P1

Comparative study assessing sporting ability after arthrodesis and cartiva hemiarthroplasty for treatment of hallux rigidus

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Background: Arthrodesis and Cartiva synthetic cartilage implant (SCI) are accepted treatments for hallux rigidus. Arthrodesis is the gold standard treatment of hallux rigidus. Although good functional outcomes have been reported for both procedures, there is little data available on post-operative sporting ability for these patients. As of now, there are no independent comparative series for treatment of hallux rigidus utilising polyvinyl alcohol implants.
Objectives: To compare sporting ability after Arthrodesis and Cartiva SCI hemiarthroplasty of the first metatarsophalangeal joint.
Study design and methods: Patients at a single centre with symptomatic hallux rigidus who underwent Arthrodesis or Cartiva SCI hemiarthroplasty were identified. Sporting ability was assessed at a minimum of 12 months post-operative utilising the patient reported outcome measure, Foot & Ankle Ability Measure (FAAM) sports questionnaire. First metatarsophalangeal joint arthritis was radiographically graded according to the Hattrup and Johnson (HJ) classification.
Results: 42 Arthrodesis and 26 Cartiva patients were included in this study. Mean ages for this cohort were 64 and 58 respectively with a follow-up time of 19 and 18 months respectively. Arthrodesis patients consisted of 6.8% HJ1, 40.9% HJ2 and 52.3% HJ3 and Cartiva SCI patients 31% HJ2 and 69% HJ3 with no HJ1 patients. Mean post-operative FAAM scores were 80.9% for Arthrodesis and 78.9% for Cartiva SCI. Mann-Whitney U testing revealed no statistically significant difference between Arthrodesis and Cartiva SCI ($p>0.3$). Comparing age (< 55 and >55) and gender matched cohorts revealed no statistically significant results.
Conclusions: Our results suggest that both Arthrodesis and Cartiva SCI result in similar post-operative sporting ability. Cartiva SCI results in a faster return to activities and preserves joint flexibility with adequate pain reduction. More research with larger cohorts and longer follow up is indicated. Initial results of Cartiva SCI are favourable and comparable to arthrodesis.

P2

Severe insertional Achilles tendinopathy: Our experience with two different surgical techniques

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Introduction: Severe insertional Achilles tendinopathy (IAT) is difficult to treat. This study reviews our experience of two surgical approaches undertaken at a single unit, open debridement of Achilles tendon insertion and dorsal closing wedge calcaneal osteotomy.
Methods: 35 patients with failed conservative management were considered for surgery. 25 patients were in the open debridement and 11 patients in the calcaneal osteotomy group. The open debridement, with excision of Haglund's when present, was performed by a single surgeon from 2010-2019. Standard technique used, with suture anchors for reinforcement of TA when required. The calcaneal osteotomies were performed by another surgeon during 2014-2019. Zadek's technique was utilized and plantar cortex was kept intact at the apex of the osteotomy. Fixation was achieved with screws, IOFIX device or calcaneal compression plates. The Manchester-Oxford foot questionnaire (MOXFQ) and followup assessment by the surgeon were used to assess outcomes.
Results: A total of 36 feet (35 patients) were assessed with a mean age of 52.6 years and followup of 20 weeks. The debridement group showed 76% (19 patients) with good to excellent outcome. Three patients required revision debridement with a fair outcome. Three patients had a poor outcome. One patient required revision with Zadek's osteotomy, two patients were referred to rheumatology for ongoing pain.
The calcaneal osteotomy group showed 82% (9 patients) with good to excellent outcome. Two patients required removal of metal work with a fair outcome. One patient developed plantar fasciitis. Osteotomies were united in all patients. There were no major complications including venous thromboembolism in either group.
Conclusions: Both techniques are safe and satisfactory and correct patient selection is paramount for each. Calcaneal osteotomy also demonstrates encouraging results. The authors recommend a prospective comparative study with larger population and longer followup, as there is paucity of such studies in published literature.

P3

Surgical reconstruction in patients with a delayed presentation of TURF toe injury: early functional outcomes

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Introduction: TURF toe is a hyperextension injury of the first metatarsophalangeal joint common amongst athletes. Axial loading of the dorsiflexed MTP joint in a well grounded forefoot results in the attenuation or disruption of the capsular ligamentous complex supporting the joint. This may lead to an unstable joint, fracture of the sesamoids or traumatic valgus deformity of the toe.

Aim: The aim of this study is to assess outcomes and complications following surgical treatment for delayed TURF toe presentation using the Manchester-Oxford foot questionnaire.
Materials and methods: Prospective data was collected for 7 patients who received surgery for delayed TURF toe presentation. All patients underwent a standardized process of care and all cases were operated on by a single foot and ankle surgeon. Functional outcome scores were measured using the MOxFQ and statistics were obtained using SPSS for Windows. Data was checked for normality, which confirmed a non-normal distribution. Subsequently, the non-parametric Wilcoxon signed rank test for paired data was used to test for statistical significance between the pre and post-operative scores.
Results: This study included 3 male and 4 female patients who had surgery between 2011 and 2015. Patients presented 12 to 18 months following initial injury. The mean age at the time of surgery was 32.7 years and mean follow up was 7.5 months post operative. 5 of the 7 patients had a history of hyperextension injury of the great toe. Improvements in all domains were statistically significant (P=< 0.05). The mean time to return to full functional capacity post-operative was 4 months, and no complications or reoccurrence of symptoms were documented following surgery.
Conclusion: This study demonstrated that good patient outcomes can be obtained with appropriate surgical treatment of TURF toe injuries with delayed presentation following a correct diagnosis and careful selection of surgical candidates.

P4

Does the presence of pes planus deformity increase recurrence of hallux valgus deformity following surgery?

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Risk factors for Hallux Valgus include; shod footwear, genetic factors, metatarsal morphology, ligamentous laxity and Pes Planus. Loss of arch increases Hallux plantar medial pressures and drives deformity during heel rise. Elevation of Hallux with defunctioning of Peroneus Longus, hindfoot eversion and forefoot abduction also contribute.
There is little in the literature regarding whether Pes Planus is associated with increased recurrence rates. This paper reports a restrospective review of 183 consecutive Hallux valgus cases performed 07/03/2008-05/12/2017. Follow up for at least six months . X-rays were performed at six weeks, three months and at six and/or 12 months . We examined Sesamoid location (Hardy and Clapham Classification), Hallux Valgus Angle (HVA), Intermetatarsal Angle, Meary's angle and Talonavicular uncovering.
12 were excluded due to previously amputated second toes, Hallux Varus, revision surgery and loss to follow up. Or the 171 remaining cases 75 had Pes Planus (Meary's < -4°).
144/171 (84.2%) cases had HVA correction to < 15°. The incidence of recurrent HVA > 15° was significantly higher in those with Meary's angle < - 4° (Chi-Sq P-value0.000002). Those with a Meary's angle -20° to -10° had a significantly higher rate of recurrence than ones measuring -10° to -4° (Chi-Sq P-value0.0018). 51/75 (68%) breaks in Meary's line were located at the Naviculocuneiform joint.
Overall progression of deformity was no different between those initially corrected post surgery to HVA < 15° (Chi-Sq P-value0.61) and those not. Multiple regression analysis revealed there was no meaningful association with sesamoid location and recurrence.
Our results demonstrate a link between Pre-operative Pes Planus deformity and increased recurrence rates of Hallux Valgus deformity following surgery.

P5

The posterior malleolus approaches clock: a method of guiding incision choice for fragment specific fixation

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Aim: The aim of this study was to determine the most appropriate approach for fixation of each type and fragment of posterior malleolar fractures.
Materials and methods: A retrospective analysis of a prospectively collected database was performed on 141 posterior malleolar fractures. On the CT scan axial slice, a clock face was drawn using the posterolateral corner of the tibia as the centre and the Achilles tendon as the 6 o'clock axis. A box was then drawn from the fracture plane, with 90-degree lines corresponding to the medial line (ML) and lateral line (LL) extremity of the fracture and a central line (CL) (i.e. orthogonal central plane, for optimum screw placement). It was recorded where the ML, LL and CL exited the clock face. All fracture patterns were further assessed by both senior authors regarding their choice of approach based on CL and all variances resolved by discussion.
Results: The LL was equivalent across the groups (except for the 2B medial fragments), indicating a consistent posterolateral corner fragment throughout the posterior malleolar sub types (p=.25). The medial aspect (ML) of the type 1, type 2A and posterolateral fragments of type 2B were equivalent. The posterolateral approach was determined to be the most appropriate approach to access these posterolateral fragments. The ML of type 3 fractures was significantly more medial than the other type 1 and 2A (p< .05), and almost all could be appropriately accessed through the posteromedial approach. The majority of type 2B fractures (2/3rds) were

determined to be best accessed through a combined posterolateral and medial posteromedial approaches.
Conclusion: We conclude that the extent of each subtype of posterior malleolar fractures are anatomical consistent. To fully expose each fracture, differing incisions are necessary and can be accurately predicted by CT classification and the clock face method.

P6
The spring ligament meniscus: an anatomical study

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Introduction: An articular facet composed of fibrocartilage has previously been described in the superomedial spring ligament. Our aim in this study was to analyse this fibrocartilage structure, assessing its association with the other aspects of the acetabular pedis.
Methods: We examined 14 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 spring ligament was approached from the superior direction. The talus was disarticulated and high-resolution images were taken of the acetabular pedis. ImageJ software was used to calculate the surface area of the spring ligament articular facet (SLAF).
Results: Dissection was performed on 14 specimens, 4 left and 10 right. All specimens were morphologically normal with no evidence of previous surgical intervention. The mean area of the SLAF was140.79mm^2 (95% Confidence intervals 125.31, 156.27), equivalent to the size of the medial facet of the calcaneum. The SLAF was attached anteriorly to the navicular and posteriorly to the sustentaculum, orientated to not only bear weight in stance phase with the load of the talar head but also in propulsive phase, bearing weight between the navicular and the sustentaculum tali when the foot was in inversion. The SLAF was composed of fibrocartilage with a smooth superior articular surface.
Conclusion: The SLAF is an important weight bearing structure in all phases of gait. More work needs to be done in its role in the biomechanics of the foot and the options for reconstruction in pes planus deformity.

P7
High BMI increases rates of non-union in hind and mid-foot arthodesis

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Background: Arthrodesis is used to treat arthritis and deformity in a range of hind and midfoot joints. The affect of BMI on rates of non-union remains unclear from current evidence. We have analysed our cohort of patients to further examine this relationship.
Methods: 381 primary joint arthrodeses (in 277 patients) were identified from a single surgeon´s logbook. Case notes were reviewed to gather demographic data including BMI. Patients were divided into obese (BMI >30) and normal (BMI< 30). Primary outcome was clinical union as diagnosed by the treating physician at the time, based on clinical and radiological review.
Results: 190 joints were classed as obese and 191 as normal. There were no significant differences in baseline demographics or rates of smoking. There was a significantly higher rate of non-union amongst the obese group (7.9%) than the normal group (2.6%), P-Value 0.030. There was no difference in rates of deep infection or delayed union.
Conclusion: Previous literature has not been conclusive on the impact of BMI on non-union rates. Data from our cohort supports a role of obesity in the development of non-union. The majority of patients are advised to remain non-weightbearing in cast immobilisation post-operatively. It is not clear if our findings are as a result of a physiological or biomechanical cause.

P8
Surgery for non-union after 5th metatarsal fractures - the good guy becomes the bad guy!

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Introduction: The majority of the 5th metatarsal fractures are successfully treated conservatively and only a few patients require surgical fixation for symptomatic non-union. The tuberosity avulsion fractures are generally considered benign injuries with the more distal fractures showing a propensity to develop delayed/non-union. We studied a cohort of patients who underwent surgery for the treatment of non-union and report on the outcome and the rate of complications and requirement for additional surgery.
Methods: All patients, who required surgery to their fifth metatarsal, from June 2008 to May 2018, were included in this retrospective study. Demographic and clinical outcome data and radiographic classification of fracture types were collected, reviewed and analysed.
Results: 35 patients had undergone surgery for 5th metatarsal fractures during this time period and 31 of these had been operated for a painful non-union. 12 were tuberosity avulsion fractures (Lawrence and Botte Type 1) and 23 were Type 2 and 3. Five patients (14.3%) experienced a further symptomatic non-union after initial surgery; Type 1 fractures were 11 times more likely to result in non-union (p=0.0375). Wound complications

were seen in 14.3% of the sample whilst 22.9% of the group required some form of further surgery, with a significant association between Type 1 fractures and the need for further surgery (p=0.0107).
Conclusion: This study is the first of its kind reporting specifically on the outcome after surgical fixation of a non-union of the fifth metatarsal fractures. Overall, surgery had a good outcome with a low complication rate, though it is interesting to note that Type 1 fractures which traditionally have a low non-union rate after conservative treatment are associated with a significantly increased incidence of non-union if operated for symptomatic non-union and require additional surgery.

P9

Nottingham experience with the fixed bearing Infinity Total Ankle Replacement

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Introduction: Total ankle arthroplasty (TAA) is increasingly used for treatment of end stage arthritis of the ankle; improvements continue to evolve in implant design and instrumentation. Recently there has been considerable excitement about fixed bearing TAA and we present our experience of the Infinity Total Ankle Arthroplasty, this is a fixed bearing 4th generation implant with improved instrumentation.
Methods: This is a retrospective study with prospective data collection, we I identified in our institution 92 (52 Male/40 Female) who had the an infinity Total ankle replacement during the period October 2016 -July 2019, The mean age 67.5(33-87), there were 43 right side and 49 left none of our patients had bilateral ankle replacements, the indication for the surgery was End stage Osteoarthritis in 83 patients and Rheumatoid arthritis in 9, All patients had follow up appointments at 6 weeks, 3,6 and 12 months and were required to fill in PROMS (MOXFQ and EQ5D) all had weight bearing X-rays as well.
Results: Improvement in Clinical outcome and PROM data was noted on follow up, radiological alignment was maintained, it was noted that 15(16%) patients had heterotopic ossification in the posterior capsule, lucency in the tibia implant was noted in 4 ankles and fibula erosion was noted in one, 2 implanted needed to be revised due to malpositioning and we had no infections in our short term series.
Conclusion: Our results show considerable improving in patient outcomes, particular short recovery time and improvement in mobility post operatively, and low complication rate, only 2 implants were revised and we attribute that the learning curve needed at the start of practice.
This implant is fluoroscopically navigated allowing precise implantation with dedicated instrumentation and we feel this attributed to the low complication rate and good results in our short-term study.

P10

Long-term outcome of ankle replacements in patients with inflammatory joint disease and osteoarthritis: Is there a difference?

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Aims: We aim to provide long-term implant survival rates of total ankle replacement in patients with inflammatory joint disease and osteoarthritis.
Methods: Between November 1993 and February 2000, a single surgeon implanted 200 Scandinavian Total Ankle Replacement (STAR) prostheses (184 patients). Data were collected prospectively. Pain and function were assessed using American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot scoring system. Failure was considered as re-operation with revision of one or all the components or conversion to arthrodesis.
Results: The underlying diagnosis was inflammatory joint disease in 119 and primary or posttraumatic osteoarthritis (OA) in 81 ankles. Mean age at implantation was 60 years with a significant difference in the two groups (IJD=58.2 years, OA= 62.6 years, p= 0.01). Mean follow-up was 15.8 years. Mean AOFAS scores were comparable in the two groups (IJD=61, OA=60). Nineteen patients were lost to follow up.
In total 32 ankles required revision (16%); 14 in IJD (11.7%) and 18 in OA group (22.2%), significantly lower in IJD group (p=0.03). Average time from surgery to implant failure was 9.5 years in patients with IJD and 7.1 years in patients with OA. One hundred patients (113 ankles) died during the observation period, of which 87 patients (100 ankles) died without requiring revision surgery. Among the surviving 84 patients (87 ankles, IJD=40, OA=47), seven ankles in patients with IJD and twelve ankles in patients with OA required revision surgery. At 15.8 years, the overall implant survival was 76.16%. The implant survival was 81.95% in patients with IJD and 68.10% in patients with OA (p=0.03).
Conclusion: We report significantly better long-term implant survival rates in patients with inflammatory joint disease compared to OA after total ankle replacement with similar functional results. The predominant mode of failure was coronal plane malalignment in IJD and aseptic loosening in OA.

P11

Outcomes of spiral osteotomy of the tibia to correct coronal plane deformities in patients with concomitant end-stage osteoarthritis of the ankle

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Introduction: The management of end-stage osteoarthritis of the ankle with concomitant angular deformity of

the tibia more than 10 degrees generally necessitates the correction of the deformity prior to operative intervention for the ankle. We present a series of patients with the CORA of tibial deformity at the middle third / lower third junction of the tibia corrected with spiral osteotomy of the tibia. Osteotomies of the tibia around diaphysis have a higher risk of complications including non-union.
Methodology: All patients who underwent the tibial spiral osteotomy and plate fixation under the care of senior authors at our institute between 2008 to 2019 were included in our present study. The patient demographics and details of the operation, degree of correction achieved, complications and any further interventions for the ankle arthritis were noted as well.
Results: A total of 12 patients (M:F = 7:5; average age = 68.8 years) were identified that underwent a spiral tibial osteotomy. Prior to the osteotomy, the average distance from the ankle to the CORA was 10.24 cm and the average degree of coronal plane deformity was 11.24. 10 patients had a varus deformity and 2 patients had a valgus deformity. 4/12 patients went on to have an ankle replacement after the osteotomy, 8/12 had their symptoms well controlled with the osteotomy itself and did not need ankle surgery. None of the patients had non-union or metal-ware failure. 4 patients needed removal of metal-ware.
Conclusion: As a summary, the procedure of spiral oblique tibial osteotomies is a safe and re-producible method to align the tibia prior to definitive interventions for the ankle. 66% of patients had their ankle arthritis symptoms significantly improved by the correction of their limb alignment.

P12

The evaluation of outcomes for neglected or relapsed club-foot managed with circular frame in a low-income country

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Background: Worldwide the majority of club-feet are treated conservatively with the Ponseti method. However, in countries where resources and medical expertise are limited, neglected club-foot is commonly encountered and is often too late to respond to conservative treatment.
Objectives: To analyse the outcomes of patients treated with circular frame correction for neglected, resistant or relapsed congenital clubfoot (CTEV).
Methods: Between 2008 and 2016 twenty-seven patients with neglected or relapsed clubfoot have been treated with circular frame at Beit-CURE Hospital in Malawi. Ten patients were excluded from the study for valid reasons, leaving 19 patients with a total of 29 Ilizarov corrections. Evaluation of clinical outcomes included four scoring systems with objective and subjective components.
Results: Follow-up ranged from one to nine years. At review all patients reported an improvement in the shape and function of their feet. One patient had no deformity according to PAVER-score, sixteen mild, twelve moderate and none had severe deformity. According to ICSFG assessment, very good and good results were obtained in 12 feet, 16 fair and 1 scored poor. Ponseti functional rating showed similar results with ten feet classified as excellent and good, seventeen as fair and one had poor result.
Subjective outcomes measured with OxAFQ-C showed, with minor exceptions, patients´ overall satisfaction with the improvement of their feet function and appearance. Two patients reported less than good or very good physical results, all reported no or nearly no limitations at school, and only three reported less than 100% emotional satisfaction with their outcomes.
Conclusions: This case series of 29 relapsed or neglected clubfoot deformities managed by ilizarov correction, is the biggest of its kind found in the literature for a low-income country. The short term clinical and functional results of resistant clubfoot deformities with Ilizarov´s external fixator is promising and apparently a good option.

P13

The ability to wear high heeled footwear after first metatarsophalangeal joint fusion

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Background: Fusion is a well entrenched treatment modality for symptomatic 1stMTP joint arthritis. It has been customary to advice female patients that they would be unable to wear high-heeled footwear post surgery due to lack of dorsiflexion at the 1stMTPJ.
Objectives: To determine the proportion of patients who could continue wearing high-heels after 1stMTPJ fusion and whether they required a change in the size of their footwear.
Methods: A retrospective review of 50 female patients who have had an isolated 1stMTPJ fusion between 2004 and 2016 was undertaken with a follow-up telephone survey which included questions on ability to wear high-heels pre and post-operatively, duration and height of heels they could wear.
Results: This study included 50 female patients (62 feet) with mean age of 63(43-78) years with a mean follow up of 6.5(2.5-14) years from surgery. Of 42 patients who wore high-heels pre-surgery, 26(62%) continued wearing them. Majority of them (n=23) were able to wear the same height heels.
88% patients were able to wear heel heights of 1.5'' or higher and wear them for 30 minutes to 8hours (Mean=3hrs 15mins). 20 patients (40%) required different sized footwear following surgery. None of the patients wearing high-heels returned to clinic with midfoot/hindfoot symptoms, one returned for IPJ symptoms.
Conclusions: This pilot study has important implications for information given to patients during consent for this operation. It may be that in many cases functional change in neighbouring joints compensates for the loss

of movement at the 1stMTPJ although it was outside the scope of this study to determine how this occurred. Our results have shown that many patients continue to wear high-heels following 1st MTPJ fusion with minimal symptoms in neighbouring joints. The most important factor appears to be the ability of the patient to wear high-heels preoperatively.

P14

Early outcomes of pes planus reconstruction using either hamstring allograft or synthetic ligament

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The medial longitudinal arch is crucial to efficient gait and the Spring and Naviculocuneiform ligaments are important stabilisers. Attenuation of these ligaments leads to Pes Planus deformity and subsequent defunctioning of the PTT. This prospective study evaluates the functional and radiological outcomes of Spring and Naviculocuneiform ligament reconstruction using Hamstring (Semitendinosis) allograft vs. Synthetic ligament (Internal BraceTM, Arthrex). 33 reconstructions were performed 11/11/2013-06/03/2018. All patients underwent serial radiographs and functional scores including; MOXFQ, EQF5D and VAS, within minimum six month follow up.
Surgery included a proximal medial gastrocnemius recession and medialising calcaneal osteotomy where required. For allograft reconstructions, a pre-tensioned Semitendinosis allograft was fixed proximally to Talar neck using a tenodesis screw and passed plantar to PTT and through a bone tunnel in the medial cuneiform. Synthetic ligaments were inserted from the Sustentaculum Tali to the medial cuneiform in a hammock fashion. In both reconstructions tendinopathic PTTs were excised and FDL transfered. 17 were synthetic ligament reconstructions (6 male/11 female) and 16 allograft reconstructions (6 male/10 female). Groups were matched pre-operatively for age, functional scores and radiological markers (T-test P-values >0.05). At six months significantly better improvements were observed in the synthetic ligament group compared to allograft group with regards to VAS, MOXFQ pain score, Meary's line, 1st metatarsal Talus angle, Talonavicular uncoverage angle and Hindfoot alignment (T-test P< 0.05). Statistical significance was maintained at 12 months with the synthetic ligament providing a significantly better reduction of Meary's line 1st Metatarsal Talar angle, Talonavicular uncoverage and hindfoot alignment. 2 patients were revised to double fusions in the allograft group and 1 patient revised in the synthetic ligament group. Statistically significant improved functional scores and radiological appearance can be found up to 1 year following Synthetic ligament reconstruction of the Spring and Naviculocuneiform ligaments when compared to Hamstring allograft.

P15

Subtalar arthroereisis as an adjunct for treatment of the flexible adult acquired flatfoot deformity - a 9 years experience

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Background: The purpose of this study is to evaluate the use of subtalar arthroereisis as an adjunct in the surgical management of the flexible adult acquired flatfoot deformity.
Methods: Two hundred and twenty-nine feet in 214 adult patients with Stage IIA acquired flatfoot deformity had reconstructive surgery including a medialising calcaneal osteotomy, flexor digitorum longus tendon transfer, and implantation of a subtalar arthroereisis device, during the study period (2010-2018). Clinical assessment was performed with FAOS scores. Post-operative questionnaire including patient satisfaction, how likely to have same surgery again were completed. Impact of implant removal was considered.
Results: 150 women and 64 men were included, mean age 57 years (24-82). Mean follow up was 2.4 years (6 months - 5.1 years). Subtalar arthroereisis implant was removed in 108 feet (47%) for lateral hind foot pain at an average of 8.5 months (6-26 months) following the primary procedure, with symptom resolution in all but 4 cases later necessitating subtalar arthrodesis. No significant difference in post-operative FAOS scores was observed between patients with retained implant versus implant removed (p= 0.6). Patients who had Achilles lengthening performed had lower rate of implant removal but difference was not statistically significant. Post-operatively 95% of patients were either satisfied or very satisfied with the results of their surgery.
Conclusions: Reconstruction of the flexible adult acquired flat foot with an adjunctive subtalar arthroereisis resulted in satisfactory reproducible clinical outcomes in the medium term. Implant removal is considered by the authors for persistently symptomatic patients but does not appear to adversely impact outcome.

P16

Early experience of autologlous graft, hydroxyapatite & calcium sulphate antibiotic paste in revision hind-foot & ankle arthrodesis

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Revision arthrodesis on a background of infection carries high risks. We describe a new technique combining

adjuvant antibiotic loaded bio-composite autologous bone graft layer technique coupled with rigid fixation in definitive surgical reconstruction.
Patients who underwent revision foot and ankle arthrodesis for proven/suspected infection were included. Standard work-up including local aspiration, bone-biopsy, definitive radiology and MDT-discussion. Definitive arthrodesis involved debridement of infected scar tissues, multiple biopsies as either part of a staged or definitive process. All bone voids were measured intra operatively and classified according to volume.
At definitive arthrodesis pelvic autograft (cancellous/ cortical/structural) was mixed/layered with a 40% hydroxyapatite (HA), 60% calcium sulphate (CaS) paste with appropriate antibiotic to fill the void; followed by compression fusion.
Empirical/pathogen specific antibiotics were given until sample-specific-antibiotics were identified. All patients were followed up for a minimum 1 year & AOFAS scoring undertaken.
20 pts meet the inclusion criteria, and were prospectively followed up, M:F ratio (n = 1:1), mean age 52.7yrs, 25% were smokers. Surgical indications following deep sampling for revision arthrodesis:
Infected non/mal-union (n=14)
Aseptic-loosening (n=6)
Voids defects at the time of surgery were:
< 1cm3 (n=2)
1 - 1.5 cm3 (n=8)
1.5 - 2cm3, (n=8)
2 - 5cm3 (n=2)
12 pts were treated with Vancomycin 8 with Gentamicin paste depending on bacterial advice and pre-operative sampling. No-patients were lost to follow-up; 87.5% were united on imaging and mean time to independent-ambulation was 2.9 months (functional weight bearing was reached at 1.1 months). Two-patients had radiographic evidence of non-union 1-asymptomatic, & 1-requiring revision surgery (void >3cm). Two-patients remain under review. The average AOFAS score was 82.8; no-patients were treated for post-operative-infection.
Layered-autologous bone-grafting, with adjuvant-antibiotic loaded bio-composite and rigid fixation has been shown to be effective and safe in revision arthrodesis with low co-morbidities in void gaps are less than-2cm3.

P17

Minimum two year outcomes of a fixed bearing total ankle replacement in the United Kingdom

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Introduction: The Infinity (Wright Medical Group) total ankle replacement (TAR) has become the most implanted ankle replacement in the United Kingdom (UK) with a 30.1% share in the most recent 2016 England and Wales National Joint Registry 14th report. It is a fixed bearing implant utilising an anterior approach and radiological guidance to aid alignment, and is approved for use in the UK as an uncemented implant.
Methods: Since introducing the Infinity TAR in June 2014, all implants from two centres in the UK; The Royal Devon and Exeter Hospital National Health Service (NHS) Foundation Trust and Northumbria NHS Healthcare Trust, have been followed up prospectively. 113 implants are included with two year minimum follow-up, average follow-up being 33 months (24-52). Pre- and post-operative demographic, radiographic and functional outcomes were collected including Visual Analogue Score (VAS), Manchester Oxford Foot Questionnaire (MOxFQ; UK validated patient reported outcome score) and EQ5D (validated quality of life score). Complexity was assessed using the Canadian Orthopaedic Foot and Ankle Society classification pre-operative grade.
Results: Implant survivorship was 93.8% at two years minimum. Median age was 68 years (42-92), male:female ratio 72:41. Mean MOxFQ improved by 28, mean EQ5D by 1.4 and mean VAS by 7. 16 cases had planned additional procedures, five required intra-operative medial malleolar fixation. There have been two revisions for deep infection, two for tibial sided implant subsidence, one for instability and two for unexplained pain (6.2%). Five patients have required further surgery to the ankle and hindfoot with implant retention (4.4%). Three patients have asymptomatic tibial cysts (3.4%) and one patient has an asymptomatic talar cyst (0.9%), there is no evidence of progression or loosening.
Conclusions: We report favourable early functional, radiographic and survivorship outcomes of this implant in the UK population.

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Management of osteomyelitis of the diabetic foot using highly purified calcium sulphate impregnated with antibiotics: a 2 year follow up

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Aim: Osteomyelitis is a challenging complication of the diabetic foot with prevalence of up to 20% of infected ulcers. This may lead to a greater incidence of amputations. Whilst 70-80% of osteomyelitis can be managed with systemic antibiotics alone surgery is indicated for those in whom this fails. Traditionally, surgery involves debriding to healthy bone, leaving the wound open for drainage. This often leaves severe tissue loss. There are

many local antibiotic delivery products used in adjunction to surgery.
The aim our study was to look at outcomes over a 2 years follow up of 109 diabetic patients who underwent surgery using highly purified calcium sulphate/ antibiotics as an adjunct.
Method: 109 patients were reviewed who had undergone day case surgery from March 2013 to February 2016. Conservative management with off-loading and systemic antibiotics were tried. All patients had neuropathy and their circulation deemed to be adequate. Osteomyelitis was diagnosed using imaging and/or microbiology. All patients underwent debridement of the ulcer and bone sequestra. Remaining bone was packed with highly purified calcium sulphate impregnated with Vancomycin 1g and Gentamicin 80mg. Intra operative bone samples were sent to microbiology. Primary closure was carried out where possible.
Results: Median duration of ulcer pre-operatively 17 weeks
Duration of pre-operative systemic antibiotics 8 weeks
Healing time post operatively 6 weeks
Duration of antibiotics post operatively 1.4 weeks
No complications / adverse events noted.
Discussion: Results show effectiveness of this treatment modality for management of osteomyelitis. The authors acknowledge limitations of this case series and would recommend a prospective multi-centre randomised control trial.
Conclusion: Our experience using this technique has changed the way we manage our patients. We offer this much earlier in the patient's management particularly where the wound is deteriorating despite being on appropriate antibiotics. We have reduced the duration of systemic antibiotics.

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Comparison of topical skin adhesive and simple interrupted nylon sutures for wound closure in forefoot surgery:a prospective randomised trial

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There are many options for wound closure in forefoot surgery. The purpose of this study was to compare topical skin adhesive (2-Octyl-cyanoacrylate) to simple interrupted nylon sutures with attention to the quality of wound healing and acceptability to the patient.
Patients undergoing 1st ray forefoot surgery utilising a medial incision, Hallux Valgus correction or 1st MTPJ arthrodesis, were recruited. Patients were randomised during surgery to final layer wound closure with either the intervention topical skin adhesive (TSA) or the control interrupted nylon sutures (INS). Primary outcome measured was wound care pain (VAS) at 2 weeks post operatively. Secondary outcomes assessed include time taken to perform wound closure, quality of wound healing and time taken for wound care at 2 weeks postoperatively, and patient satisfaction at 6 weeks postoperative.
70 patients (18 bilateral) were recruited, 42 feet in each study group (after 4 exclusions for incomplete data). Mean age 61 (29-83). There were no statistical differences in the demographics or surgery performed between groups. Patient reported pain was significantly less with TSA (VAS 0 vs 2, p=0.025). Time to perform wound closure was significantly slower for TSA (272secs (SD 72.2) vs 229secs (SD 58.8), p=0.0038), whilst postoperative wound care was significantly faster for TSA (71secs (SD 50.8) vs 120secs (SD 47.8), p< 0.0001). More inflammation and wound edge separation was recorded with TSA (17 vs 5 cases, p=0.006) and (12 vs 3 cases, p=0.02) respectively. A high degree of overall patient satisfaction was reported in both groups, without significant difference.
Topical skin adhesive and interrupted nylon sutures are both acceptable closure methods for forefoot surgery with high satisfaction rates, low pain scores and low complications. However, the observation of significantly more inflammation and areas of wound separation with topical skin adhesive is sufficient to recommend continued routine use of sutures.

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Comparative analysis of dorsal nerve relocation versus dorsal neurectomy in the surgical management of Morton´s neuroma

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Methods: Patients who underwent surgery for Morton´s neuroma via the dorsal approach between 2002 and 2014 were analysed. Data was collected using hospital computer database, an in-depth review of patient´s case notes, postal and telephonic questionnaires. Out of 76 patients in total, there were 40 in the Dorsal nerve relocation (DNR) and 36 in the Dorsal neurectomy (DN) groups. Primary outcome measures used were Coughlin´s overall patient´s satisfaction criteria. Secondary outcome measures were resolution of sensory symptoms and any footwear restrictions.
Results: This study shows excellent to fair results in 35 patients (87%) in the DNR and 30 patients (83%) in the DN groups. There were poor results in 5 patients (13%) the DNR group and 6 patients (17%) in the DN group. 31 patients (77%) had resolution of sensory symptoms in the toes in the DNR group where as it was in 23 patients (64%) in the DN group. 4 patients (10%) reported no change and 5 (13%) were worse after surgery in the DNR group were as in the DN group 7 patients (19%) reported no change and 6 patients (17%) were worse after surgery. 35 patients (88%) had no restriction in wearing any type of footwear in the DNR

group when compared to 30 patients (83%) in the DN group. 5 patients (12%) in the DNR group and 6 patients (17%) in the DN group wore modified or shoes without heels.
Conclusion: Overall there was no significant statistical difference in the outcome of the two surgical procedures.

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High Incidence of spring ligament failure in ankle fractures with complete deltoid ruptures: apreviously missed entity leading rapid destabilisation of the first ray and symptomatic adult flat foot

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Injury to the deltoid ligament complex is an easy to diagnose and an accepted frequent consequence following ankle fractures involving the medial foot. Injury to the spring ligament however is not easily diagnosed and the incidence following ankle fractures with deltoid ligament rupture is unknown. We present a series of 15 patients who were followed up at 28.5 (+/-14) months post ankle fracture involving deltoid ligament rupture as diagnosed on radiographs. We found that 100% of patients had spring ligament rupture as diagnosed with a lateral translation score of >20mm ($p< 0.001$). These patients were also found to have tarsometatarsal (TMT) instability, an established complication of spring ligament rupture, implicated in the development of adult acquired pes planus ($p< 0.001$). We found that the degree of spring ligament strain correlated with the degree of TMT instability (correlation coefficient +0.62). This study demonstrates an unrecognised phenomenon in the literature. The rupture of the spring ligament at the time of injury is not recognised and, as we demonstrate with TMT instability, leads to rapid failure of the first ray. This finding would indicate that a new facet of treatment must be recognised and implemented in the long term management of ankle fractures as this medial column instability must be recognised.

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Role of subtalar arthroereisis as adjunct procedure in treating stage IIb adult-acquired flatfoot deformity

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Background: The role of subtalar arthroereisis (STA) in surgical management of adult acquired flexible flatfoot deformity (AAFD) is controversial. Our aim was to determine whether STA as adjunct procedure improved radiographic correction of stage IIb AAFD focusing on the longitudinal medial arch and forefoot abduction. We also reported complications after STA.
Methods: All patients diagnosed with stage IIb AAFD treated by medialising calcaneal osteotomy, flexor digitorum longus transfer, spring ligament repair with or without Cotton osteotomy and STA between 2004 and 2019 were retrospectively reviewed. Seven measurements were recorded on pre and minimum 24-week postoperative weightbearing radiographs by two observers. Interobserver reliability was assessed. Univariate analysis was used to test the association of demographic (sex, side, age, BMI) and surgical variables (Cotton osteotomy and STA) with change in radiographic angles. Significant variables were included in a multivariable regression model. Twentytwo feet (21 patients, mean±SD age: 55.2±2.4 years) with a mean±SD radiographic follow-up of 11.2±1.2 months were investigated.
Results: There was excellent interobserver reliability for all parameters (ICC range, 0.75-0.94).
The addition of STA correlated with greater change in the talonavicular coverage angle (TNCA) (p=0.04) and calcaneus-fifth metatarsal angle (CFMA) (p=0.01), while Cotton osteotomy did not (p>0.05). Multivariate regression showed that STA was the only predictor of change in TFNA (p=0.03) and in CFMA (p=0.02). The final regression model demonstrated that STA was associated to a greater change in TNCA by 10.1 degrees and in CFMA by 5 degrees. Four (33%) patients complained of sinus tarsi pain, requiring removal of the implant with resolution of symptoms in three quarters of cases.
Conclusion: Subtalar arthroereisis as an adjunct procedure to medialising calcaneal osteotomy, flexor digitorum longus transfer, spring ligament repair in the treatment of stage IIb AAFD leads to improved forefoot abduction, measured through TNCA and CFMA.

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Charcot foot reconstruction - how does hardware failure and non-union affect the clinical outcomes?

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Aim: Surgical reconstruction of severe Charcot foot deformities using internal fixation is a commonly used option. However, there has been a concern that this carries a higher risk of major hardware failure. The aim of our study was to look at the demographics of hardware failure and non-union in Charcot midfoot and hindfoot reconstructions, the radiological and clinical outcomes in those with and without hardware failure.
Results: 19/78 (24.4%) patients had major hardware failure. 14/25 (56.0%) of patients who underwent combination hindfoot and midfoot surgery had hardware failure, in comparison to 5/53 (9.4%) in cases with

surgery in either hindfoot or midfoot (p < .001). 7/19 (36,8%) patients developed full fusion radiologically, compared to 49/59 (83.1%) of the non-hardware failure patients (p < .001). In the hardware failure group 9/19 (47.4%) were able to weight bear in shoes, in comparison to 43/59 (72.9%) in the non-hardware failure patients (p=.040). 10/19 (52.6%) patients from the hardware failure group needed a cast or orthosis to ambulate compared to 11/59 (18.6%) in the non-hardware failure group (p= .004). 8/19 (42.2%) in hardware failure cases required revision surgery, compared to 19/59 (32.2%) in the non-hardware failure cases (p= .089) The patients with BMI over 30 were 3.5 times more likely to have hardware failure (95% CI [1.08, 12.22], p = .038). Limb salvage was achieved in all patients.
Conclusion: The hardware breakage is common following Charcot hindfoot and midfoot deformity corrections, highest among combined reconstructions. However, the clinical and radiological outcomes are still satisfactory following such complex procedures. Dedicated durable hardware designed for Charcot foot reconstructions will potentially reduce this complication and improve the patient outcomes further.

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The anatomy and insertion of the anterior inferior tibiofibular ligament and the wagstaffe fracture

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Introduction: Our aim in this study was to identify the fibular footprint of the Anterior Inferior Tibiofibular Ligament (AITFL) and its relation to Wagstaffe fracture fragment size.
Methods: We examined 25 cadaveric lower limbs that had been preserved in a solution of formaldehyde. The lower limbs were carefully dissected to identify the ligamentous structures on the anterolateral aspect of the ankle. The AITFL anatomy was compared to Wagstffe fractures identified from our ankle fracture database. All ankles which had undergone CT imaging were included in the study.
Results: There were 13 right and 12 left feet used for dissection. The AITFL origin was from the anterior fibular tubercle with an average length of 21.49 mm (95% CI 20.14, 22.85). The average distance of the distal aspect of the AITFL footprint to the distal fibula margin was 11.60mm (95% CI 10.49, 12.71).
40 ankle fractures with Wagstaffe fracture fragments were identified from our database. The average age of the patients was 52.2 years. On average the length of the Wagstaffe fragment was 10.28mm (95% CI 8.12, 12.44). The average distance from the distal tip of the fibula to the Wagstaffe fracture fragment was 9.58mm (95% CI 20.14, 22.85)
In total there were 22 syndesmosis injuries, The average length of the Wagstaffe fragment associated with syndesmotic instability on testing was 11.25 (95% CI 7.66, 14.84). The average Wagstaffe fracture length in syndesmotic stable ankle fractures was 9.21 (95% CI 6.81, 11.61). The difference was not statistically significant p=0.462 (Mann-Whitney test).
Conclusion: The AITFL fibular origin was almost twice the length of the Wagstaffe fracture fragments seen in our institution. Therefore, this suggests that a ligamentous failure.

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Revision of failed primary total ankle replacements to the Inbone 2 Total Ankle Replacement system: the Nottingham Experience

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Number of primary total ankle replacement (TAR) rises, the need for revision TAR's has also increased. Salvage procedures for failed TAR to date have ranged from ankle and TTC fusions, cement arthroplasty, attempts at further ankle replacement and below knee amputations. Clearly revision to another TAR is ideal and thus attempts continue to develop a satisfactory revision implant system.
We present our experience of the Inbone 2 TAR system for revision of failed TAR from a high volume total ankle arthroplasty centre in the UK. We believe this to be the largest series of the Inbone 2 implant as a revision system worldwide, presented to-date.
Methods: We carried out a retrospective review of prospectively collected data at our institution and identified 26 patients (17M, 9F) that required revision to the Inbone 2 TAR with a mean age 66 years (51-81) between June 2016 and July 2019, the mean time to revision was 60 months (15-150) All implants were revised because of aseptic loosening. All patients were required to fill in PROMS (MOXFQ, EQ5D) and all had weight bearing X-rays at their follow up appointments at 6 weeks, 3, 6 and 12 months and then annually.
Results: A substantial improvement was noted in the clinical presentation of these revision cases as borne out by the significant improvement of their PROM scores, radiological alignment and range of movement. No lysis, cyst formation or ectopic bone was noted on x-rays at this early stage. All patients were fully mobile without walking aids. Full data will be presented at the meeting if the paper is selected.
Discussion: This very short-term review has got us excited because of the improvements noted clinically and radiologically. Whilst the procedure is complex, it does offer an opportunity to retain movement. Clearly these difficult cases will need continued follow-up.