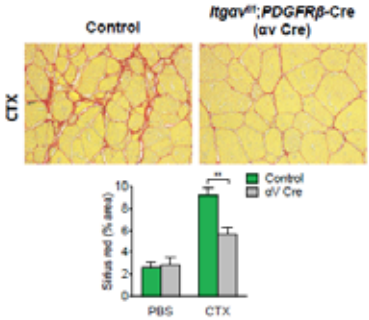


Figure 2. Genetic ablation of αv integrins on PDGFRβ+ cells protects mice from CTX induced muscle fibrosis.

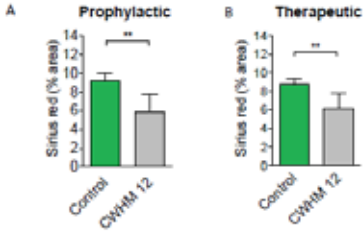


Figure 3. Pharmacological blockade of αv integrins using a small molecule inhibitor (CWHM12) protects mice from CTX induced muscle fibrosis.

CONCLUSIONS: PDGFRβ-Cre labels profibrotic cells in skeletal muscle and depletion of αv integrins in these cells reduces muscle fibrosis. Most importantly from a treatment standpoint, pharmacologic inhibition of αv integrins using a small molecule inhibitor may have utility in the prevention and treatment of skeletal muscle fibrosis.

LEVEL OF EVIDENCE: Basic Science

OUTCOMES FOLLOWING SURGERY FOR ADOLESCENT HALLUX VALGUS – A SYSTEMATIC REVIEW

Introduction: The management of adolescent hallux valgus (AHV) remains controversial, with reservations about both conservative and surgical treatments. Non-operative management has a limited role in preventing progression. Surgical correction of AHV has, amongst other concerns, been associated with a high prevalence of recurrence of deformity after surgery. We conducted a systematic review to assess clinical and radiological outcomes following surgery for AHV.

Methods & Materials: A comprehensive literature search was performed in the Cochrane Library, CINAHL, EMBASE, Google Scholar, and Pubmed.. The study was performed in accordance with the recommendations of the PRISMA guidelines. Demographic data, radiographic parameters, and results of validated clinical scoring system were analysed.

Results: Nine contemporary studies reporting on 201 osteotomies in 140 patients were included. The female to male ratio was 10:1. Mean age at operation was 14.5 years (10.5-22). Mean follow-up was 41.6 months (12-134). The mean post-operative AOFAS score was 85.8 (sd ±7.38). The mean AOFAS patient satisfaction showed that 86% (sd ± 11.27) of patients satisfied or very satisfied with their outcome. On the DuPont BRS, 90% rated their outcome as good or excellent. There was a statistically significant improvement in the IMA ($p=0.0003$), HVA ($p<0.0001$), and DMAA ($p=0.019$). The main complication was persistent pain (12%); others included infection (2%), scar hypersensitivity (4.5%), and non-union, metatarsalgia, and CRPS (each at 0.5%), and no reports of metatarsal head AVN.

Conclusion: Based on the most current published evidence, surgery for AHV shows excellent clinical and radiological outcomes, with high patient satisfaction. The rates of recurrence and other complications are lower than the historically reported figures. There is, however, a need for high level, multi-centre collaborative studies with prospective data to establish the long-term outcomes and optimal surgical procedure(s).

Notes:

THE ORTHOPEDIC TRAUMA SURGERY PRACTICE: IS IT SAFE?

Introduction: Orthopedic trauma surgery is characterized by repetitive, forceful tasks that are physically demanding, thus theoretically increasing the risk of musculoskeletal injuries in these surgeons. The aim of this study is to assess prevalence, characteristics and impact of musculoskeletal disorders among orthopedic trauma surgeons.

Methods: A modified version of the physical discomfort survey was sent to surgeon members of the Orthopedics Trauma Association (OTA) via e-mail. For data analysis, one-way ANOVA and Fisher Exact test were performed to compare the variables where appropriate. P values<0.05 were considered statistically significant.

Results: A total of 86 surgeons completed the survey during the period of data collection. Of the respondents 84.9% were males and more than half were aged between 30-45 years old (Figure 1). The majority of musculoskeletal complaints and disorders were low back pain (29.3%), wrist or forearm tendinitis (18.0%), elbow lateral epicondylitis (15.4%), plantar fasciitis (14.7%) (Figure 2). When data was analyzed according to number of years in practice the results yielded a significant difference between the groups in both number of regions involved ($p<0.05$) and number of musculoskeletal disorders ($p<0.05$), as a higher proportion of these were documented in surgeons practicing for 16-20 years and more than 30 years. Also surgeons working in a private setting ($p<0.005$), surgeons working in more than one institute ($p<0.005$), increased number of regions involved ($p<0.001$) and increased number of musculoskeletal disorders ($p<0.001$) were significantly more likely to require time-off work.

Conclusion: To our knowledge, our study is the first of its kind that shows a high percentage of orthopedic trauma surgeons sustain occupational injuries some time in their careers. Cost of management and rehabilitation of these injuries, in addition to the amount of missed workdays due to these injuries indicate that these injuries have a significant economic burden on the health-care system.

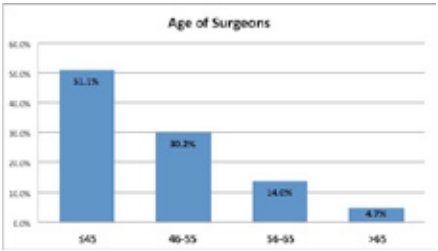


Figure 1: Diagram of age distribution of surgeon participant in survey.

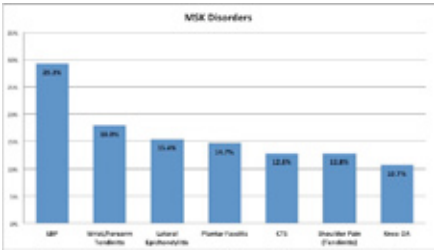


Figure 2: Diagram of musculoskeletal disorders and complaints of surgeon participants in survey.

Notes:

EVOLUTION OF CHEMOTHERAPY IN OSTEOARTICULAR TUBERCULOSIS : A PROSPECTIVE STUDY DISCLOSURE

No relevant financial disclosures or conflicts of interest from any of the authors

Background: The discussion over the duration, type of therapy and regimen to be used in osteoarticular tuberculosis is losing importance in all orthopaedic gathering. Still little consensus is there over the universality of a treatment regime for osteoarticular tuberculosis.

Material and Method: 340 new cases of osteoarticular tuberculosis were included in the study that were medically treated in the department of orthopaedics in a tertiary care center between 2001 and 2011. Out of which 202 cases were of spinal tuberculosis and 138 cases of extraspinal tuberculosis. 88 cases of spinal tuberculosis were treated by conventional method and 114 cases by short course chemotherapy. 60 cases of extraarticular tuberculosis were treated by conventional chemotherapy and 78 cases by short course and intermittent therapy.

Results: All cases were evaluated on clinical, radiological and haematological basis. Cases who received conventional therapy received 18-24 months of treatment irrespective to the clinical, radiological and haematological parameters. Whereas those who received short course (2HRZE+4 HR) and intermittent therapy (DOTS) were evaluated for clinical improvement. Maximum follow up was of 12.8 years (conventional) minimum follow of 8 years (intermittent). The trend of fall in ESR, clinical and radiological parameters showed improvement beyond 2 years of initiation of treatment in cases that had stopped treatment at 6 months. But the improvement was slow after six months even in cases who received 24 months of chemotherapy. There were no relapses in all the three groups.

Conclusion: This study reinforces that chemotherapy tailored to the response of treatment (6-9months) is the rational therapy. This study gives an insight over the evolution of different regimes as well as gives an understanding of the clinical treatment.

Level Of Evidence:Level 1

Notes:

MARKERLESS MOTION ANALYSIS AND ITS POTENTIAL USES IN ORTHOPAEDICS

R Hurley, A Devitt

Background: New marker free motion analysis systems are being used extensively in the area of sports medicine and physiotherapy. The accuracy and validity of use in an orthopaedic setting have not been fully assessed for these newer marker free motion analysis systems. The aim of this study is to compare leg length and varus/valgus knee measurements performed by leg measurement x-ray, and performed using the new marker free motion analysis system (Organic motion biostage).

Methods: Patients attending the orthopaedic department for total knee replacements were recruited. They underwent radiological leg measurement x-ray, clinical leg measurement, and finally assessment using the organic motion biostage system. These were analysed using the motion monitor software, microsoft excel and minitab 16.

Results: For 23 patients assessed, all methods showed a statistically significant result ($p<0.05$) using paired t-tests. This rejects the null hypothesis- indicating that organic motion does not have the accuracy currently to measure leg length or knee varus/valgus angle.

Conclusions: Results indicate that the organic motion biostage system- a new marker free motion analysis system, is not feasible currently as a method of accurately measuring leg-length. Given the current modelling methods used by this new system there are limitations, that if addressed may yet allow the system to become a useful clinical tool. These authors feel it still has applications in orthopaedics as a useful, quick, and easy to use method of motion analysis and functional screen in orthopaedic patients, and warrants further investigation. We also present a case of lumbar pedicle subtraction osteotomy, and show how markerless motion analysis is a useful tool for assessing spinal sagittal balance, and its effect on the biomechanics of walking.

Level of evidence: IV

Notes:

EXTERNAL VALIDATION OF A TOOL FOR THE ESTIMATION OF LIFE EXPECTANCY IN PATIENTS WITH SKELETAL METASTASES—DECISION ANALYSIS AND COMPARISON OF THREE MAJOR INTERNATIONAL PATIENT POPULATIONS

Presented by Silvia Spinnelli

Background: Metastatic bone patients who require surgery needs to be evaluated in order to maximize quality of life and avoiding functional impairment, minimizing the risks connected to the surgical procedures. The best surgical procedure needs to be tailored on survival estimation. There are no current available tool or method to evaluate survival estimation with accuracy in patients with bone metastasis. We recently developed a clinical decision support tool, capable of estimating the likelihood of survival at 3 and 12 months following surgery for patients with operable skeletal metastases. After making it publicly available on www.PATHFx.org, we attempted to externally validate it using independent, international data.

Methods: We collected data from patients treated at 13 Italian orthopaedic oncology referral centers between 2008 and 2012, then applied to PATHFx, which generated a probability of survival at three and 12-months for each patient. We assessed accuracy using the area under the receiver-operating characteristic curve (AUC), clinical utility using Decision Curve Analysis DCA), and compared the Italian patient data to the training set (United States) and first external validation set (Scandinavia).

Results: The Italian dataset contained 287 records with at least 12 months follow-up information. The AUCs for the three-month and 12-month estimates was 0.80 and 0.77, respectively. There were missing data, including the surgeon's estimate of survival that was missing in the majority of records. Physiologically, Italian patients were similar to patients in the training and first validation sets. However notable differences were observed in the proportion of those surviving three and 12-months, suggesting differences in referral patterns and perhaps indications for surgery.

Conclusions: PATHFx was successfully validated in an Italian dataset containing missing data. This study demonstrates its broad applicability to European patients, even in centers with differing treatment philosophies from those previously studied.

Notes:

TOWARDS ROBOT ASSISTED FRACTURE SURGERY FOR INTRA-ARTICULAR JOINT FRACTURES

Ioannis Georgilas, Giulio Dagnino, Payam Tarassoli, Roger Atkins, Sanja Dogramadzi

Background: Treating fractures is expensive and includes a long post-operative care. Intra-articular fractures are often treated with open surgery that require massive soft tissue incisions, long healing time and are often accompanied by deep wound infections. Minimally invasive surgery (MIS) is an alternative to this but when performed by surgeons and supported by X-rays does not achieve the required accuracy of surgical treatment.

Methods: Functional and non-functional requirements of the system were established by conducting interviews with orthopaedic surgeons and attending fracture surgeries at Bristol Royal Infirmary to gain first-hand experience of the complexities involved. A robot-assisted fracture system (RAFS), see Figure 1, has been designed and built for a distal femur fracture [1] but can generally serve as a platform for other fracture types.

Results: The RAFS system has been tested in BRL and the individual robots can achieve the required level of reduction positional accuracy (less than 1mm translational and 5 degrees of rotational accuracy). The system can simultaneously move two fragments. The positioning tests have been made on Sawbones.

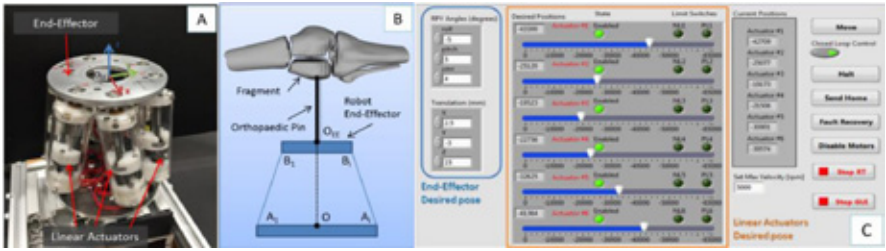


Figure1: RAFS robotic component

Conclusions: The proposed approach is providing an optimal solution by merging the fracture reduction knowledge of the orthopaedic surgeon and the robotic system's precision in 3D.

Level of Evidence: The current level of evidence is limited and based on the Sawbones testing.

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Bibliography: [1] Raabe D, Dogramadzi S and Atkins R. Semi-automatic percutaneous reduction of intra-articular joint fractures – an initial analysis, accepted for Int. Conf. Robotics and Automation (ICRA), 2012.

Notes:

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