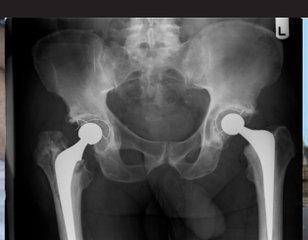
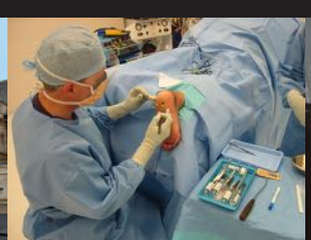
The Oxford Bone Infection Unit

5th Annual Oxford Bone Infection Conference (OBIC 2015)

Thursday 26th & Friday 27th March 2015

Examination Schools
81 High Street
Oxford




Oxford University Hospitals NHS
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ESCMID
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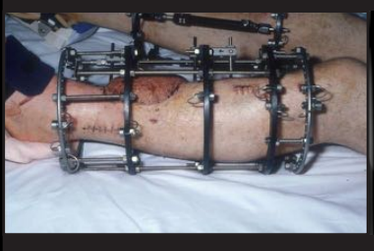
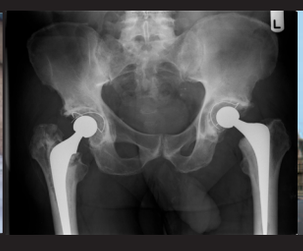

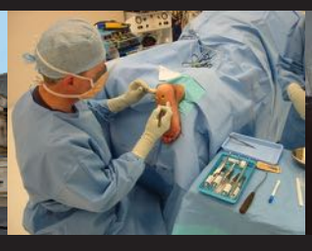


5TH ANNUAL OXFORD BONE INFECTION CONFERENCE

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INTRODUCTION

Dear Colleagues and Friends

It is a great pleasure and privilege to welcome you to the 5th Oxford Bone Infection Conference.

A founding premise of OBIC is that successful management of complex bone and joint infection depends upon multidisciplinary team working; we hope that this meeting helps to promote and facilitate this process. We are delighted to be able to introduce international experts in microbiology and infectious diseases, orthopaedics, plastic and reconstructive surgery, and representation from nursing and allied health specialties. We are particularly proud this year to welcome Professor Werner Zimmerli, one of the world's most influential authorities in the field.

The programme provides an opportunity for debate, discussion and the exchange of ideas in the rapidly developing field of musculoskeletal infection. In response to feedback from previous years, we have tried to incorporate greater opportunity for delegates to present their work and for interaction between the disciplines represented. We have an impressive list of oral and poster presentations which we hope will stimulate further discussion and research.

The conference venue, Oxford University Examination Schools, was designed and built by Thomas Jackson between 1876 and 1881. The building stands on a part of the site of the Angel Inn, which is reputed to have been the first Inn in England. Each year thousands of undergraduates sit their exams in this historical Grade II listed building, which is commonly known as the "Schools". They must wear traditional 'sub-fusc', black and white attire which is an Oxford tradition that is still rigidly enforced.

This year there are again networking and social opportunities including a drinks reception and a conference dinner. The dinner will be served a short walk from the conference venue at Oriel College, the buildings of which date back to the 14th century. Oriel College alumni include Sir Walter Raleigh and Cecil John Rhodes.

We would sincerely like to thank all our commercial sponsors, without whom this meeting would not have been possible. Please make a special effort to meet with the sponsors' representatives.

We also would ask you to complete the post-meeting feedback survey which will be sent to you by e mail after the meeting. We hope you have an enjoyable and educational meeting.

Dr Bridget Atkins, Mr Martin McNally, Dr Ivor Byren, Mr Alex Ramsden, Mr Roger Gundle, Mr Adrian Taylor, Mr David Stubbs, Mr Mark Rogers, Dr Andrew Woodhouse, Dr Matt Scarborough, Dr Elham Khatamzas

The Bone Infection Unit, Oxford

The Bone Infection Unit at the Nuffield Orthopaedic Centre is part of Oxford University Hospitals (OUH) NHS Trust. It remains dedicated to the investigation and treatment of all aspects of bone and joint infection, including chronic long-bone osteomyelitis, diabetic foot infections, spinal osteomyelitis and orthopaedic device-related infection. In addition to serving the local population, it is a tertiary referral centre for patients across the UK, many referrals being complex infected cases from other orthopaedic surgeons. The centre of activity of the unit is a 26-bed dedicated inpatient ward. Each patient is under the combined care of a consultant infection physician and a specialist orthopaedic surgeon (together with trainees in both specialities). Many cases also have a plastic surgeon involved. There is a full multi-disciplinary team and a large outpatient parenteral antibiotic therapy (OPAT) programme. The BIU runs consultant ward-rounds, multidisciplinary team (MDT) meetings, radiology meetings, combined orthopaedic / infection / plastics outpatient clinics and an OPAT clinic. There is an active education programme. The BIU is an ESCMID collaborative centre and runs observer programmes through ESCMID and also by direct communication. There is also a research group with publications and on-going projects, including the OVIVA (oral vs. IV antibiotics) trial. The unit is closely integrated with infection control and the OUH departments of adult and paediatric infectious diseases and microbiology. The BIU is also a major contributor to the UK Standards for Microbiology Investigations for orthopaedic samples.

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PROGRAMME: THURSDAY 26TH MARCH

08:45 - 09:20	*Registration & refreshments*	
09:20 - 09:30	Welcome and introduction	Dr Tony Berendt, *Oxford*
Session One:	**Principles of Bone and Joint Infection Management**	**Chair: Professor Werner Zimmerli**
09:30 - 10:40	Multidisciplinary work	Dr Bridget Atkins, *Oxford*
	Orthopaedic management	Mr Martin McNally, *Oxford*
	Soft tissue management	Dr Jan Smit, *Amsterdam*
	Antibiotic management	Dr Alex Soriano, *Barcelona*
	Discussion	
10:40 - 11:10	*Tea / coffee, poster viewing and exhibition*	
Session Two:	**Interactive Session**	**Chair: Dr Ivor Byren**
11:10 - 12:30	Conundrum cases	Dr Olivier Borens, *Lausanne* Dr Andrew Woodhouse, *Birmingham*
	• Two stage knee fusion and preservation of limb length with osteobridge nail for the management of persistent periprosthetic infection. A case report.	Mr Dimitrios Giotikas, *Cambridge*
	• Multiple drug allergy: challenges in the management of infected metal work	Dr Hala Kandil, *Stevenage*
	• Fever and acutely swollen joints	Dr Emma-Jo Hayton, *France*
	• Infected non-union of radius	Mr Neal Jacobs, *Southampton*
	• A stubborn surgical infection	Dr Edouard Devaud, *France*
	Discussion	
12:30 - 13:00	Introduction of sponsors	
13:00 - 14:00	*Lunch, poster viewing and exhibition*	
Session Three:	**Debate**	**Chair: Professor Ben Lipsky**
14:00 - 15:00	One-stage vs two-stage revision	Dr Heinz Winkler, *Vienna* Mr Adrian Taylor, *Oxford*

Session Four: Case-based Workshops

15:00 - 16:00

1. **Prevention of infection** — **Room 6**
   Mr Mike Reed, Dr Parham Sendi, Dr Matthew Scarborough, Dr Damian Mack
2. **Hand infections** — **Room 7**
   Mr Darren Chester, Dr Jan Smit, Dr Andrew Woodhouse, Mr Alex Ramsden
3. **Key roles in a multidisciplinary bone infection team** — **Room 9**
   Dr Bridget Atkins (Clinical Infection), Mr David Stubbs (Orthopaedics), Ms Sue Leahy (Physiotherapy), Ms Sarah Wyatt (Physiotherapy), Ms Bethany Hougham (Occupational Therapy), Ms Maz Sutherland (Ilizarov Specialist Nurse), Ms Kirsty Gee (OPAT Specialist Nurse)
4. **A prosthetic joint infection workshop** — **South School**
   Dr Olivier Borens, Professor Lars Engesæter, Mr Roger Gundle, Dr Ivor Byren

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16:00 - 16:30	*Tea / coffee, poster viewing and exhibition*	
Session Five:	**Rapid fire presentations**	**Chair: Dr Elham Khatamzas**
16:30 - 17:00	• What proportion of clinical recurrences of diabetic foot infections (DFIs) are microbiologically due to new pathogens?	Dr Ilker Uçkay, *Geneva*
	• Bacterial contamination of diathermy tips used during orthopaedic procedures	Mr Ali Abdulkarim, *Ireland*
	• Soft tissue reconstruction for lower limb bone defects: muscle versus fasciocutaneous flaps	Dr James Chan, *Oxford*
	• *Staphylococcus epidermidis* discitis in adults: a case series	Dr Ken Agwuh, *Doncaster*
	• Microbiology culture analysis in primary v recurrent diabetic foot infections (DFI)	Mr Nick Pieterson, *Liverpool*
	• Osteoarticular infection (OI) by multi drug-resistant *Pseudomonas aeruginosa* (PA): what about treatment?	Dr Alba Ribera, *Barcelona*
	• Clinical and epidemiological differences between implant-associated and implant-free orthopaedic infections	Dr Ilker Uçkay, *Geneva*
Session Six:	**The Cierny-Mader Lecture** *To communicate excellence and innovation in the multidisciplinary management of bone and joint infection* **Sponsored by the British Infection Association**	**Chair: Dr Tony Berendt**
17:00 - 17:45	Pathogenesis and treatment of periprosthetic joint infection	Professor Werner Zimmerli, *Basel*
17:45	*Close*	

Social Programme

18:00	**Drinks Reception** - Examination Schools
19:30	**Conference Dinner** - Oriel College

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PROGRAMME: FRIDAY 27TH MARCH

08:00 - 08:30 *Registration*

Session One:	**Keynote Lectures**	**Chair: Dr Olivier Borens**
08:30 - 09:00	Registries: Infection after primary hip arthroplasty in Norway and the rest of Scandinavia	Professor Lars Engesæter, *Bergen*
09:00 - 09:30	Prevention and treatment of infection in tumour surgery	Dr Werner Hettwer, *Copenhagen*

Session Two: Meet the Expert Sessions

09:30 - 10:30

1. Esoteric infections Dr Stephen Wright, Dr Jim Buckley, Dr Andrew Brent	**Room 7**
2. Clinical research in bone and joint infections Dr Alex Soriano, Dr Simon Warren, Mr Adrian Taylor, Dr Johan Lammens	**Room 9**
3. Biomaterials and local antimicrobial delivery Dr Werner Hettwer, Mr Martin McNally, Dr Parham Sendi	**Room 6**
4. Diabetic foot infection Mr Mark Rogers, Professor Ben Lipsky, Dr Tony Berendt	**South School**

10:30 - 11:00 *Tea / coffee, poster viewing and exhibition*

Session Three:	**Free Papers** *(Please select one session to attend)*	**Chairs: Mr Mark Rogers and Dr Matthew Scarborough**
11:00 - 12:00	**Session A**	**South School**
	• Use of a new antibiotic bone substitute to induce healing of osteomyelitis in the diabetic foot	Dr Christine Whisstock, *Italy*
	• Treatment of paediatric bone and joint infection - University Hospital experience	Dr Kishore Dasari, *Birmingham*
	• Chronic osteomyelitis of the calcaneum: surgical technique, patient management and clinical outcome	Mr Martin McNally, *Oxford*
	• Diabetic foot infections: deep tissue biopsies v superficial swabs	Mr James Widnall, *Liverpool*
	• The management of hip and knee prosthetic joint infections in a district general hospital. How successful is the debridement, antibiotic and implant retention (DAIR) strategy?	Dr Stephen Ng Man Sun, *Milton Keynes*
	• Two-stage ankle joint arthrodesis in septic joint arthritis	Dr Martins Malzubris, *Riga*
	• Evaluation of serum and synovial procalcitonin levels as an indicator of septic arthritis	Dr Joanna Lumb, *Newcastle*
11:00 - 12:00	**Session B**	**Room 6**
	• Enzymatic biofilm prevention using a marine endonuclease - a new paradigm in the treatment of periprosthetic joint infections	Dr Andrea Nicolas, *Newcastle*
	• Teicoplanin anaphylaxis after switching standard orthopaedic prophylaxis to teicoplanin and gentamicin	Dr Simon Warren, *London*

	• *Staphylococcus aureus* versus β-hemolytic streptococci in orthopaedic infections	Dr Ilker Uçkay, *Geneva*
	• Evaluation of the synergistic effect of penicillin plus gentamicin on stationary phase group B streptococci (GBS)	Ms Corinne Ruppen, *Bern*
	• A retrospective cohort review of the diagnosis and management of orthopaedic infections and antimicrobial resistance in Syrian refugees with war related injuries in a specialist surgical hospital in Amman, Jordan	Dr Aula Abbara, *London*
	• Septic arthritis of the small joints and wrist	Dr Parham Sendi, *Bern*
	• An evaluation of the Synovasure near patient lateral flow test for the diagnosis of periprosthetic joint infection	Dr Andrea Nicolas, *Newcastle*
Session Four:	**Management of the Infected Lower Limb**	**Chair: Mr Martin McNally**
12:00 - 12:20	Infected non-unions	Dr Johan Lammens, *Leuven*
12:20 - 12:40	Soft tissue reconstruction in orthoplastic infection	Mr Alex Ramsden, *Oxford*
12:40 - 13:00	Illustrative clinical case	Dr Parham Sendi, *Bern*
13:00 - 14:00	*Lunch, poster viewing and exhibition*	
Session Five:		**Chairs: Mr Alex Ramsden and Dr Elham Khatamzas**
14:00 - 15:00	Best free papers	
	• Long term suppression of prosthetic joint infection: the experience of the North-Western French Reference Centre for Complex Osteo-Articular Infections	Dr Sophie Nguyen, *France*
	• Bone and joint tuberculosis at a tertiary orthopaedic centre: educing time to diagnosis and treatment	Dr Claire Broderick, *London*
	• Does administration of antibiotic agents before intraoperative sampling in orthopaedic infections alter culture results?	Dr Ilker Uçkay, *Geneva*
	• The use of the reamer-irrigator-aspirator and antibiotic absorbable pellets with the Masquelet technique for the management of bone loss in complex open lower limb fractures. Our early experience	Mr Dimitrios Giotikas, *Cambridge*
	• Gracilis free flap reconstruction in the treatment of osteomyelitis; a 3 year case series from a single unit	Ms Georgina Williams, *Oxford*
15:00 - 15:40	Take home message	Dr Tony Berendt, *Oxford*
15:40 - 16:00	Prizes and closing remarks	Dr Bridget Atkins, *Oxford*

Prizes (kindly sponsored by Heraeus)

There will be two prizes of £300:

The Heraeus Best Oral Prize
The Heraeus Best Poster Prize

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BIOGRAPHIES

Dr Bridget Atkins

Dr Bridget Atkins trained in Cambridge & Royal London Hospital, then specialised in Microbiology and Infectious Diseases, training in London, Oxford and Sydney. She was appointed Consultant in Infectious Diseases and Microbiology, Oxford University Hospitals in 2000. She is Lead Physician to the Bone Infection Unit, ID/Micro Training Programme Director (Health Education Thames Valley) and Senior lecturer (Hon), Oxford University. She has a major interest in bone and joint infection, including optimising the patient pathway and delivery of bone infection services. She led the NHS England Bone and Joint Infection Service Specification 2013/14 (available on their website). She has published widely on diagnostics and management of bone and joint infections.

Dr Tony Berendt

Tony Berendt trained in Medicine in Cambridge and Oxford, and underwent specialised training in Infectious Diseases and General Medicine in Oxford. Following research into the adhesion of malaria-infected red cells to human vascular endothelium, he developed interests in the interaction of *Staphylococcus aureus* with endothelium, and clinical interests in bone and joint infection. He went on to be appointed as the first Consultant Physician-in-Charge of the Bone Infection Unit, at the Nuffield Orthopaedic Centre NHS Trust (NOC), in 1997. With the support of colleagues in Oxford and elsewhere, he has been fortunate to be part of the development of the Oxford BIU from its inception. He was appointed as Medical Director of the NOC in 2004, remaining in this role until the NOC merged with the ORH to create the Oxford University Hospitals NHS Trust (OUH) in November 2011.

As an physician he has served on a number of clinical practice guideline development groups for NICE (CG 119 on diabetic foot problems in hospitalised patients in 2011), the International Working Group on the Diabetic Foot (guidance on diabetic foot infections in 2004, specific guidance on diabetic foot osteomyelitis in 2008, and updated guidance on diabetic foot infections in 2012) and for the Infectious Diseases Society of America (diabetic foot infection in 2004 with a full update published in 2012, and prosthetic joint infection published in 2013). He is now the full-time Medical Director of the OUH, as part of which he is Responsible Officer for 1180 doctors, is the Trust Board lead for Quality, and is the Trust Director of Infection Prevention and Control.

Dr Olivier Borens

Olivier Borens, MD, PD MER, is Head of the Unit of Septic Surgery and Head of the Orthopaedic-Trauma Unit of the Department for the Musculoskeletal System of the University Hospital (CHUV) in Lausanne (Switzerland). He has received his medical education at the University of Basel and specialized in Orthopaedics and Traumatology at the hospitals of Liestal and Lausanne. After a one-year-followship at the Hospital for Special Surgery in New York his work concentrated on the traumatology of the acetabulum and the pelvis and on infections of the musculoskeletal system, especially following joint replacement.

He has made his department a reference center for orthopaedic infections in the European Society for Clinical Microbiology and Infectious Diseases (ESCMID), welcoming visitors from Europe, North and South America as well as Australia. Olivier Borens is intensly involved in scientific activities and regularly invited to present at national and international conferences. His research focuses on the prevention, diagnosis and treatment of periprosthetic infections, biofilm, local antibiotics and minimally invasive techniques in traumatology, among others.

Among others he is a member of the European Trauma Society (ETS) and of the Swiss AOTrauma Committee as well as board member of the European Bone and Joint Infection Society (EBJIS). He takes active part in the education of medical students and the training of under- and post-graduate physicians. His publication list includes more than 70 journal articles, several book chapters and a great number of abstracts.

Dr Andrew Brent

Andrew Brent is a Senior Clinical Researcher and Honorary Consultant in Infectious Diseases in Oxford, and one of the Oxford Bone Infection Unit physicians. His research focusses on the epidemiology and diagnosis of infections including prosthetic joint infection.

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Dr Jim Buckley

Having graduated from University College London Medical School in 1998, Dr Jim Buckley attained a Certificate for Completion of Training (CCT) in Infectious Diseases, Intensive Care Medicine and General Medicine in 2011. His PhD was in sepsis and septic shock. He currently works on a busy, general infectious diseases unit at Northwick Park hospital, with a large cohort of general ID, TB & HIV patients. With a large and ethnically diverse local population, there are a significant number of patients with fever on return from travelling. He is the clinical lead for the hospital's OPAT services and has a clinical interest in bone, joint, skin and soft tissue infections.

Dr Ivor Byren

Ivor Byren qualified in Cape Town, South Africa in 1981. He then trained in South Africa, New Zealand, USA and United Kingdom. He has been a Consultant Physician since 1993 and practices in Infectious Diseases and General Medicine at Oxford University Hospitals NHS Trust. Ivor is currently an Associate Medical Director & Hon. Senior Clinical Lecturer and was the Bone Infection Unit Lead from 2004 - 2011.

Mr Darren Chester

Mr Chester has been a Consultant for the last 7 years, firstly at Selly Oak Hospital and then the Queen Elizabeth Hospital Birmingham. He has a specialist interest in soft tissue reconstruction for the upper limb following traumatic injuries and infections. He was lead for upper limb reconstruction during the recent Afghanistan conflict when his unit accepted all battle casualties. He has lectured nationally on reconstruction following blast injury. The Queen Elizabeth Hospital Birmingham has since become a Major Trauma Centre and he maintains an active role in upper limb reconstruction for this service. Mr Chester is also clinical lead for hand surgery, heading up a department of 11 consultants.

Professor Lars Engesæter

Professor Lars Birger Engesæter is currently a Professor in the Department of Clinical Medicine, University of Bergen, Orthopaedic Department, Haukeland University Hospital and Head of the Norwegian Hip Fracture Register.

Overview scientific work:

1976-79 Experimental thesis at Institute of Surgical Research, University of Oslo

1980-81 7 months at University of Illinois, Chicago, USA, experimental work on spine and hip

1987-88 12 months clinical work (paediatric and arthroplasty) at Nuffield Orthopaedic Centre, University of Oxford, UK

1981- Different clinical and university positions at Haukeland University Hospital and University of Bergen. Mainly paediatric orthopaedics and work in the Norwegian Arthroplasty Register

He is the author of about 150 scientific papers and 350 scientific abstracts.

Mr Roger Gundle

Roger Gundle is Consultant Orthopaedic Surgeon to the Nuffield Orthopaedic Centre, Oxford University Hospitals. He has wide experience of hip and knee surgery with particular expertise in the surgical management of inflammatory joint diseases and prosthetic joint infection and has been part of the Oxford Bone Infection Unit from its inception. Prior to appointment as Consultant in Oxford in 1995 he was Clinical Lecturer in Orthopaedic Surgery to the University of Oxford for seven years during which time he gained a doctorate for research on human bone cell biology. He is Honorary Senior Clinical Lecturer in Orthopaedic Surgery to the University of Oxford and a Fellow of University College Oxford, teaching anatomy to undergraduate students and clinical surgery to graduate medical students.

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BIOGRAPHIES

Dr Werner Hettwer

Werner Hettwer is a senior member of the Musculoskeletal Tumor Section at the Department of Orthopaedic Surgery at Rigshospitalet (National Hospital), in Copenhagen, Denmark. He qualified from Ludwig Maximilians University in Munich after medical studies in Germany, the UK, Belgium and Switzerland, underwent orthopaedic training in Germany and Norway and advanced subspeciality training in Australia, the USA and New Zealand. He has clinical and research interests in complex extremity reconstruction, tumor arthroplasty and complication avoidance.

Dr Elham Khatamzas

Elham Khatamzas is a Specialist Trainee in Infectious Diseases and Microbiology in Oxford. She completed her undergraduate training in Heidelberg and Berlin and has trained in Berlin and Bristol. She completed her Wellcome Trust Clinical Research fellowship studying HIV-1 signaling. During her training she was a registrar on the Bone Infection Unit for six months and has developed a strong interest in the subject.

Dr Johan Lammens

Johan Lammens is an Orthopaedic Surgeon at the University Hospital Pellenberg (Katholieke Universiteit Leuven – Belgium). He devotes his career to limb lengthening, limb deformity correction and treatment of non-unions and bone defects for which he was trained by the late Professor Roberto Cattaneo and Maurizzio Catagni from the Italian centre for Ilizarov surgery in Lecco, Italy.

He has a very close collaboration with the department of skeletal infections in his hospital, which houses the largest division for bone infections in the country. He actively participates as a researcher in 'Prometheus', the division of skeletal tissue engineering of the KULeuven developing strategies for bone defect reconstruction using large animal models allowing a quick transformation to the clinical situation.

Ms Sue Leahy

I qualified as a Physiotherapist in 1988 and have worked at the Nuffield Orthopaedic Centre since 1991 (with a gap of 5 years spent working at Oxfordshire Mental Health NHS Trust). I have worked on the Bone Infection Unit since 2008.

Professor Ben Lipsky

Benjamin A. Lipsky is a Teaching Associate at Green Templeton College (Oxford), Visiting Professor of Medicine (Infectious Diseases) at the University of Geneva and Emeritus Professor of Medicine at the University of Washington, Seattle. He is a Fellow in the American College of Physicians, Infectious Diseases Society of America, and the Royal College of Physicians (London). Professor Lipsky has authored over 300 peer-reviewed scientific papers, monographs and book chapters, co-authored three books. He has chaired the guidelines committees of both the International Working Group on the Diabetic Foot and the Infectious Diseases Society of America since their inceptions. Among his honors are the Olmos Award for Advocacy in Amputation Prevention (Diabetic Foot Global Conference), and the Pecoraro Lecture Award (American Diabetes Association).

Dr Damian Mack

Dr. Damien Mack is a Consultant Microbiologist and Infection Control Doctor at the Royal Free London NHS Foundation Trust and the Royal National Orthopaedic Hospital NHS Trust. His interests include the laboratory diagnosis of orthopaedic infections including the use of MALDI-TOF and automated culture systems, and the antimicrobial treatment of orthopaedic infections. These overlap with his interests in antimicrobial stewardship including surgical prophylaxis, and the prevention and control of healthcare associated infections particularly *C. difficile*. After undergraduate training in Australia he completed post-graduate training in the UK including an MSc in medical microbiology and an MSc in epidemiology.

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BIOGRAPHIES

Mr Martin McNally

Martin McNally is a whole time Limb Reconstruction Surgeon at the Nuffield Orthopaedic Centre and Honorary Senior Clinical Lecturer at Oxford University. He spends almost all of his time in infection management, treating around 150 new cases of osteomyelitis per year. He was trained in Northern Ireland, USA and Oxford. He has a particular interest in bone reconstruction in osteomyelitis, infected fractures and non-unions. He runs research projects in outcome of treatments for bone infection and local antibiotic delivery systems. He is the Delegate for the United Kingdom on the Executive Committee of the European Bone and Joint Infection Society and contributes regularly to instructional courses, national and international meetings on bone infection and limb reconstruction.

Mr Alex Ramsden

Alex Ramsden is a Consultant Plastic Surgeon working in the Nuffield Orthopaedic Centre, Oxford. He is a member of the Bone Infection MDT and has weekly joint operating lists and clinics with orthopaedic surgeons and physicians. He has a busy practice in acute limb trauma, chronic osteomyelitis and prosthetic joint infection. He supports his orthopaedic colleagues by providing an extensive range of soft tissue and bone flap solutions. He has successfully completed over 100 free tissue transfers for bone infection and trauma.

Mr Mike Reed

Mike Reed is a full time Hip and Knee Arthroplasty Surgeon with an interest in training and outcomes. He trained in the North of England, and did fellowships in New Zealand. He is a Senior Lecturer at the University of Newcastle and his research focuses on clinical outcomes - based around infection prevention and management, the NHS dataset, and the National Joint Registry. At a Trust level Mike has run improvement programmes in hip fracture care, infection prevention and enhanced recovery for Northumbria Healthcare. He currently leads on quality in Trauma and Orthopaedics, and Chairs quality panels assessing all specialities, and provides external reviews for other organisations.

Mr Mark Rogers

Mark Rogers trained in Bristol and Oxford and was appointed as a Consultant Foot and Ankle Surgeon at the Nuffield Orthopaedic Centre, Oxford in 2013. His practice covers all aspects of Foot and Ankle Surgery. He is the appointed Foot and Ankle Surgeon to the Bone Infection Unit and runs a combined osteomyelitis clinic in conjunction with the Bone Infection Unit Consultants.

Dr Matt Scarborough

Matt studied medicine at Queens University Belfast and undertook post graduate training mainly in London and Oxford. He currently works as a consultant physician in clinical infection and general medicine at Oxford University Hospitals NHS Trust. His research interests include orthopaedic infection, bacterial meningitis and blood stream infections.

Dr Parham Sendi

Dr Sendi is a specialist in Internal Medicine and Infectious Diseases (ID). He is a Consultant in ID at Bern University Hospitals, Lecturer at the University of Bern, and responsible for the training programme of ID registrars in Bern, Switzerland. His specialty training in ID was undertaken at the Liestal University Hospital Basel, Switzerland, Center of Infectious Medicine, Karolinska Institutet, Stockholm, Sweden and University Hospital Bern, Switzerland. He visited the Bone Infection Unit Nuffield Orthopaedic Centre, Oxford within the ESCMID Observership programme. Dr Sendi has been particularly interested in orthopaedic infection since 2005. He is a regular speaker at national and local conferences and educational events on orthopaedic infection.

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BIOGRAPHIES

Dr Jan Smit

After a psychology bachelor, Jan Maerten finally succeeded to overcome the Dutch lottery system to enter medical school in Utrecht. Plastic surgery training followed at the Erasmus University Medical Center in Rotterdam under Professor Steve Hovius, where he stayed as a Consultant for a few years. After a Fellowship in Perth, Australia, he joined the VU University Medical Center in Amsterdam, where he currently works at the department for plastic reconstructive and hand surgery, as well as gender reassignment surgery. For his reconstructive surgery, he happily overcomes any barrier to join the Max Facs, orthopaedic, neurosurgical or Traumatology OR.

Jan Maerten is married to Sanne Moolenburgh and has 1 son and in a few weeks a daughter as well….

Dr Alex Soriano

Dr Soriano studied Medicine at the University of Barcelona. He did his residency in Internal Medicine at the Hospital Clinic, Barcelona (from January 1991 to December 1996) and he obtained the PhD in Medicine in the University of Barcelona, Spain in 2006. His current position is Consultant of Infectious Diseases (from 2001) in Infectious Diseases Department of Hospital Clínic of Barcelona. His main research interest is the diagnosis and treatment of foreign-body infections with particular interest on prosthetic joint infections. He has over 90 peer-reviewed publications.

Mr David Stubbs

David Stubbs is a full time Orthopaedic Consultant at the Nuffield Orthopaedic Centre. His workload is divided equally between joint replacement and limb reconstruction surgery with a special emphasis on bone infection and problem fractures. He trained in Sheffield and Oxford and completed fellowships in Oxford and Sydney in limb reconstruction and joint replacement respectively.

Ms Maz Sutherland

Maz Sutherland is a full-time Advanced Nurse Practitioner in Limb Reconstruction. This is a subspecialty of orthopaedic surgery, which deals with the treatment of complications after injury and the correction of limb deformity including limb lengthening. A large proportion of these patients will be diagnosed with osteomyelitis (infected bone) and require complex treatment from a large multidisciplinary team led by the Bone Infection Unit, the only dedicated unit of its kind in the UK.

Maz has a particular interest in difficult wound management, including leg ulcers, plastic surgery and infected soft tissue management and has published articles in this field. Maz is a trained independent non-medical prescriber and holds a keen interest in biochemistry and pharmacokinetics and pharmacodynamics.

Mr Adrian Taylor

Adrian Taylor is a Consultant Orthopaedic Surgeon at the Nuffield Orthopaedic Centre (NOC), Oxford and an Honorary Senior Clinical Lecturer at Oxford University.

His undergraduate training was at St Bartholomew's Hospital and Orthopaedic surgical training on the Severn Training scheme with a fellowship at the Royal Perth Hospital, Australia.

His practice is in lower limb arthroplasty from primary joint replacements to complex revision surgery of both the hip and knee. He has an interest in the treatment of infected joint replacements as part of the Bone Infection Unit at the NOC.

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BIOGRAPHIES

Dr Heinz Winkler

Dr Heinz Winkler is a Consultant Orthopaedic Surgeon, Associate Professor for Orthopaedics at Academy for Physiotherapy Vienna, Founder Austrian Tissue Bank, Founding member of European Association of Tissue Banks (EATB), Founder Osteitis Centre in Privatklinik Döbling/Vienna, Director Osteitis Centre Vienna. Since 2013 he has been President of the European Bone and Joint Infection Society EBJIS.

Dr Winkler is a member of Deutsche Gesellschaft für Orthopädie und Traumatologie, Österreichische Gesellschaft für Orthopädie und orthopädische Chirurgie, European Association of Musculoskeletal Transplantation, American Association of Tissue Banks, Association pour l´Etude des Greffes et des Substituts Tissulaires en Orthopédie, European Association of Tissue Banks, European Hip Society, European Bone and Joint Infection Society EBJIS.

His main field of interest is revision total joint arthroplasty, infection in bone and joints.

Dr Andrew Woodhouse

Andrew Woodhouse trained in Infectious Diseases and General Medicine in New Zealand and the UK. He began his consultant career in Auckland in 1998 where he worked for 8 years prior to relocating to the UK. He is currently Consultant Physician and Clinical Lead in the Department of Infection and Tropical Medicine at Birmingham Heartlands Hospital, having spent 7 years as a Consultant in Oxford including in the Oxford Bone Infection Unit. His clinical interests include musculoskeletal infections, infections in immunocompromised hosts and the rational use of antimicrobial agents.

Dr Stephen Wright

Stephen Wright was a Consultant Physician at the Hospital for Tropical Diseases, London and continues in private practice at King Edward VII Hospital, London W1G 6AA. He has worked in Nigeria, Nepal and Saudi Arabia and has particular interests in GI infections, schistosomiasis, brucellosis and Lyme disease.

Ms Sarah Wyatt

Sarah Wyatt qualified as a Physiotherapist in 1992. Her background is in Trauma and Orthopaedics. She joined the Nuffield Orthopaedic Centre in 1999 and commenced work on the Bone Infection Unit in 2000.

Professor Werner Zimmerli

Werner Zimmerli is Professor in Internal Medicine and Infectious Diseases. Until 3/2013 he was Head of the Basel Medical University Liestal and is now Consultant for Orthopaedic Infections at the Kantonsspital Baselland. He received his MD degree from the University of Basel in 1974. He performed postdoctoral fellowships in Geneva/Switzerland and at the NIH in Bethesda/USA. His research interest is in the field of implant-associated infections. He started with projects on physiopathology, continued with treatment studies in an animal model and performed several clinical studies in cohorts of patients with periprosthetic joint infection (PJI). He studied the role of rifampin in vitro, in an animal model and in patients. In addition, in collaboration with Peter Ochsner and Andrej Trampuz he published an algorithm on the surgical management of PJI.

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SPEAKER ABSTRACTS: THURSDAY

PRINCIPLES OF BONE AND JOINT INFECTION MANAGEMENT

MULTIDISCIPLINARY WORK
Dr Bridget Atkins

Patients who have bone and joint infections are often highly complex. They usually have significant active co-morbidities. They have frequently been "unlucky" in the first place to be in the minority that have acquired a post-operative infection. They may they may then have had several attempts to make things right. They have required prolonged antibiotics, on which they may have suffered side effects. They often require central venous access for prolonged periods (and some get line infections). They often have chronic pain, discharging "stinky" wounds, disability, significant soft tissue defects and by this stage depression and anger at the medical profession. Alongside this, they may have lost relationships and employment. A number of patients spend months in hospital while all this is happening and are at risk of acquiring hospital acquired infections and multi-drug resistant organisms. They need a "one stop shop" where all the health care professionals required are in one place, can assess the patients' needs and expectations, counsel appropriately, create a realistic plan and, where appropriate, perform orthopaedic or ortho-plastic surgery with appropriate sampling, antibiotics, management of medical co-morbidities followed by safe discharge planning. These issues with examples will be discussed.

ORTHOPAEDIC MANAGEMENT
Mr Martin McNally

Chronic osteomyelitis is characterised by bone death, soft-tissue compromise, functional impairment and systemic ill-health. It remains challenging to treat.

It is useful to classify the disease in terms of the local pathology in the bone and the physiological state of the patient (Cierny and Mader Classification). Effective management requires close co-operation between surgeons, physicians and therapists to address the components of the condition. Surgery is aimed at delivering key principles in the treatment plan;

1) excision of all involved tissues
2) clean deep sampling for culture
3) dead space management
4) bone stabilisation
5) restoration of a healthy tissue envelope

Past pessimism around outcome from treatment is now unwarranted. Several large series have shown that up to 90% of patients are infection-free for 5 years after surgery and many remain without symptoms for decades. However, good outcomes can only be achieved with careful attention to the principles of treatment and close multi-disciplinary working.

SOFT TISSUE MANAGEMENT
Dr Jan Smit

The goal of my presentation is *Replacing orthopaedic **disconfidence** for soft tissue loss with **confidence** in a colleague plastic surgeon*. Options and considerations in soft tissue management.

ANTIBIOTIC MANAGEMENT
Dr Alex Soriano

In order to select the best treatment option for bone and joint infections it is necessary to understand the pathogenesis of these infections, particularly the presence of intracellular bacteria and biofilms, their role and how they respond to different antibiotics. The lecture covers these aspects and a critical revision of the available literature about clinical experience with different antibiotics or combinations of antibiotics particularly focused in prosthetic joint infections according to the speaker's experience in this field.

DEBATE: ONE-STAGE VS TWO-STAGE REVISION

ONE-STAGE REVISION OF INFECTED TOTAL JOINT REPLACEMENT
Dr Heinz Winkler

Biological reconstruction and effective antimicrobial treatment using antibiotic impregnated allograft bone

Infection of a total joint replacement (TJR) is considered one of the most serious complications in orthopaedic surgery. Problems derive from the presence of biofilms with inherent resistance to usual antibiotic treatment and bone defects resulting from infection induced osteolysis. Discussions on the choice of treatment mainly focus on the chance of eradicating the infection in either one ore more stages. The advantages of only one operation regarding patients´ satisfaction, functional results and economical burden are evident. However, the fear of re-infection usually leads surgeons to multiple stage procedures, mostly using antibiotic loaded spacers in the interval. Spacers have no effect on biofilms and are associated with a high rate of complications like breakage or dislocation.

Cemented revisions show several disadvantages like reduction of biomechanical properties through added antibiotics resulting in inferior long term results and difficulties of removal in case of recurrence. Uncemented implants appear more advantageous but are at risk of becoming colonized by eventually remaining biofilm fragments. To overcome that risk higher local concentrations of antibiotics are needed. As long as we are able to provide effective local antimicrobial concentrations it may be expected to eradicate infection in the majority of cases with a single operation. Antibiotic loaded spacers may be colonized with biofilm remnants the same as definite metal implants. So why not use original implants immediately after thorough cleaning? Uncemented prostheses can be removed as easily as spacers in case of failure and may be left in place in case of success. Microscopical remnants of biofilm may be eliminated by simultaneous application of local antibiotic carriers providing a sustained release with biofilm-active concentrations. Allograft bone may be impregnated with high loads of antibiotics using special impregnation techniques, resulting in an antibiotic bone compound (ABC). ABC provides local concentrations exceeding those of cement by more than a 100fold and efficient release is prolonged for several weeks. The same time it is likely to restore bone stock, which usually is compromised after removal of an infected endoprosthesis. Based on these considerations new protocols for one stage exchange of infected TJR have been established. Bone voids may be filled with ABC, uncemented implants may be fixed in original healthy bone. Recent studies indicate an overall success rate of more than 90% with one operation, without any adverse side effects. Incorporation of allografts appears as after grafting with unimpregnated bone grafts. One stage revision using ABC together with uncemented implants such should be at least comparably save as multiple stage procedures offering clear advantages, for the quality of life of patients as well as for economy.

TWO-STAGE REVISION
Mr Adrian Taylor

CASE-BASED WORKSHOPS

PREVENTION OF INFECTION
Mr Mike Reed, Dr Parham Sendi, Dr Matthew Scarborough, Dr Damian Mack

Through use of clinical scenarios, this session will provide a forum to discuss the importance of various factors in reducing the risk of post-operative infection in orthopaedic surgery. Faculty members will provide expertise in theatre design and operative techniques, patient selection, preparation and optimisation, and the use of peri-operative antibiotics. We will include a discussion on emerging evidence in the field of infection prevention and we welcome questions and discussion from delegates.

HAND INFECTIONS
Mr Darren Chester, Dr Jan Smit, Dr Andrew Woodhouse, Mr Alex Ramsden

This workshop will use clinical cases as the basis for discussion of the management of complex hand infections, with input from plastic surgery and infectious diseases expertise. This session will appeal to both specialists in the field and to those with limited exposure who wish to learn more. Delegates are encouraged to contribute to the discussion: please feel free to question or challenge the facilitators and to bring your own experiences or cases.

KEY ROLES IN A MULTIDISCIPLINARY BONE INFECTION TEAM
Ms Sue Leahy (Physiotherapy), Ms Bethany Hougham (Occupational Therapy), Ms Maz Sutherland (Ilizarov Specialist Nurse), Ms Kirsty Gee (OPAT Specialist Nurse), Ms Louise Flaxman (Ward Sister), Dr Bridget Atkins (Clinical Infection), Mr David Stubbs (Orthopaedics)

This will be a case based interactive workshop where we will discuss the roles of the various health care professionals involved in patient care, rehabilitation and discharge planning. It will be an opportunity to discuss some of the issues that physiotherapists, occupational therapists and specialist nurses face when dealing with complex bone and joint infection patients. Such patients may have to deal with pain, wounds, frames, vascular access and antibiotics. They may have lost confidence, independence, mobility, relationships, employment and even accommodation.

A PROSTHETIC JOINT INFECTION WORKSHOP
Dr Olivier Borens, Professor Lars Engesæter, Mr Roger Gundle, Dr Ivor Byren

Through the use of clinical scenarios, this interactive session will discuss strategies for managing prosthetic joint infections. Faculty members will present a variety of cases and will include opportunities for the audience to ask for the faculty's opinion on a scenario.

THE CIERNY-MADER LECTURE

PATHOGENESIS AND TREATMENT OF PERIPROSTHETIC JOINT INFECTION

Professor Werner Zimmerli

Introduction: Implant-associated infections are caused by surface-adhering bacteria persisting as biofilm. Implants are not rejected by the body. However, the host reacts with these foreign bodies, a process which is designated as biocompatibility. The interaction of the device with adjacent granulocytes and complement induces local inflammation and impairs local microbial clearance.

Pathogenesis: Despite laminar airflow technique and antibiotic prophylaxis during surgery, the infection rate is still as high as 0.5% after hip replacement and even 4-8% after ankle arthroplasty. This is due to the fact that 100 CFU *S. aureus* are enough to cause a permanent device-associated infection. The presence of a foreign device increases the risk for infection at least 105-fold. This high susceptibility of implants to bacteria or fungi is due to a locally compromised host defence. The interaction of the non-phagocytosable implant with local granulocytes results in an impaired ingestion rate, impaired bactericidal activity, decreased superoxide production, and partial degranulation of these cells. Similarly, the polyethylene wear debris induce a local granulocyte defect, characterized by impaired uptake of *S. aureus* and a decreased bactericidal activity. More recently, it has been shown that biofilm-embedded *S. epidermidis* were more resistant to the killing of normal neutrophils than the isogenic biofilm-negative ica mutant. Due to the local immunodeficiency, prosthetic joints are life-long endangered by haematogenous seeding during sepsis. Indeed, the risk for haematogenous seeding on prosthetic joints is 34-39% during *S. aureus* bacteraemia.

Treatment: The treatment goal is complete eradication of infection, freedom of pain, and correct function of the joint. Reaching this goal requires rapid diagnosis and a rational treatment strategy including adequate surgery (debridement, one-stage or two-stage exchange) combined with prolonged antibiotic therapy. Surface adhering biofilms are highly resistant to host defence and antimicrobial agents. According to animal experiments and clinical studies, rifampin is more efficacious against surface adhering staphylococci than other agents. The risk for emergence of rifampin resistance should be minimized by correct use of this drug. Following a rational treatment algorithm, periprosthetic joint infections can be cured in 80-90% of the cases.

Outlook: Given the limited efficacy of traditional antibiotics in implant-associated infections, novel strategies such as coating of the device, vaccination against biofilms, and quorum-sensing inhibitors are promising future options for prevention and treatment.

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CONUNDRUM CASES

Conundrum Case 1

Title **Two stage knee fusion and preservation of limb length with osteobridge nail for the management of persistent periprosthetic infection. A case report.**

Authors Dimitrios Giotikas, Ahmed Magan, Alan Norrish

Address *Cambridge University Hospitals NHS Foundation Trust, UK*

Abstract

We report the case of a 35 year old male patient who underwent a two stage knee fusion with Osteobridge nail in order to preserve the leg length as part of the treatment of persistent periprosthetic knee infection.

Conundrum Case 2 / Poster 0001

Title **Multiple drug allergy: challenges in the management of infected metal work**

Authors Helen Nutall, Timothy Karssiens, Tamer Sherief, Hala Kandil

Address *East and North Hertfordshire NHS Trust, Stevenage, UK*

Abstract

Management of patients with bone infection and documented multiple drug allergy (MDA) is often challenging. We present a case of infected dynamic hip screw (DHS) in a 36 year old gentleman who developed reactions to various classes of antibiotic. We will discuss antibiotic choices and learning lessons.

Conundrum Case 3 / Poster 0002

Title **Fever and acutely swollen joints**

Authors Marc Dumas[1], Edouard Begon[1], Laurent Blum[1], Emma Hayton[1,2]

Addresses *[1]Centre Hospitalier René Dubos, Pontoise, France, [2]Oxford University Hospitals, UK*

Abstract

A 33 year old Beninese man, who had been living in France for 14 years, presented with acute pain and swelling in his left wrist and right ankle, and fever.

On examination, the left wrist and right ankle were swollen and hot with very limited movement. Other joints appeared normal, although the patient complained of some pain in both shoulders. He had pustules on his face and scalp, with smaller lesions on his trunk. He had a fever of 38°C.

Conundrum Case 4 / Poster 0003

Title **Infected non-union of radius**

Author Neal Jacobs

Address *University Hospital Southampton, UK*

Abstract

On 26 July 2013, Mr NW, a 48 year old right hand dominant butcher was admitted to University Hospital Southampton with polytrauma following motorcycle versus car road traffic accident.

Injuries sustained included:

- Right superior pubic ramus and acetabular fracture
- Open right intraarticular distal femoral fracture
- Right radius and ulnar fracture
- Right index finger degloving injury
- Right foot fifth metatarsal fracture

Treatment included ORIF of radius and ulna fractures, washout and spanning external fixation right knee with free flap, and subsequent right above knee amputation. His pelvic fractures were managed non-operatively.

In August 2014 he was diagnosed with established non-union of his radius fracture.

What next?

Surgical options?

Conundrum Case 5

Title **A stubborn surgical infection**

Authors Emma-Jo Hayton[1,2], Hassan Fokeladeh[1], Edouard Devaud[1]

Addresses *[1]Centre Hospitalier René Dubos, Pontoise, France, [2]Oxford University Hospitals, UK*

Abstract

A 30 year old man, born in the Comores but living in France, presented in February 2013 following fracture of the left femur at a previous operative site. Details of his previous operations were unclear, but he had fractured his femur 3 years previously in an accident in the Comores. He had undergone internal fixation in Madagascar, but the metalwork was later removed due to infection.

He underwent fixation with placement of a femoral nail. Intraoperatively a large piece of necrosed bone was removed.

Rapid Fire Presentation 1

Title **What proportion of clinical recurrences of diabetic foot infections (DFIs) are microbiologically due to new pathogens?**

Authors Karim Gariani[1], Dan Lebowitz[1], Benjamin Kressmann[1,2], Ilker Uçkay[1,2], Elodie Van Dach[3], Domizio Suvà[2], Benjamin Lipsky[1]

Addresses *[1]Infectious Diseases, Geneva University Hospitals, Switzerland, [2]Orthopaedic Surgery, Geneva University Hospitals, Switzerland, [3]Infection Control Program, Geneva University Hospitals, Switzerland*

Abstract

Purpose: Clinical recurrences of DFIs are common and most often attributed to a failure of adequate surgical or antibiotic treatment of the initial infection. This study was designed to investigate how many recurrences at the same anatomical site are caused by new pathogens.

Methods: We developed a single-centre database of patients hospitalized for treatment for DFIs, defined according the IDSA guidelines. We excluded patients with a foot wound without evidence of infection and those who had received recent antibiotic therapy. Pathogen identification and determination of antibiotic susceptibilities were performed routinely in the clinical microbiology laboratory.

Results: Among 517 episodes of DFI, a recurrence occurred in 244 (47%) after a median of 2.4 years (range 60 days-5 years). The median duration of prior antibiotic therapy was 14 days (range, 0 to 315 days) with a median duration of intravenous therapy of 2 days (range, 0 to 90). Almost all patients had undergone at least 1 surgical intervention (range, 0 to 5, including 120 amputations). Among these 244 recurrences, 157 (64%) had isolates from their wounds that were not identified (among the three main pathogens) during the preceding episode.

Conclusion: Our results suggest that up to two-thirds of recurrent DFIs at the same anatomical localisation may be due to new pathogens. This retrospective analysis needs further investigation by with sophisticated bacterial typing methods. This high rate of new pathogens in recurrent infections may be related to surgical site infections or selecting of pathogens by previous antibiotic use.

Rapid Fire Presentation 2 / Poster 0004

Title **Bacterial contamination of diathermy tips used during orthopaedic procedures**

Authors Ali Abdulkarim, Andrew Moriarty, Peter Coffey, Eoin Sheehan

Address *Midland Regional Hospital Tullamore, Co Offaly, Ireland*

Abstract

Introduction: The role of diathermy in orthopaedic surgical practice has increased since its introduction. We aim to determine the prevalence of bacterial contamination of diathermy tips during orthopaedic surgery and to assess any correlation with surgical site infections.

Methods: Diathermy tips from 86 consecutive orthopaedic procedures using diathermy were cultured using direct and enriched media. All patients underwent an orthopaedic procedure for a non-infected condition. For each procedure an unused control diathermy tip was placed on the instrument table at the beginning of the procedure and processed similarly. All patients were followed for any postoperative complications.

Results: 108 diathermy tips from 86 orthopaedic procedures were cultured. None of the tips cultured directly on blood agar demonstrated bacterial growth. Following enrichment culture, 6 (5.6%) of the procedure diathermy tips and 1 (0.92%) of the control tips demonstrated bacterial growth. Coagulase-negative staphylococci (83.3%) and proprionibacterium (16.7%) were cultured from the tips. One of the patients who had bacterial growth from the diathermy tip developed a superficial surgical site infection.

Conclusions: Diathermy tips may not be as sterile as previously thought. There may be benefit in changing the diathermy tips during orthopaedic procedures as they may represent a possible source of bacterial contamination.

Rapid Fire Presentation 3 / Poster 0005

Title	**Soft tissue reconstruction for lower limb bone defects: muscle versus fasciocutaneous flaps**
Authors	James Chan, Lorraine Harry, Jagdeep Nanchahal
Address	*University of Oxford, UK*

Abstract

Open tibial fractures are severe injuries, largely affecting young men of working age, and take on average 43 weeks to unite, with 13 percent developing nonunion in the best centers. There is therefore an urgent need to enhance the process of bone repair in these patients.

There have been numerous innovations in the techniques used for fracture stabilization and biological therapy, such as bone morphogenetic proteins. Improvement in the care pathway, through a multidisciplinary and integrated orthoplastic approach, has also led to significant improvements in patient outcomes. These refinements have reduced the mean union time to 26 weeks.

Considerations when planning soft-tissue coverage include the size and location of the defect and donor-site morbidity. An area that has not featured prominently in determining flap choice thus far is the potential biological role the flap may play in the fracture repair process.

We review the experimental and clinical evidence for the use of fasciocutaneous and muscle flaps for soft tissue reconstruction of open fractures. (Chan et al PRS 2012).

Rapid Fire Presentation 4 / Poster 0006

Title	***Staphylococcus epidermidis* discitis in adults: A case series**
Authors	Ken Agwuh, Vivek Panikkar, Jas Sawhney
Address	*Doncaster and Bassetlaw Hospitals NHS Foundation Trust, UK*

Abstract

Introduction: *Staphylococcus epidermidis* is a coagulase negative Staphylococcus that is a normal inhabitant of the skin but occassionally implicated in catheter-related blood stream infections (CRBI) and endocarditis. This case series occurred between 2010 to 2014. Biopsy samples inoculated into blood culture bottles, done via CT-scan guide, using aseptic technique and by same Radiologist with musculoskeletal interest.

Case 1: A 77 year old male, presented withh increasing back pain, apyrexial, past medical history of spinal decompression. MRI confirmed L3/4 discitis. Aspirate grew *Staphylococcus epidermidis*, was treated with 8/52 of iv vancomycin.

Case 2: A 62 year old male presented in 2011 with pyrexia associated with back pain. Previous history of lumbar discectomy. MRI confirmed L4/5 discitis with epidural abscess. Four sets of blood cultures over 5 days grew same *Staphylococcus epidermidis*, aspirate from abscess grew same isolate, ECHO negatve for endocarditis. Treated with teicoplanin and rifampicin for 6/52, then linezolid for 4/52.

Case 3: A 50 year old male in 2012 presented with pyrexia and back pain. Past medical history of rheumatoid arthritis. MRI confirmed L5/S1 discitis with abscess. Three sets of blood cultures and aspirate grew *Staphylococcus epidermidis*. ECHO negative for vegetation. Treated with iv flucloxacillin and fusidic acid for 6/52, then oral linezolid for 4/52.

Case 4: A 56 year old male presented in 2013 with back pain and apyrexial. No significant past medical history. MRI reported as L2/3 discitis with collection. Aspirate from spine grew *Staphylococcus epidermidis*. Treated with iv flucloxacillin with fuscidic acid for 6/52 and then linezolid for 4/52.

Case 5: A 54 year old lady in 2013 presented with back pain, no pyrexia. No significant past medical history. MRI showed L4/5 discitis with abscess, aspirate grew *Staphylococcus epidermidis* treated with 6/52 of flucloxacillin with fuscidic acid, and then 4/52 of linezolid.

Case 6: A 54 year old lady in 2014 with complex co-morbidities and recurrent line infections, presented with increasing back pain but apyrexial. MRI confirmed L4/5 discitis and aspirate grew *Staphylococcus epidermidis*, she was successfully treated with teicoplanin and rifampicin for 10/52.

Discussion: Though small numbers 4(67%) were associated with abscess, 2(22%) with previous history of spinal surgery, while 2(22%) associated with pyrexia and organism recovered also in serial blood cultures. All patients except case 6 have had their one year follow up and discharged from clinic.

Conclusion: A specialist team approach in required to provide consistent diagnostic criteria and antimicrobial management plan for successful outcomes.

Rapid Fire Presentation 5

Title	**Microbiology culture analysis in primary v recurrent diabetic foot infections (DFI)**
Authors	Nicholas Howard, Tarek El Gamal, David Harvey, Simon Platt, Gillian Jackson
Address	*The Wirral University Teaching Hospital NHS Trust, Merseyside, UK*

Abstract

Introduction: We compared the microbiology results of diabetic patients presenting for the first time with ulceration and those who have recurrent or chronic ulceration.

Results: 8 patients presented with their first DFI episode with 33 patients representing with recurrent or chronic ulcers. 29/33 (88%) of the chronic/recurrent group showed polymicrobial growths in comparison to 3/8 (38%) of the first time presentations. *Staphylococcus aureus* was the most common pathogen in both groups however it was present in 4/8 (50%) of the first group and dropped significantly to 10/33 (30%) in the chronic group.

Gram-negative organisms were only seen in 1 culture of the primary presentation group and no anaerobes were cultured from this group.

19/33 (58%) of recurrent ulcers contained gram-negative cultures and 9/33 (27%) grew anaerobic cultures. Gram-positive cultures were seen in 17/33 (52%) of recurrent ulcers with enterococcus being the second most common causative organism present in 9/33 (27%) of cultures.

Conclusions: Microbiology cultures differ significantly between first time presentation and recurrent or chronic ulcers in DFIs. Polymicrobial causative cultures are seen more commonly in chronic infections with an increased occurrence of anaerobic and gram negative organisms.

Discussion: The frequency of polymicrobial cultures and variance in causative organisms including anaerobes and gram negative organisms make it impossible to provide effective antimicrobial guidance without first obtaining deep cultures.

Rapid Fire Presentation 6 / Poster 0007

Title	**Osteoarticular infection (OI) by multi drug-resistant *Pseudomonas aeruginosa* (PA): what about treatment?**
Authors	Alba Ribera, Oscar Murillo, Eva Benavent, Maria de la Fe Tubau, Javier Ariza
Address	*Hospital Universitari de Bellvitge, Barcelona, Spain*

Abstract

Introduction: The treatment of OI by multi drug-resistant (MDR) PA is a challenge for the clinician, and data on the efficacy of beta-lactams (BL), alone or in combination, mainly when strains are none-fully susceptible, are scarce.

Objectives: To describe the experience of MDR-PA OI in a tertiary-hospital in Barcelona.

Methods: Prospective analysis (2004-2013); including patients with OI by MDR-PA *(Magiorakos, CMI 2012)*. Orthopaedic devices were retained in acute infections with device stability. Antibiotic treatment was administered according to clinician criteria: monotherapy/combined therapy (BL, colistin, aminoglycosides); BL were used by intermittent boluses (IB) or continuous infusion (CI).

Results: Of 34 patients [age 69, 20 (59%) male] 15 (44.1%) were prosthetic joint infections (PJI); and 19 (55.9%) osteoarthritis (8 related to an orthopaedic device). Polymicrobial infection was present in 16 (47.1%) and PA as a superinfection in 20 (58.8%). There were 23 (67.6%) cases with extensively drug-resistant (XDR) PA. During the initial treatment: monotherapy was used in 19 (55.9%; 4 colistin, 14 BL-IB, 1 BL-IC) and combined therapy in 15 (44.1%, 5 BL-IB, 10 BL-IC); 14 (41.2%) required removal of the orthopaedic device. Overall cure rate was 50% after initial therapy (60% within XDR), ranging from 31.6 % with monotherapy and 73.3% with combined therapy (p=0.037). BL-CI and colistin were well tolerated with no serious adverse events. After rescue therapy cure rate reaches to 85.3%.

Conclusions: Our final results suggested that combined therapy (BL with colistin) is a reasonable good option for OI by MDR-PA, despite the difficulties of its management.

Rapid Fire Presentation 7

Title	**Clinical and epidemiological differences between implant-associated and implant-free orthopaedic infections**
Authors	Wilson Belaieff[1], Domizio Suva[1], Benjamin Kressmann[1,2], Ilker Uckay[1,2], Benjamin Lipsky[1,2]
Addresses	*[1]Orthopaedic Surgery, Geneva University Hospitals, Switzerland, [2]Infectious Diseases, Geneva University Hospitals, Switzerland*

Abstract

Purpose: The presence of an implanted foreign body is a major risk for infection. Although there have been many publications regarding the epidemiology and risk factors for implant-associated orthopaedic infections, few studies have investigated how clinical presentations may differ between infections with and without osteosynthethic material.

Methods: We pooled clinical data from several databases of adult patients with orthopaedic intections hospitalised at Geneva University Hospitals from 2004 and 2014. We compared groups using the Pearson-χ^2-test or the Wilcoxon-ranksum-test.

Results: Among 2632 episodes of orthopaedic infection, 76% were implant-free osteoarticular or soft tissue infections. Among the 636 (24%) infections that involved osteosynthetic material, 312 (49%) were total joint arthroplasties, 143 single plates, and 50 single nails. The remainders were mixed implant infections, e.g., pins, wires, screws, spondylodeses, or cerclages.

The implant-associated, compared to the implant-free, infections were significantly more frequently associated with: male sex (403/636 vs. 595/1996; p<0.01); older age (median 57 vs. 54 years; p<0.01); and, infections caused by skin commensal pathogens, e.g., coagulase-negative staphylococci, corynebacteria, propionibacteria (131/636 vs. 466/1599; p<0.01). In contrast, implant-associated infections were significantly less frequently associated with: bacteraemia (99/636 vs. 212/1996; p<0.01); immune suppression (177/636 vs. 803/1996; p<0.01); abscess formation (79/636 vs. 917/1996; p<0.01); polymicrobial pathogens (103/597 vs. 434/1733; p<0.01); and, foot infections (25/636 vs. 388/1996; p<0.01). The serum CRP levels at admission were similar (median 77 mg/L vs. 75 mg/L; p=0.21).

Conclusions: Compared to implant-free infections, implant-associated orthopaedic infections are more likely monomicrobial and due to skin commensals, but less often associated with bacteraemia, immune suppression, or abscesses.

SPEAKER ABSTRACTS: FRIDAY

REGISTRIES: INFECTION AFTER PRIMARY HIP ARTROPLASTY IN NORWAY AND THE REST OF SCANDINAVIA

Professor Lars Engesæter

The effects of ***antibiotic prophylaxis***, systemically and in bone cement, on the revision rate of cemented total hip arthroplasties (THAs) based on data from the Norwegian Arthroplasty Register (NAR) during the period 1987-2001 were reported in 2003.[1] Of 22,170 THAs studied, 696 THAs (3.1%) were revised, 440 (2.0%) for aseptic loosening and 102 (0.5%) for deep infection. We found the lowest risk of revision when the antibiotic prophylaxis was given both systemically and in the cement (15,676 THAs). Compared to this combined regime, patients who received antibiotic prophylaxis only systemically (5,960 THAs) had 1.8 times higher revision rate with infection as the endpoint (p=0.01). Compared to systemic antibiotics given 4 times the day of surgery (2,194 THAs), the risk for revision due to infection was 3.5 times higher as compared to once (1,424 THAs) ($p < 0.001$), 2.5 times higher twice (2,680 THAs) ($p < 0.001$), and 1.8 times higher compared to three times the day of surgery (5,522 THAs) ($p = 0.02$). Compared to systemic prophylaxis 4 times the day of surgery, no improvements were found for extended systemic prophylaxis for 2 days or for 3 days postoperatively. This observational study shows that the best results were recorded when antibiotic prophylaxis was given both systemically and in the bone cement, and if the systemic antibiotic was given 4 times on the day of surgery.[1]

In another study we assessed ***the risk of revision due to deep infection*** for primary THAs reported to the Norwegian Arthroplasty Register (NAR) ***over the period 1987-2007***.[2] We included all primary cemented and uncemented THAs reported to the NAR from 1987 to 2008. Of the 97,344 primary THAs that met the inclusion criteria, 614 THAs had been revised due to deep infection (5-year survival 99.46%). Risk of revision due to deep infection increased throughout the period studied. Compared to the THAs implanted in 1987-1992, the risk of revision due to infection was 1.3 times higher (95%CI: 1.0-1.7) for those implanted in 1993-1997, 1.5 times (1.2-2.0) for those implanted in 1998-2002, and 3.0 times (2.2-4.0) for those implanted in 2003-2007. The most pronounced increase in risk of being revised due to deep infection was for the subgroup of uncemented THAs from 2003-2007, which had an increase of 5 times (2.6-11) compared to uncemented THAs from 1987-1992.[2]

In a third study, we investigated whether this increased risk for revision is a common feature in **all the Nordic countries** (Denmark, Finland, Norway, and Sweden).[3] The study was based on the Nordic Arthroplasty Register Association (NARA) dataset. 432,168 primary THAs from **1995 to 2009** were included (Denmark: 83,853, Finland 78,106, Norway 88,455, and Sweden 181,754). 2,778 (0.6%) of the primary THAs were revised due to infection. Compared to the period 1995-1999, the relative risk (with 95% CI) of revision due to infection was 1.1 (1.0-1.2) in 2000-2004 and 1.6 (1.4-1.7) in 2005-2009. Adjusted cumulative 5-year revision rates due to infection were 0.46% (0.42-0.50) in 1995-1999, 0.54% (0.50-0.58) in 2000-2004, and 0.71% (0.66-0.76) in 2005-2009. The entire increase in risk of revision due to infection was within 1 year of primary surgery, and most notably in the first 3 months. The risk of revision due to infection increased in all 4 countries. No change in risk factors in the NARA dataset could explain this increase. We believe that there has been an actual increase in the incidence of prosthetic joint infections after THA.

This risk for revision due to infection has continued to increase in the most recent dataset both in NARA (2010-2013) and in NAR (2010-2014).

In a study based on data in the Norwegian Arthroplasty Register (NAR), ***the surgical procedures*** in the treatment of periprosthetic infection after total hip arthroplasty (THA) were focused.[4] Four different surgical procedures for revision were compared regarding the risk of re-revision: 2-stage with exchange of the whole prosthesis, 1-stage with exchange of the whole prosthesis, major partial 1-stage with exchange of stem or cup, and minor partial 1-stage with exchange of femoral head and/or acetabular liner. Between 1987 and 2009, 124,759 primary THAs were reported to the NAR, of which 906 (0.7%) were revised due to infection. Included in this study were the 784 revisions that had been performed by 1 of the 4 different surgical procedures. 2-stage procedures were used in 283 revisions (36%), 1-stage in 192 revisions (25%), major partial in 129 revisions (17%), and minor partial in 180 revisions (23%). 2-year Kaplan-Meier survival for all revisions was 83%; it was 92% for those re-revised by 2-stage exchange procedure, 88% for those re-revised by 1-stage exchange procedure, 66% for those re-revised by major partial exchange procedure, and it was 76% for those re-revised by minor partial exchange. Compared to the 2-stage procedure and with infection as the endpoint (108 re-revisions), the risk of re-revision increased 2.0 times for 1-stage exchange ($p = 0.04$), 6.0 times for major partial exchange ($p < 0.001$), and 2.3 times for minor partial exchange ($p = 0.02$). We concluded that the survival after revision of infected primary THA with 2-stage implant exchange was slightly superior to that for 1-stage exchange of the whole prosthesis. This result is noteworthy, since 2-stage procedures are often used with the most severe infections. However, the far less extensive procedure debridement with exchange of head and/or liner but with retention of the fixed implant (minor revision) meant that there was a 76% chance of not being re-revised within 2 years.

Based on data in the Scandinavian hip arthroplasty registers the incidence for revision due to infection is still increasing. This increase in revisions reflects most likely a combination of a true increase in infection and an apparent increase due to better diagnostic, lower threshold for revision and more attention on infection.

1. Engesaeter LB, Lie SA, Espehaug B, Furnes O, Vollset SE, Havelin LI. Antibiotic prophylaxis in total hip arthroplasty: effects of antibiotic prophylaxis systemically and in bone cement on the revision rate of 22,170 primary hip replacements followed 0-14 years in the Norwegian Arthroplasty Register. *Acta Orthop Scand* 2003;74-6:644-51.
2. Dale H, Hallan G, Espehaug B, Havelin LI, Engesaeter LB. Increasing risk of revision due to deep infection after hip arthroplasty. *Acta Orthop.* 2009;80-6:639-45.
3. Dale H, Fenstad AM, Hallan G, Havelin LI, Furnes O, Overgaard S, Pedersen AB, Karrholm J, Garellick G, Pulkkinen P, Eskelinen A, Makela K, Engesaeter LB. Increasing risk of prosthetic joint infection after total hip arthroplasty. *Acta Orthop.* 2012;83-5:449-58.
4. Engesaeter LB, Dale H, Schrama JC, Hallan G, Lie SA. Surgical procedures in the treatment of 784 infected THAs reported to the Norwegian Arthroplasty Register. *Acta Orthop.* 2011;82-5:530-7.

PREVENTION AND TREATMENT OF INFECTION IN TUMOUR SURGERY
Dr Werner Hettwer

Patients undergoing large tumor resection/reconstruction procedures are at substantial risk of surgical site infection. Their general health and nutritional status is often diminished and overall systemic progression of disease, as well as oncological treatment with chemo- and/or radiotherapy further compromise general immune status and local tissue conditions. The surgical intervention, out of necessity often of prolonged duration, then adds to this a substantial amount of microbial contamination, which falls on fertile grounds on the surface of extensive tissue defects and cavities left by the resection and the large surgical implants required for the reconstruction. Infection of an orthopaedic mega-implant is very challenging to treat and can have disastrous consequences for the patient. Prevention therefore is paramount and all reasonable preventive efforts should be directed at the recognized risk factors. Intraoperative blood loss, post-operative haematoma formation and requirement for blood transfusions can all be reliably reduced by routine prophylactic administration of tranexamic acid, meticulous dissection technique & hemostasis and routine application of an effective post-operative compression dressing. Use of a meticulous occlusive wound closure technique can help reduce the post-operative complications of prolonged serosanguineous wound drainage and secondary wound dehiscence. The ultimate challenge thus remaining is to effectively reduce and prevent the consequences of the substantial microbial contamination that inevitably occurs during these surgical procedures. While there is broad consensus that adequate perioperative antibiotic prophylaxis should be administered routinely, the optimal duration of this antibiotic prophylaxis remains unknown. Based on the rationale to maintain antibiotics for as long as post-operative wound contamination is possible, i.e. as long as the wound is wet and draining, it has long been strict policy in our department to prolong treatment with intravenous Cefuroxime 1500mg x 3, until the surgical wound is dry. We have observed comparatively low post-operative infection rates (3-4%) with this extended prophylaxis/preemptive antibiotic treatment, which is usually maintained for an average of approximately 7 days. Finally, we report our early experience with a Gentamycin-eluding, synthetic calciumsulphate/hydroxyapatite bone substitute for reconstruction of contained periprosthetic bone defects. In a small pilot sample of 11 cases, we consistently found very high drain fluid concentrations of Gentamycin (between >100 and >1000mg/ml), while serum levels remained undetectable. As Gentamycin becomes increasingly effective, even against micro-organisms protected by biofilm and/or with relative Gentamycin resistance at such high concentrations, local antibiotic delivery using synthetic bone graft substitutes represent an attractive novel treatment option with a promising potential to decrease local bacterial contamination, impair implant colonization and biofilm formation and warrant close further investigation.

5TH ANNUAL OXFORD BONE INFECTION CONFERENCE

Thursday 26th & Friday 27th March 2015

SPEAKER ABSTRACTS: FRIDAY

MEET THE EXPERT SESSIONS

ESOTERIC INFECTIONS
Dr Steven Wright, Dr Jim Buckley, Dr Andrew Brent

In this interactive session a selection of more unusual cases of musculoskeletal infection will be presented and discussed. While the individual cases will be of interest to many participants in their own right, by learning from these cases we hope also to reinforce the medical and surgical principles underpinning management of all musculoskeletal infections.

CLINICAL RESEARCH IN BONE AND JOINT INFECTIONS
Dr Alex Soriano, Dr Simon Warren, Mr Adrian Taylor, Dr Johan Lammens

During this interactive session we will use cases that highlight potential scenarios that are often common but which need research to inform what we should do. Looking at fields such as diagnostics, treatment and prevention.

BIOMATERIALS AND LOCAL ANTIMICROBIAL DELIVERY
Dr Werner Hettwer, Mr Martin McNally, Dr Parham Sendi

This workshop will introduce case-based discussions around the use of new materials for management of infected bone defects and delivering high dose antibiotics to infected bones.

DIABETIC FOOT INFECTION
Mr Mark Rogers, Professor Ben Lipsky, Dr Tony Berendt

An interactive session to allow delegates the opportunity to ask questions or discuss areas of uncertainty in the treatment of diabetic foot infection. The panel will answer questions, promote discussion and use cases to illustrate medical and surgical principles of the management of diabetic foot infection.

INFECTED NON-UNIONS
Dr Johan Lammens

Infected non-unions are challenging problems due to the absence of a normal biological repair process in an infected environment. This leads to extensive bone destruction, instability and failure of osteosynthesis material, the latter also being a trigger for maintenance of the infection, due to biofims that are formed on the metal devices by microorganisms.

A two step approach is usually indicated to eradicate the infection, followed by the reconstruction of the bone defect. The first step of eliminating the infection should not be guided by the reconstruction possibilities afterwards as this might lead to insufficient debridement with remnants of dead bone and recurrent infections.

This means that a thorough debridement should be performed with the removal of the internal fixation devices and the resection of sequestrums and dead fragments of bone till freshly bleeding bone ends. For the majority of cases a stabilisation with external devices is recommended to maintain stability and allow the subsequent reconstruction.

There are several ways to fill bone defects for which autologous bone grafts are still the gold standard. However for large defects there is a lack of quantity of grafts necessitating other techniques for which the bone transport technique is very appropriate as it allows to replace the bone loss but also addresses concomitant deformities and limb length inequality. This method has a learning curve with its own tricks and pitfalls, especially regarding the final healing of the docking site as will be demonstrated. Other solutions such as the Masquelet and RIA technique are discussed as well as future options of tissue engineering.

SOFT TISSUE RECONSTRUCTION IN ORTHOPLASTIC INFECTION
Mr Alex Ramsden

A high quality soft tissue envelope around bone is a critical element in successful eradication of bone infection. A range of reconstructive techniques can be employed to provide access, eliminate dead space, augment bony reconstruction and provide a durable vascularised soft tissue resurfacing around the underlying skeleton. Soft tissue reconstruction should always be considered at the time of orthopaedic procedures. Plastic surgical techniques are essential in the treatment of many bone infections. Indications, options and outcomes are discussed.

ILLUSTRATIVE CLINICAL CASE
Dr Parham Sendi

Infection after a total hip replacement is a severe complication. In some cases, Girdlestone arthroplasty may be the only possible treatment. In clinical practice, this procedure may be applied too early in the treatment algorithm. These patients qualify for a reimplantation of a total hip arthroplasty when they are referred to specialist center. Nevertheless, the procedure of Girdlestone arthroplasty is – irrespective of the time point applied – not without problems. Delayed wound healing and chronic discharge (i.e. persistent infection) can develop. Two cases with two different outcomes are presented. Surgical and antimicrobial treatment concepts are discussed.

Session A: Presentation 1

Title	**Use of a new antibiotic bone substitute to induce healing of osteomyelitis in the diabetic foot**
Authors	Christine Whisstock, Sasa Ninkovich, Mariagrazia Marin, Giuseppe Scavone, Marino Bruseghin, Giuliana Di Paolantonio, Marco Manzi, Antonio Volpe, Enrico Brocco
Address	*Policlinico Abano Terme, Abano Terme, Italy*

Abstract

Aim: Aim of this work was to evaluate the efficacy of a new antibiotic bone substitute (CERAMENT™|G) in the treatment of osteomyelitis (OM) in diabetic foot.

Methods: From June 2013 to September 2014 we used a new calcium sulphate hemihydrate + hydroxyapatite + gentamicin sulfate (CSH + HA + GS) compound to fill resected bone voids following surgical intervention in cases of diabetic foot OM. The uniqueness of this product is that it induces native bone growth, while the synthetic bone disappears and antibiotic is released into the surrounding tissues, maintaining high gentamicin concentrations for some weeks.

In 14 patients, with or without Charcot neuroarthropathy and post-lesional osteomyelitis, after removal of infected bone we applied 10 to 20 ml CSH + HA + GS, filling the residual spaces and aiming to stabilize the remaining bone fragments. When needed, these arthrodeses were stabilized by external-internal hybrid fixators. X-ray evaluations and, when indicated, MRI evaluations were performed before and after surgical intervention, and 3 months post-op. Revascularization with percutaneous angioplasty was performed when needed.

14 patients affected by OM were treated, 2 of them having 1st metatarsal head involvement, 2 having heel involvement, 10 tarsal and hindfoot involvement. After surgical intervention all of them were treated with standard medication and pressure relief.

Results: The two 1st metatarsal OM cases healed, both in regards to infection and lesions. One of the patients with heel OM presented with a worsening of the infection and was treated by major amputation, the other one presented with good soft tissue growth and, two months from the intervention, and in the absence of clinical signs of OM relapse, was treated with a sural fasciocutaneous pedicled flap. 7 of the 10 patients who had midfoot or hindfoot partial resections healed, the remaining 3 patients are still ongoing. The healed patients are all wearing suitable shoes.

Conclusion: The use of a new CSH + HA + GS bone substitute has shown to be efficacious in inducing OM healing and preserving foot structures in diabetic feet.

Session A: Presentation 2 / Poster 0008

Title	**Treatment of paediatric bone and joint infection - University Hospital experience**
Authors	Kishore Kumar Dasari, Claire Carpenter
Address	*University Hospital of Wales, Cardiff, UK*

Abstract

Introduction: A delay in the diagnosis of paediatric acute and sub acute haematogenous osteomyelitis and septic arthritis can lead to potentially devastating morbidity. There are no definitive guidelines for the diagnosis and treatment of paediatric osteomyelitis, and recommendations are based on expert opinions, case series and cohort studies.

Objectives: To evaluate the university hospitals current practice in the management of pediatric orthopedic infections (bone and joint infection) with up-to-date literature and guidance from BSCOS.

Methods: Outcome evaluated by retrospectively and prospectively in patients with average age of 70.8 months (3 weeks to 15 years) between 2009 and 2014. We evaluated 54 (12 septic arthritis and 42 osteomyelitis) patients for following criteria

skeletal distribution, presenting features, time of presentation, comorbidities, blood parameters, results of blood cultures, number of patients under went surgical intervention, duration of antibiotics and clinical & radiological outcome.

Results: On admission 50% of children were afebrile. In our study distal tibia (8) and distal fibula (6) are the most commonly affected long bone. In addition, knee joint (5) and hip joint (4) are the most commonly affected joint infections (septic arthritis). Blood cultures were performed in forty five cases on presentation to the hospital and showed positive results in 33%. *Staphylococcus aureus* is the most common organism detected, but unusual isolation of scedosporium prolificans (Mycelial fungus) in one patient requiring multiple surgeries. On average patients received two weeks of intravenous antibiotics and six weeks of oral antibiotics on the advice of microbiologist. 35 (65%) patients underwent surgical intervention in the form of decompression, debridement and joint wash out when patients were not improved with antibiotics alone. 91% of above group showed cure rate based on clinical, radiological and blood parameters with average follow-up of 6 months. 9% of the patients lost follow up but shown clinical improvement before discharge from the hospital. One patient had avascular necrosis of the hip joint following hip septic arthritis. 11 patients are under long term follow up for monitoring recurrence and growth disturbances.

Conclusions: A multidisciplinary approach is essential in the management of these patients to ensure early diagnosis and effective treatment. Our Hospital database was helpful in maintaining and monitoring of the patients. Furthermore, data base also provides valuable information about local epidemiology, identifying unusual presentations and liaising with local health authority where appropriate. Our present approach showed good out comes based on existing literature.

Session A: Presentation 3

Title	**Chronic osteomyelitis of the calcaneum: surgical technique, patient management and clinical outcome**
Authors	Martin McNally, Adrian Kendal, Ruth Corrigan, David Stubbs, Andrew Woodhouse
Address	*The Bone Infection Unit, Nuffield Orthopaedic Centre, Oxford, UK*

Abstract

Aims: Chronic osteomyelitis of the calcaneum is uncommon but is an increasing problem with operative fixation of heel fractures and the high prevalence of diabetes mellitus.

In 1931, Gaenslen reported treatment of haematogenous calcaneal osteomyelitis by surgical excision through an incision on the sole of the heel. This was before the discovery of antibiotics. We have modified this approach to allow shorter healing times and early mobilisation in a modern series of cases with haematogenous, post-surgical and diabetic osteomyelitis.

Method: Sixteen patients with mean age 54.1 years (range; 20-88) and Cierny-Mader Stage IIIB chronic osteomyelitis were treated with split-heel incision, calcaneal osteotomy, radical excision, local antibiotics, direct skin closure and parenteral antibiotics for 6-12 weeks.

4 patients had diabetic foot infection with neuropathy, 5 had infection after open injuries, 4 had haematogenous osteomyelitis and 3 had Grade 4 pressure ulceration with bone involvement. 14 had discharging sinuses and 12 had undergone previous surgery for infection.

Microbiological culture grew staphylococci in 12 and Gram negative organisms in 5, with polymicrobial infection in 7.

Patients were mobilised non-weight-bearing in a special splint for a mean of 12 weeks (range; 9-19).

Primary outcomes were eradication of infection, time to sinus/ulcer healing, mobility and need for modified shoes.

Results: Mean hospital stay was 19.2 days (range; 7-44).

14 patients (88%) had no recurrence of infection at final follow-up (minimum 12 months; mean 53 months). One patient had a recurrence at 12 months treated by amputation. A second patient had continued infection and a below-knee amputation at 19 months.

Ulcers and sinuses healed in 14 patients between 4 and 15 weeks. One had persistent ulceration which healed at 1 year.

Of the 14 salvaged patients, 10 mobilised unaided. 9 required modified shoes for walking. Only five used normal footwear.

Conclusion: This protocol gave effective control of infection and ulcer healing within an acceptable time. The low recurrence rate was encouraging but amputation remains a risk in recurrent or uncontrolled infection. Functional outcome was good but most patients need custom shoes for comfortable weight-bearing.

Gaenslen FJ JBJS[Am] 1931; 13:759-75.

Session A: Presentation 4

Title	**Diabetic foot infections: deep tissue biopsies v superficial swabs**
Authors	Nicholas Howard, Steve Brookes-Fazakerley, Gillian Jackson, Simon Platt, David Harvey
Address	*Wirral University Teaching Hospital NHS Trust, Merseyside, UK*

Abstract

Summary: We aim to demonstrate the value of deep tissue biopsies to guide antimicrobial treatment of diabetic ulcers.

Introduction: Some recent studies have advocated the role of superficial swabs to guide antibiotic treatment in comparison to deep tissue biopsies previously perceived as the gold standard of microbiology diagnosis. We performed a retrospective analysis of microbiology culture results of patients with infected diabetic ulcers comparing superficial vs deep biopsy microbiology results.

Results: 41 diabetic ulcers in 41 patients were included. The mean numbers of isolates from soft tissue and bone biopsies were 2.1 and 1.8 respectively. 39/41 combined soft tissue and bone biopsies were culture positive. The most prevalent organism seen in deep samples was *Staphylococcus aureus* (14) followed by anaerobes (9), and enterococcus (9). In superficial swab cultures 21 patients (51%) cultured non-specific, mixed skin flora and enteric species. The remaining 20 patients cultured *Staphylococcus aureus* (11), *Steptococcus* (6), *Pseudomonas* (2) and anaerobes (6). 3 superficial swabs matched deep tissue biopsy cultures. 16 deep biopsies grew organisms seen none specifically in superficial swab cultures with 22 deep tissue biopsies cultures growing organisms not seen on superficial swab with 8 being anaerobes.

Conclusion: We have shown that in 54% of cases, deep tissue cultures isolated organisms that were not grown by superficial swab cultures. We highlight the importance of deep tissue biopsies to guide effective treatment.

Session A: Presentation 5 / Poster 0009

Title	**The management of hip and knee prosthetic joint infections in a district general hospital. How successful is the debridement, antibiotic and implant retention (DAIR) strategy?**
Authors	Stephen Ng Man Sun, Ruth Corrigon, Mansoor Raza, Oliver Pearce
Address	*Milton Keynes Hospital, UK*

Abstract

Introduction: Prosthetic joint infection is a common and serious complication of joint arthroplasty with an incidence of 0.6%-2%. Eradication of infection whilst maintaining joint function remains the primary goal and this may be achieved through DAIR, or single / two stage revision. The combination of early aggressive debridement with a prolonged course of intravenous and oral antibiotics may successfully lead to implant retention and forms the basis of DAIR. This study describes our experience of DAIR in a district general hospital setting.

Objectives: To evaluate the success of DAIR strategy for treatment of hip and knee prosthetic joint infections in a district general hospital.

Methods: Patients with prosthetic joint infections were identified from the Outpatient Parenteral Antibiotics Therapy (OPAT) database during a 30-month period (Oct. 2011 – March 2014). Patient notes were reviewed retrospectively.

Results: 35 cases with PJI were identified during the 30 month period. 26/35 (74%) with PJI were managed with DAIR strategy (16 TKR and 10 THR) with prolonged courses of intravenous followed by oral antibiotics (6 months in TKR and 3 months in THR). 12 males and 14 females with mean age was 64 years and BMI 33. Of the 26 managed with DAIR, 14 presented early (<3 months), 4 delayed (3-12 months) and 8 late (>12 months) after their primary surgery.

Implants were retained successfully in 19/26 (73%) without ongoing antibiotic suppressive therapy. The remaining 7 patients remained symptomatic and 1 underwent single stage revision, 4 two-stage revision and 2 had suppressive antibiotics. 5 of these patients presented more than 12 months after their primary surgery.

Causative organisms included: methicillin-sensitive *Staphylococcus aureus* (MSSA) in 13 cases, coagulase negative staphylococci (CNS) in 4, streptococci in 4, *Proteus* in 2, *Pneumococcus* in 1 and 2 were culture negative (clinically infected at time of surgery).

Teicoplanin was used in the majority followed by ceftriaxone. Ciprofloxacin was used as an oral follow up agent in a third of cases with rifampicin as a second agent in the majority throughout therapy.

Conclusions: The outcome of management of joint infections in our district general hospital is excellent with minimal need for tertiary centre referral. In particular, the strategy of DAIR was successful in 73% cases. OPAT facilitates early discharge of these patients. DAIR was largely unsuccessful in those presenting >12 months after their primary surgery and in this group, early revision surgery would have been the better option.

Session A: Presentation 6 / Poster 0010

Title	**Two-stage ankle joint arthrodesis in septic joint arthritis**
Authors	Martins Malzubris[1], Luize Raga[2]
Addresses	*[1]Hospital of Traumatology and Orthopaedics, Riga, Latvia, [2]Riga Stradins University, Riga, Latvia*

Abstract

Septic ankle joint arthritis is serious and potentially debilitating situation, especially when combined with joint forming bone osteomyelitis and after surgical interventions.

We present case series with 10 patients with septic ankle joint lesions undergoing two-stage ankle joint arthrodesis. 3 of 10 patients had infection following trauma and surgical manipulations, 7 had chronic ankle joint septic arthritis for longer period of time or hematogenous septic arthritis within arthritic joint. All patients were managed in two-stage fashion with debridement, bone cement with antibiotics implantation, temporary external fixation (ExFix) in first stage, and ExFix, bone cement evacuation and arthrodesis in second stage. One patient had soft tissue reconstruction with free flap during first stage.

Joint infection and adjacent bone osteomyelitis was approved microbiologically or histologically in 8 of 10 and 9 of 10 cases, respectively. Most common microorganism was *Staphylococcus aureus* in 6 of 10 cases, followed by coagulase negative staphylococci in 3 of 10, and *Acinetobacter baumanii* and *Micrococcus* each in one case.

In second stage tibiotalocalcaneal arthrodesis with nail was performed in 8 of 10 cases and 2 cases with screws. 2 patients later underwent revision arthrodesis surgery with plate fixation and Ilizarov ExFix each in one case. Overall complications were observed in 7 of 10 cases, 4 of them minor with one revision surgery - surgical site hematoma revision, and 3 cases with repeated revisions, including change of cement spacer.

At last visit all patients stayed infection free, although 3 of them are still only partially weight bearing because of not full consolidation.

Session A: Presentation 7 / Poster 0011

Title	**Evaluation of serum and synovial procalcitonin levels as an indicator of septic arthritis**
Authors	Julie Samuel, Caroline Williams
Address	*Newcastle upon Tyne Hospitals, UK*

Abstract

We prospectively evaluated 80 cases where synovial fluid was sent for diagnostic evaluation of septic arthritis. The differential diagnosis mainly included osteoarhritis, rheumatoid arthritis, crystal arthropathy, psoariatic arthritis and septic arthritis associated with a prosthetic joint. The diagnotic cutt off value for PCt was :>0.1ng/mL - clinically relevant bacterial infection* >0.5ng/mL - risk of severe sepsis. The PCT values were divided into 3 categories:

a. <0.05-<0.1 ng/ml , b. >0.1- <0.5 , c. >0.5

30 patients were in group A, 24 prosthetic and 6 native joints (psoraitic arthritis, OA, pseudogout and prepatellar bursitis). The prosthetic joint fluids were sent as part of the revision workup.

25 pts group B: synovial fluid PCT >0.1- <0.5. Only 2 cases of septic arthritis in this group with staph hominis and MSSA infection in prosthetic joints. 3 samples showed high false positive results, 1 psoriaitic and 2 which were contaminated with CoNS.

25 pts belonged to group C. The cases of septic arthritis with the pathogens associated and synovial PCT values are as shown below.

Synovial PCT 3.99 prosthetic knee strep mitis, prosthetic knee MSSA (2.1), native knee MSSA (9.87), prosthetic knee *Candida albicans* (1.15), native knee *Kingella* (1.59), native knee on abx (3.9). Very high false positive results were noted in degenerative joint disease, crystal arthropathy, OA, psoraitic arthritis and some prosthetic revisions.

This study shows that the cutoff values for synovial fluid PCT need to be established. We found a significant proportion of cases of septic arthritis correspondedd with PCT value >0.5.

Serum PCT and synovial fluid PCT collected simultaneously did not correlate together. The highest value of synovial PCT 9.93 was observed with gout followed by MSSA septic arthritis at 9.87ng/ml.

Session B: Presentation 1 / Poster 0016

Title	**Enzymatic biofilm prevention using a marine endonuclease - a new paradigm in the treatment of periprosthetic joint infections**
Authors	Andrea Pujol Nicolas[1,2], Martin Marsh[1,2], Nithyalakshmy Rajarajan[1], Nicholas Jakubovics[3], Grant Burgess[1], Mike Reed[2]
Addresses	*[1]School of Marine Science and Technology, Newcastle University, UK, [2]Trauma and Orthopaedics, Northumbria Healthcare NHS Trust, North Shields, UK, [3]Dental Shool, Newcastle University, UK*

Abstract

Purpose: Prosthetic joint associated infection (PJI) is commonly associated with biofilm formation. Prevention of biofilm attachment as well as disruption of established biofilms may therefore allow more effective treatment. NucB is a novel marine bacterial endonuclease which degrades extracellular DNA, a structural component of biofilms. Our team is pioneering the use of NucB in clinical applications. The aim was to demonstrate the prevention of formation and dispersal of biofilms of clinical isolates of *Staphylococcus aureus* and *S. epidermidis*, and to quantify enzyme activity against biofilms attached to surfaces such as glass, and surgically relevant metals such as stainless steel.

Methods: Biofilms were grown in microtitre plates and quantified using crystal violet staining as well as confocal microscopy. High purity NucB (>95%) was used in biofilm prevention and dispersal assays.

Results: In the presence of low concentrations of NucB we observed significant reduction in biofilm formation (< 72%) and up to 80% biofilm dispersal. We also observed a significant increase in the ability of antibiotics to kill bacterial cells in the presence of NucB compared to controls. NucB could effectively disperse biofilms attached to glass and metal surfaces.

Conclusions: NucB can successfully prevent the formation, and can disperse biofilms of clinical isolates of *Staphylococcus aureus* and *S. epidermidis*. This enzyme is well adapted to dispersing biofilms on glass and metal. This is a new approach to biofilm prevention and dispersal, and is currently being developed into a therapeutic protein which can hopefully reduced problems associated with PJI in the future.

Session B: Presentation 2 / Poster 0012

Title	**Teicoplanin anaphylaxis after switching standard orthopaedic prophylaxis to teicoplanin and gentamicin**
Authors	Amritpal Shakhon[1], Simon Warren[1,2]
Addresses	*[1]Royal National Orthopaedic Hospital, Stanmore, UK, [2]Royal Free Hospital, London, UK*

Abstract

As part of the strategy to reduce the number of cases of *Clostridium difficile* in our Trust we changed the standard antibiotic prophylaxis regimen to teicoplanin 10mg/kg (maximum 800mg) stat iv plus gentamicin 5mg/kg stat iv.

We started receiving reports of possible anaphylaxis soon after making the change. Initially it was felt that these cases may represent red man syndrome due to large doses being given relatively quickly. The speed of administration was reduced to a 30 minute infusion but further cases continued to occur.

Each case was notified to the infection department. We ensured that cases were formally reported as an incident internally and recommended serial tryptase levels. In addition each case was referred for formal allergy testing. We identified all cases occurring in the first full year of the new regimen and collated data from incident forms, notes, blood results, and allergy testing results.

From 1st October 2013 to 30th September 2014 we identified 9 reported cases. Complete data was available for all cases. One patient was excluded from the analysis as on review they had clearly not had an anaphylaxis-like presentation.

All cases occurred in theatres with no similar cases occurring on the wards. There was documented previous exposure to teicoplanin in 63% of cases. Typically onset of symptoms or signs was within 5 minutes of administration. Rash was seen in 5/8 cases (638%). All patients had cardiovascular signs: hypotension was universal (100%) with tachycardia being common (75%) and 3/8 patients (38%) needed CPR, which responded well to fluid and adrenaline. Hypoxia and bronchospasm were relatively uncommon. All patients survived without sequelae.

Acute rise in serum tryptase level was seen in most patients when measured, however the rise was variable with no distinct trend. So far we have allergy testing results from 5 patients: 4 have confirmed allergy to teicoplanin and 1 has confirmed allergy to rocuronium, (received at induction). Results are outstanding for 3 patients.

During the study period there were 10,346 operations at RNOH. Extrapolation from an audit in 2013 showing that 77% of surgical procedures received prophylaxis suggests that 7,966 patients potentially received teicoplanin. This figure correlates well with the number of doses issued to theatre. Depending on the outstanding results this gives a rate of true anaphylaxis between 0.050% and 0.088% (equating to between 1:1,138 and 1:1,992). This is broadly equivalent to the rate of between 1:100 and 1:1,000 reported by the manufacturer.

Session B: Presentation 3

Title	***Staphylococcus aureus* versus β-hemolytic streptococci in orthopaedic infections**
Authors	Domizio Suva[1], Ilker Uckay[1,2], Benjamin Kressman[1], Benjamin Lipsky[1,2]
Addresses	*[1]Orthopaedic Surgery, Geneva University Hospitals, Switzerland, [2]Infectious Diseases, Geneva University Hospitals, Switzerland*

Abstract

Purpose: Clinical experience suggests that *S. aureus* tends to form abscesses (e.g., carbuncles, septic bursitis), whereas streptococci more often cause phlegmons and diffuse spreading infections (e.g., erysipelas, necrotizing fasciitis). We were interested in comparing the clinical presentation and measurable evidence of virulence of infections caused by *S. aureus* and β-hemolytic streptococci, especially *S. pyogenes*.

Methods: We reviewed clinical information from databases of adult orthopaedic patients hospitalised at Geneva University Hospitals. We excluded patients with polymicrobial infections or who had received antibiotic therapy prior to admission. Group comparisons were made with Pearson-χ^2-test.

Results: Among 1229 different evaluable orthopaedic infections, 666 (54%) were caused by *S. aureus* , and 168 (14%) by various streptococci, with 39 (3%) caused by *S. pyogenes*. Of the 834 episodes caused staphylococcal or streptococcal, 122 (15%) were accompanied by bacteraemia.

Comparing infections caused by *S. aureus* vs. all streptococci, there were no significant differences in sex, age, presence of diabetes mellitus or other immune suppression, serum CRP levels, percentage with infections of the foot, osteoarticular sites, or fracture-devices. In contrast, infections caused by *S. aureus* was significantly more often associated with bacteraemia (83/666 vs. 39/168; $p<0.01$), abscess formation (333/666 vs. 61/168; $p<0.01$), septic bursitis (219/666 vs. 28/168; $p<0.01$), and prosthetic joint infections (70/666 vs. 27/168; $p=0.046$), while necrotizing fasciitis was significantly more often caused by monomicrobial streptococcal infection (0/666 vs. 1/168; $p=0.046$).

A comparison of infections caused by *S. aureus* vs. *S. pyogenes* alone yielded similar results, with the only significant difference being that *S. pyogenes* tended to be associated with a higher serum CRP level (median 95 mg/L vs. 76 mg/L; $p=0.05$).

Conclusions: Our results confirm the clinical impression that infection with *S. aureus* is significantly associated with abscess formation, prosthetic joint infection and bacteraemia compared to β-hemolytic streptococci and that *S. pyogenes* tends to be associated with a high serum CRP level.

Session B: Presentation 4 / Poster 0013

Title	**Evaluation of the synergistic effect of penicillin plus gentamicin on stationary phase group B streptococci (GBS)**
Authors	Corinne Ruppen[1,2], Parham Sendi[1,3]
Addresses	*[1]Institute for Infectious Diseases, University of Bern, Switzerland, [2]Graduate School for Cellular and Biomedical Sciences, University of Bern, Switzerland, [3]Department of Infectious Diseases, Bern University Hospital, Switzerland*

Abstract

GBS is increasingly causing invasive infections in elderly and people with comorbidities. The optimal treatment for foreign-body infections is unknown. Penicillin plus gentamicin is recommended, based on *in vitro* studies postulating a synergistic effect on planktonic bacteria. Here, we investigated the synergistic effect of penicillin plus gentamicin in stationary phase bacteria.

The minimal biofilm eradication concentration (MBEC) for 4 GBS isolates was determined with the MBEC Assay®. It was used for checkerboard-like analyses and calculation of the fractional inhibitory concentration index (FICI). In a second assay, biofilm was grown on bone-cement-beads for 24h and subsequently challenged for 12h with penicillin (4MIC) or gentamicin (4ug/mL=LD, 12.5ug/mL=HD) alone, or combined. Synergy was defined as ≥100-fold increase in biofilm-bacteria killing (bbk) with the combination in comparison to the most active single drug. In both assays, biofilm eradication was also evaluated with a scanning electron microscope (SEM).

The penicillin MBEC was up to 10^4 ≥ MIC of planktonic GBS, while gentamicin MBECs were ≤4 MIC. The MBEC checkerboard assays revealed synergistic effects with the combination therapy (mean FICI 0.28, 0.38 , 0.4, 0.1). With gentamicin concentrations of ≤2 MIC, the penicillin MBEC decreased to MIC values. In the bone-cement assay, bbk was $<10^2$ cfu/ml with penicillin alone. In 2 isolates HD gentamicin alone was more effective than penicillin alone (bbk $>10^3$ cfu/ml). A synergistic effect with penicillin plus HD gentamicin was observed in 2 of 4 isolates. These results were confirmed in SEM analyses. While penicillin alone reduced the biofilm, the combination eradicated it.

Session B: Presentation 5 / Poster 0014

Title	**A retrospective cohort review of the diagnosis and management of orthopaedic infections and antimicrobial resistance in Syrian refugees with war related injuries in a specialist surgical hospital in Amman, Jordan**
Authors	Aula Abbara[1], Timothy Rawson[2], Zaher Sahloul[3], Nizar Alharbat[5], Omar Gabbar[4]
Addresses	*[1]London Deanery, Infectious Diseases, London, UK, [2]Imperial College, London, UK, [3]Syrian American Medical Society, Chicago, IL, USA, [4]University Hospitals Leicester, UK, [5]Maqasid Hospital, Amman, Jordan*

Abstract

Introduction: Diagnosis and management of orthopaedic infections amongst Syrian refugees present numerous challenges. This study addresses these challenges and identifies the proportion of multidrug resistant (MDR) organisms amongst microbiological isolates.

Methods: A retrospective cohort review of orthopaedic patients in a specialist surgical hospital in Amman with basic microbiological services was undertaken from 12th January 2015 to a total of 75. Demographic details, diagnosis, antibiotic exposure and microbiology were recorded. Multidrug resistance (MDR) was defined as per the CDC as 'non-susceptibility to at least one agent in three or more antimicrobial categories.'

Results: 75 patients (13 female, 62 male) were identified. Median age: 23 (IQR 14-30; 25/75 aged ≤ 16.) Median length of stay was 13.5 days (IQR 6-26.75.) 23/75(31%) had dominant injury to the upper extremity, 34/75(45%) to the lower extremity and 18/75(24%) had multitrauma. 28/75(37%) had external fixators. 15/75(20%) had suspicion (clinical, radiological or microbiological) of osteomyelitis. There were 30 positive microbiology isolates amongst 21/75(28%) patients; most were deep wound swabs at operation. 29/30(97%) were gram negatives (10 *Proteus*, 10 *E. coli*, 5 *Pseudomonas*, 4 *Klebsiella*) and 19/29(66%) were MDR with 11/19(58%) carbapenem resistant; 10/19(53%) MDR had metalwork.

Conclusion: It is striking that rates of gram positive infections is low; this may relate to poor sampling (lack of intraoperative bone/tissue samples) or laboratory practice. Rates of MDR gram negatives is high but is in line with a comparable study from MSF(1). Ongoing education, capacity building of microbiology services, antibiotic stewardship and infection control are key to optimising diagnosis and management.

Reference:

1. Teicher CL, Ronat JB, Fakhri RM, Basel M, Labar AS, Herard P, et al. Antimicrobial drug-resistant bacteria isolated from Syrian War-injured patients, August 2011-March 2013 [letter]. Emerg Infect Dis. 2014 Nov

Session B: Presentation 6 / Poster 0015

Title **Septic arthritis of the small joints and wrist**

Authors Rahel Meier[1], Thomas Wirth[1,2], Frederic Hahn[1], Esther Vögelin[1], Parham Sendi[2]

Addresses *[1]Departments of Plastic and Hand Surgery, Bern, Switzerland, [2]Department of Infectious Diseases, Bern University Hospital, Switzerland*

Abstract

Septic arthritis of the hand and finger joints is rare entity. There are few published data on the aetiology, surgical and medical therapy.

We reviewed charts of patients with small joint and wrist arthritis from 2005-2014. We categorized infections in native joint arthritis (NJA) and device-associated infection (DAI). The definition of arthritis was composed of (i) clinical signs of inflammation, (ii) the need for arthrotomy, (iii) the microscopic presence of leucocytes and (iv) the exclusion of an alternative diagnosis. NJA was categorized in posttraumatic, iatrogenic, haematogenous and per continuitatem, and DAI in exogenous and haematogenous. The interval from inoculation and/or symptoms to diagnosis was used to categorize arthritis in early/acute or chronic (£ or > 4 weeks). Microbiology samples only from the joints were included.

In the 8-y period, we identified 110 patients with 114 small joint infections (101 NJA, 13 DAI), 65 (62%) were male; med. age 52 (IQR 38-68) years. Most NJA were posttraumatic, followed by per continuitatem, haematogenous and iatrogenic. 88 (77%) episodes were acute/early. The 3rd (27, 24%) and 2nd (26, 23%) digit were most commonly affected, as were the DIP (28, 25%) and PIP joints (30, 26%). *S. aureus* was the most frequent pathogen followed by *Streptococcus, Pasteurella* and *Enterobacter* spp.. The infection was treated with 1 intervention in 69 (63%) episodes, >1 intervention in 28 episodes, arthrodesis in 5 and amputations in 2. One or two surgical treatments and 14 days (median) of antimicrobial therapy was effective in 86.6% of the cases.

Session B: Presentation 7 / Poster 0017

Title **An evaluation of the Synovasure near patient lateral flow test for the diagnosis of periprosthetic joint infection**

Authors Ramsay Refaie[1,2], Alan Marriott[1], Martin Marsh[1,2], Andrea Nicolas[1,2], Mike Reed[1,2]

Addresses *[1]Northumbria Healthcare, Northumberland, UK, [2]Newcastle University, Institute of Cellular Medicine, UK*

Abstract

Background: The diagnosis of deep periprosthetic joint infection (PJI) remains a challenge. The Synovasure™ test for alpha defensins 1-3 is a new test that has a reportedly high sensitivity and specificity for the diagnosis of PJI.

Purpose: To evaluate the performance of the Synovasure near patient device a novel test for the diagnosis of PJI.

Methods: All patients undergoing investigation/treatment for suspected PJI at our institution had synovial fluid testing using the synovasure device at the time of arthrocentesis or revision surgery. Diagnosis of deep PJI was based on the Public Health England modified CDC definition as used for mandatory reporting of surgical site infection in the NHS in England and Wales.

Results: A total of 25 tests were carried out in 24 patients. Tests were carried out on 12 male and 12 female patients. 13 knees and 11 hips were tested; these included 15 primary joint replacements, 5 revisions, 2 hemiarthroplasties, 1 unicondylar knee replacement and 1 girdlestone. A diagnosis of infection was confirmed in 4 out of 24 patients (2 primary hip replacements, 1 hemiarthroplasty and 1 girdlestone). The synovasure test correctly identified all patients with a confirmed infection. In the remaining patients the synovasure test was negative. In two patients, who did not meet the criteria for infection, contaminants were grown on enrichment culture - these synovasure tests were negative.

Conclusion: In this cohort of 25 patients the synovasure near patient test has demonstrated 100% sensitivity and 100% specificity for the diagnosis of PJI.

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Thursday 26th & Friday 27th March 2015

BEST FREE PAPERS

Best Free Paper 1 / Poster 0018

Title **Long term suppression of prosthetic joint infection: the experience of the North-Western French Reference Centre for Complex Osteo-Articular Infections**

Authors Sophie Nguyen[1], Maxime Pradier[1], Michel Valette[1], Philippe Choisy[1], Henri Migaud[2], Eric Beltrand[3], Eric Senneville[1]

Addresses *[1]Centre Hospitalier de Tourcoing, Service Universitaire de Maladies Infectieuses, Tourcoing, France, [2]Centre Hospitalier Universitaire de Lille, Service d'orthopédie, Lille, France, [3]Centre Hospitalier de Tourcoing, Service d'orthopédie, Tourcoing, France*

Abstract

Purpose: There is currently no consensus on the use of prolonged suppressive antibiotic therapy (PSAT) in PJI. We describe herein the experience of the North-Western French Reference Centre for Complex Osteo-Articular Infections (Lille and Tourcoing Hospitals) on PSAT.

Methods: A retrospective analysis was performed on consecutive patients with PJI who received PSAT between January 2006 and September 2013. All patients had surgical management, followed by systemic antibiotic treatment and at least 6 months of PSAT. Treatment success was defined as a case where the patient was asymptomatic with a functioning prosthesis.

Results: Fifty-one patients with a mean age of 61.5 years were included. Twelve patients were excluded for PSAT duration shorter than 6 months: among them PSAT was stopped due to (i) planned end of treatment (n=3), (ii) surgery for mechanical reason (n=2), (iii) adverse event (n=2), (iv) treatment failure (n=3), (v) unknown reason (n=2). Among included patients, 11 (22%) had neoplasia, 5 (10%) diabetes mellitus, 6 (12%) rheumatoid arthritis, and 4 patients (8%) were receiving corticosteroids or chemotherapy. There were 27 knee (56%), and 23 hip (46%) infections, with a mean delay from implantation of 7.90 ± 7.35 months (range 1 - 25). Surgical management consisted in debridement and implant retention for 38 patients (76%), or in implant exchange for 12 patients (24%). Main pathogens were coagulase-negative staphylococci (39%) and *Staphylococcus aureus* (30%); 22 patients had polymicrobial infection (29%). The most frequent initial antibiotic regimens debuted before PSAT were rifampicin combinations (61%). Mean duration of curative antibiotic therapy was 113 ± 94 days. Indications of PSAT were (i) patients unsuitable for or refusing further surgery (n=18), (ii) too long delay before revision (n=13), (iii) no optimal curative antibiotic (n=8), (iv) complex orthopaedic surgery (n=6), and (v) immunosuppressive status (n=5). Almost all patients received cyclines (doxy or minocycline) as PSAT (n=48). Mean PSAT duration was 769± 553 days (range 189-2900), with a mean follow-up of 1120 ± 655 days. Adverse events were reported in 9 patients (18%), leading to PSAT discontinuation in 3 (6%). During follow-up, 37 patients were considered in remission (73%), and 14 failed including 8 relapses (16%) and 6 reinfections (12%). Among failure patients, 5 pathogens resistant to doxy/minocycline were identified, including 2 doxycyclin resistance acquired in the initial strain.

Conclusions: In our study, PSAT is associated to a 73% remission rate, with an acceptable tolerability. Further studies are warranted to determine ideal regimens and optimal duration of PSAT.

Best Free Paper 2 / Poster 0019

Title **Bone and joint tuberculosis at a tertiary orthopaedic centre: reducing time to diagnosis and treatment**

Authors Claire Broderick[1], Susan Hopkins[1,2], Damien Mack[1,2], Shara Palanivel[1,2], John Skinner[2], Will Aston[2], Rob Pollock[2], Simon Warren[1,2]

Addresses *[1]Royal Free Hospital, London, UK, [2]Royal National Orthopaedic Hospital, Stanmore, UK*

Abstract

Introduction: Tuberculosis (TB) infection of bones and joints accounts for 5% of the UK's TB cases. The Royal National Orthopaedic Hospital (RNOH) is a specialist centre for bone tumor, spinal and reconstrrctive referrals from a wide geographic region. We audited the pathways through which RNOH patients are referred, diagnosed and treated for TB infection.

Methods: Retrosective observational study of all adults with positive TB cultures on tissue and bone samples between 01/06/2012-30/05/2014. Subjects were identified via a laboratory information system search. Demographics, clinical features, radiological findings, histopathology and important dates were obtained from paper and electronic patient records.

Results: Thirty one adults were TB culture positive. 68% were male. Median age was 37 years (range 19-85). Ninety percent (N=29) were were born outside the UK (predominantly Asia). Median time spent in UK prior to diagnosis was 6 years (range <1-64). Main sites affected were joints (10), long bones (6), and axial bones (4). 26% presented with multifocal disease.

Median time from symptom-onset to RNOH referral was 7 months (range 1-104 months, N=21); 28 (90.3%) were referred via the sarcoma pathway. Median time from RNOH referral to starting TB treatment was 71 days (range 28 to 554 days, N=30). After imaging, TB was suspected in 83% pre-biopsy (N=30). Specimens were not sent for TB culture in 7/31, 5 of whom were suspected to have TB; all required repeat biopsy. Time to second biopsy was 9 to 273 days, median 39 days. Granulomas but no acid fast bacilli were seen in 20/23 histopathology samples. TB cultures were positive in 22/24 of first biopsies; median time to culture positivity was 22 days (range 5 to 79 days); plus a further 10 days (range 5- 37) for confirmation of Mycobacterium tuberculosis. GeneXpert was performed on 5 samples with 4 returning a positive PCR result, taking 2 days from biopsy to results (range 0-7). 13 started TB treatment prior to culture positivity. Median time from culture positivity to treatment was 20 days (range 4-93). Longer delays between referral and starting treatment were seen in those referred back to the GP (median 30 days) than those referred to TB clinic (13 days).

Conclusions: Patients with bone and joint TB experience delays in diagnosis and treatment. Routine TB culture of all biopsy specimens and, where pre-test probability is high, TB PCR, will reduce time to diagnosis. Once TB is confirmed, direct referral to TB services is essential.

Best Free Paper 3

Title	**Does administration of antibiotic agents before intraoperative sampling in orthopedic infections alter culture results?**
Authors	Domizio Suva[1], Ilker Uckay[1,2], Mohamed Al-Mayahi[1], Anais Cian[1], Hermes Miozzari[1], Benjamin Lipsky[1,2]
Addresses	*[1]Orthopaedic Surgery, Geneva University Hospitals, Switzerland, [2]Infectious Diseases, Geneva University Hospitals, Switzerland*

Abstract

Purpose: Clinicians frequently withhold antibiotics before intraoperative sampling for infection. Recent reports suggest, however, that pre-sampling antibiotics does not lead to more culture-negative results.

Methods: Case-control study of adult patients hospitalised with orthopaedic infections at Geneva University Hospitals from 2000-2014. We compared patients who did, and did not receive pre-operative antibiotics using multivariate analyses with logistic regression and group comparisons with the Pearson-χ^2-test. Preoperative exposure was defined as any antibiotic consumption during the 14 days prior to surgical sampling, including patients with prophylactic exposure and those with an antibiotic-free window (e.g. 10 days of pre-incision therapy, but pause during the two days prior to sampling).

Results: Among 2400 episodes of orthopaedic infections (1059 osteoarticular, 302 prosthetic joint, 588 implant-associated, 435 bursitis), 1001 (42%) had received antibiotic therapy before surgery. Among these, 191 (19%) grew no pathogens while the proportion of culture-negative results in the 1399 who had no preoperative antibiotic therapy was only 6%. Of all positive intraoperative cultures, 38% exposed to pre-operative antimicrobial agents had a resistant pathogen isolated, although the clinical course was favorable in the majority of cases.

By multivariate analyses, pre-operative antibiotic exposure was associated with significantly more culture-negative results (odds ratio 2.6, 95% confidence intervals [CI] 1.2,6.0) and to the isolation of more antibiotic-resistant pathogens (OR 3.1 for the "emergence" or detection in non-fermenting gram-negative rods; OR 3.3. for skin commensals). In patients who had pre-operative antibiotics stopped, the proportion of culture-negative results was 20% at day 0, 13% between days 1-3 and reached the average for patients who did not receive pre-operative antibiotics (6%) on day 4. The proportion of culture-negative results was not significantly lower when the antibiotic-free window was longer than 4 days.

67 patients received a single pre-incisional "prophylactic" antibiotic dose which was also significantly associated with subsequent culture-negative results compared to patients who received no preceding prophylaxis (17/67 [25.4%] vs. 263/2332 [11.3%]; Pearson-χ^2-test, $p<0.01$). Moreover, in 20 of these 50 culture-positive episodes the isolated pathogen was resistant to the prophylaxis administered <1 hour before. These resistant pathogens were isolated significantly more often in patients who had pre-operative antibiotic prophylaxis (20/50 vs. 206/2070; $p=0.02$).

Conclusion Pre-operative antibiotics are associated with a three-fold increase in culture-negative intraoperative results and selection of antibiotic-resistant non-fermenting rods and skin commensals. An antibiotic-free window of 4 days is associated with the same proportion of culture-negative results as a longer window.

Best Free Paper 4

Title	**The use of the Reamer-Irrigator-Aspirator and antibiotic absorbable pellets with the Masquelet technique for the management of bone loss in complex open lower limb fractures. Our early experience.**
Authors	Dimitrios Giotikas, Ahmed Magan, Alan Norrish, Andrew Carrothers, Matija Krkovic
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Abstract

The Masquelet technique is an established treatment involving the induction of a fibrous tissue membrane around the bone defect site, taking advantage of the body's foreign body reaction to the presence of a polymethylmethacrylate (PMMA) spacer. The aim of this study was to explore a modification of the technique: the use of a novel composite spacer with both PMMA and absorbable calcium sulphate (Stimulan) antibiotic dispersing beads in the first stage and the use of Reamer-Irrigator-Aspirator (RIA) bone graft mixed with Stimulan beads for the 2nd stage.

Ten patients and eleven fractures were managed with this modified Masquelet technique in the last 14 months. There were six Gustillo-Anderson grade IIIB open fractures, four grade IIIA and one grade II. The first stage included debridement of all non-viable bone and soft tissue, fixation of the fracture, insertion of the novel composite PMMA/Stimulan bead spacer and coverage with the aid of the plastics team when necessary. The second stage followed at a mean of 78 days (range 28-153) later and consisted of graft harvesting from the femoral canal with the RIA and insertion in the bone defect mixed with Stimulan beads. The mean follow up is 19 weeks (range 8 -36). In one case we encountered significant intraoperative bleeding during the graft harvesting with the RIA. In two cases the quantity of bone graft was not satisfactory. In one case with segmental tibial fracture we performed the second stage twice, once for each fracture level to promote bone healing. Until the final follow up none of the patients developed surgical site infection and on the radiological evaluation all showed evidence of progression towards bone union with bridging callus formation.

We suggest these two modifications may be helpful in the treatment of these complex injuries.

Best Free Paper 5 / Poster 0020

Title	**Gracilis free flap reconstruction in the treatment of osteomyelitis; a 3 year case series from a single unit**
Authors	Georgina Williams, Roba Khundkar, Alex Ramsden
Address	*Oxford University Hospitals Trust, UK*

Abstract

Introduction: Chronic osteomyelitis is a challenging clinical problem. Bone sampling followed by complete excision of infected bone with orthopaedic reconstruction, obliteration of dead space and immediate vascularised soft tissue coverage with targeted antimicrobial therapy post-operatively are the principles of treatment.

The gracilis muscle flap is our workhorse free flap for immediate soft tissue resurfacing of small to moderate skin defects in limb osteomyelitis. We describe the experience and use of this flap in our unit over a 3 year period.

Methods: Clinical records were reviewed from a prospective free flap database. All patients who received a free gracilis flap reconstruction as part of the treatment of chronic osteomyelitis between 2011 and 2014 were included in the study.

Results: 40 patients received immediate free gracilis muscle flaps following excision of infected bone and soft tissue; 38/40 for lower limb and 2/40 for upper limb osteomyelitis. Recipient artery, the donor side was dependent on local factors in the limb. Twenty one were end-to-end and nineteen were end-to-side arterial anastomosis. Two were myocutaneous flaps whilst the remainder were muscle and skin graft. The return to theatre rate for re-exploration was 12.5% with a total flap loss rate of 5%. One patient with total flap loss then underwent further successful free tissue transfer with latissimus flap 16 days later. Other flap-specific complications include partial flap loss (2.5%), donor site haematoma (2.5%), flap site haematoma (2.5%) and seroma (2.5%). Systemic complications included pulmonary embolism (2.5%) and a single death from sepsis.

Thirty six of the forty patients remain disease-free following their initial surgery, with a mean follow up of 12.4 months (range 1-23 months). One patient required ankle fusion for residual osteomyelitis, another required further bone excision. A third patient with recurrent osteomyelitis underwent further debridement and was found to have squamous cell carcinoma in the resected area of osteomyelitis. She was treated with an above knee amputation.

The gracilis muscle flap provides a moderately sized flap that is thin and pliable. It allows for simultaneous two team operating and has an acceptable pedicle length and diameter. Larger defects required coverage with a latissimus dorsi muscle.

Conclusions: We have demonstrated that immediate soft tissue resurfacing following excision of osteomyelitis using the free gracilis muscle flap is reliable with low donor site complications.

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Poster 0021

Title	**Open your heart, suffer the consequences**
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Abstract

Introduction: Post-sternotomy osteomyelitis is a complication of open heart surgery that occurs in 1-5% of patients. It typically presents with purulent sternocutaneous fistulas, often treated with antibiotics plus sternectomy. Our case illustrates a very unusual presentation.

Description: A 39-year-old male with a bicuspid aortic valve and aortic root aneurysm underwent an aortic root and ascending aortic replacement with a mechanical prosthesis. The postoperative course was complicated by hospital-acquired pneumonia, treated with levofloxacin, and by sepsis due to staphylococcus epidermidis bacteremia, treated with vancomycin. He noted no improvement after 2 weeks of antibiotics and returned to the Emergency Department with persistent fever, fatigue, dyspnea, cough, and abdominal pain. He was in severe sepsis, with AST > 7000 U/L, ALT 4228 U/L, INR > 10, creatine kinase 29000 U/L, and urine myoglobin 1235 mcg/L. A viral hepatitis, acetaminophen, and urine drug screen were negative, and there was no history of syncope or hypotension that would suggest ischemic hepatitis. He was empirically started on vancomycin, cefepime, and levofloxacin. Given his unremarkable physical exam, an extensive evaluation with transesophageal echocardiogram, blood and urine cultures, and CT of the head, chest, and abdomen were performed, showing no infectious source. However, the sternotomy site edges had a new offset on CT. Subsequent cardiac MRI confirmed sternal osteomyelitis with a 1.5-cm abscess at the inferior sternotomy margin, contiguous with pericardial thickening. The cardiovascular surgeon deferred re-operation as there were no local signs of infection. Thus, the patient underwent a CT-guided sternal biopsy. However, no organisms were isolated, and cytology was non-diagnostic. The patient improved clinically on vancomycin and cefepime, and liver and muscle enzymes slowly decreased over 2 weeks. Regarding his rhabdomyolysis, he had no history of muscle injury, illicit drug use, or myopathy, and work-up for viral etiologies, such as influenza and herpes simplex, returned negative. He was discharged with instructions to continue antibiotics until follow-up appointments and repeat MRI to assess his infection.

Discussion: Our patient's presentation was severe and unusual for post-sternotomy osteomyelitis, leading to delayed diagnosis as we initially focused on sepsis, hepatitis, and rhabdomyolysis. Furthermore, this case illustrates controversies in management. Our patient did not show signs of wound infection; therefore, there was no compelling indication for sternectomy. Our patient was treated with antibiotics alone, and few studies have been done regarding conservative management. Some suggest antimicrobials for longer than 4-6 weeks. Our patient's duration of therapy will depend on clinical and radiologic findings.

Poster 0022

Title **Reconstruction of segmental defects of long bones with a new innovative procedure - in vitro and cadaver experiments, results and analysis**

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Abstract

Aim: The gold standard in reconstruction of defects of long bones is the callus distraction. The advantage is the reconstruction of a real hollow autogeneous bone. However, several disadvantages and long treatment time have not been resolved yet. An alternative is the vascularized fibula transfer. The major disadvantage is the small diameter of the fibula with a long time of consolidation to achieve mechanical stability. To reduce the disadvantages of both methods the callus distraction and the vascularized fibula transfer should be combined.

Methods: Anatomical studies with sawbone (SAWBONE®) and pta-catheter (Fa.BBraun, Germany) to show the principle functions, helped realizing the idea of the combination of callusdistraction and fibula transfer. A model of the fibula bone was splitted longitudinal over a length of 8 cm with a saw. Passing a primary performed canal on the tip of the fibula the pta-catheter was inserted in the bone marrow canal of the fibula. With the increasing filling of the pta-catheter the diameter also elongates and the prior splitted halves of the cortical part of the fibula show an enlargement of the cortical gap. With a comparable setting, anatomical investigations on human cadaver were performed. (Anotomical Institute, University Rostock, Germany) The movement of the cortical halves of the fibula were measured in biomechanical tests.

Results: The principle of the callus distraction as a method to reconstruct bone is also feasible in reverse: from distraction to expansion. For this surgical approach the anatomical requirements exist at the fibula bone. The protocol for expansion can be compared with the exertion of the callus distraction. The distance for expansion has to be appr. 13 mm. With a healing-index of 50 days/cm it implies a treatment duration until transplantation of 6 weeks independent from the length of the defect. A nail stabilizes the bone, wich has to be reconstructed.

Conclusion: Instead of transplanting an inadequate small fibula to fill a defect of a long bone the creation of a hollow bone graft with stand-alone vascularity seems to inaugurate a new dimension in reconstructing defects of long bones. The anatomical tests illustrated above suggest a technical, anatomical as well as surgical way to carry out this procedure for the human use. An interdisciplinary collaboration between plastic and reconstructive orthopedic surgeons is a major precondition. Further investigations to develop a technical device for expansion and clinical use are currently under development.

Poster 0023

Title **The effect of orthopaedic surgery on the intrinsic properties of surgical gloves**

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Abstract

Introduction: Surgical gloves function as a mechanical barrier that reduces transmission of body fluids and pathogens from hospital personnel to patients and vice versa. The effectiveness of this barrier is dependent upon the integrity of the glove.

Methods: A total of 20 unused sterile surgical gloves (neoprene and latex) were exposed to cement over 30sec, 1, 5, 12 minute intervals. Following each time point, the palmar surface and finger tips of each glove was analyzed under the scanning electron microscope (SEM), and were tested for changes in contact angle and tensile properties.

Results: Exposure to cement caused a significant increase in both the neoprene and latex glove porosities at 12 min but no significant further changes at any later time points. The latex gloves had a greater increase in pore diameter than the neoprene gloves. Exposure to cement for 12 min duration significantly decreased the tensile strength of both latex and neoprene gloves.

Conclusions: This study provides evidence that exposure to cement, a common orthopaedic material, can disrupt the intrinsic properties of the surgical gloves worn in the operating theatre. This can lead to micro or macro perforations putting both the patient and operating room personnel at risk of contamination.

Poster 0024

Title **Preliminary results after changing from a two-stage revision arthroplasty protocol to a one-stage revision arthroplasty protocol using cementless arthroplasty for chronic infected hip replacements**

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Abstract

Background: Two approaches are generally used in the setting of chronic infection of the hip prosthetic: two-stage and one-stage revision. The objective of our study was to evaluate our preliminary results after changing from a two-stage revision arthroplasty protocol to a one-stage revision arthroplasty protocol using cementless arthroplasty for all patients with chronic infected hip replacements.

Methods: Prospective study of all hip arthroplasties that were diagnosed with chronic infection and were treated using the one-stage revision without taking into account the traditional criteria used to determine the use of a one-stage revision. There were 2 main variables evaluated, infection control and costs. The infection was considered controlled when the patient presented a good functional arthroplasty with no local signs of infection and value of C-reactive protein <1.0mg/dL. The costs were calculated using average cost in euros as described by Klouche et al for one-stage or two-stage revisions.

Results: Thirteen patients were included in the study and the mean follow-up was 12.7 months. Infection was controlled in all patients and the total economic savings for our hospital for these 13 patients treated with one-stage revison was 298545 euros. Only, one patient of them required an extra surgical debridement to control the chronic hip arthroplasty infection.

Conclusions: The preliminary results that were obtained after the change in protocol for the treatment of chronic hip arthroplasty infection were very important from both a clinical and economic point of view. This clinical success has lead to an important change in our hospital in treating chronic hip arthroplasty infection.

Poster 0025

Title **Current concepts in diabetic foot infection imaging – can it help?**

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Abstract

Purpose: One third of resources used to treat diabetes are used to treat diabetic foot complications. Infection in the diabetic foot is a common clinical encounter, caused by the combination of motor, sensory and autonomic neuropathies. Charcot neuroarthropathy can often be confused with infection and vice versa. We aim to summarise radiological findings into a practical guide for clinicians dealing with diabetic foot infections.

Findings: Plain radiography is the first line of investigation. Focal demineralisation may indicate osteomyelitis or neuro-arthropathy and will not be visible for up to 21 days, resulting in poor sensitivity and specificity. Computed tomography has little to add over plain radiography but can reveal classical features of infection such as sequestrae, cloacae and involucra. It may show typical features of neuroarthropathy in more detail. Magnetic resonance imaging is the primary modality due to high tissue contrast and sensitivity approaching 100%. Osteomyelitis can be distinguished from soft tissue infection by signal change in the underlying bone. Ulcers, sinus tracts and cellulitis all suggest infection when associated with MRI changes but neuroarthropathy can appear similar or coexist. Triple phase bone scans, SPECT and PET scanning can be used to improve the specificity of imaging tests but may be associated with difficult access and high cost.

Conclusion: Imaging in diabetic foot infection is commonplace but difficult to interpret. Understanding the indications and limitations of specific modalities coupled with clinical correlation improves specificity and management.

Poster 0026

Title **Fever and its association with infection in polytrauma patients**

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Abstract

Purpose: Polytrauma patients often receive preemptive or prophylactic antibiotic therapy because of the high risk of infection and long-lasting posttraumatic fever. We investigated factors associated with proven infection and its association with fever.

Methods: Using a prospectively maintained database of patients hospitalised for severe polytrauma in our intensive care unit we conducted a case-control study with outcome infection. We did not count preoperative single-dose antibiotic prophylaxis as antibiotic therapy. We investigated the overall and daily occurrence of fever (defined as any temperature ≥38°C axillary) during the first 15 days of hospitalisation and its association with various categorical (Pearson-χ^2-tests) or continuous variables (Wilcoxon-ranksum-tests).

Results: Among 155 patients with an episode of polytrauma (median age 38 years, 9 diabetic), fewer occurred in 80 (54%) despite the prescription of anti-inflammatory drugs in all cases and also corticosteroids in 15 cases. Overall, 120 patients (80%) underwent surgery, including for open fractures in 30 cases.

The percentage of patients who were febrile was 48% on day 2 of hospitalization 52% on day 7 and 40% on day 15. Among 90 patients (58%) who were receiving antibiotic treatment (median 2 days) during the two-week window, infection was proven microbiologically and clinically in 25 patients (16%), of whom 6 (4%) fulfilled the criteria for sepsis. There were 10 episodes of pneumonia, 2 urinary tract infections, 2 bloodstream infections, 10 abdominal infections and 1 soft tissue infection. Overall, 22 of 80 (27.5%) febrile patients developed infection in contrast to 3 of 65 (4.6%) non-febrile patients (Pearson-χ^2-test; $p<0.01$). In predicting infection, fever had a sensitivity of 88%, specificity of 57%, positive-predictive value of 28% and negative predictive values of 96%. Using daily stratified analyses with categorical and continuous temperature variables confirmed the statistical association of fever with infection for each day (all p values <0.01).

By multivariate analysis, fever had an independent significant associated with infection (odds ratio 9.2, 95%CI 2.5-34.5); while surgery, open fractures, compartment syndrome pelvic trauma, facial trauma, abdominal trauma, and use of urinary catheters did not. The goodness-of-fit-value was 0.37 and the ROC value 0.85, indicating a high accuracy of our final model.

Conclusion: For polytrauma patients in the intensive care unit, both fewer and antibiotic prescriptions are frequent. Fever is significantly associated with infection both overall and stratified upon individual days, with no apparent time threshold.

Poster 0027

Title **What duration of antibiotic therapy is needed after surgical treatment of patients hospitalized for soft-tissue diabetic foot infections (DFIs)?**

Authors Karim Gariani[1], Ilker Uçkay[1,2], Elodie Van Dach[3], Dan Lebowitz[1], Benjamin Kressmann[1,2], Domizio Suvà[2], Benjamin A. Lipsky[1]

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Abstract

Methods: We conducted a retrospective case-control study of patients hospitalised in the Septic Orthopaedic Ward at Geneva University Hospitals, for whom we have a detailed database. We conducted a multivariate analysis with a cluster-controlled (at the level of the patient) Cox regression model, defining treatment failure as a clinical recurrence ≥14 days after treatment ended. We defined the follow-up as time until a clinical recurrence or the last available clinical data.

Results: We found 64 episodes of DFIs: 7 abscesses; 12 infected necrotic tissue; 8 cellulitis; 16 purulent ulcers; 16 other infected ulcers; 5 proven toe osteomyelitis with soft tissue infection. All infected bone was surgically removed, two had angioplasty before surgery, four received negative pressure wound therapy. The most commonly isolated pathogen was *Staphylococcus aureus* and the most frequently prescribed antibiotics were amoxicillin/clavulanate, clindamycin, co-trimoxazole, ciprofloxacin and cefuroxime. The median total duration of treatment was 20 days, 5 days of which was intravenous. After an average follow-up of 7 years, clinical recurrence at the same site occurred in 23 episodes (36%),

with only 3 (5%) caused by the same microorganism (*S. aureus*). By multivariate analysis, only the duration of diabetes (hazard ratio 1.1, 95%CI 1.01-1.30) and a low trans-coetaneous oxygen gradient of the forefoot (HR 1.1, 1.02-1.10) were significantly associated with recurrences. There was no association with number of surgical interventions, use of vacuum devices, duration of antibiotic total antibiotic therapy (HR 1.0, 0.99-1.05) or intravenous antibiotic therapy (HR 1.0, 0.98-1.10).

Conclusion: Our analysis of soft tissue DFIs did not define a threshold for the optimal duration of antibiotic therapy after surgical debridement. As only 5% of patients had a recurrence with the same organisms, suggesting shorter durations may be as efficacious as longer ones. In view of the known hazards of unnecessarily prolonged antibiotic therapy, these limited data support shorter treatment duration for these patients.

Poster 0028

Title	**Who receives antibiotics before intra-operative microbiologic sampling for orthopaedic infections?**
Authors	Domizio Suva[1], Wilson Belaieff[1], Mohamed Al-Mayahi[1], Anais Cian[1], Hermes Miozzari[1], Ilker Uckay[1,2], Benjamin Lipsky[1,2]
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Abstract

Purpose: Accurately determining the causative pathogens in orthopaedic infections is key for appropriately targeted antibiotic therapy. This is especially true for infections associated with the presence of a foreign body. Intraoperative tissue samplings (and/or blood cultures) prior to antibiotic treatment is considered the gold standard approach, but preoperative prescription is frequent. To ascertain the current practice on this matter in our hospital, we evaluated in which situations antibiotics were given preoperative antibiotics.

Methods: This was a retrospective study at Geneva University Hospitals, a tertiary care hospital, on adult patients hospitalized from 2004-2014. Group comparisons were conducted using the χ^2-test.

Results: We reviewed 2632 episodes of community-acquired and nosocomial orthopaedic infections, The study population had a median age of 57 years, included 828 females (31%), 311 bacteraemic cases (12%), and 980 immune suppressed patients (37%). The types of infection included 312 prosthetic joint infections, 324 fracture-device infections, 522 osteoarticular infections, 458 cases of septic bursitis, 413 neuropathic foot infections, and various soft tissue infections, including 996 abscesses. In 1120 episodes (43%) patients received antibiotic therapy (parenteral in 61%) before they had specimens for culture obtained by intraoperative sampling or blood cultures.

Factors more frequently associated with preoperative antibiotic therapy were: female sex; advanced age; immune-suppression; and, prosthetic-related infections (all $p \leq 0.01$). In contrast, factors not associated with preoperative antibiotic therapy included apparent clinical severity (e.g., later diagnosed bacteraemic cases [$p=0.42$]) and soft tissue infections with abscess or purulent discharges ($p=0.30$) other than neuropathic foot infections ($p \leq 0.01$) and septic bursitis cases ($p \leq 0.01$). The median preoperative serum CRP levels in those who did, and did not, receive antibiotics were 87 and 67 mg/L, respectively.

Conclusion: In our medical center over the past decade 43% patients hospitalized with orthopaedic infections were receiving antibiotic therapy before they had proper microbiologic sampling. Surprisingly, the clinical appearance of infection severity or the presence of pus was not associated with this preoperative antibiotic prescribing. Just on the contrary, many patients needing long-term targeted antibiotic therapy, e.g., because of the presence of osteosynthetic material or who appeared to be clinically fragile, received preoperative antibiotics without obtaining proper diagnostic specimens.

Poster 0029

Title **Promotion of fracture repair by upregulation of the innate immune response**

Authors James Chan[1], Graeme Glass[1], Adel Ersek[1], Ana Espirito-Santo[1], Garry Williams[1], Andrew Freidin[1], Kate Gowers[2], Rosemary Jeffery[3], William Otto[4], Richard Poulsom[3], Marc Feldmann[1], Sara Rankin[2], Nicole Horwood[1], Jagdeep Nanchahal[1]

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Abstract

Open tibial fractures are severe limb-threatening injuries. Recovery from these injuries is prolonged and the average time to fracture union is between 41-43 weeks while the rate of fracture non-union or delayed union is estimated to be 10-31%. Hence high energy open fractures represent an enormous unmet medical need.

Our group has previously reported that addition of rTNF to the fracture site promotes fracture healing in C57/BL6 mice (Glass et al PNAS 2011). Using a murine fracture model of endochondral healing, we observed that local addition of rTNF only accelerates fracture repair if administered within the first 24hours following injury. The optimal therapeutic dose is 1ng. TNF is first expressed by neutrophils cells in the first 72hours followed by F4/80+ monocytes/macrophages. Furthermore, downregulation of early inflammation using anti-TNF or rIL-10 impaired fracture healing. To quantify the recruitment of innate immune cells, we used a murine air-pouch model. Fracture supernatants were generated by incubating fracture fragments in media overnight to capture the local cytokine environment of the fracture site. We found that addition of rTNF promoted neutrophil recruitment, which in turn promoted recruitment of monocytes/macrophages by CCL2 production. Macrophages have previously been reported to be critical in bone repair (Alexander et al JBMR 2011). Furthermore, neutrophil depletion using anti-Ly6G antibody and inhibition of the chemokine receptor for CCL2, CCR2, led to significantly impaired fracture healing (Chan et al EMBO Mol Med 2015).

We have shown that TNF is a key upstream inflammatory mediator in fracture repair. Mechanistically, addition of rTNF upregulates CCL2 production and monocyte recruitment. Our findings provide evidence that the innate immune response represents a viable therapeutic target in the enhancement of fracture healing.

Poster 0030

Title **Associations of diabetes mellitus with orthopaedic infections: epidemiological experience from Geneva**

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Abstract

Purpose: Clinical experience suggests that a high proportion of orthopaedic infections occur in persons with diabetes. Surprisingly, there is little epidemiologic data (other than for diabetic foot infection) concerning this issue.

Methods: We analysed several databases that we have compiled on adult patients hospitalised for orthopaedic infections at Geneva University Hospitals from 2004-2014. Group comparisons were done with the χ^2 or the Wilcoxon-ranksum-test.

Results: We retrieved 2632 episodes of infection for which there were data about the presence of concomitant diabetes mellitus. Overall, diabetes was noted in the medical record for 637 (24%) of these cases. The patients with, compared to those without, diabetes had >5 times more foot infections (263/637 [41.3%] vs. 150/1995 [7.5%]; $p<0.01$) and a significantly higher serum CRP level at admission (median 102 vs. 70 mg/L; $p<0.01$). Diabetic patients were older (median 67 vs. 52 years; $p<0.01$), more often male (456/637 vs. 181/1995; $p=0.06$), had more frequent polymicrobial infections (208/537 [38.7%] vs. 329/1753 [18.8%]; $p<0.01$), more isolates of gram-negative non-fermenting rods (85/241 [35.3%] vs. 156/1753 [8.9%]; $p<0.01$) and skin commensals (53/265 [20.0%] vs. 212/1753 [12.1%]; $p=0.06$). Excluding foot infections from these analyses did not change the statistically significant differences. Diabetes was present in 17% of all infected orthopaedic patients without foot involvement. In Geneva the overall prevalence of diabetes is estimated at 5.1% while we have found that the prevalence is 13% in our hospitalised adults.

Conclusion: In Geneva, diabetes is present in 24% of all adult patients hospitalised for surgery for an orthopaedic infection, a prevalence that is several times higher than in for the general population and at least 1.5 times higher than for the population of hospitalised patients. Compared to non-diabetics, patients with diabetes have significantly more infections that are polymicrobial, contain gram-negative rods and skin commensals.

Poster 0031

Title **Risk factors for treatment failure of infected sacral pressure sores**

Authors Benjamin Kressmann, Ilker Uçkay, Kheeldass Jugun, Jean-Christophe Richard, Domizio Suvà, Benjamin A Lipsky, Ali Modarressi

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Abstract

Purpose: Infected sacral pressure sores are difficult to treat and have a high risk of recurrence, because the underlying cause of infection often cannot be corrected. There is little in the published literature regarding the outcome of treatment and long-term follow-up of these infections.

Methods: This is a single-centre (University Hospitals of Geneva) epidemiologic study of spinal cord injured adults seen between 1995-2014 with an infected sacral pressure sores whith a minimal follow-up of 3 months. Statistical analyses included cluster-controlled (at the level of the patient) Cox regression analysis with emphasis on surgery and the duration of antibiotic therapy. We included only infections accompanied by purulent secretions or proven osteomyelitis. Infections associated with osteosynthetic material and subjective variables such as patient adherence to treatment or duration and frequency of long-term off-loading.

Results: We found 70 eligible episodes in 31 patients (median age 60 years; 21 immune-compromised) with a median follow-up of 2.7 years (range, 3 months to 19 years). Underlying osteomyelitis (proven by histology and/or microbiology) was present in 52 cases. The median duration of hospitalization was 3 months. The patients had a median of 1 surgical intervention, with concomitant flap used in 25 cases. The median duration of targeted antibiotic therapy was 6 weeks including at least 1 week given intravenously. Overall, in 44 episodes (63%) there was a clinical recurrence after a median interval of 1 year. In 85% of these recurrences culture of the wound yielded a different organism than the index infection, suggesting re-infection rather than relapse.

In various multivariate analyses, no variable was significantly associated with clinical failure. The number of surgical interventions (hazard ratio [HR] 1.1, 95%CI 0.8-1.6), use of flap, bone involvement (HR 1.5; 0.7-3.1), immune suppression, prior sacral infections, duration of total antibiotic prescription (HR 0.9; 0.5-1.4) or use of parenteral antibiotic therapy were not associated with failure. Specifically, antibiotic treatment for <6 weeks had the same risk as >12 weeks. Similarly, duration of antibiotic therapy did not alter the risk of recurrence with the same pathogen (Pearson-χ^2-test; p=0.90).

Conclusions: Our retrospective study of spinal cord injured patients with an infected sacral pressure sores demonstrated that infection recurrence occurs in almost two-thirds of patients, but in only a minority with the same pathogens. The number of surgical debridements, performance of a flap, or duration of antibiotic therapy was not associated with recurrence, suggesting recurrences are due to re-infections caused by other extra-hospital factors.

Poster 0032

Title **Treatment of acute implant-related infection after distal fibula fracture and ORIF using an injectable calcium sulphate/calcium phosphate component plus gentamicin (CERAMENT™ G, Bonesupport) - a case report**

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Abstract

A 38 year old female presented with a distal fibula fracture (Weber B, AO 44.B1). On the 30th of May 2013 open reduction and internal fixation (ORIF) with a lag screw and a plate was performed. After surgery an acute implant-related infection developed. An operative revision with debridement, sonication, irrigation, placement of a Gentamicin-collagen-fleece, implant retention and wound closure was done on the 26th of June 2013. In the intraoperative tissue samples S. aureus was found. However, this revision was not sufficient to cure the infection. A second revision had to be scheduled for the 24th of July 2013. The implant was removed and the bone debrided. Several sequesters were found in the implant bed and excised. The fracture of the distal fibula had healed in the meantime, but debridement led to a large bone defect at the lateral malleolus. This bone void and the screw channels were filled with an injectable calcium sulphate/calcium phosphate component plus gentamicin (CERAMENT™ G, Bonesupport) during surgery. A drain was placed and the wound closed in layers.

An oral antibiotic therapy with clindamycin 300mg 4 times a day was started one the first day after surgery and continued for 10 days. The left lower extremity was placed in a short leg cast and mobilisation started without weight bearing. The wound healed *per primam intentionem*. A redness of the wound and surrounding skin on day 14 resolved without further therapy. Radiographic controls 7 and 11 weeks after implant removal (IR) showed increasing remodelling of bone at the defect of the lateral malleolus. 7 weeks after IR partial and after 11 weeks full weight bearing was allowed.

Conclusion: Here we report our first use of CERAMENT G, Bonesupport, in acute implant-related infection after ankle fracture type Weber B and ORIF. In only one revision surgery implant removal, bone debridement and simultaneous bone void filling was performed. We see a huge potential in the combination of hydroxyapatite, Calcium Sulphate and Gentamicin for one stage revisions in acute and chronic osteomyelitis. Further procedures like removal of PMMA beads or autologous cancellous bone graft can be avoided.

Poster 0033

Title	**Good outcome on a host B type patient with infected tibial non-union, MSSA bacteraemia and disseminated musculoskeletal infections**
Authors	Dimitrios Giotikas, Matija Krkovic
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Abstract

We report the case of a 52 year old female patient with septic complication after nailing of her tibial non-union. Her medical history included smoking, depression and Sjogrens syndrome. Originally she was treated with Ilizarov frame for multifragmentary distal tibial intraarticular fracture. After removal of frame proximal fracture was not united. Treatment with Sarmiento plaster was unsuccessful. She was treated with conversion to an IM Nail. Six weeks post insertion of the IM nail she developed disseminated *Staphylococcus aureus* infection (MSSA bacteraemia), right supraclavicular abscess, left PIP joint infection of the thumb, and multiple abscesses over the tibia, all at the level of operative incisions. She was treated with abscess drainage of the tibia and supraclavicular abscesses and aspiration of the thumb PIP joint. Intramedullary nail was not removed due to unwillingness of the patient to go back to circular frame type of fixation. Intravenous and oral antibiotics were administered for a total of five months. The drainage was followed by management of the wounds with negative pressure device. The patient developed antibiotic related diarrhoea and urinary tract infection. At the most recent -10 month follow up since the IM nail there was not reoccurrence of the infection and the non-union was united uneventfully.

Poster 0034

Title	**A case study, illustrating an under-recognized, under-reported, potentially severe disease, representing a significant public health threat**
Authors	Uriel Giwnewer[1], Nimrod Rozen[1,2], Bibiana Chazan[2,3], Anna Yanovskay[2,3], Yoram Kennes[4]
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Abstract

We present a case study of a 54 years old male, married and father of four, Israeli Muslim, who was presented to the ER with complaints of chronic left knee pain with an acute exacerbation during the last day. On further questioning he tells he has been suffering from the pain for a period of a month, with no fever and he didn't feel either a movement restriction, nor swelling, local rash or other complaints, until now. He denies experiencing any blow or injury to the knee. His medical history includes essential hypertension, diabetes mellitus type 2, obesity, s/p stroke (homonimus hemianopsia) and smoking 30PY. On arrival to the ER he had 38.5°C fever. Patient was not septic. On physical exam we found a swollen, painful, red left knee with a movement restriction. Blood count and electrolytes were taken: WBC 12K/ul with 57% PMN, HB 14.1 g/dL, Plt 247 K/ul, Cr 1.24mg/dL, Urea 53 mg/dL, Na 140mmol/l, CRP 26mg/L. Routine chest X-ray was normal. We performed an arthrocentesis of the knee joint: the synovial fluid was clear, with 2090 cells, 77 glucose mg/dL, with no crystals viewed using negative polarized light. The sample was sent to culture and it was concluded that septic arthritis is not likely. During the first week of his hospitalization he underwent several arthrocentesises. All cultures were negative (blood, urine and synovial fluid). After 14 days patient underwent an arthroscopy that showed multiple infection sites. The gram-stain showed late growth of gram negative rods of 100 micron length (approximately 50 times larger than common microbes), arranged in loops or sausage-like invaginations, with no identification on antibiogram and sample was sent for PCR.

Patient was treated with empirical Augmentin and Ciproxin. All serologies were negative including: hepatitis B and C, CMV, EBV, Q fever, *Brucella*, chlamydia, HIV, syphilis. After 24 days of hospitalization all cultures were still negative. A DNA sequencing revealed *Streptobacillus moniliformis* gene for 16S rRNA, partial sequence strain: IKB1 AKA: rate bite fever. Treatment was changed to penicillin. Upon re-questioning the patient admitted to being bitten by a small fast animal on his 1st left toe, he didn't see what kind of animal it was and he bled a little and forgot about it. Unlike the common symptoms our case presented with monoarthritis and pneumonitis. Patient was treated with penicillin for 3 weeks with a full recovery. The patient bought a cat.

Poster 0035

Title	**Epidemiology, and clinical influence, of clinical obligate anaerobic isolates in diabetic foot infections (DFI)**
Authors	Dan Lebowitz[1], Benjamin Kressmann[2,3], Karim Gariani[2], Ilker Uçkay[2,3], Elodie von Dach[4], Patrick Charles[4], Benjamin A. Lipsky[2]
Addresses	*[1]Internal Medicine, [2]Infectious Diseases, [3]Orthopaedic Surgery, [4]Infection Control Program / University Hospitals of Geneva, Switzerland*

Abstract

Purpose: The importance of isolates of anaerobes from wounds of DF is controversial.

Methods: We performed a literature search of DFI studies published from 2004-2014 seeking all papers that reported data on causative pathogens and compared the results to our own cohort study of DFI patients at Geneva University Hospitals. We excluded papers reporting on colonization or clinically uninfected ulcers, case reports, animal or human *in vitro* studies, review papers, abstracts, and those that failed to specify cultures were processed for anaerobic pathogens.

Results: Our search revealed 42 large-scale epidemiologic or interventional trials. In virtually all, the presence of anaerobes was not a major study question and mentioned in only a few lines. The unweighted mean percentage of patients who had at least one anaerobic pathogen in was 10% (range, 0% to 67%). There were large discrepancies among the studies both over time and within a same country, suggesting a lack of completeness of reporting results. The details of reporting varied regarding whether anaerobic pathogens were reported as a group or as individual microorganisms. None of the studies described what proportion of patients was receiving antimicrobial therapy. The main reported isolates in almost all studies were *Bacteroides* spp and *Peptostreptococcus* spp. Randomized trials of both soft tissue and bone infections reported similar rates of clinical success with all organisms, and with drugs having a large or small anaerobic coverage spectrum.

In our hospital, among 517 DFI episodes we detected anaerobes in only14 cases (3%), always as part of a mixed infection with aerobes. In three cases anaerobes were the main pathogens, in four a second pathogen and in seven the third pathogen on "semi-quantitative ranking". The presence of anaerobic pathogens did appear to influence the risk of infectious treatment failure (7/14 vs. 237/517; Pearson-χ^2-test; p=0.15) but was highly associated with the need for minor amputations clinically performed for ischemia (9/14 vs. 100/517; p<0.01). There were no episodes of anaerobic bacteraemia.

Conclusion The available literature and own experience do not reveal a clinically important role for obligate anaerobic (co) infections in the diabetic foot.

Poster 0036

Title	**Outcome of treatment of diabetic foot infections (DFIs) associated with colonisation or infection with MRSA or ESBL**
Authors	Dan Lebowitz[1], Benjamin Kressmann[2,3], Karim Gariani[2], Ilker Uçkay[2,3], Elodie von Dach[4], Benjamin A. Lipsky[2]
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Abstract

Purpose: It is suggested, but heretofore not proven, that body colonisation or infection caused by multiresistant microorganisms is associated with a higher failure rate in patients treated for a DFI.

Methods: We conducted an epidemiologic survey in our hospital to determine the rate of successful treatment of DFIs in patients with, versus without, concomitant colonisation or infection with methicillin-resistant *S. aureus* (MRSA) or extended-spectrum-lactamase (ESBL) carrying bacilli. In our hospital, the overall prevalence of MRSA or ESBL colonisation on admission is 5% for each. We defined colonisation as a swab yielding one of these organisms during the two weeks before or after the start of antibiotic therapy for the DFI. MRSA carriage was swabbed in the nares, wound and the groin. ESBL was swabbed perianally and in the wound. All statistical tests of comparisons are with Pearson-χ^2-tests.

Results: Among 517 episodes of DFI from 2008-2014, 244 (47%) recurred after a median surveillance period of 2.4 years (range 60 days-5 years). The median duration of antibiotic therapy overall was 14 days (range, 0 to 315 days) and almost all had at least one surgical intervention. Among all DFI episodes, MRSA was isolated from 80 (15%), 77 of which were from clinical samples. Colonisation/infection with MRSA tended to be associated with prior antibiotic exposure for a DFI (14/80 vs. 55/517; p=0.08), and significantly lowered treatment success of the current episode (28/80 vs. 244/517; p=0.04). In 24 (5%) of the DFI episodes patients had rectal or urinary colonisation with ESBL. There was no association of ESBL colonisation/infection with prior antibiotic treatment for DFI (14/24 vs. 65/517; p=0.56), nor did it affect the success of DFI treatment (10/24 vs. 234/517; p=0.73).

Conclusion: In patients with a diabetic foot wound, MRSA is usually considered to be a pathogen, and it is three times more prevalent than ESBL carriage in our DFI patients. The rate of ESBL carriage among patients with DFI is similar to that among the general patient population in our hospital. Infection or colonization with MRSA, but not ESBL, may be associated with failure of treatment of DFI.

Poster 0037

Title	**Proximal tibial osteomyelitis after high tibial osteotomy for post traumatic malalignment treated with single stage revision free gracilis flap**
Authors	James Masters[1,2], Karan Goswami[2], Andrew Grazette[2], Richard King[2,1], Pedro Foguet[2,1], Jo Skillman[1,2], Andrew Sprowson[1,2]
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Abstract

Background: Mr GW was referred to the knee team at UHCW from Liverpool for a depressed articular fragment after a tibial plateau fracture. To address the depressed fragment, a high tibial osteotomy was performed. Post operatively he presented with cellulitis, wound dehiscence and was treated for infection - a fully sensitive coagulase staphylococci (CNS).

He had two subsequent washouts and treatment with suppressive antibiotics for a period of twelve weeks - CT at this point identified bony union and no evidence of osteomyelitis

However the soft tissue infection persisted and surgery to remove the plate was carried out. The wound edges were excised and managed with negative pressure wound therapy - with a view to delayed soft tissue coverage. The operative cultures grew CNS and diptheroids that had developed flucloxacillin (amongst others) resistance.

The wound failed to granulate fully and a sinus developed-the patient had further debridement and excision of soft tissue-this grew an enterobacter.

An MRI Sept 2014 showed a soft tissue collection adjacent to proximal tibia.

Definitive Management: This took the form of radical synovectomy, resection of the proximal tibia up to but excluding the insertion of the extensor mechanism, which lies close to the margin of infection seen on both MRI and plain radiograph.

The cruciate and collateral ligaments were sacrificed and hence a linked endoprosthetic knee was inserted.

The soft tissue defect was managed with a free gracilis flap from the contralateral limb.

The patient was treated with 6 weeks of antibiotics post operatively. At 6 weeks follow up he is mobilising with a healed wound.

Controversial Points:

- Was single stage revision appropriate in this case?
- Given the location of the osteomyelitis in the proximal tibia should the extensor mechanism been resected in the one stage procedure?

NB We have clinical photographs, radiographs and microbiological information for this patient for the purposes of presentation.

Poster 0038

Title **Bone Infection Group Coventry and Warwickshire (BIGCOW) experience of single stage revision for infected hip and knee replacements**

Authors James Masters[1,2], Andrew Sprowson[1], Matt Rodgers[2], Richard King[2,1], Pedro Foguet[2]

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Abstract

Introduction: Single stage revision of infected hip and knee replacements has yet to find an agreed and established indication. Evidence supporting the practice of single stage revision is limited. We present the University Hospitals Coventry and Warwickshire experience with single stage revision of infected hip and knee replacement.

Methods: We reviewed the case notes for 27 patients (13 knees and 14 hips) with chronic prosthetic joint infection (PJI) who were treated at our institution.

Follow up was at a mean of 34 months (20-58) for hips and 24 months range 12-50) for knees. Length of stay for patients and need for further surgery was examined and extrapolated to gauge any cost savings associated with a single stage procedure.

Results:

1) Eradication of infection
   a. Hips
      13/14 infection free at last follow up
   b. Knees
      10/13 infection free at last follow up

   Ten of the knees and 11 of the hips fell within 'accepted' practice for single stage revision (monomicrobial, sinus free and non-fungal).
2) Microbiology
   a. Knee
      Twelve of thirteen cases had monomicrobial infection. One patient had polymicrobial (three) infection. Coagulase negative staphylococci the most prevalent organism (10 cases).
   b. Hip
      Eight cases were monomicrobial, six were polymicrobial (two). *Staphylococcus aureus* most prevalent.
3) Adverse Outcomes
   One death (unrelated to surgery), 1 revision for recurrent dislocation, 1 revision for aseptic loosening
4) Cost Implications
   Average stay for single stage revision 16 days compared to 56 days for two-stage revision. Avoided 22 further operations.

Conclusion: Single stage revision is a suitable surgical strategy for selected patients with established prosthetic joint infection. The benefits for patient and healthcare provider are significant.

Poster 0039

Title ***Salmonella enteritidis*** **discitis post holiday in Greece: difficulties with diagnosis and management**

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Abstract

Introduction: Early diagnosis and treatment of discitis leads to better outcomes, MRI allows early detection with a reported sensitivity of 96% and specificity of 94%.

Case: A 82 year old lady presented at our hospital in November 2012 with a history of back pain of sudden onset associated with pyrexia, had EWS of 4, discitis was suspected as no other system involved, sepsis screen done, Flucloxacillin commenced to cover possible staphylococcal infection. Planned for CT spine as MRI contra indicated due to presence of pacemaker. Blood cultures positive with *Salmonella sp*, was switched to cefotaxime 2gm qds, further history confimed travel

to Greece 3 months prior to presentation but had no significant diarrheal illness. CT spine reported as degenerative changes L3/4/5, abdominal CT showed small gall stones in the gall bladder, transthoracic echocardiogram negative for vegetation and Leukoscan reported as no evidence of infective focus. She was de-escalated after one week to oral amoxicillin 1gm qds to complete 2/52 at home, as inflammatory markers settling and remains apyrexia and stable.

Re-admitted 2 weeks post discharge with increasing back pain and pyrexia, and worsening inflammatory markers. Repeat blood cultures grew *Salmonella sp* in 2 sets, repeat CT spine reported as suspicious inflammatory discistis L3/4, biopsy aspirate grew *Salmonella*. Restarted on cefotaxime 2gm qds for 5/52 making good progress and discharged home on oral ciprofloxacin 750mg bd.

Reviewed in fracture clinic two week later, worsening back pain and rising inflammatory markers, re-admitted for iv cefotaxime, had transesophageal echocardiogram, reported as no evidence of vegetation and pacemarker site good. Repeat sets of blood cultures negative. After a further 4/52 of cefotaxime was discharged home via the Community Intervention Team (CIT) to once daily iv xetriaxone 2gm for 4/52. She made good recovery with resolution of her back pain, CRP and ESR fell from 228 and 132 at start of treatment to 8.6 and 35 respectively when antibiotic stopped.

One year follow up showed she continued to remain clinically well, pain free and repeat spine X-ray showed bone fusion.

Discussion: Infection was probably in Greece 3 months prior to presentation. Initially managed by the medical team before referral to orthopeadic and Microbiologist with interest in discitis. MRI contraindicated, missed the opportunity to diagnose and treat her with appropriate antibiotic. Had treatment failure with amoxicillin and ciprofloxacin despite sensitive profile reported on Vitek and E-test.

Conclusion: The reference laboratory reported the isolate as *Salmonella enteritidis* (phage type 20, serotype 19, 12; g.m). We advocate early referral to specialist team with interest in discitis, in difficult to diagnose and manage cases, to improve outcome thereby reducing morbidity and mortality.

Poster 0040

Title **Bioactive glass S53P4 in the treatment of osteomyelitis**

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Abstract

Osteomyelitis is an infectious process in bone, occasionally leading to bone destruction. A successful treatment outcome of chronic osteomyelitis relies on proper debridement. Traditionally, the surgical procedure is performed in combination with systemic and local antibiotics as a two-stage procedure. After debridement the cavitary defect is filled with antibiotic loaded polymethylmetacrylate (PMMA) beads or a spacer.

To overcome problems related to PMMA or to avoid the second procedure induced by the need of removing the PMMA, synthetic antibiotic-loaded bone substitutes have been used as a part of the treatment. However, antimicrobial resistance has become a growing health treat around the world, and is today a serious global problem.

Bioactive glass (BAG), S53P4 is an antibacterial synthetic bone substitute in itself. The antibacterial property of the BAG is based on an increase in pH and the osmotic pressure around the BAG, a phenomenon which has been shown to kill both planktonic bacteria and bacteria in biofilm in-vitro.

In a retrospective multinational study, 102 patients from six countries (Finland, Italy, the Netherlands, Germany, Poland and Azerbaijan) with verified osteomyelitis were treated with BAG-S53P4 as a bone substitute. Several of the patients had previously undergone a number of procedures without success. The mean age of the patients was 50 years (16-87). The location of the osteomyelitis was mainly in the tibia followed by the femur and calcaneus. The most common pathogens causing the osteomyelitis was Staphylococcus aureus. In 83 patients the procedure was performed as a one-stage procedure. The minimum follow-up was one year (1-7 years). The total success rate was 90% and most of the patients showed a rapid recovery. Poor or fair postoperative soft tissue healing was the most predictable factor for a poor outcome. Seroma leakage was observed in two patients. In one patient an infection recurrence, related to incomplete debridement, occurred after a four-year follow-up.

This study shows that BAG-S53P4 can be used in treatment of osteomyelitis with excellent results.

Poster 0041

Title	**The use of Stimulan with tailored antibiotics for salvage of chronic diabetic feet infections**
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Abstract

Purpose: To improve outcome in diabetic feet infections by using local tailored antibiotics in Stimulan.

Methods: 15 patients underwent salvage surgical debridement for diabetic foot infection. The mean age was 51.5; 12 males and 3 females. 11 patients type I and 4 type II diabetics. All were discussed in the Multidisciplinary Team Meeting which included, foot & ankle surgery, microbiology & musculoskeletal radiology consultants. All had magnetic resonance imaging preoperatively to define the extent of infection.

All 15 patients had chronic osteomyelitis; 8 phalangeal, 3 metatarsals and 4 calcaneum. Surgical debridement was undertaken in 6, 5 toe amputations and 4 ray amputation. Standard biopsies were sent for microbiology and histopathology.

All patients had Stimulan paste mixed with tailored antibiotic injected into the deep tissues and or bone. 8 patients had postoperative negative pressure wound therapy (NPWT) dressings. 7 underwent primary closure. 8 were treated with oral antibiotics and 3 had intravenous antibiotics. 4 patients did not receive any antibiotics.

Results: The seven patients who underwent primary closure have healed with no recurrence. The 8 patients who underwent NPWT have demonstrated absence of infection. Due to the extensive debridement undertaken in these patients the limiting step in healing was epithelisation of the wound.

Conclusions: Local antibiotic delivery is efficacious in the treatment of chronic diabetic foot infection. We postulate that a tailored antibiotic regime based on cultures would have greater efficiency in treating infection. This is a small case series with promising outcomes.

Poster 0042

Title	**Challenges in managing extensively drug resistant spinal tuberculosis (XDR-TB): the journey from complete lower limb motor paraplegia to independent mobilisation**
Authors	Neeraj Ahuja, Jane Vanhoutte, Himanshu Sharma
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Abstract

Background: The management of patients with spinal tuberculosis has become increasingly complicated due to an increasing proportion of multi-drug & extensively drug resistant TB strains (MDR & XDR-TB). It is associated with significant proportion of morbidity and mortality.

Purpose: We report multiple challenges faced in managing such an interesting case whereby a patient with XDR-TB recovered from total lower limb motor paraplegia to independent mobility.

Case: A 32-year-old man who recently immigrated to England from India presented with thoracic back pain, intercostal neuralgia and numbness below the level of T6. His past medical history was insignificant. On examination, he had proximal weakness in hip flexion bilaterally at outset. An MRI of his spine showed a lesion at T6 with a surrounding collection suspicious of spinal TB. Extensive blood investigations and CT guided biopsy was performed. Histology confirmed granulomatous infiltration. The patient was started on empiric first line Anti-TB medications based on high index of suspicion while biopsy results were awaited. He dramatically deteriorated neurologically and became near total paraplegic. Subsequent imaging confirmed disease progression with epidural collection causing cord compression. This deterioration warranted surgical intervention in the form of decompression and spinal stabilisation. His neurology further deteriorated immediate post-operatively. He was taken to theatre again for wash-out of haematoma. He did not improve for 4 weeks period. He was then diagnosed with MDR-TB and eventually with XDR-TB. His antibiotic therapy was tailored to the sensitivities. He developed tuberculous myelitis, which was treated with high dose steroids, immunoglobulin therapy and plasmapheresis. He needed negative pressure room, barrier nursing, expensive multiple medications and prolonged neuro-rehabilitation. He had multiple side-effects from anti-tuberculous therapy. He remained inpatient for almost 9 month period due to variety of reasons. With the help of various members of the multi-disciplinary team, he has achieved independent mobility (elbow crutches for long distance and unassisted for short distances at 10 month follow-up).

Conclusions: Extremely drug resistant spinal tuberculosis with complete paraplegia and tuberculous myelitis carries dismal prognosis. We report multiple challenges faced during management of this patient and very positive outcome with regaining independent mobility.

Poster 0043

Title	**Trends in *Candida* prosthetic joint infection - a literature review**
Authors	Melissa Baxter, Marina Morgan
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Abstract

Background: *Candida* species are a rare cause of native joint septic arthritis and an even rarer cause of prosthetic joint septic arthritis, accounting for approximately 1% of all PJI. Since the reported first case of *Candida* PJI in 1979 there were less than 50 cases described in the English literature by 2012. With a senescent population, rising number of joint arthroplasties being performed and increasing co-morbidities we can expect an inexorable increase of these opportunistic infections. *Candida* PJI pose a considerable diagnostic and therapeutic challenge, with a lamentable lack of standardised treatment regimens and outcome data.

Materials and Methods: Medline and Embase were searched by terms pertaining to *Candida*, prostheses and infection and bibliographies were searched for additional cases, resulting in a total of 85 individually described cases from 45 publications from the years 1979-2013.

Results: Of the *Candida* species isolated from 86 joints. *C. albicans* predominated, (n= 42) followed by *C. parapsilosis* (n=24) *C. glabrata* (n=10) *C. tropicalis* (n=7) and one case each of *C. lipolytica* and *C. guillermondii.* [One isolate unspeciated]. The male to female ratio was 44:41 cases respectively, and the age of patients ranged from 31-83 years (mean age 64.8, median 66). Trends in time to presentation may indicate shorter incubation and possibly increased virulence of *C. tropicalis* and *C. parapsiolosis* compared to the more commonly indolent progress and late presentation with *C. glabrata.*

Reported management was variable but broadly followed five principles-

- medical management with antifungal only (n=7)
- surgery with retention of prosthesis (n=9)
- arthrodesis (n=33)
- Two stage exchange arthroplasty (n=34)
- one stage exchange arthroplasty (n=2)

Of the widely differing outcomes, exchange arthroplasty in one or two stages combined with antifungal therapy appears to offer the best chance of cure.

Conclusion: *Candida spp* are an uncommon cause of PJI that are challenging to manage. With no standardised treatment regimens, scattered case reports using myriad combinations of different modes of delivery of antifungals *[parenteral, in cement, beads or other material]* and a hotchpotch of surgical management options, *Candida* PJI is unsurprisingly associated with variable outcomes. We suggest a national database is set up to meaningfully standardise diagnostics and therapy.

Poster 0044

Title	**Squamous cell carcinoma complicating chronic osteomyelitis: clinical features and outcome of a case series**
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Abstract

Aims: Squamous cell carcinoma (SCC) is a rare complication of chronic osteomyelitis (OM), often arising in a sinus tract (Marjolin's ulcer). We routinely send samples for histological analysis for all longstanding sinus tracts in patients with chronic osteomyelitis.

Methods: A retrospective study was performed of patients with osteomyelitis between January 2004 and December 2014 in a single tertiary referral centre. Clinical notes, microbiology and histo-pathological records were reviewed for patients who had squamous cell carcinoma associated with OM.

Results: We treated 7 patients with chronic osteomyelitis related squamous cell carcinoma. The mean age at time of diagnosis was 51 years (range 41-81 years) with 4 females and 3 males. The mean duration of osteomyelitis was 16.5 years before diagnosis of SCC. SCC arose in osteomyelitis of the ischium in 4 patients, sacrum in 1 patient, femur in 1 patient and tibia in 1 patient. The histology showed well differentiated SCC in 2 cases and moderately differentiated SCC in one case with invasion. Two patients had SCC with involvement of bone. All patients had polymicrobial or Gram-negative cultures from microbiology samples.

Four patients (57%) in our series died as result of their cancer despite wide resection. The mean survival after diagnosis of SCC was 1.3 years and mean age at time of death was 44.7 years. Two of these patients had ischial disease and were treated with hip disarticulation, partial pelvectomy and iliac node clearance.

Three patients remain disease free at a mean of 3.4 years (range 0.25 – 7yrs) after excision surgery. One patient in this group underwent a through-hip amputation, one underwent an above knee amputation and one underwent excision of ischium and surrounding sinuses. Of note, all these patients had clear staging scans at time of diagnosis.

Conclusions: This case series demonstrates the consequences of an uncommon complication of osteomyelitis. In our series only 1 patient underwent biopsy for suspected SCC due to clinical appearances. The other cases were all identified incidentally after routine histological samples were sent – demonstrating the importance of this practice.

Poster 0045

Title	**Prosthetic joint and endoprosthetic infections caused by vancomycin-resistant enterococci (VRE): experience at the Royal Orthopaedic Hospital Birmingham 2011-2014**
Authors	Pauline Jumaa[1,2], Sarah Mimmack[1], Nia Reeves[1], Andrew Pearson[1]
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Abstract

Purpose: Orthopaedic infections caused by vancomycin-resistant enterococci (VRE) present a therapeutic challenge. There are few reports in the literature. We report 12 consecutive cases where VRE was isolated from prosthetic joint (PJI) and endoprosthetic infections (EPR).

Methods: The Bone Infection Unit database was used to identify all VRE from 2011 to 2014. Data analysed included: demographic details; site of infection; duration of infection; surgical management; VRE phenotype; antimicrobial treatment; outcome.

Results: 12 VRE cases were identified from the database (12/422, 3%) comprising 10 PJI's (7 hips,3 knees) and 2 pelvic EPR's. The age range was 42-94yrs (mean 69.9 yrs) in 5 males and 7 females. 11/12 VRE were *Enterococcus faecium*. All VRE isolates were Van A phenotype. In 2 cases the clinical significance of VRE was unclear. In 9/12 cases the duration of infection before isolation of VRE was > 6 months. Amputation or removal of metalwork was required in 6/12 cases. Antimicrobials used to treat VRE comprised linezolid, daptomycin and in one case amoxicillin. Treatment in 5/12 patients was considered successful.

Conclusions: We suggest that VRE is a marker for poor outcome in longstanding orthopaedic prosthetic infections. Treatment was most likely to be successful if the infection duration was <3 months.

Poster 0046

Title	**'Whats a nice bug like you doing in a joint like this?'; two cases of pneumococcal septic arthritis in prosthetic knee joints**
Authors	Kim Findlay-Cooper, Marina Morgan
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Abstract

Prosthetic joint infection [PJI] is most commonly caused by staphylococci and streptococci, pneumococcal septic arthritis being uncommon. Pneumococcal prosthetic joint infection is very rare, with less than 15 single case reports in the world literature to date.

Primarily a respiratory pathogen, factors predisposing to invasive pneumococcal infection include chronic disease, immunocompromised states, splenic dysfunction and some malignancies.

We report two cases of *S. pneumoniae* septic arthritis in patients with prosthetic knee joints in the absence of concomitant pneumococcal infection elsewhere: no symptoms or signs of respiratory infection or proven bacteraemia. The patients were both elderly with underlying haematological malignancy – one with undiagnosed CLL at the time of presentation, the other with a known diagnosis of multiple myeloma. Both presented with a hot, swollen prosthetic knee joint with loss of range of movement in the absence of respiratory illness or fever. The time interval between arthroplasty and infection was years in both patients, with no antecedent joint infection. *S. pneumoniae* was isolated from joint aspirates in both cases and successfully treated with arthroscopic irrigation and antibiotics.

Our cases highlight the importance of awareness of:

- the association between pneumococcal PJI and severe immunocompromise - specifically those patients with underlying haematological malignancy and effective hyposplenism
- antibiotic and surgical management considerations
- the importance of prophylactic vaccination in this subgroup.

Poster 0047

Title **Assessment of National Joint Registry data quality on hip prosthetic joint infection**

Authors Atif Sabah[1], Shiraz Sabah[2], Johann Henckel[3], Jonathan Miles[2], Richard Carrington[2], Rikin Hargunani[2], John Skinner[2], Alister Hart[2], Simon Warren[2,4]

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Abstract

Purpose: The National Joint Registry (NJR) publishes implant, surgeon and hospital outcomes following hip arthroplasty. The incidence of prosthetic joint infection (PJI) is an important performance indicator. This study aimed to validate reporting of PJI on the NJR.

Methods: Data linkage was performed between the NJR hip revision database and hospital records at the Royal National Orthopaedic Hospital, Stanmore from 1st Jan to 31st Dec 2013. Case notes and microbiology results were analysed to validate the reason for revision and type of revision procedure.

Results: 178 metal-on-metal hip revision procedures were identified on the NJR (Single-stage [n=130], Stage1/2 [n=24], Stage 2/2 [n=24]). Infection was recorded as an indication for revision in 51 cases and stated as 'not present' in 127 cases. No discrepancies were found after preliminary review of case notes and microbiology results.

Conclusion: This is the first study to examine the data quality of the NJR for hip joint infection. The NJR appears to provide valid epidemiological data on infection from our centre. Prospective data validation by other revision centres and implant retrieval centres is needed to maintain high data quality.

Poster 0048

Title **A cough and a painful hip**

Authors Edouard Devaud[1], Jean François Boitiaux[1], Emma-Jo Hayton[1,2]

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Abstract

A 59 year old Sri Lankan man presented on the 19th June with right-sided chest pain, cough, breathlessness and a painful left hip. He had a past medical history of type 2 diabetes, hypogonadism and bilateral osteonecrosis of the femoral head, and a left total hip replacement.

Clinical examination revealed crepitations in the left base, a soft systolic cardiac murmur, and a painful left hip with reduced movement. He had a normal full blood count and U & Es, and elevated C reactive protein (CRP) at 359.

He was treated with amoxicillin 1g TDS IV. Blood cultures were positive for *Streptococcus pneumoniae*. A joint aspirate from the hip taken three days later showed numerous polymorphs, consistent with a purulent effusion, but cultures were negative. How should the hip be managed?

An Infectious Diseases opinion was sought. The hip infection was felt to be in the very early stages, secondary to the bacteraemia. Amoxicillin IV was replaced, after a week of therapy, with levofloxacin 500mg BD and rifampicin 600mg BD for a duration of 12 weeks. At review 18 months later the patient was asymptomatic, with a normal range of movement in the left hip and a CRP of 0.2.

Poster 0049

Title	**Risk of infection and revision surgery after total hip arthroplasty in HIV patients without haemophilia: a systematic review and meta-analysis**
Authors	Raghavendra Marappa Ganeshan[1], Naveen Keerthi[2], David Sochart[1], Ihab Hujazi[1]
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Abstract

Background: The number of HIV positive patients needing joint arthroplasty surgeries is increasing(1). Studies(2) have suggested the relative risk of infection is higher in HIV positive patients after arthroplasty surgery compared to HIV negative patients. Majority of those studies have reported on patients with other co-morbidities like haemophilia and intra-venous drug usage, which are recognized risk factors on their own(3).

Objective: Identify the incidence of infection and revision surgery after THA in HIV patients without haemophilia.

Methods: Literature search was performed from electronic databases EMBASE, MEDLINE and CENTRAL on 21st December 2014. We then hand searched relevant references from appropriate articles.

Data collection and synthesis: Systematic data collection was made using the PRISMA statement, independently by 2 authors followed by quality assessment while disagreements were resolved by consensus.

Results: 3 cohort studies met the criteria, with a pool of 102 THA surgeries in 76 HIV positive and 133 THA in 104 HIV-negative patients. There were 2 revisions in each group for deep-infection with Odds ratio of 1.310 (95%CI, 0.129-13.26) and relative-risk-ratio 1.304(95%CI, 0.133-12.831) based on Mantel-Haenszel method. There was one revision each for instability and inadequate-fixation in HIV patients and 2 revisions for aseptic-loosening and 2 for instability in HIV-negative group.

Conclusions: With this small hetergenous pool, there is no statistically significant difference in infection and revision surgery risk, in mid-term outcome between the groups. This review highlights the need for larger and robust studies to make evidence based conclusion.

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Poster 0050

Title	**Case report of *Actinomyces naeslundii* infection in a total hip replacement**
Authors	Shara Palanivel[1,2], Damien Mack[1,2], Simon Warren[1,2]
Addresses	*[1]Royal National Orthopaedic Hospital, Stanmore, London, UK, [2]Royal Free London NHS Foundation Trust, London, UK*

Abstract

A 63 year old man presented with painful purpuric masses over his 15 year old left total hip replacement and painful range of movement in July 2014.

An ultrasound guided aspiration and synovial biopsy (3 of 3 samples) grew *Actinomyces naeslundii*. This organism was also isolated from all 5 intra-operative samples from his subsequent 1st stage revision in late 2014. The organism grew within 48 hours in Bactec™ blood culture bottles innoculated with intra-operative tissue samples.

Initial antimicrobial susceptibility testing (AST) by E-test showed resistance to penicillin and the isolates were sent to the Public Health Laboratory Anaerobic Reference Lab in Cardiff, Wales for confirmation of identity and AST.

The reference lab confirmed the identity of the organism and showed it to be very susceptible to penicillin and clindamycin.

The patient still shows signs of active actinomycosis and is receiving a prolonged duration of antimicrobial therapy prior to his second stage prosthesis implantation.

Conclusion: Innoculation of intra-operative tissue into blood culture media in the processing laboratory may be an expedient method of obtaining culture positivity. In-house AST may not be a reliable method of ascertaining susceptibilties in slower growing or fastidious organisms.

Poster 0051

Title	**Acute late *Staphylococcus aureus* infection in metal-on-metal hip arthroplasty: a life threatening complication**
Authors	Scott Parker, Elizabeth Clatworthy, Marci Mahesan, Harriet Hughes, Alun John, Steve Jones
Address	*Cardiff and Vale NHS Trust, UK*

Abstract

Adverse local tissue reactions occurring in metal-on-metal hip arthroplasty can make the diagnosis of infection challenging. The authors report on 11 cases of late acute *Staphylococcus aureus* infection in metal-on-metal hip arthroplasty presenting as emergency admissions between 2010 and 2015.

The six women and five men had an average age 65 years at presentation. The time from primary operation was 5.6 years (range 1.5-10.6). The cohort included both patients with failing metal-on-metal hips awaiting revision and those with well functioning hips under ongoing surveillance.

All were systemically unwell at presentation with 85% of blood cultures positive for *Staphylococcus aureus*. Initial working diagnosis included pyrexia of unknown origin, necrotizing fasciitis, groin abscess and soft tissue injury. Treatment was often delayed by presentation to other specialties and distracting minor falls.

All patients underwent surgical management with 7 (64%) requiring multiple surgeries to control infection and 8 (73%) needed ITU admission. Initial microbiology on hip samples confirmed *Staphylococcus aureus* in all cases, 10 MSSA and 1 MRSA, on multiple specimens. Antibiotic treatment was prolonged with 4 cases developing secondary polymicrobial infection on later theatre samples.

Acute delayed joint infection in metal-on-metal arthroplasty was primarily caused by *Staphylococcus aureus* in our cohort. Patients were septic and presented to both medical and surgical specialties. Diagnostic difficulties, poorly localized symptoms and rapid patient deterioration make this a life threatening condition. Metal-on-metal hip replacement may be a risk factor for haematogeneous seeding resulting in acute delayed *Staphylococcus aureus* joint infection.

Poster 0052

Title	**A bone infection registry – demonstrating a united front against orthopaedic infections**
Authors	HK Li, J Finney, M Scarborough, B Atkins, A Woodhouse, A Ramsden, D Stubbs, M McNally
Address	*Oxford University and Oxford University Hospitals NHS Trust, UK*

Abstract

Bone and joint infections are common. Management is technically complex, carries significant healthcare costs and is a daunting experience for patients.

Frequently, patients will require multiple operations in order to treat the infection. Each surgical intervention usually results in greater bone loss, worsening skin and soft tissue scarring and increasingly diverse and resistant microorganisms. Specialist bone infection units involving highly integrated orthopaedic and plastic surgery, as well as infection management, may improve patient outcomes. However, in order to determine the hierarchy of factors influencing outcome, a mechanism for rich, prospective data collection is necessary.

In December 2014, the Nuffield Orthopaedic Centre began to pilot a bone infection registry which aims to provide a Trust-wide service evaluation tool. The registry records specific activities following a patient referral. These include triage actions, multidisciplinary radiology review, "one-stop" combined triple outpatient clinic, operative procedures, medical and surgical complications, essential pathology results with corresponding antibiotic treatments and patient reported outcome measures.

The registry includes six distinct domains that allow for delegation of data entry by each part of the multidisciplinary team thus promoting data accuracy. It includes the capacity to interface with existing hospital databases in order to avoid duplication of data collection.

We aim to demonstrate that such a registry can be of use in designing service provision, reviewing quality metrics and improving patient experience.

Poster 0053

Title	**OVIVA – A trial of oral versus intravenous antibiotics in bone and joint infection (update)**
Authors	HK Li, R Zambellas, A Harin, L Spoors, C Cooper, I Rombach, P Bejon, M Scarborough
Address	*Oxford University and Oxford University Hospitals NHS Trust, UK*

Abstract

Bone and joint infections are common in the UK. The morbidity, mortality and associated disability can be devastating to patients and costly to the NHS.

The current standard care in most centres includes a prolonged course of intravenous antibiotic therapy. This carries with it excess healthcare costs, as well as risks and inconvenience for patients. Conversely, oral therapy, carefully chosen for bioavailability, tissue penetration and activity against the known or likely pathogens, may negate this. Our aim is to determine whether a similar rate of infection recurrence occurs in patients treated with oral as compared to intravenous regimens.

This randomised, non-inferiority trial is currently ongoing in NHS hospitals across the UK. Adults with a bone, joint or metalware-associated infection, who have received less than seven days of intravenous antibiotics from the date of definitive surgery (or diagnosis), are eligible for inclusion. Participants are randomised to receive either oral or intravenous antibiotics for the first six weeks of therapy. The primary outcome measure is definite treatment failure within one year of follow up.

Since March 2013, a collaboration of 26 NHS Trusts has recruited over 800 participants with a target total of 1050. Patient categories include native and prosthetic joint infections, as well as spinal, diabetic foot and long bone osteomyelitis. Pending advice from the data monitoring committee following a second interim analysis, we expect recruitment to continue until late 2015.

Should non-inferiority of oral antibiotic administration be demonstrated, we anticipate that a profound impact on patient experience and healthcare costs will be realised.

5TH ANNUAL OXFORD BONE INFECTION CONFERENCE

Thursday 26th & Friday 27th March 2015

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BONESUPPORT is a Scandinavian medical technology company that produces CERAMENT™|G, the first CE-marked injectable gentamicin antibiotic eluting bone substitute on the market, engineered to provide high local antibiotic delivery whilst remodeling into bone. CERAMENT™|V with vancomycin will be launched towards the end of 2015, offering surgeons an additional tool in the management of osteomyelitis.

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We are proud to be driving improved outcomes across a wide range of clinical applications, in musculoskeletal infection, trauma, spine and sports injuries, for surgeons and patients alike.

Expertise in Infection Management, Heraeus Medical concentrates on medical products for orthopaedic surgery and traumatology. As industry leader for bone cements, the company develops, produces, and markets biomaterials and accessories to make an essential contribution to improving surgical results in bone and joint surgery as well as infection management.

The rise in revision procedures due to infection is one of the most important and serious trends in the Orthopaedic market, and more specifically in the joint arthroplasty segment. For this reason, there is an increasing demand for products for infection diagnostics and management. Biomet offers a diverse product portfolio including; antibiotic-loaded cement for cemented arthoplasty procedures (not for sale in Germany), antibiotic–loaded resorbable fleeces, cement spacer moulds for 2-stage revisions (shoulder, knee, hip), and a cement removal system. Biomet also has an agreement with UK Orthopaedic Microbiology Services (UKOMS) utilizing their expertise in infection diagnostics. These products and services together with our knowledge and competence constitute a critical part of a solution for the surgeon with regard to the treatment of infections in Orthopaedics.

Smith & Nephew develops and markets advanced medical devices that help healthcare professionals treat patients more effectively – and patients get back to their normal lives faster. Our dedicated Global Business Units – Advanced Surgical Devices and Advanced Wound Management – specialise in innovative, cost-effective products that meet pressing healthcare needs.

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Through collaboration with experts in new technology development and clinical practice, CelgenTek is committed to improving surgical outcomes through proven innovative and cost efficient product design and technologies, supported by evidence based research, driven by an experienced and knowledgeable team.

For over 30 years ConvaTec have consistently provided new and innovative products in an ever-changing healthcare environment. From the beginning, our dressings have been defined by their excellent quality and are painstakingly designed to meet the changing needs of patients and the healthcare professionals who care for them.

Acelity is a global wound care and regenerative medicine company committed to advancing the science of healing and restoring people's lives. Headquartered in San Antonio, Texas, Acelity delivers value through cutting-edge therapies and innovative products that address unmet clinical needs and lead the industry in quality, safety and customer experience. Our passion for our customers and their patients unites Acelity employees around the world. For more information, please visit Acelity.com.

'We have been bringing innovative answers to clinical questions since 1984. We find these answers by listening to health care professionals and patients, and having the courage to answer the difficult questions with new ideas. As a group we focus on reconstruction, sports medicine, accessories and infection control. The company has grown to command a high level of clinical respect amongst leading clinicians, academics and industry leaders within the global orthopaedic market.

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The Nordic Group is privately-owned, fast-growing, fully-integrated, pan-European Pharmaceutical group with a strong emphasis on quality product and services that cater to the special needs of each client and patient. The Nordic Group originated in 1995 with the establishment of the first Nordic organisation in Scandinavia. Today the group focuses in two specialised segments of the pharmaceutical market: marketing and sales of speciality pharmaceuticals; specialised pharmaceutical services which focus on product development, manufacturing, supply logistics and regulatory activities. Our vision is to establish a pan-European speciality pharmaceutical group and to provide the highest quality international pharmaceutical products and services to our customers, partners and patients.

In 2009, the British Infection Society merged with the Association of Medical Microbiologists to form the British Infection Association. With over 1400 members, the BIA promotes the science and practice of medicine in relation to infection, and provides support for all infection specialists and trainees, whether in clinical practice, laboratory medicine, public health, research or education. The Association is committed to working collaboratively with other professional bodies and external agencies to produce standards and evidence-based guidance to improve patient care.

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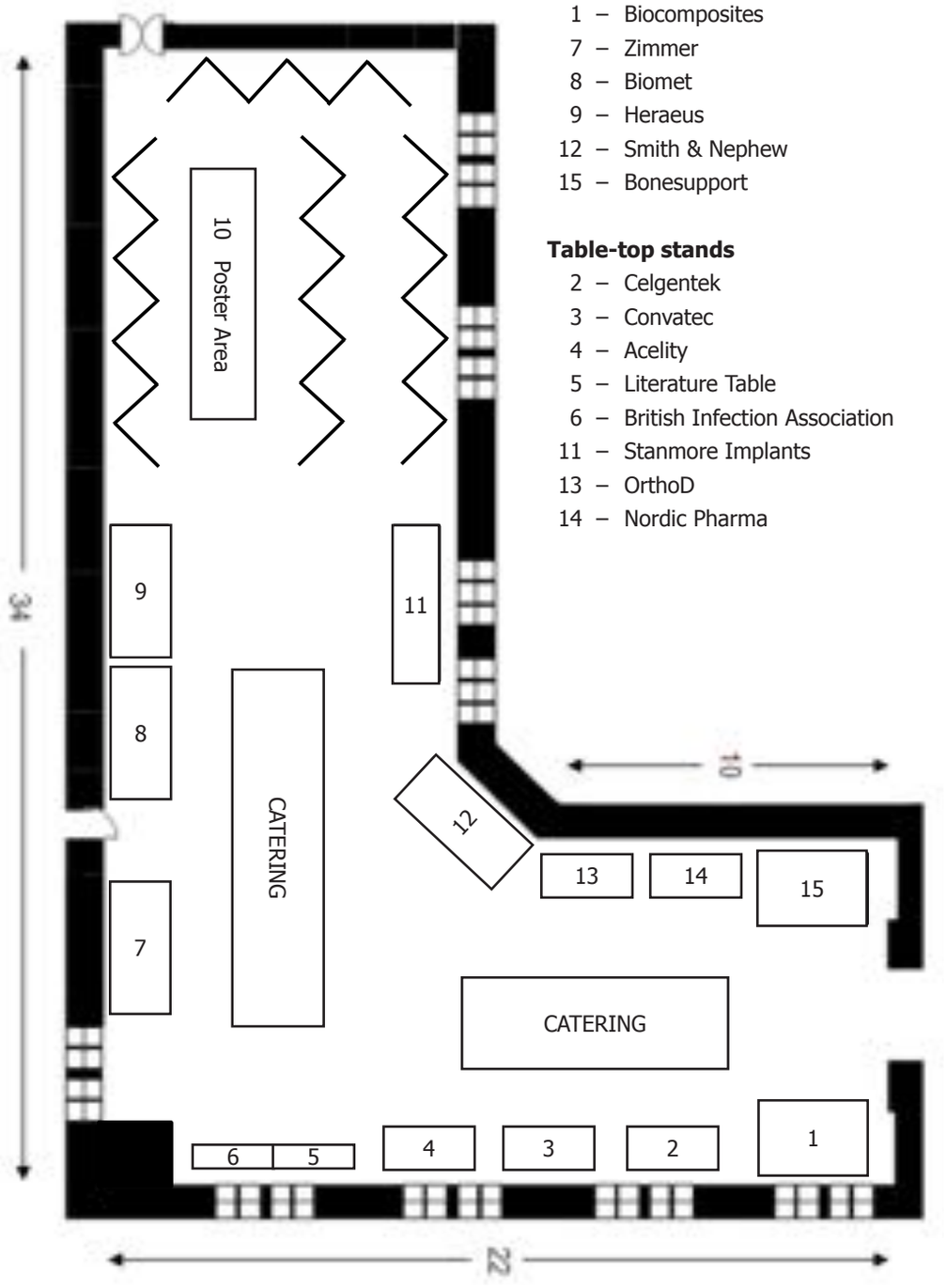
EXHIBITION HALL

EXAMINATION Schools



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2 – Celgentek
3 – Convatec
4 – Acelity
5 – Literature Table
6 – British Infection Association
11 – Stanmore Implants
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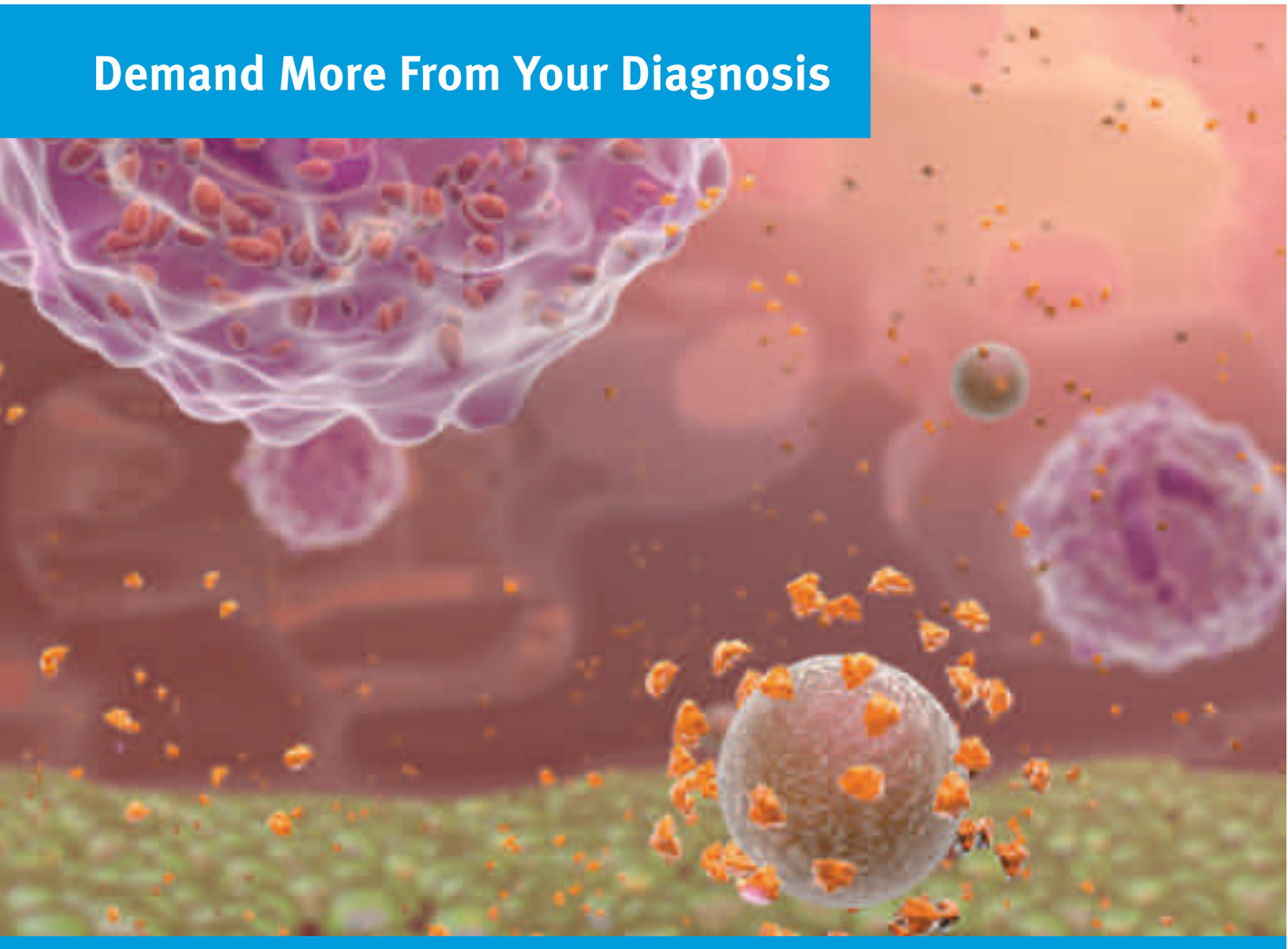

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[1] Deirmengian et al – Combined Measurement of Synovial Fluid α-def and CRP level – J Bone Joint Surg Am. 2014;96:1439-45

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