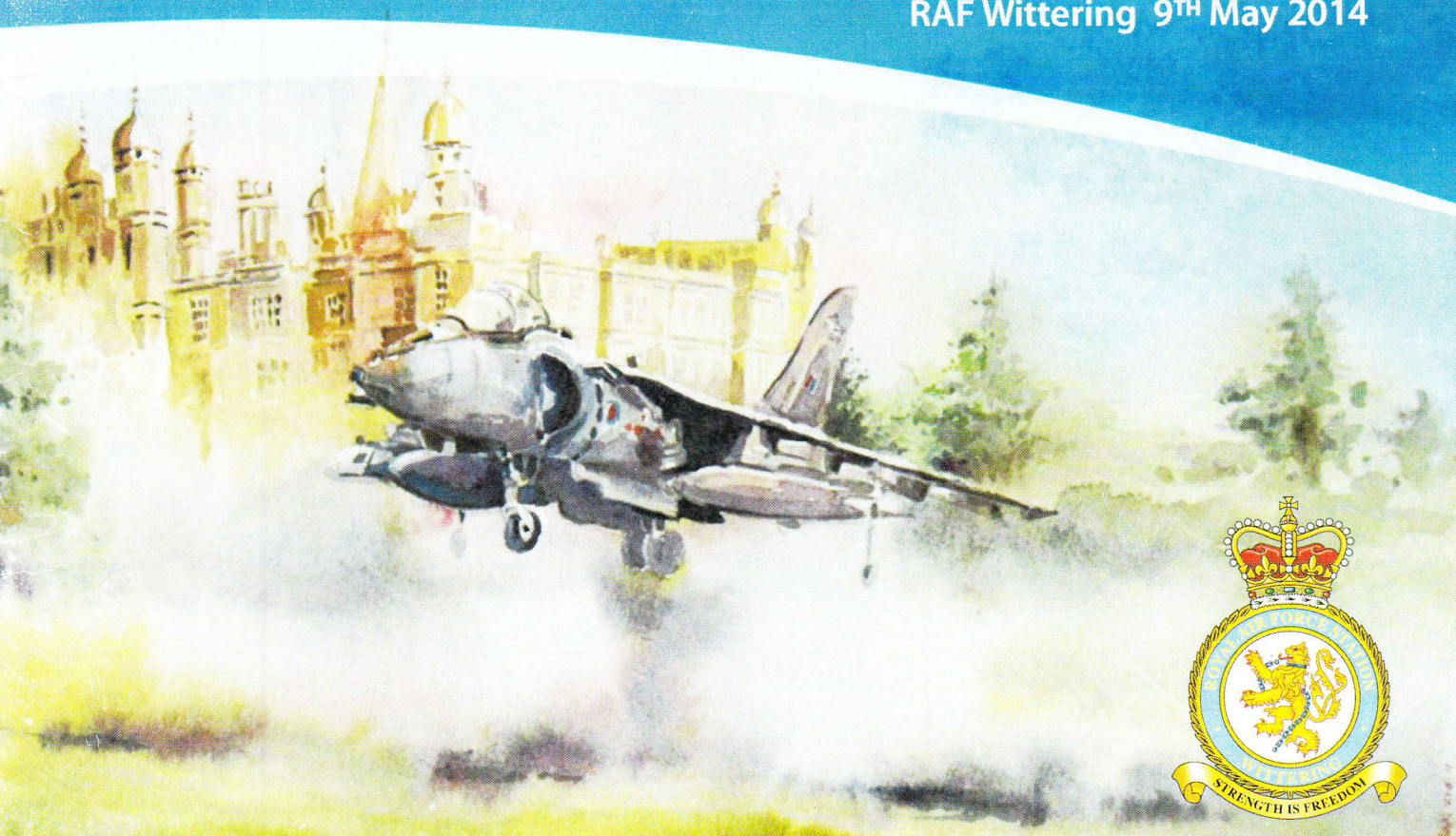


# Combined Services Orthopaedic Society

RAF Wittering 9<sup>TH</sup> May 2014





## SESSION 1

### BLAST-MEDIATED TRAUMATIC AMPUTATION: EVIDENCE SUGGESTING A NEW INJURY MECHANISM

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#### The Royal British Legion Centre for Blast Injury Studies at Imperial College London.

Recent evidence suggests that both the accepted mechanism of blast-mediated traumatic amputation (TA) (shockwave then blast wind exposure) and the link with fatal shockwave exposure merit review. Searching UK military prospectively gathered trauma registry data and post mortem CT (PM-CT) records identified casualties from August 2008 to August 2010 with blast-mediated TAs. TA level and associated injuries were recorded. Data on pre-debridement osseous and soft tissue injuries were only consistently available for fatalities through PM-CT imaging. 146 Cases (75 survivors and 71 fatalities) with 271 TAs (130 in survivors and 141 in fatalities) were identified. Through-joint TA rate in fatalities was 34/141 (24.1%). PM-CT analysis demonstrated only 9/34 through joint TAs with contiguous fractures in the immediately proximal long bone/limb girdle. 18/34 had no fracture, and 7/34 had a non-contiguous fracture. The previously reported link between TA and blast lung injury was not present, calling into question the significance of shockwaves in generating blast-mediated TAs. Furthermore, contemporary blast injury theory cannot account for the high prevalence of through joint TAs (previously published rate 1.3%). The proportion of through joint TAs with no associated fracture or a non-contiguous fracture (74%) is supportive of pure flail as a mechanism for blast-mediated TA.

### DYNAMIC RESPONSE INDEX IS NOT A SUITABLE PREDICTOR OF SPINAL INJURY RISK IN UNDERBELLY BLAST

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#### Royal British Legion Centre for Blast Injury Studies at Imperial College London

Improvised Explosive Device (IED) attacks on vehicles have been a significant feature of recent conflicts. The Dynamic Response Index (DRI), developed for predicting spinal injury in aircraft ejection, has been adopted for testing vehicles in underbelly blast. Recent papers suggest that DRI is not accurate in blast conditions. We suggest that the distribution of blast and ejection injuries is different.

A literature review identified the distribution of spinal fractures in aircraft ejection incidents. A Joint Theatre Trauma Registry search identified victims of mounted IED blast with spinal fractures. The distribution of injuries in the two groups was compared using the Kruskal Wallis test.

329 fractures were identified in ejector seat incidents; 1% cervical, 84% thoracic and 16% lumbar. 245 fractures were identified in victims of mounted blast; 16% cervical, 34% thoracic and 50% lumbar. There was no significant similarity between the two ( $p=1$ ). There was no statistically significant difference between the distribution of fractures in blast survivors versus fatalities.

The difference between blast and ejection injury patterns suggests that injury prediction models for ejection should not be extrapolated to blast mechanisms and that new models need to be developed.

### THE "SEVEN QUESTIONS": A NOVEL SURGICAL PLANNING STRATEGY BASED ON MILITARY DOCTRINE

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Surgical planning is the first step in operative fracture management. Complex situations are often faced which pose difficulties on both technical and logistic fronts. Surgical planning is the first step in operative fracture management. The degree of planning that is required is therefore determined by a number of factors including: the nature of the injury mechanism and its concomitant physiological insult, complexity of the fracture and region, expertise of the surgical team and equipment limitations. This paper explores a novel planning process in orthopaedic trauma surgery based upon British Military Doctrine. The seven questions of surgical planning represent a novel method that draws inspiration from the combat estimate process. It benefits from a global approach that encompasses logistic as well as surgical constraints. This, in turn, allows the surgical team to form an understanding of the nature of the fracture in order to develop, document and deliver a surgical plan. This has benefits for the operating surgeon, operating room practitioners and trainees alike and ultimately can result in improved patient care.

### A BIOMECHANICAL COMPARISON OF THE STRENGTH OF EXTERNAL FIXATOR CONSTRUCTS FOR THE MANAGEMENT OF LIMB TRAUMA

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*\*Portsmouth University*

The use of external fixation in the management of long bone fractures has long been recognised.

The aim of this study was to compare 3 differing constructs of Hoffman-2 and Hoffman-3 External Fixator systems to assess which potentially withstood the greatest load.

Three different constructs (2, 3 and 4-bar) of Hoffman 2 and 3 External Fixation systems were tested. A UHMWPE tube was utilised as a bone substitute to construct a biomechanically reproducible model which could be tested on an MTS testing jig. Each construct was loaded to 3, 5, 8, 12 and 15mm of displacement at the fracture gap. Each construct was cyclically loaded 200 times for each test and repeated 5 times.

The results demonstrate that the Hoffman-3 configurations withstood a load of at least twice that of the Hoffman 2 configurations across all displacements. Using a 2-way ANOVA test at all displacements the 2-bar configuration withstood greater load than the 3 bar ( $P < 0.0001$ ). With Hoffman 2 the 2-bar configuration withstood a greater load than the 4 bar diamond configuration.

These results demonstrate that Hoffman-3 External Fixation Device has a greater axial loading capacity than its Hoffman-2 predecessor.



### DOES THE PRE-OPERATIVE BRIEFING IMPROVE PATIENT SAFETY? A COMPLETE AUDIT CYCLE.

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Implementation of the World Health Organisation checklists have reduced errors, however, the impact of pre-operative briefings on adverse events has not been assessed. A prospective case control study assessing the association between pre-operative briefings and minor, potentially major and major adverse events was performed in two phases. Phase one involved prospective data collection for trauma and orthopaedic lists over 2 weeks. Changes were implemented and following this, the study was repeated (phase two). 41 lists were audited during phase one and 47 lists in phase two. Adequate pre-operative briefings were performed in 10/41 lists (24%) in phase one. There was a significant association between the occurrences of intra-operative adverse events ( $n=37$ ) when a briefing was not performed ( $p<0.01$ ), and when a briefing was performed incompletely ( $p=0.01$ ). In phase two, after staff re-education and policy change, briefings were found to be adequate in 38/47 lists (81%) with the occurrence of only three minor adverse events. Team familiarity also improved significantly ( $p=0.02$ ). Inadequate pre-operative briefings are associated with increased minor adverse events and are detrimental to team familiarity. On the basis of our findings we recommend that all surgical units perform pre-operative briefings.

### ACHIEVING BEST PRACTICE TARIFF IN WARFARINISED HIP FRACTURE PATIENTS

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Best Practice Tariff (BPT) recommends operation for hip fracture within 36 hours. Anticoagulation reversal often delays this. Audit of our service, to establish the impact on BPT of anticoagulation reversal, showed a loss of revenue and delays. Subsequently an 'early trigger' Intravenous Vitamin K (IVK) pathway was introduced and re-audit completed. Hip fracture patients admitted over a 32-month period were reviewed. Primary outcome was time to theatre for warfarinised and non-warfarinised patients. This was analysed using independent t-tests. A change in practice, involving nurse led administration of 2mg IVK in the Emergency Department prior to knowledge of the coagulation screen, was instigated. 3 months later a re-audit occurred. In the first audit cycle, 83 patients were admitted on warfarin with a median time to theatre of 49.7 hours. 21% of these patients gained BPT. Following protocol change, over three months, 14 warfarinised hip fracture patients were admitted. 12 patients achieved satisfactory reversal; 8 with one IVK administration. Median time to theatre was 33.9h. Compliance with BPT in terms of delay due to anticoagulation was 86%. Our audit demonstrates that 'early-trigger' IVK reduces delays to theatre and helps reduce BPT related financial loss. It enables high quality patient-centered care within financial constraints.



## DON'T BE A CLOT- ENSURE THE PRESCRIPTION OF OUT-PATIENT VTE PROPHYLAXIS FOLLOWING HIP AND KNEE REPLACEMENT SURGERY

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NICE guidelines state that patients undergoing hip or knee arthroplasty should start as an in-patient and then continue, pharmacological VTE prophylaxis for 28-35 days.

Retrospective review of all elective hip and knee arthroplasties during one calendar month gave a baseline measurement of how many patients had VTE prophylaxis prescribed on their discharge summary.

A new, electronically completed, bespoke Trauma and Orthopaedic discharge summary was created with a discreet area clearly marked for VTE prophylaxis, to serve as a reminder to prescribe it.

In March 2012, 93 patients underwent hip/knee arthroplasty. 76% (71/93) were prescribed VTE prophylaxis to take home, there was no clinical reason explaining the failure to prescribe prophylaxis in the remaining 24%.

In July 2013, after implementation of the change, 117 patients underwent hip/knee arthroplasty. 99% (116/117) were prescribed VTE prophylaxis to take home.

Repeat audit in October 2013 showed that 103 patients underwent hip/knee arthroplasty and 100% were prescribed VTE prophylaxis.

A simple but clear change to paperwork, brought about a rapid and seemingly

lasting change in the prescription of out-patient VTE prophylaxis.

The improvement was seen before and after a change of the Junior Doctor workforce suggesting the change in documentation was the main influencing factor.

## THE INFRA-PATELLA FAT PAD AS A SOURCE OF PERIVASCULAR STEM CELLS FOR TISSUE ENGINEERING

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Perivascular stem cells (PSCs) from lipoaspirate demonstrate increased purity and immaturity with greater engraftment potential than standard mesenchymal stem cells (MSCs). MSCs from the infra-patellar fat pad (IPFP) have previously demonstrated increased chondrogenic potential. This study investigated the availability and potential of PSCs harvested from the infra-patella fat pad of the human knee for musculoskeletal regeneration.

Sections of IPFP were stained with markers for PSCs, MSCs and endothelial cells to confirm their presence and location. Samples were obtained from patients undergoing TKR (n=13) or ACL reconstructions (n=10). Pericytes and adventitial cells made up 3.8% and 21.2% respectively of the stromal vascular fraction. The total number of pericytes and adventitial cells were  $4.6 \pm 2.2 \times 10^4$  and  $16.2 \pm 3.2 \times 10^4$  respectively. Cells were cultured both separately and combined. Cell identity was ascertained using fluorescence-activated cell sorting and immunocytochemistry. Cultured PSCs were differentiated using



chondrogenic, osteogenic, adipogenic and myogenic medias. Differentiation was determined using Alcian Blue, Alizarin red, Oil Red O and myosin staining.

This study demonstrates that the IPFP is a viable source of PSCs that can be harvested either arthroscopically or through an arthrotomy by orthopaedic surgeons for cell-based musculoskeletal regeneration. Their potential now needs to be compared to conventional MSCs.

### **VOLAR LOCKING DISTAL RADIUS PLATES: HOW ANATOMICAL ARE THEY?**

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Fractures of the distal radius are common, with volar locking plates being increasingly used in their treatment. They aim to provide stable internal fixation and are designed to mirror the natural anatomy. Current volar plate designs incorporate a volar cortical angle (VCA) of 25 degrees. Hypothesis: The aim of this study is to determine whether the VCA in uninjured distal radii corresponds accurately with modern volar plate designs. A retrospective radiological analysis utilizing Computed Tomography scans to assess the VCA of 100 distal radii. Each distal radius was subjected to 3 measurements of the VCA in the sagittal plane. Results: One hundred patients were identified (67 male, 33 female; mean age 37.4 years). The mean VCA was 32.9 degrees (S.D.  $\pm$  5.14 degrees). The VCA in male patients was significantly greater than in females (33.6 vs 31.5 degrees;  $P = 0.04$ ). There was a statistically significant difference between the lateral VCA and medial VCA (32.2 vs 34.3 degrees,  $P = 0.02$ ). Our study clearly demonstrates that the VCA measured in the distal radius is significantly greater

than the volar angulation incorporated within modern plate design. Given that the aim of ORIF is to anatomically reconstruct the distal radius, our study highlights that this may not be possible with current plates.

## **SESSION 2**

### **MILITARY FREEZING COLD INJURIES: 12 YEARS OF COLD WEATHER INJURY REFERRALS. PREMATURE SURGERY MUST BE AVOIDED WHERE POSSIBLE**

*HEIL KM, WOOD AM, OAKLEY EHN*

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Freezing cold injuries (Frostnip and Frostbite) (FCI) have become uncommon in UK military personnel relative to non-freezing cold injuries (NFCI, 'trench foot'). However if unidentified or inappropriately treated they may lead to avoidable medical downgrading or discharge. JSP 539 recommends delay or avoidance of surgical debridement where possible.

An anonymised retrospective audit was performed of FMED7 medical reports of cases seen in the Institute of Naval Medicine Cold Injury Clinic (CIC) between July 2002 and January 2014 inclusive.

In all 149 FCI cases were identified, 71 affected hands only of which 34 were bilateral, and 58 affected feet only, 34 of those being bilateral. A total of 17 patients had injured both hands and feet, with 10 bilateral. Royal Marines accounted for half of these cases, with the Army making up a further third, and the Royal Navy and RAF making up the remainder. Most FCI were found to have occurred in Norway, with Marine ranks being most commonly affected.



Ten cases underwent surgery: aspiration of blisters, debridement of tissue, or amputation. Seven of these procedures took place prematurely, which appeared detrimental to recovery. No patients required fasciotomy.

FCI are uncommon, but in arctic conditions their risk rises dramatically. The best treatment is conservative where possible following JSP 539 guidelines and consultation with CIC should occur at the earliest possibility. The Potential benefits of surgery must be weighed against problems of injured tissue healing and expert opinion should be obtained.

### ORTHOPAEDICS AT SEA: A GDMO'S PERSPECTIVE

*SURGIT LOUISE MCMENEMY*

#### **HMS Defender**

General Duties Medical Officers (GDMO) deploy to singleton posts on a variety of platforms with, in some cases, limited orthopaedic exposure.

The aim of this paper is to investigate the type of orthopaedic conditions presenting to a GDMO at sea onboard a Royal Fleet Auxiliary (RFA) platform to gain a better understanding of the breadth and chronicity of cases. This information can then be utilised when planning the New Entry Medical Officer programme to ensure GDMO pre-deployment teaching is pitched appropriately.

All cases contained in a prospective database over a four month period at sea were interrogated and data pertaining to orthopaedic cases was collected.

Data analysis revealed that almost a fifth of cases were orthopaedic related with back and knee problems accounting for 50%. The case mix was similar to that

seen by Primary Healthcare Practitioners ashore with only one case requiring medical evacuation from the ship.

The data revealed that the comparably older civilian population on RFA platforms present with a wide breadth and chronicity of problems and with increasing numbers of GDMOs deploying on these platforms the data demonstrated the need to ensure teaching covers the management of common acute and chronic conditions as well as emergencies.

### THE EPIDEMIOLOGY OF OPEN FRACTURE IN SPORT: ONE CENTRE'S 15 YEAR RETROSPECTIVE STUDY

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Open fractures are uncommon in the UK sporting population, however because of their morbidity then are a significant patient group. Currently there is very little in the literature describing the epidemiology of open fracture in sport. We describe the epidemiology of sport related open fractures from one centre's adult patient population.

Retrospective analysis of a prospectively collected database recording all sport related open fractures over a 15 year period in a standard population.

Over the 15 year period, there were 85 fractures in 84 patients. The mean age was 29.2 years (range 15–67). 70 (83%) were male and fourteen female (17%). The six most common sports were football (n=19, 22%), rugby (n=9, 11%), cycling (n=8, 9%), hockey (n=8, 9%); horse riding (n=6, 7%) and skiing (n=6, 7%). The top five anatomical locations were fingers phalanges, 35%; tibia-



## Abstracts

fibula 23%; forearm 14%; ankle 11% and metacarpals 5%. The mean injury severity score was 7.02. Forty five patients were grade 1; 54 patients were grade 2; 8 patients were grade 3a; and 4 were grade 3b according to the Gustillo-Anderson classification system. Seven patients (8%) required plastic surgical intervention for the treatment of these fractures. The types of flaps used were split skin graft (n=4), fasciocutaneous flaps (n=2); and adipofascial flap (n=1).

We looked at the epidemiology open fractures secondary to sport in one centre over a 15 year period. Football was the most common sport (22%) and within football, the most common site was the tibia and fibula. In contrast, within the cohort as a whole the majority of fractures were upper limb, with the hand being the most common site. Whilst not common in sport, when they are sustained they are frequently occur on muddy sport fields or forest tracks and must be treated appropriately. A good understanding of the range and variety of injuries commonly sustained in different sports is important for clinicians and sports therapists.

### COMPLICATIONS FOLLOWING MEDIAL OPENING WEDGE HIGH TIBIAL OSTEOTOMY FOR MEDIAL COMPARTMENT OSTEOARTHRITIS OF THE KNEE EVANS JT, WOODACRE T, HOCKINGS M, TOMS A

#### Princess Elizabeth Orthopaedic Centre, Royal Devon and Exeter

We aimed to analyse complication rates following medial opening-wedge high tibial osteotomy (OWHTO) for knee OA.

A regional retrospective cohort study of all patients who underwent HTO for isolated medial compartment knee OA from 2003-2013.

115 OWHTO were performed. Mean age = 47 (95%CI 46-48). Mean BMI = 29.1 (95%CI 28.1-30.1).

Implants used: 72% (n=83) Tomofix, 21% (n=24) Puddu plate, 7% (n=8) Orthofix

Grafts used: 30% (n=35) autologous, 35% (n=40) artificial and 35% (n=40) no graft.

25% (n=29) of patients suffered 36 complications. Complications included minor wound infection 9.6%, major wound infection 3.5%, metalwork irritation necessitating plate removal 7%, non-union requiring revision 4.3%, vascular injury 1.7%, compartment syndrome 0.9%, and other minor complications 4%.

Apparent higher rates of non-union occurred with the Puddu plate (8.3%) relative to Tomofix (3.6%) but was not statistically significant. No other significant differences existed in complication rates relative to implant type, bone graft used, patient age or BMI.

Serious complications following HTO appear rare. The Tomofix has an apparent lower rate of non-union compared to older implants but greater numbers are required to determine significance. There is no significant difference in union rate relative to whether autologous graft, artificial graft or no graft is used.



## IS KINEMATIC ALIGNMENT ASSOCIATED WITH AN INCREASED INCIDENCE OF EARLY COMPLICATIONS FOLLOWING TOTAL KNEE ARTHROPLASTY?

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Kinematic alignment has increased in popularity over the last few years in an attempt to improve clinical outcomes following total knee arthroplasty (TKA).

In our unit kinematic alignment has been used with patient-specific cutting guides as part of on-going clinical trials. We performed a retrospective analysis on all the TKA which had been planned to be implanted outside of the mechanical axis ( $0^\circ \pm 3^\circ$ ) based on pre-operative MRI scans and looked at their radiographic and clinical outcomes.

We identified 21 knees which had been implanted as 'planned outliers'. All had clinical and radiographic follow up to a mean 11.6 months post op. All had a standard long leg alignment radiograph performed at 6 weeks post op to confirm alignment.

All patients had a good improvement in their Oxford Knee Scores with mean improvement from 23 pre-op to 42 at 1 year. Of our patients none had a poor clinical outcome due to the alignment of their TKA, 1 patient had a poor outcome because of a quadriceps rupture which occurred 4 months post-op. There were no post-operative radiographic abnormalities.

In our unit kinematic alignment outside of the mechanical axis is not associated with an increased rate of short term complications.

## THE COMBINED TECHNIQUE FOR DISTAL BICEPS REPAIR USING A SOFT TISSUE BUTTON AND BIOTENODESIS INTERFERENCE SCREW: THE PLYMOUTH EXPERIENCE

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Our study aims to demonstrate the efficacy of using endobutton and interference screw technique in the repair of acute distal biceps ruptures.

From April 2009 to May 2013, 25 consecutive patients had acute distal biceps tendon repairs using an endobutton and interference screw technique. 3 patients were lost to follow up leaving 22 patients available for review. Mean follow up was 24 months(1-51). All were evaluated using a questionnaire, examination, radiographs, power measurements, and Oxford Elbow and MAYO scores.

Overall 95% patients(21/22) felt that their surgery was successful and rated their overall experience as excellent or good. Mean return to work was at 100 days(0-280) and mean postoperative pain relief was 23 days(1-56). 55% returned to sport at their pre-injury level. There was one case(4.5%) of heterotopic calcification with 3 superficial infections(14%). There were no intra or postoperative radial fractures, metalwork failures or metalwork soft tissue irritations.

Mean pre-operative Oxford Elbow Scores were 18(6-37) and post operative 43(24-48) ( $p < 0.00001$ ). Mean pre-operative Mayo scores were 48(5-95) and post-operative were 95(80-100)( $p < 0.00001$ ).

Our study supports that distal biceps repairs using the endobutton and interference screw technique appears to lead to high patient satisfaction rates with a relatively early return to function.

### AFGHANISTAN: THE TRAUMA-RELATED AMPUTATION REHABILITATION LEGACY

*EDWARDS DS, PHILLIP RD, CLASPER JC*

Royal British Legion Centre for Blast Injury Studies at Imperial College London

2014 sees the withdrawal of British troops from Afghanistan. It is documented that the conflict is associated with increased survivability from military related trauma attributed to personal protection equipment, improved on the ground medical care and rapid extraction of the casualty. However, the consequence is that of complex trauma patients and in particular trauma-related amputations (TA). With the draw down a complete picture is now possible.

This report quantifies and qualifies the extent and nature of TA from Afghanistan by means of a retrospective analysis of an accurate database of TA casualties from this conflict. This will provide useful information for the resources required for managing these complex patients in the future. Data extracted included number of amputations, locations and level of amputations and date of injury.

265 casualties sustained 416 amputations. The commonest injury pattern per casualty seen was that of a single amputation. The commonest level of amputation was trans-femoral (TF)(153), followed by 143 trans-tibial (TT) (143). Single amputations associated with TT injuries. TF amputations were

commonest in double and triple amputees. The commonest double amputee pattern was TF:TF casualty.

Casualties from this conflict are more likely to have greater number of amputations and higher levels.

### SURVEILLANCE OF MUSCULOSKELETAL INJURIES SUSTAINED ON MILITARY OPERATIONS IN AFGHANISTAN

*ROBIATI LA, NICOL AM*

#### 1 Medical Regiment

Musculoskeletal injuries are one of the leading causes for morbidity within military personnel on operations and are the leading cause for aeromedical evacuation of British military personnel from Afghanistan for Disease and Non-Battle Injury. The objective of this study was to improve our knowledge relating to these injuries.

This prospective cohort study included all British military personnel presenting with musculoskeletal injuries to primary healthcare in Camp Bastion and the rehabilitation team working in British bases forwards of Bastion, Afghanistan. Injury report forms were completed by medical officers and physiotherapists. Data was collected over two separate two week periods during the first and second half of the tour.

273 injury forms were completed in total. Most injured body parts were back (23%), knee (17%), shoulder (13%) and ankle (13%). 53% were attributed to training, 25% were due to overuse and 37% were old injuries.



Leading cause for musculoskeletal injuries sustained on operations was training, not sport. Further studies are required to clarify what training factors are attributing to injuries which will enable design and implementation of prevention strategies.

### THE PATTERN OF CONTEMPORARY BLAST INJURY IN THE PAEDIATRIC POPULATION

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A retrospective analysis of all paediatric patients admitted to Camp Bastion Role 3 between June 2006 and March 2013 was conducted from the UK trauma database. Patient demographics, mechanism of injury, anatomical distribution of injury and treatment are described.

Two hundred and ninety eight children were admitted, 225 males with a median age of 9 years old. The highest number of cases (78) was recorded in 2011. Overall there were 55 fatalities (85.6% male). Most injuries were by IED (68% of cases) with 74% requiring operative intervention. Seventy-four percent of casualties had three or more anatomical regional injuries. Whilst the most commonly injured region was the lower limb (78%), head injuries were seen in 41%, abdominal injuries in 48% and thorax injuries in 44%. Debridement (including amputations) (59.4%) and laparotomy (30.6%) were the commonest operations performed. Sixty percent of cases were in theatre within one hour of arrival. Amongst survivors the mean ISS score was 17 and amongst fatalities 43; NISS 22 and 51; RTS 5.45 and 2.91.

Paediatric blast injuries represent a significant burden to medical facilities in contemporary conflict. Whilst limb injuries predominate, the proportion of head and torso injuries is higher than seen in adult blast injuries.

### SESSION 3

#### MUSCULOSKELETAL PATHOLOGY IS RESPONSIBLE FOR THE MAJORITY OF MEDICAL DOWNGRADES IN THE ROYAL AIR FORCE

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Medical employment standards (MES) are used to identify and quantify the effects of pathology on a person's ability to carry out their duties. Any person requiring a change in their MES for longer than 28 days should have their permanent MES altered accordingly. In the Royal Air Force this is undertaken by Medical Boards.

A retrospective review was performed of all personnel attending RAF Medical Boards for a change in their PMES between 15/1/12 and 31/10/13. The primary reason for downgrade was recorded using ICD-10 code.

There were 1,583 PMES downgrades, approximately 800/year. This is approximately 2% of all regular RAF personnel. Musculoskeletal disease accounted for 58% of all cases (923 cases, 500/year). Other causes included medicine and general surgery (23%), mental health (10%), obstetrics and

gynaecology (5%) and other causes (4%). The majority of the musculoskeletal cases were arthropathy (42%) or back pain (31%).

Musculoskeletal disease is the most common cause for medical downgrade in the RAF. More data are required to ascertain the precise nature of these cases and the level of the imposed limitations. This will allow targeted use of increasingly limited resources to ensure that our personnel are as fit as possible to execute their duties.

### USE OF DISTRACTION OSTEOGENESIS FOR RECONSTRUCTION OF BONE DEFECTS FOLLOWING RESECTION OF PRIMARY MALIGNANT TUMOURS OF LONG BONES

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A systematic literature review of distraction osteogenesis (DO) for the primary reconstruction of bone defects following resection of primary malignant tumours of long bones (PMTLB) is presented. Fewer than 50 cases were identified. Most reports relate to benign tumours or secondary reconstructive procedures. The outcomes of our own series of 7 patients is also presented (4 tibiae, 3 femora). All patients had isolated bone lesions without metastases and were assessed through the hospital sarcoma board. Mean follow-up was 59 months (17-144). Mean age was 42 years. Final histologic diagnoses were 3 chondrosarcoma, 2 malignant fibrous histiocytoma, 1 adamantinoma and 1 malignant intraosseous nerve sheath tumour. Mean bone defect after resection was 13.1cm (10-17) and bone transport was the reconstruction method in all. There was one local recurrence of tumour six months post-

resection, necessitating amputation. Mean frame index for remaining cases was 32.3 days/cm (10.6-42.5). Complications included pin infection, docking site non-union, premature corticotomy union, soft-tissue infection and minor varus deformity. Six cases remain tumour-free with united, well-aligned bones and good long-term function. We conclude DO provides an effective biologic reconstruction option in select cases of PMTLB.

### ASSESSMENT OF THE TIMELINESS OF MANAGEMENT OF CLOSED TIBIAL SHAFT FRACTURES IN A MAJOR TRAUMA CENTRE

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#### **James Cook University Hospital, Middlesbrough**

Commissioning for quality and innovation (CQUIN) guidelines specify that diaphyseal fractures of the tibia should be treated within 24 hours of admission. We aimed to identify our compliance at a Major Trauma Centre.

Restrospective analysis of all tibia fractures over 12 months. Fractures that were not diaphyseal or open were excluded. Time of presentation., x-ray, arrival to ward and arrival in theatre were analysed against CQUIN guidelines.

43 fractures, 18 (42%) arrived in theatre for operative management within 24 hours. 15 (35%) were managed operatively in the subsequent 24 hours and 10 (23%) were managed after 48 hours. Average time to theatre was 38 hrs 37 mins (SD 29hrs 42mins). It took on average 51mins (SD 43 mins) for a patient to have an xray and 3 hrs 53 mins (SD 1hr 47mins) to arrive on the ward, and average 3 hrs 2 mins (SD 1hr 43mins) between xray and the ward.

42% of patients are making CQUIN standards for closed tibial shaft fractures.



There are logistical and resource factors contributing towards this as well as clinical issues. To address this there needs to be an agreed multidisciplinary pathway developed to ensure compliance with CQUIN standards.

### THE INCIDENCE OF SPORTS INJURIES REQUIRING ROLE 1 OR ROLE 3 INTERVENTION DURING HERRICK 18

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#### Role 3 Hospital, Op Herrick

This project determine the numbers of UK service personnel with sports related injuries requiring physiotherapy or admission to Bastion Role 3 facility. We identified the trend of the injuries and how they were sustained during. The outcomes were recorded to determine the cost to the mission.

Data was collected from April to September 2013. Results included 123 (29% of the deployed contingent in BSN catchment) were unfit for role whilst receiving treatment and 27 personnel (6%) were unable to return to their role in theatre due to their injury. 19 personnel were evacuated to UK, 7 to RCDM and 12 DAH to RRU. The mean length of hospital stay was 2.5 days, the total number of overnight stays was 58. The cost of an overnight stay in a Role 3 hospital bed is £200 and the cost of an escorted Aeromed £8,020.

Incidence of sports injuries of UK personnel during H18, requiring role 1 or role 3 interventions was 6.3%. Individual PT accounted for 84% of injuries and 16% due to duty PT. 50% were lower limb injuries (UL – 25%, spine – 25%). Following treatment 94% patients remained in BSN in role, 4% Aeromed to UK. The potential cost was estimated at a minimum of £163,980.

### EXTREMITY INJURIES PREDOMINATE IN TEN YEARS OF ROYAL NAVY AND ROYAL MARINE CASUALTIES SUSTAINED IN COMBAT IN IRAQ AND AFGHANISTAN

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The UK Military Trauma Registry was searched for all RN/RM personnel injured between March 2003 and April 2013. These records were then cross-referenced with the records of the Naval Service Medical Board of Survey which evaluates injured RN/RM personnel for medically discharge, continued service in a reduced capacity or return to full duty (RTD). Population at risk data was calculated from service records.

There were 277 casualties in the study period: 61 (22%) of these were fatalities; of the 216 survivors, 63 or 29% were medically discharged; 24 or 11% were placed in a reduced fitness category. A total of 129 individuals (46% of the total and 60% of survivors) returned to full duty. The greatest number of casualties was sustained in 2007; there was a 3% casualty risk per year of operational service between 2007-2013. The most common reason cited by the Naval Service medical board of survey for medical downgrading or discharge was injuries to the lower limb with upper limb trauma being the next most frequent injury.

This study characterises the injuries sustained by RN and RM personnel during recent conflicts and demonstrates significant challenge of predominantly orthopaedic injuries for reconstructive and rehabilitation services.

### CASE SERIES OF PECTORALIS MAJOR RUPTURES REQUIRING OPERATIVE INTERVENTION SUSTAINED ON THE ROYAL MARINES "TARZAN" ASSAULT COURSE

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We present (with intra-operative imaging) 4 patients who sustained Pectoralis major ruptures on the same piece of equipment of the "Tarzan" assault course at the Commando Training Centre, Royal Marines (CTCRM). Recruits jump at running pace, carrying 21 pounds of equipment and a weapon (8 pounds) across a 6ft gap onto a vertical cargo-net. The recruits punch horizontally through the net, before adducting their arm to catch themselves, and all weight, on their axilla.

All patients presented with immediate pain and reduced function. 2 had ruptures demonstrated on MRI, 1 on USS and one via clinical examination. All 4 patients were found, at operation, to have sustained type III injuries.

All patients underwent Pectoralis major repair using a uni-cortical button fixation and had an uneventful immediate post operative course. Patient 1 left Royal Marines training after the injury (out of choice, not because of failure to rehabilitate). All other patients are under active rehabilitation hoping to return to training.

Review of 10 years of records at CTCRM reveal no documented Pectoralis major rupture prior to our first case in October 2013. There has been no change to the obstacle or technique used and all patients deny the use of steroids.

### THE CORRELATION BETWEEN PAPER THEATRE RECORDS AND ELECTRONIC RECORDS ON WHIS (WHOLE HOSPITAL INFORMATION SYSTEM)

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The Whole Hospital Information System (WHIS) was introduced to Camp Bastion on 01 Feb 2012. It is a custom-built software solution for electronic patient records. A one-day training package is mandatory as part of current pre-deployment training

The aim of this study was to identify how well the data recorded on WHIS correlates with the information recorded within the paper-based theatre logbook.

A bespoke search was created by the Hospital J6 team, which identified the procedure, the surgeons involved, the date and time of the procedures and the demographic of the patient. The search was completed to include all operations performed from 01 Feb 2012 to 31 Mar 2013. This corresponds to the first 14 months of WHIS usage.

The results at first looked promising, showing that 2672 procedures had been performed, with an average 1.68 (0-11) procedures and 2.1 (0-9) surgeons per case. The mean operative duration was 1 hour 38 minutes. However on closer scrutiny, the records showed that 47 cases had no procedure and 138 cases had no surgeon. 29 cases had no procedure and no surgeon recorded.

The data recorded on WHIS during the study period is not currently complete enough to discontinue usage of paper records.



### MEDIUM-TERM OUTCOMES FOLLOWING LIMB SALVAGE FOR SEVERE OPEN TIBIA FRACTURE ARE SIMILAR TO TRANS-TIBIAL AMPUTATION

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The aim of this study was to establish medium term outcomes in military casualties following severe open tibia fractures. Cases from a previously published series were contacted and assessed with the SF-36 outcome tool. Their results were then compared to a similar study of military trans-tibial amputees.

Of the original data set of 49 patients, 30 patients were followed up and completed an SF-36 (61%) with a median follow-up of 4 years (49 months, IQR 39-63). Ten of the 30 required revision surgery, 3 of which involved conversion from initial fixation to a circular frame. Twenty-two of the 30 patients recovered sufficiently to complete a military basic fitness test. The median physical component of SF-36 in the tibia fracture group was 46 (IQR 35-54) which was similar to the trans-tibial amputation cohort ( $p=0.3057$ , Mann-Whitney). Similarly there was no difference in mental component scores ( $p=0.1595$ , Mann-Whitney). There was no significant difference in the proportion of patients in the amputation or fracture group reporting pain ( $p=0.1157$ , Fisher's exact test) or with respect to SF-36 physical pain scores ( $p=0.5258$ , Mann-Whitney).

We present the patient reported outcomes following combat open tibia fracture and show that they are similar to those achieved after trans-tibial amputation.

### CLINICAL OUTCOMES AT ONE YEAR FOLLOWING IMPLEMENTATION OF THE 2011 NICE GUIDELINES REGARDING FRACTURED NECK OF FEMUR IN HIGH FUNCTION PATIENTS

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The management of patients with displaced intra-capsular hip fractures is usually a hip hemiarthroplasty procedure. NICE guideline 124 published in 2011 suggested that Total Hip Replacement (THR) surgery should be considered in a sub group of patients with no cognitive impairment, who walk independently and are medically fit for a major surgical procedure.

The Royal Devon and Exeter Hospital manages approximately 600 patients every year who have sustained a fracture of neck of femur, of which approximately 90 patients fit the above criteria. Prior to the guideline less than 20% of this sub-group were treated with a THR whereas after the guideline over 50% of patients were treated with THR, performed by sub-specialist Hip surgeons.

This practice is financially viable; there is no apparent difference in the overall cost of treating patients with THR. Complete outcome data at one year show fewer patients step down a rung in terms of both independent living and independent walking after the adoption of the NICE guideline. However, this effect was not limited to patients who received THR. Patients who underwent hemiarthroplasty were also less likely to deteriorate after the NICE guideline.