The twin terror: fungal and tuberculous co-infection of the spine in a non-immunocompromised patient

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Simultaneous infection of both fungal and tuberculous organisms is a very remote occurrence, especially in a non-immunocompromised patient. A previously healthy 66 years old male presented with severe backpain and weakness of lower limbs for 2 weeks. Examination revealed localised tenderness at thoracolumbar region, with both lower limbs exhibited grade 3 muscle power. Laboratory investigations showed normal white cell count and erythrocyte sedimentation rate. Thoracolumbar radiograph revealed collapse of T11 with endplates erosion. Magnetic resonance imaging confirmed the findings, and found abscess within T10/T11 intervertebral disc space, extending to the paraspinal region. He underwent debridement, posterior decompression and stabilisation of thoracolumbar spine. Intraoperative culture yielded growth of Candida albicans. Surprisingly, Mycobacterium tuberculosis was also isolated from bone and tissue culture. Polymerase-chain reaction (PCR) test for tuberculosis returned positive. Combination of antituberculosis (anti-TB) regime and oral antifungal medication was started. He gradually recovered, currently ambulating with walking frame. Despite its rarity, fungal and tuberculous co-infection of the spine should be managed the way it is treated when occurred individually—by prioritising medical therapy and combining with surgery whenever it is indicated. Early diagnosis and commencement of treatment have shown to correlate with good outcomes.

Abstract without diagnosis
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Title: A rare form of osteomyelitis(?) located the proximal lower leg

Authors: Jan Hendrik Rolfing¹,², Klaus Kjær Petersen³

Addresses: ¹Department of Orthopedic Surgery, Aarhus University Hospital, Aarhus, Denmark. ². ³Department of orthopedic Surgery, Aarhus University Hospital, Aarhus, Denmark

Abstract

A thirty year old healthy woman with no known diseases or injuries. She has just moved to our area. For about seven years she has been bothered by swelling and light pain in the left lower leg. Radiographs was taken showing sclerotic changes in the proximal tibia and fibula and destruction of the proximal tibiofibular joint. At “elsewhere hospital” biopsies were taken previously. All cultures and PCR were negative. Histology showed “chronic inflammation, no malignity”. Fungal osteomyelitis were suspected on the basis of the radiological examinations. Blood titre of Aspergillus was very high and decreased after starting antifungal treatment – and increased again after discontinuation. So we believe it is a fungal osteomyelitis. The patient is doing fine: can look after a full time standing and walking job and has just given birth to her second child. What to do?!

Abstract without diagnosis

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What is the diagnosis and what to do?!
**Cysticercosis of the foot – Case report of a rare pseudo-tumour**

**Authors**
Sachindra Nayak Kapadi¹, Prathap Parvataneni², Sanjeev Musuvathy Ravi³

**Addresses**
¹Wrightington Wigan and Leigh NHS, Wigan. ²KIMS hospital, Hyderabad, India

**Abstract**

**Introduction:** Cysticercosis in humans is due to Taenia Solium parasite infection. They most commonly affect the central nervous system and less commonly the eye and striated muscles. We would like to present one such case which we came across in clinical practice and posed a serious diagnostic dilemma.

**Case report:** A 22 year old Indian female presented to our teaching hospital in southern India with complains of an atraumatic swelling and pain in her left foot for a week. She had no constitutional symptoms. On local examination there was diffuse swelling and redness on both dorsal and plantar surface of the foot with no local rise of temperature. Palpation revealed a 2 x 2 cm deep swelling with undefined margins.

**Investigations:** Besides an ESR of 75 mm/hr, all her other blood investigations were normal. At this juncture the differential diagnosis was that of a soft tissue tumour and it was decided to go ahead with a MRI scan. MRI foot showed small cystic scolex shaped lesion measuring 8 millimeter in the plantar aspect deep to flexor tendons at the level of 2nd metatarsal with a hypo tense focus and associated collection which confirmed a striated muscle Cysticercosis.

**Treatment:** The patient was treated conservatively with a combination of albendazole, analgesics and a single intramuscular steroid injection. She made a dramatic recovery in one and half months’ time.

**Conclusion:** Cysticercosis can affect the muscles of the foot and mimic a tumour. It can however be treated conservatively with good clinical outcome.

**Abstract without diagnosis**

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**Investigations:** Besides an ESR of 75 mm/hr all her other blood investigations were normal. X ray of the foot was normal as well. At this juncture the differential diagnosis was that of a soft tissue tumour and it was decided to go ahead with a MRI scan. MRI foot showed small cystic scolex shaped lesion measuring 8 millimeter in the plantar aspect deep to flexor tendons at the level of 2nd metatarsal with a hypo tense focus and associated collection

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Title  Locally invasive Aspergillus infection of the iliac bone: a unique case
Authors  Abi Manesh, Boopalan PRJVC, Abel Livingston
Address  Christian Medical College, Vellore, India

Abstract

Introduction: A 46 years old radiology technician from South India presented with complaints of right hip pain since four months. He described the pain as a constant ache, with no radiation, and exacerbated particularly by movements. The hip pain had also been limiting with work and activities of daily living and he was limping for the last 2 months. On examination he had a pain free full range of movement in his right hip. He did not have sacroiliac joint tenderness as well. He has history of receiving multiple injections in the right gluteal area. He has diabetes mellitus for seven years and is on insulin therapy.

Investigations: His bloods showed mildly elevated inflammatory markers with a negative rheumatological screen. X-Ray revealed osteolyelitic changes in the right iliac bone. The MRI revealed an altered marrow signal intensity involving the right iliac wing in the form of T1 intermediate and T2 and STIR heterogeneous hyperintensity suggestive of osteomyelitis with collections around the iliac crest and surrounding muscles. He underwent debridement and biopsy of the right iliac bone under general anesthesia. The biopsy showed chronic granulomatous inflammation with septate fungal hyphae. The fungal cultures grew aspergillus flavus sensitive to amphotericin and voriconazole.

Treatment: He was commenced on voriconazole. He had full symptom resolution on therapy and his MRI 6 months later showed near complete resolution of the previous changes.

Conclusion: Aspergillus, a ubiquitous fungus may rarely present with locally invasive bone infections especially in patients with uncontrolled diabetes mellitus.

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Title  Retained topical negative pressure dressing foam masquerading as sacral osteomyelitis

Authors  Johann Jeevaratnam, Alex Ramsden

Address  Oxford University Hospitals NHS Foundation Trust, Oxford

Abstract

We present the case of a 63-year-old diabetic gentleman, who was referred to the Oxford Bone Infection Unit due to concern regarding a non-healing sacral wound and suspected underlying osteomyelitis. The wound resulted following a prolonged period of immobility while on critical care following coronary heart bypass surgery in November 2017.

Magnetic resonance imaging at the referring hospital raised concern with regard to sacral osteomyelitis, which they managed locally with intravenous antibiotics and topical negative pressure (TNP) dressings.

Despite removal of retained TNP sponge by the Practice Nurse in March 2019, the wound failed to heal. Further MRI suggested possible osteomyelitis in the coccyx and sacrum. The patient underwent wound excision, bone sampling and local muscle flap closure in Oxford, in October 2019, approximately two years after the inciting incident.

Peri-operative findings were that of extensive chronic inflammatory tissue around what appeared to be retained TNP sponge, lying 10 cm cranial to the sinus opening. Both sacrum & coccyx were healthy. Histopathology ultimately confirmed these suspicions, identifying a mesh-like foreign body.

The patient went on to achieve primary healing with no further wound concerns.

Abstract without diagnosis

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A 40 year old fit stay-at-home dad first presented with right upper lobe pneumonia at the end of 2017. Despite standard pneumonia investigations and treatment he subsequently developed a subcutaneous collection to the posterior back, which was drained. He was given multiple courses of antibiotics for skin and soft tissue infection but continued to complain of discharge and pain. The respiratory team requested interval imaging to assess the right upper lobe changes, which incidentally picked up T2-T7 osteomyelitis and a paravertebral abscess. CT-guided biopsy grew *Aggregatibacter actinomycetemcomitans*. Gram staining of the tissue revealed Gram positive filamentous organisms suspicious for Actinomyces. These two pathogens are well known to co-exist. On questioning, the patient recalled dental issues culminating in a tooth extraction which was thought to be the source. We postulated a haematogenous route of dissemination; happily TTE was normal with no features of endocarditis.

The patient was managed with IV ceftriaxone via OPAT, followed by a long course of PO doxycycline 200mg OD to treat Actinomycosis.

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Free Papers 1

Title

Double-barrel non-vascularised free fibular graft for treatment of non-union following distraction osteogenesis after resection of chronic osteomyelitis of the femur

Authors

Ahmad Arieff Atan¹, Sughilan Sundara Murthi², Khong Wee Lee², Idris Abu Bakar², Mustaqim Afifi²

Addresses

¹Department of Orthopaedic, Hospital Tuanku Ja'afar, Seremban, Negeri Sembilan, Malaysia. ²Department of Orthopaedic, Hospital Tawau, Tawau, Sabah, Malaysia

Abstract

A huge gap following resection of infected bone usually necessitates a longer duration of bony transport for distraction osteogenesis. Non-union at docking site is a common complication, and normally requires bone grafting with favourable osteogenetic capability, such as a vascularised bone graft. A 20 years old male was diagnosed with chronic osteomyelitis of left femur, after presented with swelling and pus discharge from the left thigh. Initial radiograph revealed irregular, thickened cortical surfaces with multiple lytic area. Further evaluation using MRI and CT scan revealed presence of multiple sequestrum and involucrum, with a communicating intramuscular sinus extending to the anteromedial subcutaneous area. He underwent resection of the infected bone, application of limb reconstruction system (LRS) monorail and cement spacer insertion. The resected part measured about 29.5cm. After 2 weeks, the cement spacer was removed and corticotomy for bone transport was done. The culture grew Staphylococcus aureus, and he completed antibiotics regime for 6 weeks. Subsequently, the infection was eradicated and bony transport was successful to regenerate new bone at the resected part. Total bone transport duration was about 10 months. However, as anticipated, it was complicated with fibrous non-union at the docking site. He underwent bone grafting using double-barrel non-vascularised free fibular graft, while the LRS was removed and replaced with a long reverse distal femoral locking plate. After 10 weeks, the bone achieved union and he was able to walk without support. Double-barrel non-vascularised fibular graft is a viable option for management of non-union after long-duration bone transport.

Abstract without Diagnosis

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Does local implantation of gentamicin impair renal function in patients undergoing surgery for chronic osteomyelitis and fracture-related infection?

Catherine Birnie, Robert Hyder-Wilson, Jamie Ferguson, Martin McNally

Bone Infection Unit, Oxford

Introduction: Chronic osteomyelitis is often treated with local antibiotic carrier implantation following dead bone excision. Whilst gentamicin has been used locally, concerns have existed of induced renal dysfunction due to systemic toxicity.

Method: 163 patients had single-stage chronic osteomyelitis excision and void filling with Cerament G™, containing gentamicin. Mean carrier volume was 10.9mls (range 1-30mls) and mean gentamicin dosing was 190.75mg (maximum 525mg). Seven patients had pre-existing renal disease. Serum creatinine levels were collected pre-operatively and during the first seven days post-operatively. Glomerular filtration rate (GFR) was calculated using the CKD-epi creatinine equation. Renal function was described using the Chronic Kidney Disease (CKD) Staging.

Results: 155 cases had a pre- and post-operative GFR. Pre-operative CKD staging demonstrated 118 Class I, 30 Class II, 3 Class IIIa, 3 Class IIIb, and 1 Class V. Mean pre-operative GFR (99.7ml/min/1.73m², SD 21.0) was no different to post-operative GFR (103.2ml/min/1.73m², SD 21.3), p= 0.0861. No patient had clinical signs of new acute renal dysfunction post-operatively. Four cases had >10% decline in GFR below normal, with only one case dropping a CKD stage, from I (normal) to II (mildly decreased).

Only 1/7 case with pre-existing renal disease had a GFR drop >10% (from 11ml/min/1.73m² to 8ml/min/1.73m²).

70/155 (45.2%) had a temporary GFR drop post-operatively, with the biggest drop occurring a mean 3.06 days following surgery (SD 2.1).

Conclusion: Renal function is not significantly affected by local implantation of gentamicin up to 525mg. The presence of pre-existing renal disease is not a contraindication to local gentamicin therapy.
Title: Review of the current management of bone and joint infections within the Outpatient Parenteral Antimicrobial Therapy (OPAT) service of a large tertiary hospital in Dublin, Ireland.

Authors: Eileen Sweeney¹, Aimee Mc Greal-Bellone¹, Muhammad Muneeb Umar², Con O'Donovan¹, Colm Bergin¹,², Concepta Merry³, Brian O'Connell⁴, Susan Clarke¹

Addresses: ¹Department of Genito Urinary Medicine and Infectious Diseases, St. James Hospital, Dublin, Ireland. ²School of Medicine, Trinity College, Dublin, Ireland. ³Department of Microbiology, St. James Hospital, Dublin, Ireland

Abstract

Purpose: Bone and joint infections (BJI) require prolonged antimicrobial therapy. Although traditionally given intravenously (IV), the optimal route and duration of antimicrobial treatment are now under consideration. The aim of this review was to ascertain the current management of BJI referred to Outpatient Parenteral Antimicrobial Therapy (OPAT) in St. James Hospital (SJH), Dublin.

Method: A retrospective review was conducted on patients referred to the OPAT programme between October 2018 – October 2019. Variables including demographics, co–morbidities, surgical intervention and antimicrobial history were collected from patient records.

Results: 81 patients were included in the study. 73 % were male, mean age of 54.7 years. The predominant site affected was the foot (23/81, 28%), 65% of whom had underlying diabetes. There was a surgical intervention in 47 of 81 (58%) patients. Targeted therapy was prescribed in 56 of 81(69%) of patients. Methicillin susceptible Staphylococcus aureus (MSSA) alone or in combination was the most commonly recovered organism (27/81, 33%). Over half of MSSA isolates were susceptible to oral antimicrobials with excellent bioavailability. At least six weeks of IV antimicrobials was prescribed in 63 of 81 (78%) patients. Ceftriaxone was most frequently prescribed IV antimicrobial 35/81(43%). Subsequent oral consolidation was prescribed in 41% of patients.

Conclusion: Most patients managed by OPAT in SJH for BJI received six weeks of IV antimicrobials in keeping with current guidelines. Over half of MSSA associated infections could have been considered for oral antimicrobials in accordance with recent clinical trials which would have a significant impact on OPAT resource utilisation.
| **Title** | The impact of the gentamicin-eluting injectable synthetic bone substitute, CERAMENT G, in the treatment of toe amputation for chronic bone infection at a minimum one year follow-up. |
| **Authors** | Michael Field, Jamie Banks, Joshua Luck, Nicholas Ward, Alexander Wee |
| **Address** | Frimley Park Hospital, Camberley |

### Abstract

**Purpose:** To assess the impact of the gentamicin-eluting injectable synthetic bone substitute, CERAMENT G, in the treatment of toe amputation for chronic bone infection at a minimum one year follow-up.

**Methods:** We retrospectively reviewed all cases of toe amputation in our institution where CERAMENT G was used. We also identified a cohort of patients who underwent toe amputation for chronic bone infection where no local antibiotic eluting agent was used. Re-operation rate and evidence of local complications, including symptomatic heterotrophic ossification, were assessed in both groups.

**Results:** Patients undergoing toe amputation for chronic bone infection with the use of CERAMENT G demonstrated a lower re-operation rate at minimum one year follow-up with no additional adverse outcomes noted.

**Conclusions:** CERAMENT G demonstrates potential benefits in toe amputation for chronic bone infection at minimum one-year follow up.
Title  |  Comparison of the presentation and outcomes of bacterial and tuberculous large joint infection

Authors  |  Dr Jack Goodall, Dr Jessica Barrett, Dr Ben Patterson, Dr Matthew Colquhoun, Dr Sarah Williamson, Dr Ana Clayton-Smith, Dr Tumena Corrah

Address  |  Northwick Park Hospital, London

Abstract

Introduction: Large joint infections can lead to significant long-term morbidity, however, data regarding outcomes are limited.

Methods: We reviewed the presentation and outcomes of large joint tuberculosis infections (LJTI) and bacterial infections (LJBI) as a service evaluation. LJTI were identified via the London Tuberculosis Register (01/01/2010-01/01/2019) and LJBI via positive joint fluid samples (01/01/13-01/01/19). Data were collected from the medical records and via telephone follow-up. Prosthetic and superficial infections were excluded.

Results: We evaluated 44 patients with LJTI and 64 patients with LJBI. The organism in LJBI were: 42.2% Staphylococcus aureus (with 11% of these being methicillin resistant); 12.5% Streptococcus pyogenes; 9.4% Escherichia coli and 6.3% Pseudomonas aeruginosa. Other gram positives were found in 25% and other gram negative in 4.7%.

<table>
<thead>
<tr>
<th>Joint fluid</th>
<th>TB n= 30</th>
<th>Bacterial n = 58</th>
</tr>
</thead>
<tbody>
<tr>
<td>acellular</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>+</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>++</td>
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<td>16</td>
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<tr>
<td>+++</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>Granulomata</td>
<td>3</td>
<td>0</td>
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</tbody>
</table>

Table: comparison of joint fluid aspirates

<table>
<thead>
<tr>
<th>LTI</th>
<th>Bacterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Median (IQR)</td>
</tr>
<tr>
<td>WCC</td>
<td>6.9 (6.1-8.1)</td>
</tr>
<tr>
<td>Neutrophils</td>
<td>4.5 (4.0-5.7)</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>1.5 (1.1-1.8)</td>
</tr>
<tr>
<td>CRP</td>
<td>24.5 (7.3-37)</td>
</tr>
<tr>
<td>ESR</td>
<td>45 (15.3-63.3)</td>
</tr>
</tbody>
</table>

Table 1: comparisons by Mann Whitney U

Following antimicrobial therapy (excluding loss to follow-up)
LJTI: (n=36)
- 77.8% asymptomatic at last follow-up
- 13.9% symptomatic, not requiring surgery
- 8.3% underwent surgical intervention (one bone graft, one arthroplasty, one arthroscopy)
- No deaths

LJBI: (n=43)
- 51.2% asymptomatic at last follow-up
- 25.6% symptomatic, not requiring surgery
- 9.3% underwent surgical intervention (two arthroplasties, two arthroscopies)
- 14% mortality

The mortality was significantly greater in the LJBI group (p=0.029 by Fisher’s exact test).

**Conclusions:** LJBI was associated with higher serum inflammatory marker and higher mortality rates compared with LJTI. Post-treatment morbidity was common in both groups.
Title: The effect of sole gentamicin loaded bio-composite treatment following limited or extensive debridement of osteomyelitis lesions in a porcine model

Authors: Sophie Amalie Blirup-Plum¹, Thomas Bjarnsholt²⁻³, Henrik Elvang Jensen¹, Kasper N Kragh⁴, Bent Aalbæk¹, Hans Gottlieb⁵, Mats Bue⁵, Louise Kruse Jensen¹

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⁴Department of Orthopedic Surgery, Herlev Hospital, Herlev Ringvej 75, 2730 Herlev, Denmark
⁵Orthopaedic Research Unit, Aarhus University Hospital, Palle Juul-Jensens Boulevard 99, 8200 Aarhus N, Denmark

Abstract

Objectives: CERAMENT™|G is an absorbable gentamicin loaded bio-composite, trusted by several clinical studies as an on-site vehicle of antibiotics for the treatment of chronic osteomyelitis. We aimed to assess the sole effect of CERAMENT™|G, i.e. without additional systemic antibiotic therapy, in relation to a limited or extensive debridement of osteomyelitis lesions in a porcine model.

Methods: Osteomyelitis was induced in nine pigs by inoculation of 10⁴ CFU of Staphylococcus aureus into a drill hole in the left tibia. After one week, the pigs were allocated into three groups. Group A (n=3) received no treatment during the study period (19 days). Group B (n=3) and C (n=3) received limited or extensive debridement 7 days post inoculation, respectively, followed by injection of CERAMENT™|G into the bone voids. The pigs were euthanized 10 (Group C) and 12 (Group B) days after the intervention.

Results: All animals demonstrated confirmatory signs of bone infection post-mortem. The estimated amount of inflammation was substantially greater in Groups A and B compared to Group C. In both Groups B and C, peptide nucleic acid fluorescence in situ hybridization (PNA FISH) of CERAMENT™|G and surrounding bone tissue revealed bacteria embedded in an opaque matrix, i.e. within biofilm. In addition, in Group C, the peak post-mortem gentamicin concentrations in CERAMENT™|G and surrounding bone tissue samples were 16.6 µg/mL and 6.2 µg/mL, respectively.

Conclusion: CERAMENT™|G may not be used as a standalone alternative to extensive debridement or be used without the addition of systemic antibiotics.

¹(CeramentTM | G, BONESUPPORT, Lund Sweden)
Title: Bone and joint infections due to methicillin susceptible staphylococcus aureus bacteraemia - a one year retrospective study at tertiary hospital, UHCW.

Authors: Rinku Chaurasia, Anand Deshmukh, Peter Munthali

Address: University Hospital Coventry and Warwickshire NHS Trust, Coventry

Abstract

Background: Staphylococcus aureus is recognised an important pathogen of bone and joint infections. The pattern of acute infections caused by these virulent pathogen has changed over the time.

Aim: The study was undertaken to present the clinical characteristics, risk factors, and outcomes of patients with osteoarticular infections, associated with Staphylococcus aureus infections.

Method: A total of 121 patients with MSSA sepsicaemia between January 2019 to December 2019 were included. Demographic and clinical characteristic reviewed from the Patient information system.

Results: The primary source of infection was musculoskeletal in 31 patients (25.6%). Among these 49.1% native septic arthritis, 19.5% prosthetic joint infection, 16.2% long bone Osteomyelitis, 13% vertebral Osteomyelitis and 9.6% others. The overall rate of infection was higher in males than in females with the incidence recorded highest amongst person > 65 years. Several groups were identified as being at significantly higher risk for developing metastatic infections. Out of 31 Patients, six had other deep seated focus such as Infective Endocarditis. Two patients (6%) with MSSA Septicaemia died from other cause of sepsis.

Conclusion: Staphylococcus aureus bacteraemia are particularly problematic because of the high incidence of associated complicated infections. Therefore, it is important to treat vigorously at early stages to prevent furthermore complications.
Title: Prevalence of staphylococcus aureus colonization in patients for total joint arthroplasty in South Africa

Authors: Jurek Pietrzak, Zia Maharaj, Lipalo Mokete

Addresses

Abstract

Introduction: Periprosthetic joint infections (PJIs) are a major source of morbidity and mortality for patients undergoing Total Joint Arthroplasty (TJA). Staphylococcus aureus (S aureus) colonization is an independent, modifiable risk factor for PJI. Post-operative infections are reported to be ten times greater in S aureus-carriers compared to non-carriers in developed countries however similar data is lacking for the developing world. This study aims to determine the prevalence of S aureus colonization in patients awaiting TJA in South Africa.

Methods: We prospectively assessed 119 patients awaiting Total Knee Arthroplasty (TKA) and Total Hip Arthroplasty (THA) between May and October 2016. We screened three separate anatomical sites on each patient for S aureus. Patients with positive cultures were treated with intranasal mupirocin ointment and chlorhexidine body wash. Data was correlated with positive results and potential risk factors were evaluated.

Results: The overall prevalence of Methicillin Sensitive S aureus (MSSA) was 31.9% (n = 38). There were no patients colonized with Methicillin Resistant S aureus (MRSA). Eradication was successful in 94.74% (n=36) after five days treatment. The overall complication rate was 7.6% (n=9). The 30-day readmission rate in the MSSA-colonized group was 7.9% (n=3) as opposed to 7.4% (n=6) in the non-colonized cohort. No cases were revised at a mean follow-up of 2.26 years.

Conclusions: The prevalence of S aureus in TJA patients in South Africa is equivalent to reported data from developed countries. A larger cohort of patients is recommended to determine risk factors and post-operative septic sequelae in this population group.
Necrotizing Fasciitis – an experience in a UK District General Hospital

Kawaljit Dhaliwal¹, Rajesh Bawale², Srinivaso Samsani¹

¹Medway Maritime Hospital, Gillingham, United Kingdom. ²Medway maritime Hospital, Gillingham

Abstract

Background: Necrotizing fasciitis (NF) is a life/limb threatening condition that results in gross morbidity and mortality if not treated in its early stages. However, on onset, it is difficult to differentiate from other superficial skin conditions such as cellulitis, bruising secondary to the trauma. In this case series we aim to review the clinical presentation of Necrotising fasciitis orthopaedic cases, the role of early diagnosis to assess the PPV of the LRNEC score in cases proven to need urgent surgical intervention.

Methods: The data was collected prospectively and retrospectively from computerised and file records of 16 consecutive patients who have been admitted in our hospital. When clinical assessment and surgical exploration were equivocal, the final diagnosis of NF in our study was made based on confirmatory histopathologic analysis. LRNEC score was calculated at presentation.

Results: The results collected for each of the 16 patients were age, gender, pre-disposing factors, presenting signs and symptoms, location of infection, laboratory findings, microbiological cultures, the type of therapy used, treatment outcome and number of days in the hospital. Patient age ranged from 30 to 77 years (average age 54.6). In our case series, we noted streptococcal is the commonest pathogen found in 9 cases, staphylococcus was seen in 4 cases, 2 cases had serretia marcescens and mixed anaerobes noted in 1 case.  PPV for LRNEC was 96%.

Conclusion: We strongly recommend high clinical suspicion, prompt investigations and resuscitation with appropriate antimicrobial therapy followed by expedited surgical debridement to reduce the morbidity and mortality.

Abstract without diagnosis

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Title Debridement, Antibiotics and Implant retention (DAIR) following total hip and knee replacements: a DGH experience

Authors Fady Awad, Salim Punjabi, Kodali Prasad, Chanaka Silva, Stephen Sarasin, Peter Lewis

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Abstract

Introduction: The gold standard management for a prosthetic joint infection (PJI) is a two stage revision procedure. However, if a PJI is diagnosed promptly a debridement, antibiotics and implant retention (DAIR) procedure can be performed. We report the results of our experience with the DAIR procedure in a District General Hospital.

Methods: This is a single centre retrospective review of a prospectively updated database. All patients who underwent a DAIR procedure following a total hip or knee replacement from August 2012 to July 2019 were included in the study with no exclusions.

Results: Four total knee replacements, fifteen total hip replacements, two revision total hip replacements and three hemiarthroplasties were included in the study. Average duration from onset of symptoms to the DAIR procedure was 10 days. All patients had exchange of modular components during the DAIR procedure. Staphylococcus aureus (23%) and staphylococcus epidermidis (23%) were the most common causative organisms and the most common antibiotic regimens included intravenous teicoplanin (54%) and flucloxacillin (16%). Average follow up in clinic was 48 months. 80% of patients had a stable post-operative recovery with no recurrence of infection. One patient required a revision total hip replacement for aseptic loosening; one patient required a knee arthrodesis and three patients died.

Conclusion: This mid term study with mean follow up of 48 months from a DGH setting presents the outcome of 24 DAIR procedures. Positive cultures were identified in 22 cases, infection was successfully eradicated in 19 patients and 2 patients required revision surgery.
Title: Management of Fracture Related Infections (FRIs) at a Local DGH against British Orthopaedic Association Standards for Trauma (BOAST) guidelines.

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Abstract

Introduction: Poor management of fracture related infections can have a significant impact on patient outcomes and on the associated morbidity and mortality. This in turn has an associated adverse impact for NHS Trusts in relation to length of stay & cost of treatment. We aim to assess our practice in identifying & managing fracture related infections (FRIs) as compared to the new BOAST guidelines.

Method: This was a retrospective study. We identified patients presenting to Southport District General Hospital with a post-operative infection following fracture fixation between September 2018 - September 2019. Clinical notes, pathology and imaging results were reviewed.

Results: 16 patients were identified after developing a FRI. The cohort included 7 hip fractures, 3 olecranon fractures, 2 clavicle, 2 ankle, 1 forearm and 1 foot fracture. Identification/work-up: Only 40% of septic patients had a medical review. 82% of septic patients had blood cultures. 94% of all cases had plain radiographs taken and 12% had their wound photographed.

Management: 82% had i.v antibiotics without delay. 100% of patients with a FRI were discussed at a bone & joint infection MDT. 88% required at least 1 return to theatre. There were 3 mortalities.

Conclusions: This study demonstrates that fracture related infections are a serious complication of surgical fixation; with a high return to theatre rate (88%) and resulting in 3 fatalities in our unit. Following this audit we have implemented a management flow chart for use in A&E to improve our practice. This includes expert advice from Tissue Viability and Microbiology teams regarding wound management and Antibiotic choice.
Purpose: The role of a labelled white cell scans to help diagnose a peri-prosthetic joint infection (PJI) in the painful knee arthroplasty remains unclear. The International Consensus Meeting (ICM) criteria represent an accepted method of defining the presence of a PJI. This retrospective study assesses the diagnostic accuracy of labelled white cell scans when compared to the ICM criteria.

Methods: All patients over a 72-month period in a high-volume tertiary knee revision unit, in whom a labelled white cell scan was performed, were retrospectively analysed. The interpretation of these scans was compared to the ICM criteria for a diagnosis of a PJI.

Results: Ninety-one scans were performed in total. Of these, 18 (19.8%) were subsequently diagnosed and treated for a PJI. Only 3 of the 91 scans (3.2%) were interpreted as diagnostic of a PJI; however all 3 patients were from the group of 18 who were treated for a PJI. Fifteen of the 91 scans (16.5%) were interpreted as inconclusive, whilst 73 scans (80.2%) were interpreted as showing no signs of a PJI. Our results shows that as an adjunct to diagnosing a PJI, a labelled white cell scan has a sensitivity of 16.7%, a specificity of 100%, a positive predictive value of 100% and a negative predictive value of 85.4%.

Conclusion: Labelled white cell scans have a limited role in diagnosing a PJI; this should still be made according to the ICM criteria. These scans may not represent a cost-effective modality and interpretation should be treated with caution.
Title: A service evaluation into the outcomes of periprosthetic joint infections in total hip replacements and total knee replacements

Authors: Ismail Saddaoui\textsuperscript{1}, Aaron Yeung\textsuperscript{1}, Edward Gardner\textsuperscript{2}, Kordo Saeed\textsuperscript{2}

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Abstract

Background: Total Hip Replacement (THR) and Total Knee Replacement (TKR) are staple procedures for end-stage arthritis and/or trauma in the young and elderly. One serious complication of these procedures is Peri-prosthetic Joint Infection (PJI) which is both equally difficult to diagnose and treat. Treatments vary from antibiotic administration to revision surgery (Debridement Antibiotics and Implant Retention [DAIR], One-stage or Two-stage) or a combination of both.

Aims: To evaluate and examine the microbiological and surgical treatment options and outcomes for treating PJIs at the University Hospital Southampton (UHS) compared to existing literature.

Methods: Patients with PJI infections of THR or TKR were identified from an infection database, referred to microbiology from the Trauma and Orthopaedics department. A total of 124 patient were identified with only 112 patients satisfying the inclusion criteria. A qualitative measure was also enlisted through the Oxford Score (Knee and Hip) used as a secondary outcome measure.

Results: 112 patients were included in the study with the mean age being 73 years old at patients’ latest operation. Of these, 38 had infected THR while 74 had infected TKR. 61\% of THR were cured after initial treatment procedure while only 47\% of TKR were cured. There was no significant different in treatment outcome of giving one intervention, be it surgical or pharmacological (i.e. antibiotics), over multiple. Three patients had an amputation after failed multiple revisions. Out of all the treatment modalities two-stage revision showed the most promising cure of infection with a success-rate of 77\% (n=58)
Title: The use of primary implants for revision of the infected total knee replacement: good short- to mid-term results with significant cost saving

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Abstract

Purpose: We report on the outcomes of revision of infected total knee replacements (TKR) using primary implants.

Methods: We performed a retrospective observational study of patients who underwent revision TKR for infection using primary implants. 20 patients underwent revision of both femoral and tibial components using the Medial Rotating Knee (MRK) prosthesis (MatOrtho, Surrey, UK). Oxford Knee Scores (OKS) were obtained pre- and post-operatively. Survivorship was assessed using Kaplan-Meier survival curves. Cost analysis was performed and compared to the total cost of the most commonly used revision construct at our institution in “like-for-like” revision cases.

Results: 20 patients underwent revision TKR for infection; 17 of these cases satisfied the 2018 ICM criteria for prosthetic joint infection, with the remaining 3 being treated as infection despite not satisfying the criteria. 18 knees (90%) underwent a 2 stage procedure whereas 2 knees (10%) underwent single stage revision. 3 patients died in the follow up period at a mean of 1.7 years post-op. Median OKS improved from 11.5 to 32.5 (IQR 21.5 – 39.3) at a mean of 5.0 years post-op (p<0.05). 5 year survivorship was 100%. The use of primary implants resulted in an average implant costs saving of 52% per case.

Conclusions: The use of primary, stemmed implants, such as the MRK, can be safely used in the management of infected TKR. This small case series has demonstrated significant improvement in patient reported outcomes and excellent survivorship.
Inferior accuracy of serum inflammatory markers in diagnosing fracture related infections

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In this retrospective study, the accuracy of serum inflammatory markers in the diagnosis of fracture related infections (FRI) defined by the FRI Consensus Definition was analysed.

Methods: Serum CRP, leukocyte count (WBC), and differential were measured preoperatively in 106 patients having surgery for suspected FRI. The cut-offs of >5 mg/L for CRP, >10x10^9 cells/L for WBC, >70% for the percentage of neutrophils (%N), and >3 for the neutrophils to lymphocytes ratio (NLR) were regarded as positive for infection. Accuracy was determined using ROC and a simple decision tree constructed.

Results: 46 patients (43%) had a confirmed FRI. Sensitivity, specificity, and AUC of serum CRP were 67% (52 – 80%), 61% (47 – 74%), and 0.64 (0.54 –0.74); of serum WBC count 17% (9-31%), 95% (86 - 99%), and 0.57 (0.50 – 0.62); of %N 13% (6 – 26%), 87% (76 -93%), and 0.50 (0.43 – 0.56); and of NLR 28% (17 – 43%), 80% (68 -88%), and 0.54 (0.46 – 0.63). CRP showed a better performance in comparison to WBC (p=0.006), %N (p<0.0001), and NLR (p=0.001). A simple decision tree approach using neutrophils (<3.165x10^9/L) and CRP (<2.45 mg/L) may allow exclusion of infection.

Conclusion: All serum inflammatory parameters showed insufficient accuracy. Although CRP had a better accuracy compared to the other markers, performance was only moderate. Hence, these parameters should only be suggestive tests in diagnosing FRI. The simple decision tree using CRP and neutrophils may allow detection of a proportion of uninfected cases.
**Title**
Superiority of combined antibiotic therapy spacers – a microbiological analysis at the second stage of revision

**Authors**
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**Abstract**

Antibiotic loaded spacers are often used during two-stage exchange for periprosthetic joint infections (PJI).

Our goal is to compare the efficacy of different antibiotic(s) in spacers concerning the rate of positive cultures at the second stage. We evaluated two-stage exchange procedures at our hospital for infected arthroplasty between 2012-2018. Microbiological findings were registered as the spacer and antibiotic(s), time between stages, duration of systemic antibiotic, and if the surgeries were performed by dedicated septic surgeon.

58 cases (22 THA & 36 TKA) with an overall rate of positive cultures during reimplantation of 18.9% (11/58). Univariable analysis suggested combined antibiotic(s) in the spacer, shorter interval between stages and dedicated septic surgeon to be significant predictors. The rate of positive cultures was significantly higher among monotherapy spacers compared to spacers with combined therapy (vancomycin+gentamicin with/without carbapenem) - 40.0% (6/15) vs. 11.6% (5/43) respectively (p = 0.016). Multivariate analysis showed combined therapy was the only independent risk factor (p = 0.049, OR: 2.5). There weren't significant differences comparing vancomycin/gentamicin (2/19) vs vancomycin/meropenem/gentamicin spacers (3/21). The necessity for subsequent surgery was significantly higher - 63.6% (7/11) in cases with positive cultures compared to 4.3% (2/47) for those with negative cultures (p < 0.001). Microorganisms present during the reimplantation were mostly staphylococci (9/11 - the same as the first stage) and resistant to the antibiotic(s) used in the spacer (7/9 cases).

Positive cultures during second stage reimplantation have been shown to increase the risk of subsequent failure as was the case in our series. The combination of antibiotic in spacers are advantageous compared to monotherapy.
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Title No joint destruction in patients with prolonged septic arthritis induced by a communicating intraosseous abscess.

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Abstract

Background: Septic arthritis demands prompt intervention due to risk of cartilage destruction when treatment is delayed.

Aim of study: We present seven cases of septic arthritis in combination with a communicating intraosseous abscess. Our goal was to assess the impact on the affected joints.

Materials and Methods: Seven male patients with median age 4 (range; 1-22) years, were identified in a period from 2010 to 2018. Data from journals, radiology, blood samples and cultures were retrospectively collected.

Results: All patients presented with a history of minor pain from affected joints as well as subfebrilia and discomfort. Median treatment delay was 2 months (range; 1 day-12 months). None of the patients were septic at admission, and median CRP was 30 (2-102 mg/L). Knee joint was involved in 5 cases and further 2 cases affecting elbow- and subtalar joints respectively. Radiographs and MRI showed juxta-articular intraosseous abscess communication into the joint with effusion, synovitis and revealed no evidence of joint destruction. 3 patients were treated with arthroscopic synovectomy and debridement of the abscess, 3 were treated with just debridement and washout of the joint, one with open synovectomy. Biopsies were taken from abscesses and synovia: Staph. aureus was responsible for 3 cases, Salmonella for one, and the remaining 3 cases had negative cultures. All patients received antibiotics for 6 weeks.

Conclusions: Patients with septic arthritis due to a communicating intraosseous abscess seem to avoid joint destructions even in situations with considerable therapeutic delay.
Title: There is a low rate of infections and subsequent 30 and 60-day admission rates in primary hip arthroscopy, revision hip arthroscopy, and cases converted to total hip arthroplasty.

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Abstract

Introduction: The incidence of hip arthroscopy (HA) has increased exponentially worldwide. Superficial infection complicates 0.3% of cases. However, complication rates may be underestimated in the literature. The aim of this paper was to determine the incidence of infective complications in primary HA, revision HA and conversion total hip arthroplasty (cTHA).

Methods: We conducted a retrospective chart review of all patients who underwent HA by a single high-volume surgeon from 2012-2018. The incidence of all complications and readmission rates were documented. All patients had an MRI arthrogram performed within 30 days prior to HA. All revision HA and cTHA had aspirate fluid sent for microscopy, culture and sensitivity (MC&S). All cases received pre-operative antibiotics.

Results: A total sample of 880 HA in 646 patients, 100(11.3%) of these being revision HA and 25(2.8%) cTHAs. The overall complication rate after HA was 4.3%(n=38). Primary HA, revision HA and cTHA were complicated by superficial infections in 0.2%(n=2), 0.1%(n=1) and 0% respectively. There was no growth on MC&S from specimens taken at any revision HA or cTHA. There were no infective complications in any cTHA. No deep infections were reported in any cases. All infections were treated successfully with oral antibiotics.

Conclusion: MRI arthrogram does not predispose infective complications. Primary HA and revision HA have a low superficial infection rate. Primary HA, revision HA and cTHA do not predispose to infective complications or increased 30-or 60-day readmission rates provided prophylactic antibiotics are prescribed and appropriate precautions are followed.
Title: Humanized mice exhibit increased susceptibility to *Staphylococcus aureus* osteomyelitis-induced bacteraemia

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Abstract

Osteomyelitis presents a significant barrier to the successful treatment of fracture-related repair and peri-prosthetic joint infection. Despite the breadth of current standard treatments, outcomes remain relatively poor, largely due to the unique abilities of *Staphylococcus aureus* to establish infection within the human host. Immune therapy towards *S. aureus* presents a highly desirable treatment option, but many attempts to produce an effective vaccine have failed. As the unique specificity of *S. aureus* as a human pathogen continues to come to light, it becomes clear that reliance on murine models may have contributed to previous failures in vaccine development. To address this, we here present a humanized mouse model of osteomyelitis. Immunodeficient non-obese diabetic (NOD)–*scid IL2Rγnull* (NSG) mice are engrafted with CD34+ human hematopoietic stem cells and subjected to MRSA osteomyelitis via a contaminated transtibial pin. Relative to their infected WT and immunocompromised counterparts, humanized mice present with several unique characteristics: namely the increased formation of Staphylococal abscess colonies (SACs), extensive osteolysis, and increased hematogenous dissemination of bacteria to distant organs. Strikingly, infection severity correlated inversely with human T-cell numbers, suggesting that T-cell responses may play a role in suppressing the spread of infection in this unique model.
The OVIVA trial demonstrated that oral antibiotic therapy is non-inferior to intravenous antibiotic therapy when used during the first 6 weeks for complex orthopaedic infection as measured by treatment failure at one year (Li, 2019).

The current study reports the antibiotic choices for patients with bone and joint infection who were discharged from the Bone Infection Unit in Oxford on >4 weeks of therapy in the 6 months following the publication of OVIVA.

Of 156 patients, 100 (64.1%) were male, and the average age was 61.4 years (range 49.3-75). 137 (87.8%) patients were discharged on oral antibiotics.

Ciprofloxacin was the most commonly prescribed oral antibiotic agent (33.8% of all oral prescriptions), followed by clindamycin (14.9%) and doxycycline (11.9%). Adjunctive rifampicin was used in 28% of oral prescriptions, most often in combination with ciprofloxacin. Rifampicin use was most commonly included in Staphylococcal infections and when metal work was left in situ.

The most common explanation for use of IV antibiotics was lack of viable oral option (12/19 patients (63%)). By pathogen, Enterococcal infections were most often treated with intravenous antibiotics (31% of infections) whereas all Staphylococcus aureus infections were treated with oral options.

In summary, following the publication of the OVIVA trial, nearly 90% of patients with bone and joint infection discharged from the BIU, Oxford, were discharged with oral antibiotics. Rates of use of intravenous antibiotics and choice of oral agent varied by pathogen isolated. Overall, ciprofloxacin (with or without adjunctive rifampicin) was the most commonly prescribed oral agent.