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# Abstracts

## Session 1 – Basic Science

A NEW ANIMAL MODEL FOR INFECTED FRACTURE NON-UNION AFTER EXTERNAL FIXATION OF TIBIA WITH REAL-TIME IN-VIVO MONITORING OF INFECTION

L. Robiati<sup>1,2</sup>, P. Hindle<sup>1</sup>, S. Stapley<sup>1</sup>, H. Simpson<sup>2</sup>

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### Aims

Non-union is a well-recognised complication after open fractures. Fifty percent of open military extremity trauma returning from operations developed non-union. Aetiology of non-union is multifactorial, with infection reported as major contributory factor. The aim of this study was to develop an *in-vivo* model of infected fracture non-union managed with external fixation which allowed real time *in-vivo* monitoring of infection to evaluate potential therapeutic strategies.

### Methods

Ten Wistar male rats underwent application of external fixator and midshaft tibia osteotomy. Osteotomy sites were inoculated with bioluminescent *Staphylococcus aureus* Xen36 (infected group; n=6); or phosphate buffer solution (control group; n=4). Animals were monitored for infection with *in-vivo* bioluminescent imaging and fracture healing with plain radiographs. Animals were sacrificed at eight weeks. Post-mortem micro-computed tomography (uCT) was used to assess fracture union; *in-vivo* bioluminescent imaging to assess persistence of Xen36 infection; tissue samples were processed for bacterial colony forming unit counts and histology to assess for fracture healing and infection.

### Results and Conclusions

Eight animals reached experiment end-point (infected=5, control=3). All five infected animals had radiographic non-union on x-ray and uCT, demonstrated bioluminescence at fracture site and grew bacteria from tissue samples which luminesced. Two of three control animals demonstrated radiographic non-union, none luminesced, one grew bacteria from tissue samples but was not bioluminescent. This study has developed an infected fracture non-union animal model. Use of bioluminescent bacteria allows for non-invasive, real-time monitoring of infection and could be used to evaluate therapeutic strategies for prevention and management of infected fracture non-union.

# PRELIMINARY EFFECT OF PROJECTILE YAW ON EXTREMITY GUNSHOT WOUNDING IN A CADAVERIC ANIMAL MODEL: A SERENDIPITOUS STUDY

Authors

Stevenson T<sup>1</sup>, Carr DJ<sup>2</sup>, Gibb IE<sup>3</sup>, Stapley SA<sup>4</sup>

## AIMS

Gunshot wounding (GSW) is capable of causing devastating tissue injuries by delivering kinetic energy (KE) through the contact surface area of a projectile. The contact surface area can be increased by yaw, deformation and fragmentation, all of which may be caused by any intermediate layers struck by the projectile prior to entering its target. The aim of this study was to investigate whether projectile yaw occurring before penetration of a cadaveric animal limb model causes worse damage with or without clothing layers present using 5.45 x 39 mm projectiles, building on previously published work examining the effect of military clothing on extremity GSWs.

## METHODS

In total, 12 fallow deer hind limbs were shot, further divided into 4 with no clothing layers ( $C_{nil}$ ), 4 with a single clothing layer ( $C_{min}$ ) and 4 with maximum clothing layers ( $C_{max}$ ) as worn on active duty by UK military personnel. Projectile yaw prior to striking the target, was induced serendipitously by firing the 5.45 x 39 mm projectiles from a barrel intended to fire 5.56 x 45 mm projectiles. Contrast CT scanning captured measurements of permanent cavity damage to allow limb wounding analysis, and results were compared using Analysis of Variance (ANOVA).

## RESULTS

No significant differences were found among clothing states for each series of wounding pattern measurements taken.

## CONCLUSIONS

Projectile yaw is therefore identified as a key variable with regard to causation of damage within this extremity wound model.

## Effectiveness of Tier 1 Pelvic Protection Against Sand Blast

Iain A. Rankin<sup>1</sup>, Thuy-Tien Nguyen<sup>1</sup>, **Louise McMenemy**<sup>1,2</sup>, John Breeze<sup>1,2</sup>, Arul Ramasamy<sup>1,2</sup>, Jonathan C. Clasper<sup>1</sup>, Spyros D. Masouros<sup>1</sup>.

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### Aim

Penetrating injury by blast fragments is the most common wounding mechanism in an explosive event. While the contribution to injury of debris such as soil or sand is not known, the presence of debris increases the risk of contamination, which can lead to extensive debridement, amputation, and late mortality. Tier 1 pelvic personal protective equipment (PPE) is an under-layer worn beneath combat trousers which aims at minimising the extent of soft tissue injury to the pelvis, perineum, and upper legs. This study aims to investigate the effect of Tier 1 pelvic PPE on mitigating soft tissue injury seen in dismounted blast.

### Method

A gas-gun system was used to replicate injury from propelled sand following blast in a human cadaveric model. The average velocity of the energised sand ejecta was  $506 \pm 80 \text{ ms}^{-1}$ . Cadaveric thigh samples were covered by the Tier 1 pelvic PPE and standard-issue combat trousers (test group) or standard-issue combat trousers only (control group).

### Results and conclusions

The results demonstrated that the Tier 1 PPE markedly improved the severity of injury: a statistically significant reduction was seen in the total surface area (143 vs. 658  $\text{mm}^2$ ,  $p = 0.004$ ) and depth of injuries (0 vs. 23 deep injuries, odds ratio = 0.0074, 95% confidence intervals = 0.0004 – 0.1379).

These findings implicate environmental debris following an explosion to be a critical mechanism of injury in the blast casualty and provide confidence in the use of the Tier 1 pelvic PPE to reduce potentially devastating genital and perineal injury following blast.

## **Strength development and muscle quality in military traumatic lower limb below knee amputations.**

**Jose Manuel Frias Bocanegra**, Natalie Egginton, Daniel Rothwell, Daniel Fong, Patrick Wheeler, Tom Blankenstein, Mark Lewis, Alex Bennett, David Williams and Sarah Stapley.

### **Aims**

The conflicts of Iraq and Afghanistan left a significant number of injured personnel with lower limb amputation requiring extensive rehabilitation following advances in battlefield medicine, personal and vehicle protective equipment increased survival rates.

To improve functional outcomes, assessment of muscle atrophy and loss of strength over time may direct new recovery pathways. Rapid clinically applicable methods of assessing muscle quality (fat infiltration), quantity, and strength to guide physiological and biomechanical interventions may offer a directed programme of physiotherapy for this cohort of prosthetic users.

### **Methods**

Lower limb muscle thickness and joint flexor/extensor group strength development has been measured for an initial cohort of transtibial amputees using ultrasound scanning and an isokinetic dynamometer. The latter was fitted with a custom bracket to allow testing of the residual stump to allow for comparison between the injured and non-injured limb.

### **Results**

Initial results indicate that amputees had more intramuscular and intermuscular fat (demonstrated by the presence of ectopic adipocytes) within their injured limb when compared to the intact limb. The knee flexors and extensors on the amputated side also show significantly diminished force production capacity to as little as 30-40% of the comparative normal limb, reflecting the compound issues associated with this type of injury pattern.

### **Conclusions**

The knee flexor/extensor muscle group shows a loss of quality and strength. This will impact gait, with consequences on activities of daily living and quality of life. Potentially a focus on preventing ectopic adipocyte storage on muscle groups should be a goal for rehabilitation.

## **Blasting BMAC: A Novel Therapy To Heal the Fractures of Combat**

**Sarah K Stewart**, Alastair Darwood, Claire Higgins, Spyros Masouros, Arul Ramasamy

### **Aims**

The high-energy fractures of combat have an increased susceptibility of progressing to non-union. Bone marrow aspirate concentrate (BMAC) is an emerging biological therapy which has shown promise in the treatment of non-union. Mechanotransduction represents a field of research whereby physical stimuli can be used to modulate cell fate. Blast waves are one such physical stimulus. The study aim was to investigate whether the osteogenic potential of BMAC can be potentiated following blast wave exposure.

### **Methods**

BMAC samples were obtained from three healthy male patients and exposed to a single blast wave with a peak overpressure of 50psi. Samples were subsequently placed in a suspension of mesenchymal stem cells (MSCs), to represent the biological environment of fracture. The MSCs and BMAC were separated by a porous membrane which allowed diffusion of signalling molecules but restricted cellular mixing. Three test groups were used: *MSC* (control); *MSC + BMAC*; *MSC + BMAC + blast wave*. Calcium mineralisation assays were performed on the MSCs on Day 7 and 14 to assess for osteoblastic transformation. Statistical analysis was performed using an unpaired two-tailed student's T-test.

### **Results and conclusion**

Calcium mineralisation was significantly increased in the *MSC + BMAC + blast wave* group compared to both the *MSC + BMAC* group and *MSC* group (mean percentage change 84.56 vs.42.12,  $p=0.012$  and 84.56 vs 0.0,  $p=0.039$ , respectively) at Day 7. This provides encouraging evidence that the osteogenic effect of BMAC can be further potentiated following blast wave exposure, and represents a novel therapy for treating combat fractures.



## Session 2 - Military

### **Abdominal Aortic Junctional Tourniquet - Stabilized (AAJTS) can be applied both successfully and rapidly by Combat Medical Technicians (CMTs)**

Thomas Nicholas Smith, **A Beaven**, C Handford, E Sellon, P J Parker

**Aims:** 'Non-compressible' haemorrhage is the leading cause of preventable battlefield death. Treatment often requires surgical or radiological intervention, which is precluded in the pre-hospital environment. The Abdominal Aortic Junctional Tourniquet - Stabilized (AAJTS) is an externally applied device that can compress the aorta and control junctional haemorrhage. This makes it well-suited to the prehospital environment. This study's aim was to determine whether Combat Medical Technicians (CMTs) could successfully apply this device to healthy volunteers.

**Methods:** CMTs applied the AAJTS to each other following a 1-hour training package. A consultant radiologist-operated hand-held ultrasound monitored flow changes in the subjects' common femoral artery. After daylight conditions, applications were additionally assessed in low-light conditions. CMTs were also surveyed for their opinions regarding utility and function.

**Results:** 17 CMTs participated with 34 applications (16 daylight and 18 low-light). 27/34 (79%) achieved a successful application. The median application time was 75 s in daylight and 57 s in low-light conditions. There was no significant difference in Body Mass Index ( $p=0.23$ ), median systolic blood pressure ( $p=0.19$ ), nor class of CMT ( $p=0.10$ ) between successful and unsuccessful applications. Higher systolic blood pressure was associated with longer application times ( $p=0.03$ ). Users deemed the device easy to use (median score 4.4 on a 5-point Likert scale).

**Conclusion:** CMTs can use the AAJTS successfully after a 1-hour training session in the majority of applications. Application was successful in both daylight and low-light conditions. Self-reported usability ratings were high. This study supports the claim that the AAJTS is easy to use.

## **A comparison of pelvic binders. Can they close the book?**

**T Howe\***, H Claireaux, H Fox, G Morgan, L McMenemy, S Masouros, A Ramasamy. \*Corresponding Author.

### **Aims**

Pelvic fracture with concurrent vascular injury is associated with a mortality rate of over 50%. A pelvic binder applied expediently can reduce the bleeding space and potentiate tamponade. Cadaveric studies have demonstrated that a circumferential force of 130N is sufficient to maintain pelvic integrity. Current NATO medical doctrine recommends definitive surgical care within 2 hours of injury. Pelvic binders are not issued to Service Personnel outside the medical role. A number of improvised binders using clothing or military equipment have been proposed but not evaluated.

The aim of this study is to compare the ability of improvised and propriety pelvic binders in holding adequate strap tension to maintain pelvic integrity.

### **Methods**

Stress-relaxation testing was conducted on three commercial binders (Sam Sling, T-POD and Prometheus) and two improvised binders (clothing and field-expedient pelvic splint, FEPS) using a uniaxial material testing machine. Six two-hour samples were completed per device; initial tension was set at 150N using a fixed displacement consistent with US Army anthropomorphic data.

### **Results and Conclusions**

At two hours the mean SAM Sling strap tension was  $136 \pm 7$ N and the T-POD  $134 \pm 2$ N. The FEPS (improvised from a SAM Splint and tourniquet) exerted a mean force greater than 130N for  $97 \pm 37$  minutes. The Prometheus underperformed holding for only  $48 \pm 17$  minutes, and the combat trousers  $5 \pm 5$  minutes.

The ability of commercial binders to hold adequate strap tension is variable. Neither improvised binder meets the NATO medical planning timelines however, the field-expedient pelvic splint may represent a temporary option in extreme circumstances.

## **Validating a clinical decision tool used to predict outcome with the Bespoke Offloading Brace in complex foot and ankle injuries**

**Louise McMenemy**<sup>1,2</sup>, Harry Claireaux<sup>1,2</sup>, Benjamin W Hoyt<sup>3</sup>, Sarah Y Nelson<sup>3</sup>, Caitlin Mahon<sup>4</sup>, Benjamin K Potter<sup>3</sup>, Bradford D Hendershot<sup>4</sup>, Spyros Masouros<sup>1</sup>, Arul Ramasamy<sup>1,2</sup>

### **Aim**

A clinical decision tool was created using injury and biomechanical data to predict which patients will continue to use the Bespoke Offloading Brace (BOB). The tool required validation for clinical use. The aim was to validate the tool using a cohort of American patients.

### **Method**

Injury, clinical and gait data was obtained on 5 patients with minimum 2 year follow up data after prescription of the orthosis. The data was analysed against the clinical decision tool blinded to outcome.

### **Results and conclusions**

All patients were male with an average age at follow-up of 43 years. Two patients were injured by dismantled blast, two by gunshot, and one in a road traffic collision. One patient had an isolated nerve injury at the knee and two had chronic pain. Three patients progressed to amputation and two continued to use the orthosis. The tool predicted that four would abandon the orthosis and one would continue to use it. The outcome data demonstrated that the tool had accurately predicted outcome for four individuals with one patient with chronic pain continuing to use the orthosis.

Although a small sample size, this is the first study to attempt to retrospectively validate the clinical decision tool for prescription of the BOB. The numbers are limited by availability of gait data. Chronic pain is complex, and this may account for the incorrect prediction in one patient. It's now necessary to use the clinical decision tool in a prospective trial to further refine and validate the results.

## **Association between combat-related traumatic injury and skeletal health: bone mineral density loss is localised and correlates with altered loading in amputees - The ADVANCE Study**

**McMenemy L**, Behan FP, Kaufmann J, Cain D, Bennett AN, Boos C, Fear NT, Cullinan P, Bull AMJ, Phillips ATM, McGregor AH

### **Aims**

The association between combat-related traumatic injury (CRTI) and bone health is uncertain. A disproportionate number of lower limb amputees from the Afghanistan conflict are diagnosed with osteopenia/osteoporosis, increasing lifetime risk of fragility fracture and challenging traditional osteoporosis treatment paradigms.

It was hypothesised that CRTI results in a reduction in Bone Mineral Density (BMD). Specifically, a localised BMD reduction in the amputated limb of lower limb amputees that is progressively greater with higher level amputations.

### **Methods**

Cross-sectional analysis of the first phase of a cohort study comprising 579 male adult UK military personnel with CRTI (UK-Afghanistan War 2003–2014; including 153 lower limb amputees) who were frequency-matched to 565 uninjured men by age, service, rank, regiment, deployment period, and role-in-theatre. BMD was assessed using DEXA scanning of the hips and lumbar spine.

### **Results and conclusions**

Femoral neck BMD was lower in the CRTI than the uninjured group (T-score -0.08 vs -0.42  $p=0.000$ ). Subgroup analysis revealed this reduction was significant only at the femoral neck of the amputated limb of amputees ( $p=0.000$ ), where the reduction was greater for above knee amputees than below knee amputees ( $p=0.037$ ). There were no differences in spine BMD.

Changes in bone health in CRTI appear to be mechanically driven rather than systemic. This may arise from altered joint and muscle loading creating a reduced mechanical stimulus to the femur. These findings support a lexicon change to *unloading osteopenia* and should not be associated with a diagnosis of systemic osteoporosis nor systemic treatments.

## **Cost-effectiveness following osseointegration for transfemoral amputation and the relationship between pre and post-operative EQ5D Health Utility Value**

**Handford, C\***. McMenemy, L. Kendrew, J. Mistlin, A. Akhtar, A. Parry, M. Hindle, P.

### **Aims**

To assess cost effectiveness using EQ5D health utility value (HUV) and to identify whether pre-operative scores can indicate patients who are likely to positively benefit from osseointegration alongside demonstrating cost effectiveness.

### **Methods**

Retrospective analysis of prospectively collected patient reported health outcomes data including both civilian and military patients. This was used to quantify health utility value in the form of an EQ5D score and inform cost analysis (cost/QALY). All individuals with data collected at any time point were included.

### **Results and Conclusions**

One hundred and six patients received The Osseointegration Group of Australia Osseointegration Prosthetic Limb (OGAP-OPL). Mean age at operation was 38.3 years (20.4-56.8) and the majority of patients were male (n=73, 69%). Mean pre-operative EQ5D HUV across all subjects was 0.66 (-0.40-0.98) increasing to 0.71 (0.23-0.96) at 5 years. In subgroup analysis our data demonstrated that transcutaneous femoral osseointegration has the most benefit in those who are struggling as indicated by an EQ5D. Those with a pre-operative EQ5D HUV <0.6 demonstrated consistent and sustained improvement in their post-operative EQ5D HUV and demonstrated a cost effectiveness reaching a threshold of under £30,000 per a QALY during their treatment course. In those with a higher starting EQ5D they may have self-perceived benefit but due to their inability to increase their HUV significantly they will not achieve 'cost-effectiveness' from a health economic perspective.

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## **The Role of the Deployed Clinical Director in the Ground Manoeuvre Surgical Long Range Reconnaissance Group Environment – A New Role in a New Era.**

**Lt.Col. D S Edwards FRCS(Tr&Orth) MD<sup>1,3</sup>; Lt.Col. P Davies FRCA<sup>2,3</sup>**

1. Joint Hospital Group (South East), Frimley Park Hospital, Frimley.
2. 22 Field Hospital, Keogh Barracks, Surrey, GU15 5RQ
3. Ground Manoeuvre Surgical Group, Queens Dragoon Guards Task Group, Op Newcombe.

The role of the Deployed Medical Director (DMD), or Clinical Director (CD), was firmly established in the Afghanistan/Bastion deployed era; their role was, principally, to be the primary interface between the Field Hospital(FH) command cell and the deployed clinician cadre. This allowed a degree of freedom of manoeuvre for the clinicians to perform and focus on clinical issues whilst deployed on high tempo operations. Often, the DMD was required to manage and conclude clinical ethical scenarios playing out in real time at a rapidly evolving pace.

Humanitarian (Operations Gritrock and Trenton), contingency and Joint Expeditionary Force(JEF) operations have become the expected environments for today's FHs. With this, the role of the DMD has changed.

Op Newcombe, the British Army's component to MINUSMA (The United Nations Multidimensional Integrated Stabilization Mission) in Mali, involves long range peace keeping mission. Without guaranteed air support, the Ground Manoeuvre Surgical Group was formed as an integrated task group asset.

The purpose of this paper is to qualify and quantify critical decision points, classified using the NATO "J" category system, that were required of the DMD/CD; the hypothesis being that clinic-ethical decisions were no longer in the majority. As the role has changed, so there is a requirement to change the training and preparedness for future DMD/CDs in this type of operation.

## **Session 3 – General Orthopaedics**

### **Unsatisfactory post-operative trauma imaging is predictive of revision surgery**

**B Atkin, M Choudri, R Nandra, P Fenton, P Hindle**

#### **Aims**

Assess the relationship between immediate post-operative imaging and the risk of revision surgery for mechanical failure and to determine the effect of peer review on the rate of unsatisfactory radiological outcomes and revision surgery.

#### **Methods**

Two trauma fellowship trained consultants reviewed all post-operative images prior to the department adopting a metalwork MDT and judged whether the surgery was satisfactory or not. Trauma lists and imaging were reviewed for a 90-day follow-up period to determine if a patient had required revision surgery for mechanical failure. Following analysis a daily review was introduced where a consensus decision was reached about the quality of the fixation. A further 90-day follow-up period was instituted to determine the subsequent rate of revision surgery.

#### **Results**

In the first cohort 977 cases were identified with an overall revision rate of 2.8%. 875 cases having satisfactory imaging (89.6%) and 102 unsatisfactory (10.4%). Revision rates were 0.5% and 22.5% respectively. Following introduction of the daily peer review process a further 709 cases were identified with an overall revision rate of 1.5%. 664 cases had satisfactory imaging (93.7%) and 45 unsatisfactory (6.3%). Revision rates were 0.5% and 17.7% respectively. Patients with unsatisfactory imaging were significantly more likely to require a revision ( $p < 0.0001$ ). There was a significant drop of 4% in the rate of unsatisfactory imaging following the introduction of the peer review process.

#### **Conclusions**

Unsatisfactory post-trauma imaging can be predictive of mechanical failure and peer review of imaging should form part of continuous clinical governance.

## **Intramedullary Nails for extra-capsular hip fractures: Are we doing it right?**

J East, S Donoghue, SR Gowda, M Panteli, JF Charity, AM Kassam

Exeter Hip Unit, Royal Devon and Exeter NHS Foundation Trust

### **Introduction**

Intramedullary (IM) nails are commonly used to treat extracapsular hip fractures. New advances in the design of the IM nails are thought to decrease the risk of failures by allowing for insertion of two interdigitating screws into the head segment. Common complications associated with IM nails include mechanical failure, screw cut out, varus collapse, shortening of femoral neck and peri-prosthetic fractures around the tip of the implant.

### **Aim**

To assess outcomes and failure rates of intramedullary nails over a 5-year period.

### **Methods**

Retrospective review of patients who had undergone internal fixation using a cephalo-medullary nailing system for extracapsular hip fractures. Types of failure were categorised into subgroups.

### **Results**

Five hundred and four (n=504) IM femoral nails were recorded during this period. 374 were female (74%), 130 male (26%). 28 patients were identified with nail failure. 5 sub-categories of mechanisms of primary mode of failure were identified; Infection (n=1), fracture non-union (n=2), metal work failure (n=6), periprosthetic fractures (n=9), superior cut out of lag screw (n=10). 26 patients required re-operation. In the superior cut out group, the mean combined tip apex distance (TAD) was 27.9mm and mean iatrogenic varus deformity was 8.5 degrees. The average failure rate (including periprosthetic fractures) over 5 years was 5.56%.

### **Conclusion**

Intramedullary nails are safe and reliable implants. Subgroup analysis confirmed no statistical difference between failure rates within the Gamma and InterTAN nailing system. Increased TAD and varus deformity (>10 degrees) were both common factors for failure of IM Nails. Our results are comparable to the published literature.



# Management of Chronic Regional Pain Syndrome in Trauma and Orthopaedic Surgery - a

## Systematic Review

Abdel Saed<sup>1</sup>, **Greg Neal-Smith**<sup>2</sup>, Scott Fernquest<sup>3</sup>, Jonathan Bourget-Murray<sup>1</sup>, Alexander Wood<sup>1,4</sup>

**Aims:** Chronic Regional Pain Syndrome [CRPS] is a debilitating condition that can be challenging to diagnose and manage resulting in increased morbidity and financial demands. Higher prevalence of CRPS has been noted amongst military personnel. This systematic review aims to evaluate the evidence of current and emerging treatment modalities for CRPS.

**Methods:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses [PRISMA] guidelines were followed. In January 2021, a search for all level I–IV evidence published in the English literature using the platforms Pubmed, MEDLINE, and Embase. Relevant original studies published up to and including January 2021 discussing the management of CRPS in adult trauma patients were identified. All prospective and retrospective studies, non-randomized comparison studies, and case series were considered for inclusion. Data extraction was performed by populating a predefined data abstraction sheet.

**Results:** There is strong evidence to suggest the efficacy of prompt physical therapy and physiotherapy, lidocaine, ketamine, bisphosphonates, sympathectomy and brachial plexus block in the management of CRPS. The latest evidence suggests Vitamin C has no significant role to play in the treatment or prevention of CRPS. Currently, there is no clear evidence of superiority in any treatment.

**Conclusions:** Multidisciplinary Team [MDT] involvement and early diagnosis are imperative in treating CRPS. The Budapest criteria and the British Orthopaedic Association Standards of Trauma and Orthopaedics [BOAST] guidelines should be used when diagnosing CRPS. Emerging treatments show promise in treating CRPS but further research is required to inform the best treatment modalities.

**Virtual fracture clinic triage and selective use of MRI:  
A hybrid model for managing suspected scaphoid fractures.**

**KH Moon**, J Heylen, N Macdonald, E Larsson, A Vaughan, R Owens

**Introduction**

The incidence of scaphoid fracture is low but missed fractures have a high chance of non-union, arthritis and poor outcomes even with salvage surgery. Currently, there is no consensus in modality of investigation. A suspected fracture can be managed by early MRI, Clinical review with serial X-rays or hybrid model which uses virtual fracture clinic (VFC) triage to determine further management. Our unit uses the hybrid model. We aimed to evaluate its efficiency, safety, clinical outcomes and cost-effectiveness.

**Method**

This is a retrospective study using electronic records. Patients attending the emergency department with either a confirmed or suspected scaphoid fracture between March and December 2020 were included (n=305). Of these 297 were referred to the VFC. Of the 297 referred to the VFC 33 had a confirmed fracture on x-ray and 264 had a suspected fracture.

**Results**

Overall, 46 of 264 suspected scaphoid fractures (17%) had further imaging – 41 MRI and 5 CT. MRI detected: 5% scaphoid fracture, 17% other fracture and no pathology 10%. The results of MRI minimally affected management. 3 patients were taken out of plaster early, 1 patient was immobilised and no patients underwent operation.

In the following 12-month period one patient re-presented with a wrist issue.

This approach avoided 218 MRIs, equating to £24000 and 109 hours of scanner time.

**Conclusion**

VFC triage and selective use of MRI scanning is a safe, efficient and cost-effective method for the management suspected scaphoid fractures. This can be implemented in units without resource to MRI all suspected scaphoid fractures.

## **Research priorities for the management of complex fractures: a UK priority setting partnership with the James Lind Alliance.**

C Bretherton, **H Claireaux\***, J Gower, S Martin, A Thornhill, L Johnson, L Silvester, R Kearney, M Baxter, P Dixon, V Giblin, X Griffin, W Eardley.

### **Aims**

To determine research priorities for the management of complex fractures, which represent the shared priorities of patients, their families, carers, and healthcare professionals.

### **Methods**

The scope includes open fractures, multi-fragmentary articular fractures, multiple concomitant fractures, and pelvis & acetabulum. A multiphase priority setting exercise was conducted over 21 months (Oct 2019 to June 2021). A national survey asked respondents to submit research uncertainties which were then combined into several indicative questions. Evidence was systematically reviewed to ensure that the questions had not already been sufficiently answered. A second national survey asked respondents to prioritise research questions. A final shortlist of 18 questions was taken to a stakeholder workshop, where a consensus was reached on the top 10 priorities.

### **Results**

A total of 532 uncertainties, submitted by 158 respondents (including 33 patients/carers) were received during the initial survey. These were refined into 58 unique indicative questions, of which all 58 were judged to be true uncertainties after systematic review of the existing evidence. 136 people (including 56 patients/carers) responded to the interim prioritisation survey and 18 questions were taken to a final consensus workshop between patients, carers, and healthcare professionals. At the final workshop, a consensus was reached for the ranking of the top 10 questions.

### **Conclusions**

The top 10 research priorities for complex fracture include questions regarding rehabilitation, complications, psychological support and return to life-roles. These shared priorities will now be used to guide funding bodies and teams wishing to research complex fractures over the coming decade.

## **Effects of COVID on Military T&O Trainees**

**Maj T Packer**, Lt Col Guthrie

Since March 2020 the COVID pandemic has had a significant impact on Trauma & Orthopaedic (T&O) services across the UK. As a result it has affected training opportunities for those within specialist training and this has been acknowledged by Joint Committee of Surgical Training (JCST). If this results in delays to CCT for military trainees, it will have an impact on long term planning for operational manning. Therefore we performed a survey to try and understand the impact the pandemic has had on military T&O trainees.

### **Method:**

All T&O Trainees (ST3-8) were sent a survey looking at surgical numbers, training opportunities, ARCP and exam progression during the pandemic period.

### **Results:**

11 (69%) trainees responded to the survey. Average number of surgical cases pre pandemic (2018-19) was 260 per year, at the height (2019-20) it was 189 and last year was 278 (2020-21). Trainees feel they have lost opportunities within arthroplasty and other elective operating. Most trainees felt that there was one less trauma case per day performed on a trauma list since the pandemic. Four trainees have had an adverse outcome at ARCP and three felt the pandemic will cause a delay in their training.

### **Conclusion:**

This survey highlights the issues the pandemic has caused within training of the military T&O cadre. There does appear to be some return of operative case numbers. Training delays may cause operation planning problems in the future, particularly if opportunities continue to be limited. It will take some innovative thinking to try and find solutions to ensure training can continue to improve.

The Combined Services Orthopaedic Society gratefully acknowledge the support of the following industry partners who enabled this meeting to proceed

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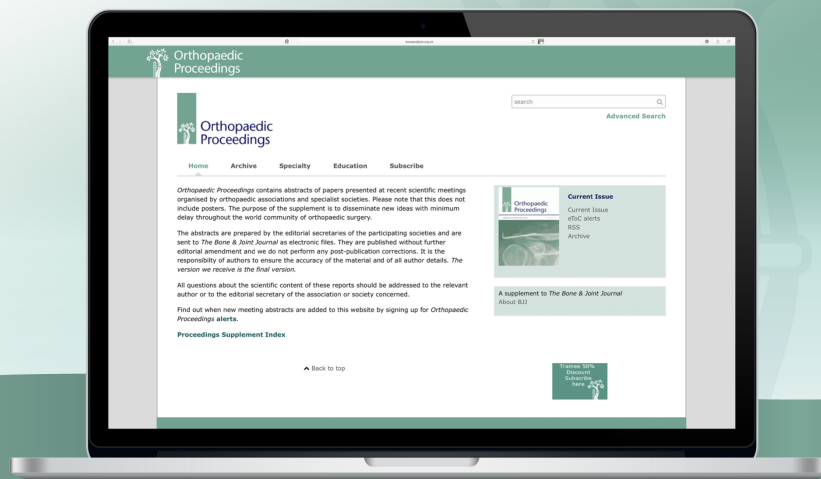
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