

P1

Minimally invasive distal metaphyseal metatarsal osteotomy (DMMO) for symptomatic forefoot pathology - Short to medium term outcomes from a retrospective case series

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Introduction: Distal metaphyseal metatarsal osteotomy (DMMO) may be used to treat metatarsalgia and other forefoot pathology by shortening the lesser metatarsals and reducing plantar pressures. It may be performed percutaneously, but there are few large series reporting its results. We report the radiographic and clinical results of a cohort of patients treated with percutaneous DMMOs at our unit.

Methods: This was a single-centre retrospective study looking at the outcome of consecutive patients undergoing percutaneous DMMOs over a 52-month period at our District General Hospital. We analysed demographics, radiological and clinical outcomes, complications and patient reported outcome measures.

Results: We included DMMOs on 106 toes in 43 feet. The mean age of patients was 60.2 ±10.2 years and 41 patients were female (95.3%). The median duration of follow-up was 38 months. The indication was metatarsalgia in 31 patients (72.1%) and MTPJ subluxation in 12 patients (27.9%). Concurrent procedures were performed in 26 cases (60.5%). DMMO was performed on multiple toes in 42 cases (96.7%). Mean shortening achieved was 3.6 ±2.2 mm, 4.1 ±1.6 mm, and 3.6 ±1.6 mm for the 2nd, 3rd and 4th toes respectively. Mean time to fusion was 11.4 ±7.8 weeks and union occurred in 105 toes (99.1%). The single non-union was asymptomatic at 12 months. Two patients (4.7%) required a subsequent additional DMMO for transfer metatarsalgia. Overall, minor complications were seen in 14 patients (31.1%). At final follow-up the mean MOxFAQ was 28.8 ±27.6, the mean EQ-5D was 0.789 ±0.225, the mean EQ-VAS was 68.5 ±20.3, the mean VAS-Pain was 3.1 ±2.8, and 41 patients (95.3%) were satisfied overall.

Conclusions: We have demonstrated excellent radiological and clinical outcomes, with relatively few complications in the short to medium term with percutaneous DMMOs.

P2

New model foot and ankle service pathway - pilot results 2 years

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Introduction: The foot and ankle services at NUTH incorporates both elective and trauma services. The elective service carries out on average 10,500- 11,000 review appointments/ year and 4000-4500 new patient appointments/year. The waiting times for new out-patient appointments were 8-14 weeks. A new pathway was designed with the aim to improve 18 week national target compliance, improve departmental efficiency, and improve patient satisfaction.

Method: A new initial assessment clinic pathway was designed where all new patients are seen in a one hour slot one stop clinic by a dedicated Extended Scope Practitioner. History and clinical examination are taken as well as initial Proms questionnaire, x-ray assessment followed by gait analysis including pain map, treadmill assessment and plantar pressure analysis. A consultant led MDT review of the finding is performed the same week where plan for treatment or further investigations is formulated.

Results: A total of 1792 patients had the initial assessment through the new clinic pathway between March 2016 and March 2018. The average waiting time for the initial assessment has been gradually reduced from 14 to 3 weeks. We obtained over 96% patient satisfaction in enhancing patient experience.

Conclusion: Our new clinic model has shown to improve efficiency, patient satisfaction and reduce waiting times.

P3

MIS distal metatarsal metaphyseal osteotomy in the treatment of metatarsalgia: MOXFQ patient reported outcomes

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Aim: The aim of this paper is to present validated patient reported outcomes for MIS Distal Metatarsal Metaphyseal Osteotomy (DMMO) in the treatment of metatarsalgia. We aim to evaluate the DMMO procedure, report patient satisfaction with the operated foot and report any complications of this procedure.

Patients and methods: Between 2014 and 2016, patients who had failed conservative treatment for

metatarsalgia were identified in the orthopaedic outpatient clinic. 24 consecutive patients requiring DMMO plus/minus toe straightening were prospectively studied. Patients requiring additional procedures at the time of surgery were excluded. Patients completed the validated Manchester-Oxford Foot Questionnaire (MOXFQ) three weeks pre-operatively and 1 year post-operatively. The MOXFQ results were analysed using paired t-tests. A supplementary question was asked regarding patient satisfaction with the operated foot.

Results: There were 20 women and 4 men with a mean age at the time of surgery of 64 years (sd 8.6). Statistically significant differences were found between the pre and post-operative MOXFQ. The post operative MOXFQ score demonstrated a poorer result for two patients, no change for two patients and improvement in 20 patients, with four of these patients recording the lowest possible score. There was a 29.5 point improvement in mean metric MOXFQ Index score. 79% (n=19) of patients were satisfied or very satisfied with the operated foot. The reported post operative complications experienced were a gastric bleed, pulmonary embolism (VTE), two delayed union, and one broken burr occurring intra operatively.

Conclusion: Our study demonstrates a statistically significant and clinically important improvement in patient reported outcomes following DMMO and good to excellent satisfaction with the procedure. We report two patients with delayed union and no non-unions which is comparable to other lesser metatarsal osteotomy procedures.

P4

The use of Percutaneous screw fixation without fracture site preparation in the treatment of 5th metatarsal base non-union

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Introduction: Non-union following a proximal fifth metatarsal can cause considerable pain with high morbidity with loss of work. Although many authors advocate early surgical management of zone 3 injuries (Jones fracture), zone 1 and 2 fractures are generally expected to heal with conservative management. Uncommonly, zone 1 and 2 fractures can develop non-unions. The aim of this study was to evaluate the efficacy of closed intramedullary screw fixation for non-unions of the 5th metatarsal base.

Methods: We performed a prospective study involving all 5th metatarsal base non-unions treated in our department over 2 years. Only minimally-displaced adult fractures were considered for this study. The fracture pattern was categorised using the Dameron classification (zone 1 - styloid process, zone 2- meta-diaphyseal area, zone 3 - proximal diaphysis). All non-unions were fixed percutaneously under radiographic guidance, without fracture site preparation. Zone 1 injuries were fixed using a 3mm headless compression screw and zone 2 and 3 with an intramedullary 4mm screw.

Results: Out of 19 patients included in this study, a minimum of 6 month clinical follow up was obtained. The average time from injury to treatment was 5.4 months (range 3-12 months). There were no smokers in this patient cohort. There were 12 zone 1 injuries, 3 zone 2 injuries and 4 zone 3 injuries. All patients achieved union by 3 months post screw fixation, with 18 out of 19 achieving union by 6 weeks. All patients had resolution of symptoms. There were no complications.

Conclusions: We conclude that percutaneous fixation of 5th metatarsal base non-unions, without fracture site preparation, achieves excellent results. We believe that the screw alters the strain of the fracture, thus promoting fibrous to osseous conversion and therefore union.

P5

Evaluating the weight bearing status of stable Weber B ankle fractures

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Introduction: Stable Weber B ankle fractures are treated with a walking boot for six weeks with instructions to fully weight bear. The aim of the present study was to evaluate the amount of weight patients manage to apply through the boot during their treatment and the amount of support the boot provides to them.

Materials and methods: All the adult patients treated with the above mentioned protocol between December 2017 and April 2018 were included to the study. Functional outcomes measured with the FADI and COST questionnaires and weight bearing radiographs were obtained at 2 and 6 weeks after the injury. The patients were asked to weight bear with and without the boot in order to measure the amount of weight going through the injured limb.

Results: Data from a total of 77 follow up appointments were collected and analysed. Most of the patients were female (61%) and their mean age was 56.3 ±18 years (mean BMI 29 ±7). At the 6-weeks follow-up the functional scores reached almost normal values (72.1 ±15.8 for FADI and 50 ±17 for COST score).

At the 2 weeks follow up, 73.5% of the patients were able to weight bear fully with and without the boot. Of the remaining 26.5%, 9.8% patients were able to put full weight through the boot only. The boot improved the weight bearing status of these patients significantly (p=0.05) by 23% of their body weight. All of the patients (100%) were able to weight bear fully with and without the boot at the 6-weeks follow-up.

Conclusion: Conservative treatment for stable Weber B ankle fractures lead to good functional outcomes. For 73.5% of the patients at the early phases of their treatment the walking boot does not aid their weight bearing

but for the remaining improves significantly the weight bearing status.

P6

Stabilisation of the ankle syndesmosis using the internal brace (Arthrex) - early results

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Introduction: The use of the internal brace to stabilize the ankle syndesmosis has previously been described by Regauer et al.(1) We describe the early results of 9 traumatic syndesmotic injuries treated in this way.

Methods: There 8 male patients and 1 female patient. Mean age 25 years(17-47 years). Included in the study were 5 professional rugby players, 1 semi professional rugby player and 1 semi professional footballer. 4 patients had isolated unstable anterior syndesmotic injuries. 3 patients had associated high fibula fractures and 2 patients posterior malleolar fractures. 1 patient had a deltoid ligament repair and another an ATFL repair at the same time. Patients were followed up at 2 weeks,6 weeks,12 weeks and approximately 6 months post surgery. AOFAS scores and range of movement in particular knee to wall distance were recorded and compared to the non-injured side. All patients underwent radiological examination at 6 weeks,12 weeks and approximately 6 months post surgery. Time to return to sports was also recorded.

Results: The early results appear encouraging with no complications related to the internal brace itself. Those patients with associated injuries had lower AOFAS scores, greater restriction in range of movement and longer return to sports.

Conclusion: We believe the internal brace provides comparable results with existing techniques to stabilize the syndesmosis. The anatomic technique we believe may have some functional advantages particularly with regard to initial stability. Further longer term larger studies are required to fully evaluate this technique.

References:

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P7

Are all Weber A ankle fractures benign?

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Introduction: Ankle fractures are a common injury with an incidence of 168.7/100,000/year. The Danis-Weber classification helps describe fibula fractures and guide treatment. Reports of non-unions in Weber A fractures are extremely rare. We present a case series of large, transverse avulsion type fracture (Weber A, Lauge-Hansen SAD stage 1 injury) which progressed to non-union and required surgical intervention. We aim to determine how commonly these fracture patterns progress to non-union.

Methods: Following initial identification of the injury pattern we searched through theatre and PACS databases to identify all similar ankle fracture non-unions that required surgical intervention. From November 2007 onwards, we also reviewed PACS imaging of all ankle radiographs reported as Weber A fractures or non-unions to try and estimate an incidence.

Results: 116 radiographs were reviewed. 19 patients were found with a fracture pattern similar to our index case. Four patients were identified with an established non-union and required surgery. These cases were dealt with by internal fixation with or without bone graft and all progressed to union.

Discussion: Three of the 4 cases reported a re-injury following their initial management. This could be a factor in the progression to non-union or a response to the already pre-existing condition. A number of theories for the development of a non-union in these cases have been proposed but no definite cause identified. If a symptomatic non-union is diagnosed then in our experience they progress to union following surgical debridement and stabilisation with or without bone graft. This injury pattern should promote thought from the treating clinician and shouldn't just be dismissed. We recommend no change to treatment applicable to any stable ankle fracture but that patients should be warned of the possibility of symptomatic non-union.

P8

Anatomy of the lateral plantar ligaments of the transverse metatarsal arch: The lateral Lisfranc ligament

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Introduction: The anatomy of the Lisfranc complex is well understood. In contrast, the lateral tarsometatarsal ligamentous structures are under investigated. A number of classifications have previously been proposed, noting homolateral and divergent subtypes of midfoot fracture dislocations. These subtypes indicate intact metatarsal connections of the middle and lateral rays (as illustrated clinically in figure 1), however little is understood in regards to these connections. Our aim was to identify the plantar ligamentous structures of the lateral tarsometatarsal joints and their significance in tarso-metatarsal joint injuries.

Methods: We examined 10 cadaveric lower limbs that had been preserved for dissection at the Human Anatomy and Resource Centre at Liverpool University in a solution of formaldehyde. The lower limbs were carefully dissected to identify the ligamentous structures of the plantar aspect of the transverse metatarsal arch.

Results: In all specimens, the long plantar ligament blended with a transverse metatarsal ligament (lateral Lisfranc) spanning from the 2nd to the 5th metatarsal. This transverse metatarsal ligament formed the basis of the roof and distal aspect of the peroneus longus canal. The separate short plantar ligament formed the floor of the peroneus longus canal. In addition, separate intermetatarsal ligaments were identifiable connecting each metatarsal. The long plantar ligament provides a connection through the transverse metatarsal ligament, connecting the transverse and longitudinal arches of the foot.

Conclusion: The plantar ligamentous structures of the lateral tarsometatarsal joints are a combination of individual intermetatarsal ligaments and a transverse metatarsal ligament. This explains the homogenous nature of a divergent tarsometatarsal joint injury and why middle and lateral columns move as one. It also has clinical significance in the observation that in some cases lateral column instability can be overcome when the middle column is stabilised.

P9

Calcaneal fracture epidemiology and fixation trends in England, 2000 to 2017

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Background: The primary aim is to document the epidemiology of admitted calcaneal fractures in England since the year 2000 in adults (age >18 years). The secondary aims are to determine whether the UK Heel Fracture Trial (UK HeFT) has impacted on the proportion of admitted calcaneal fractures being surgically fixed and whether there has been any change in the surgical technique used.

Methods: In England the Hospital Episode Statistics (HES) data is recorded annually. Between 2000/01 and 2016/17 the number of adults admitted to an English NHS hospital with a diagnosis of a calcaneal fracture and whether they were treated with surgical fixation was determined.

Results: Over the 17-year period 62,858 patients were admitted to hospital with a calcaneal fracture. The male to female ratio was 2.66:1. The mean annual incidence for males is 10.5 / 100,000 and for females 3.8 / 100,000. UK HeFT was published in July 2014. The percentage of patients with an admitted calcaneal fracture undergoing internal fixation pre-publication was 7.31% (3,792/51,859). Post-publication the internal fixation rate was 7.38% (534/7,229), which was not significantly different ($p=0.94$). Nevertheless of those calcaneal fractures that were internally fixed there has been a significant increase ($p<0.001$) in the percentage treated by closed reduction as opposed to open reduction subsequent to the publication of UK HeFT, from 8.32% (292/3511) pre-publication to 13.29% (71/534) post-publication.

Conclusion: This study documents the epidemiology and fixation trends of calcaneal fractures in England. We have established that surgeons did not change their clinical practice in terms of offering surgery for calcaneal fractures in response to UK HeFT. Surgeons though continue to innovate to find better ways of surgically treating calcaneal fractures, with a recent increase in less invasive procedures.

P10

Clinical and patient reported outcomes following low intensity pulsed ultrasound (Exogen) for established post-traumatic and post-surgical non-union in the foot and ankle

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Background: Contention exists as to the efficacy of Low Intensity Pulsed Ultrasound (Exogen) on bony healing following non-union. We examine clinical and patient reported outcomes following Exogen treatment, in patients following post-traumatic or post-surgical non-union in the foot and ankle.

Methods: Demographics, clinical and patient reported outcomes (pre and post treatment MOXFQ, EQ5D-5L and VAS scores) were gathered for 50 consecutive patients (February 2015 - February 2018) who underwent Exogen treatment for symptomatic and radiological non-union for a variety of foot and ankle pathology. The economic impact was also analysed.

Results: There were 15 fracture non-unions (tibia, ankle), 20 non unions from midfoot/forefoot procedures (talonavicular, tarsometatarsal, base 2nd metatarsal, base 5th metatarsal) and 15 from hindfoot procedures

(ankle/triple/TTC nailing). 13 patients (2,8,3) had diabetes mellitus and 6 (4,0,2) were smokers. 40 patients (14/16/10) clinically united, 4 (0,1,3) patients noticed no significant improvement but did not want to consider surgical intervention and 6 (1,3,2) patients failed treatment and progressed to revision surgery. Xray or CT scan was used to define radiographic confirmation of union post-treatment. Of those that clinically healed, radiographic union was found in 72% (29/40). PROM data showed statistically significant improvements ($P < 0.05$) at an average of 6 months post treatment. Exogen healed 93% in the fracture group, 80% in the midfoot/forefoot group and 67% in the hindfoot group. Significant cost savings were realised with the use of Exogen for this cohort of patients.

Discussion: Overall, 80% of patients with foot and ankle non-union improved clinically to discharge, (with no need for further intervention), with significant improvements in PROM scores. Poorer results may be observed in hindfoot procedures. The appropriate use of Exogen for established non-union in the foot and ankle is a safe, valuable and economically viable clinical option as an alternative to revision surgery.

P11

Tibiotalar arthrodesis - Is union rate and time to union influenced by preoperative deformity, patient related factors or open/arthroscopic procedure and what do patients perceive?

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Background: Arthroscopic ankle arthrodesis(AAA) is an established procedure for treatment of end stage ankle arthritis. It has the potential advantage of faster time to union, lower morbidity ,faster rehabilitation, less blood loss and shorter hospital stay when compared to open fusion.The purpose is to analyse if union is affected by deformity, patient related factors and measure PROMS.

Materials and methods: Between January 2005 and December 2015, 124 Ankle Arthrodesis (OAA-27; AAA-97) procedures were performed by fellowship trained foot and ankle surgeons in a single institution. Based on preoperative deformity, (AAA- 28 degree valgus to 26 degrees varus; OAA- 41 degree valgus to 28 degree varus) they were subdivided into 2 groups based upon deformity more than 15 degrees. Union rates, time to union, length of stay, PROMS (EuroQol pain and Johnson 's satisfaction scale).

Results: Mean age of patients was 60years (Range-20-82 years)(Male:Female-92:32).Overall fusion rate was 93% in AAA and 89% in OAA ($p=0.4$).On sub group analysis of the influence of preoperative deformity, there was no difference in union rates of AAA versus OAA. Average time to union was 13.7 in AAA and 12.5 weeks in OAA ($p=0.3$). Average hospital stay was 2.6 days in AAA and 3.8 days in OAA ($p=0.003$) 40% had no pain on EuroQol and 32% were completely satisfied with their procedure.

Conclusion: Although both AAA and OAA showed good union rates,hospital stay was significantly shorter in AAA. A larger deformity did not adversely affect union rates in AAA. 40% of patients reported a good outcome for pain relief. Lifestyle risk factors did not have cumulative effect on union. Our study shows that AAA is reproducible method of treating end stage arthritis of tibiotalar joint irrespective of preoperative deformity and patient related factors, however PROMs show there is still areas for improvement, upto 5 years post procedure.

P12

FORFoot: Forefoot offloading shoes vs rigid flat shoes in patients undergoing surgery of the first ray: A randomised controlled trial of clinical and radiological outcomes

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Background: It is common for patients undergoing hallux rigidus or hallux valgus surgery to be prescribed six weeks of postoperative immobilisation using either flat or reverse camber postoperative shoes. Currently, evidence is lacking to demonstrate if there is a difference between these two forms of immobilisation in either patient satisfaction or clinical outcomes.

Methods: One hundred consecutive patients undergoing Scarf/Akin osteotomies or 1st MTPJ arthrodesis were recruited. Patients were randomised to either flat or reverse camber postoperative shoes, fifty patients in each group. Patients undergoing ancillary procedures on lesser toes were not excluded. Satisfaction with each form of postoperative shoe was reviewed by patient reported VAS pain scale and Likert satisfaction survey. Radiographic outcomes were reviewed at 1-year observing differences in fusion rates (Arthrodesis) or deformity recurrence (Hallux valgus).

Results: At completion of the study there were 47 patients in the reverse cam and 43 in the flat shoe group. No difference in primary forefoot operation, additional operation, age at surgery or pre-op VAS pain score was seen between groups. At the 6 week follow up there was no difference in post op VAS pain score between the groups. However, the flat shoe group were significantly more likely to be satisfied with their general mobility in

the shoe (86.0% vs 61.7%, $p=0.01$) and satisfied with their stability in the shoe (90.7% vs 69.6%, $p=0.03$) than the reverse cam shoe group. There was no statistically significant difference seen between groups for non-union or hallux valgus recurrence rates.

Conclusions: Both forms of postoperative footwear were effective in enabling patients to mobilise and in preventing adverse outcomes. Patients are more likely to be satisfied with a flat postoperative shoe due to improved stability and ease in mobilising. The results of this study aid surgeon decision making for postoperative footwear type in forefoot surgery.

P13

Early results of Complete Cartilage Regeneration (CCR) technique for Talar Osteo-Chondral defects (OCD)

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Aim: To provide on going evidence and monitoring for a new surgical technique. In the single stage treatment of patients with cartilage defects of the talus.

Method: Bone marrow aspirate (35mls) is harvested from the posterior or anterior superior iliac spine of the pelvis. This is spun down into a Mesenchymal Stem Cell (MSC) rich concentrate. The concentrate is mixed with a Fibrin gel and hyaluronic acid. The resulting adherent mixture is glued onto the prepared defect, to form a MSC rich patch.

Results: Total number of patients to receive CRR to date is 52. There have been no serious adverse incidents to date.

Average MOX-FQ summary index pre op was 68 and improved to 47 at 6 months, 39 at 12 months and 39 at 18 months post procedure.

Average EQ5d-5L VAS pre op was 67 and improved to 73 at 6 months, 77 at 12 months and 73 at 18 months post procedure.

Average AOFAS pre op was 57, this improved to 74 at 6 months, 81 at 12 months and 75 at 18 months post procedure.

Average EQ-5d-5L index was 0.51 pre op, this improved to 0.65 at 6 months, 0.66 at 12 months and 0.79 at 18 months post procedure.

Conclusion: The early data gathered on this technique shows it to be safe and these early results are promising especially considering the trend towards continuing improvement.

P14

Is operative treatment of delayed Achilles tendon rupture presentation essential? Mid and long-term follow-up of conservatively treated patients

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Surgical treatment of delayed Achilles tendon rupture is strongly advised in the literature, but is it always required? The purpose of this study was to report the outcomes of patients with a delayed presentation of Achilles tendon rupture treated conservatively via a dedicated treatment pathway.

All Patients with a delayed presentation who had been conservatively treated between 2008 - 2014 were identified. The conservative management pathway was the Swansea Morrison Achilles Rupture Treatment (SMART protocol) as used for the acute ruptures. Following ultrasound diagnosis, patients were immobilised in equinus and followed up in a dedicated Achilles tendon clinic along strict rehabilitation guidelines.

Outcome measures included complication rates; Achilles Tendon Total Rupture Score (ATRS) and Achilles Repair Score (ARS) repeated at mid (mean of 3 years) and long follow-up (mean of 6 years); and muscle function dynamometry assessing plantarflexion torque of the ankle. MRI of ruptured and non-ruptured legs allowed measurement of Achilles tendon length. Comparisons between the two sides were made (2-tailed t-test).

19 patients with a mean age of 60 years and a mean delay to treatment of 61 days were identified. The mean ATRS at mid-term follow-up was 65/100 and ARS was 71/100. The mean plantarflexion torque for the injured side was 19.5 N.m compared to 25.7 N.m on the uninjured side, with a significant difference between the two sides ($p = 0.001$). The mean length of the injured Achilles tendon was 104.9mm and uninjured 97.3mm, with no significant difference ($p = 0.111$). At long-term follow-up ATRS was 81/100 and ARS was 73/100. There were no re-ruptures. One patient had a pulmonary embolus. One patient went on to surgery.

A conservative management regime for patients with a delayed presentation Achilles tendon rupture provides a satisfactory outcome in the majority of cases.

P15

Identification of stable supination external rotation ankle fractures - A consensus opinion

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Background: The British Orthopaedic Association Standards for Trauma (BOAST) guidelines highlight the importance of identifying stability in the treatment of ankle fractures within 2 weeks of injury. In practice, it is the supination external rotation (SER) injuries when stability remains unclear and further assessment is required.

We sought to form a sub-speciality, consensus opinion from British Orthopaedic Foot and Ankle Society (BOFAS) members, on how to determine stability in SER injuries.

Methods: We performed an electronic survey of all 456 BOFAS full members in autumn 2017. The survey contained two scenarios on how to determine stability in a young healthy patient with an isolated Weber B fracture and no talar shift: -

1. With medial tenderness
2. Without medial tenderness

Results: The response rate was 61%. In the presence of medial tenderness 71% of members would test for stability/talar shift by using weight-bearing (WB) radiographs. When medial tenderness was absent, 67% would still test stability in the same manner. The exception to this was when patients had no medial tenderness and had walked on their fracture prior to presentation. In this case 65% used the presentation radiograph, to look for talar shift and determine stability.

The method and timing of WB radiographs varied, however the majority performed standing radiographs, barefooted at approximately 1 week following injury.

Conclusion: This survey provides a consensus on determining the stability of SER ankle fractures.

Patients with un-displaced SER injuries who have not walked prior to presentation should undergo standing radiographs regardless of the presence or absence of medial tenderness, at approximately 1 week from injury. Medial tenderness does not determine stability.

Implications: To ensure early WB, individual units should ensure they have a pathway highlighting which ankle fractures should get WB radiographs including when and how they should be performed.

P16

An investigation of the damage to flexor tendons incurred by different minimally invasive proximal phalangeal closing wedge osteotomy surgical techniques in cadaveric feet

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Background: Minimally invasive surgery (MIS) for hammer toe correction has become increasingly popular in the United Kingdom. The proximal phalangeal closing wedge osteotomy component of hammer toe correction can be performed by passing the burr via a plantar incision through the flexor tendons (transtendinous) or passing the burr adjacent to the flexor tendons (paratendinous).

Aim: To investigate damage to the flexor tendons by transtendinous and paratendinous techniques in cadaveric feet.

Method: Institutional approval was granted. Alternating between right and left feet of 8 donors, MIS proximal phalangeal osteotomies were performed transtendinous (n=24) and paratendinous (n=24) using the 2nd, 3rd and 4th toes. Osteotomies were performed by 2 experienced surgeons using a 2mm x 8mm wedge burr. Toes were then dissected by an independent observer to assess damage to the flexor tendons.

Results: Using the paratendinous technique, significantly more damage to the flexor tendons was noted compared to the transtendinous technique (47% vs 4%, p< 0.05). The position of the osteotomy at or distal to the metaphyseal/diaphyseal junction was assessed. There was a significant difference in flexor tendon damage in the paratendinous group when the osteotomy was sited at the junction compared to more distally (67% vs 27%, p< 0.05). There was no significant difference accordingly to site using the transtendinous technique (7% vs 1%, p>0.05).

Conclusion: The least damage to the flexor tendon in MIS proximal phalangeal osteotomy is achieved with a transtendinous technique regardless of osteotomy site. The most damage to the flexor tendon occurs with a paratendinous technique at the metaphyseal/diaphyseal junction.

P17

A prospective study of 493 Ankle Fractures in a UK trauma unit: What lessons can be learnt?

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Introduction: Ankle fractures represent 10% of the fracture workload and are projected to increase due to ageing population. We present our experience and lessons learnt in the management of ankle fractures in a large UK Trauma unit.

Methods: Prospective data collected between 2013 and 2017 was retrospectively analysed. A total of 493 patients entered into the database were divided into Stable ankle fractures (Group A) and unstable ankle fractures treated with surgical fixation (Group B).

Petronne's criteria were used to assess quality of reduction in Group B. Pre and post injury PROMs were compared using Olerud-Molander Ankle Scores (OMAS) and Lower Extremity Functional Scales (LEFS).

Results: In Group A, 132 patients matched the criteria for the "stable ankle pathway" and were allowed weight bearing in a cast or boot. Two patients required surgery due to talar shift on weight bearing x-rays at one week and two patients had delayed union.

In Group B, of 351, data was available for 302 patients for final analysis. The mean age was 46.7, with comorbidities 186 (72.1%) overweight, 14 (4.7%) diabetes, 65 (23%) smokers, 33 (11.6%) alcoholics and 1 steroid use. Seventy-three (34%) had inadequate reduction in 2014-2015; this figure reduced to 12 cases, 13.8% in 2016-17, after introduction of a simple educational tool. There were 8 (3.1%) post-operative wound infections. Pre- and post-op OMAS and LEFS were compared which showed mean reduction of 14.7 and 11.3 respectively. Multiple regression analysis did not reveal any significant co-relation between patient demographics, co-morbidities, radiological outcomes and post-op PROMS.

Conclusion: Our 'stable ankle pathway' is safe and effective. We recommend a simple educational tool to improve trainees and general trauma surgeon's awareness in treating this injury adequately. Patients should be counselled for general decline in ankle function due to the injury regardless of adequate fixation.

P18

The incidence of gissane angle impingement and accessory anterolateral facet of the talus in adult acquired flat foot: the need for an increased awareness of non-arthritic lateral hindfoot pain

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Introduction: In Adult Acquired Flatfoot (AAF) classifications (Stage 3 of Johnson and Strom, Bluman) lateral hindfoot pain is associated with subtalar joint arthritis (STA) and arthrodesis is recommended. Bluman reports sinus tarsi pain, Gissane Angle sclerosis and subtalar joint space loss as Grade 3 changes.

We hypothesise that the occurrence of lateral pain from Gissane Angle Impingement (GAI) is independent of subtalar arthritis and is dependent on the extent of the deformity and/or the presence of an Accessory Anterolateral Facet of Talus (AAFT).

Methods: Radiographs and MRI images of AAF done between May 2015 and January 2018 were reviewed. Meary's angle, Talonavicular coverage angle, subtalar articular status, Gissane Angle bone oedema, the presence of an AAFT, calcaneofibular impingement (CFI) and hindfoot valgus angle (HFVA) were assessed.

Results: 28 (24 female, 4 male) patients with a mean age of 54.2 years were included. The mean Meary's angle was 32 degrees and the mean talonavicular coverage angle was 23.8 degrees. The mean HFVA was 33.6. 14 patients demonstrated MR signal change in both talar and calcaneal sides of the Gissane Angle and 2 patients demonstrated unilateral signal change. An AAFT was seen in the MRI images of 10 of these patients. Only 9 patients demonstrated CFI. There was STA in 11 patients. CFI & STA coexisted in 4 patients.

Presence of an AAFT was found to significantly reduce the measured tip-apex distance within the Gissane Angle (mean 3.2mm to mean 2.2mm) and was also associated with increased bone oedema.

Discussion: Our cohort of patients demonstrates significant pes planus deformity and a high prevalence of GAI on MRI scans. GAI was seen more frequently than CFI.

GAI appears independent of STA and arthrodesis need not be considered.

Identifying the causes of lateral pain and the presence of an AAFT significantly influences surgical planning.

P19

Posterior approaches to the ankle - An analysis of 3 approaches for access to the posterior distal tibia

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Aim: With the increase in the use of CT scanning and fragment specific fixation for complex ankle fractures, utilisation of multiple surgical approaches has increased. Our aim in this study was to analyse three posterior-ankle approaches to find their use and efficacy in accessing the posterior tibia.

Methods: We examined 5 fresh frozen cadaveric lower limbs at the University of Keele anatomy laboratory. Three posterior ankle approaches (posterolateral (PL), posteromedial (PM) and medial posteromedial (MPM) approaches were performed, using a consistent repeatable incision of 7cm. Kirchner wires were then placed

parallel to one another at 4 points in the posterior tibia (proximal, distal, medial and lateral). The ankles were imaged using an image intensifier and the distances measured.

Results: The PL approach allowed an average 746.9 mm² diamond of access (DOA) to the posterior tibia (46.2 x16.2mm). The PM approach allowed an average 1101.9mm² DOA to the posterior tibia (56.8x19.4mm). The MPM approach allowed an average of 1184.7mm² DOA to the posterior tibia (55.1x21.5mm).

We compared the areas of access for each incision to 149 posterior malleolar fractures on our database. Only 56% of fractures could be fully exposed using the PL incision. In comparison, 78% of fractures could be exposed using the PM incision. Only 19% of patients had posteromedial fractures that could be visualised using the MPM incision, but it did not allow access to the constant posterolateral fragment, thus its usage is primarily as a supplementary incision.

Conclusion: We conclude that the most commonly used approach (the PL approach) gives the least amount of access to the posterior tibia. In comparison to fracture fragment size, almost half of fractures would not be fully exposed through the PL approach, and if fixing such fractures the surgeon should be comfortable with multiple approaches.

P20

Prolotherapy as a treatment choice for ATFL injuries in elite athletes: A case series

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Anterior talofibular ligament (ATFL) complex injuries in professional football and rugby players are common and can cause significant time off sport at elite level competition. Prolotherapy is effective in treating refractory tendinopathies, but inadequate clinical evidence exists to recommend its use as a treatment for acute ankle sprains. Importantly there is no literature about its use in elite athletes and ankle injuries. Our series documents grade 2 or 3 ATFL tears in 10 professional elite level athletes who were injected with a solution of P2G (dextrose, glycerol and 1% phenol mixed with local anaesthetic) under ultrasound guidance and using aseptic technique weekly either twice or three times dependant on their symptoms and recovery. All athletes in combination with prolotherapy and physiotherapy returned to elite level sport without any complications and with only one reinjury. These results show that in this elite athlete population prolotherapy can be safe and effective tool to treat ATFL injuries.