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The Epidemiology of Foot Injuries in Professional Rugby Union

Pearce C, Brooks J, Kemp S, Calder J.

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Background: Foot injuries represent a small but important proportion of injuries to professional rugby union players. There are no detailed epidemiological studies regarding these injuries.

Purpose: The aim of this study was to describe the epidemiology of foot injuries sustained by a cohort of professional rugby union players and identify areas that may be targeted for injury prevention in the future.

Study design: Descriptive epidemiological study.

Methods: Medical personnel prospectively recorded injuries in professional, Premiership rugby union players in England over 4 seasons. Injuries to the foot were identified and the time away from training and playing was reported.

Results: A total of 147 foot injuries were sustained resulting in 3,542 days of absence in total. Acute events accounted for 73% of all foot injuries, with chronic, mostly overuse conditions, accounting for 25% (undiagnosed 2%). Chronic conditions led to proportionately more time away from training and playing ($p < 0.001$). Specifically, stress fractures in the foot accounted for 8% of the total foot injuries but 22% of the absence. Navicular stress fractures had the longest recovery time with the mean return to training and match play of 188 days.

Conclusions: In collision sports, such as rugby, injury is inevitable, but clinicians should always be seeking ways to minimise their occurrence and impact. This study revealed significant morbidity associated with chronic and overuse foot injuries in these professional athletes. With greater attention paid to risk factors, some of these injuries, and importantly, recurrent injuries may be avoided.

Operative treatment of stress fractures of the fifth metatarsal in elite professional footballers.

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Design: Retrospective chart and radiographic review.

Background: Stress fractures of the fifth metatarsal are increasingly common among elite professional footballers (soccer players). This reflects the use of lighter, less protective and more flexible sports footwear combined with the increasingly physical demands of the professional game at the highest level. Stress fractures of the fifth metatarsal can be satisfactorily treated non-operatively by cast immobilisation and a graduated return to activity. The demands placed on the modern elite professional footballer are such that a different treatment approach is required for the same injury in this subgroup of patients.

Methods: Stress fractures of the fifth metatarsal in elite professional footballers are treated by the senior author (JPH) by operative surgical fixation. We reviewed the charts and radiographs of all fifth metatarsal stress fractures that were treated operatively in elite professional footballers over a five year period. Details recorded included fracture location, method of fixation, complications, time to radiological union and time to return to independent weightbearing and competitive sporting activity.

Results: There were 32 fifth metatarsal stress fractures in 30 elite professional footballers. All fractures were clinically united at a mean 5.5 weeks and radiologically united at a mean of 10.3 weeks. The patients could weightbear immediately and could independently weightbear from 4 weeks. The mean time to return to full competitive activity was 10.3 weeks. There were no complications.

Conclusions: Operative treatment of fifth metatarsal stress fractures is an effective treatment in elite professional footballers that produces consistently good results and allows an early return to full activity.

Static And Dynamic Analysis Of Foot Structure In Athletes Sustaining Jones Stress Fracture

Meir N, Ifthach H, Gideon M, Moshe A.

Meir Medical Centre

Background: The literature shows an anecdotal relationship between high-arched feet and proximal fifth metatarsal stress fractures. This relationship has never been supported by sound scientific evidence. Our aim in this study was to examine whether athletes sustaining this injury are characterized by a static foot structure or a dynamic loading pattern during stance.

Materials and Methods: Ten professional soccer players who regained full professional activity following a unilateral proximal fifth metatarsal stress fracture and ten control uninjured soccer players were examined. Independent variables included static evaluation of foot and arch structure, followed by dynamic plantar foot pressure evaluation during stance. Each variable was compared between injured and uninjured feet.

Results: Static measurements of foot and arch structure did not reveal differences among the groups. However, plantar pressure evaluation during stance revealed relative unloading of the fourth metatarsal in both the injured and sound limbs of injured athletes compared with control, while the fifth metatarsal revealed pressure reduction only in the injured limbs of injured athletes.

Conclusion: Athletes who sustain proximal fifth metatarsal stress fracture are not characterized by an exceptional static foot structure. Dynamically lateral metatarsal unloading during the stance phase may either play a role in the pathogenesis of the injury, or alternatively represent an adaptive process.

Clinical Relevance: Footwear fabrication for previously injured athletes should not categorically address cushioning properties designed for high-arch feet, but rather focus on individual dynamic evaluation of forefoot loading, with less attention applied to static foot and arch characteristics.

Ankle arthroscopy: is pre-operative marking of superficial peroneal nerve important?

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Background: The incidence of nerve injury following ankle arthroscopy has a documented rate of 1% to 24%¹⁻¹⁵. The intermediate branch of the superficial peroneal nerve is at most risk with an antero-lateral portal incision^{6, 9-12}. The superficial peroneal nerve (SPN) is often marked as part of pre-operative planning,¹ despite there being little evidence of the effectiveness of this simple measure in reducing nerve injury in ankle arthroscopies.

Methods: We reviewed 100 consecutive cases who had an anterior ankle arthroscopy between February 2005 and April 2009. All arthroscopies were performed by a single surgeon (PFR) with pre-operative marking of the SPN. All patients were interviewed by telephone to find out if there had been any temporary or long-term neurological problems following the surgery. Any patients with neurological complications were reviewed in clinic. Patients' notes were reviewed for any documented complications. Their level of satisfaction and improvement of symptoms were also assessed.

Results: We were able to trace 98% of patients. The average follow up was 15.3 months (1 to 39 months). The only neurological deficit in this series was in one case (1%) who developed sensory loss in the distribution of the medial branch of the SPN. 61% of the cases were highly-satisfied/satisfied, 23% were moderately satisfied and 16% were not satisfied with the outcome of their surgery. The reason quoted by the 16% unsatisfied patients was failure to improve their symptoms to their expected level or their need for another operation (41% of the unsatisfied group)

Conclusion: The incidence of nerve injury in our series was 1%. This is a dramatic improvement on the majority of published studies¹⁻¹⁵. We believe that marking the SPN prior to surgery is a simple and essential measure in reducing the neurological complications of ankle arthroscopy.

Early results of posterior ankle arthroscopy for hindfoot impingement- Experience from a District General Hospital

Sandiford N, Weitzel S.

St Mary's Hospital, Sidcup, UK

Introduction: Arthroscopic management of posterior ankle impingement syndrome (PAIS) is now commonly practiced. Scanty information about the results of this procedure in a district hospitals is available.

Aim: We present the results of our series of patients treated with hindfoot arthroscopy for PAIS, and describe the complications encountered.

Patients and Method: Twenty procedures were performed on 19 patients (12 males, 7 females) between January 2006 and September 2008. Patients were followed up for an average of 7.9 months. Return to sport, patient satisfaction, relief of symptoms and the American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot score were all assessed.

Results: Procedures performed included excision of an os trigonum, flexor hallucis longus decompression, and microfracture of the posterior talus. The average age of the patients was 35 years. Return to activity occurred at an average of 4 weeks. Four patients were dissatisfied, 1 was unsure and all the other patients were satisfied with their outcome. The average pre-operative AOFAS score was 73.8 and the post operative score was 84.5. There were no neurovascular injuries.

Conclusion : There was a significant incidence of dissatisfied patients in the absence of major complications. This might reflect technical difficulties early in the early learning curve for this procedure.

Is there a learning curve in foot and ankle surgery?

Walton R, Theodorides A, Molloy A, Melling D

University Hospital Aintree

Introduction: A learning curve is a recognised phenomenon in surgery. It implies that the frequency of perioperative adverse events will decrease with the increase in experience of the surgeon. Evidence shows increased instruction and experience in a specific surgical task leads to improved performance. There is conflicting evidence as to whether there is a learning curve for total ankle replacement, and a paucity of evidence for foot and ankle surgery as a whole. Current evidence is centered on perioperative complications, rather than functional outcome.

Aim: To determine whether a learning curve effect is present during the first year of independent practice by measuring patient outcome.

Materials and methods: 150 patients underwent elective foot or ankle surgery during the first 12 months of a newly appointed consultant's practice. Preoperative and six month postoperative functional scores were recorded, together with perioperative complications. Two patients died of unrelated causes in the first 12 months. 121 patients (81.8%) were followed up for a minimum of six months by telephone. Functional outcome was assessed with a modified American Orthopaedic Foot and Ankle Society midfoot Score (85 points). Outcome was compared between the first and second six-month periods using the student's t-test.

Results: Eighty procedures were undertaken during the first six months compared to 70 in the second. Total ankle replacements were only undertaken in the latter period. Otherwise there was no statistical difference in the caseload. One wound infection occurred during each period and other perioperative complications were equivalent. Functional improvement was greater in the group from the second 6 months (+23.86 v's +18.69). This difference did not reach statistical significance ($p = 0.061$).

Discussion and Conclusion: There is a trend, approaching significance, towards a learning curve during a foot and ankle consultant surgeon's first year of practice. Collating data from other new consultants may demonstrate a learning curve with statistical significance.

Patient satisfaction in foot and ankle surgery – the most useful Patient Reported Outcome Measure?

Oddy MJ, Jones S, Flowers MJ, Davies MB, Blundell CM.

Sheffield Teaching Hospitals NHS Trust

Introduction: The assessment of quality in the provision of healthcare is one of the core features of the National Health Service in the 21st Century. From April 2009 Patient Reported Outcome Measure (PROM) data are being collected for the Department of Health for elective hip and knee arthroplasty using generic and disease specific measures of health status. The perceived uses of these data may be for research, assessment of procedural outcome, measures of health inequalities and to aid commissioning groups in selecting their secondary care providers. Foot and ankle surgery covers a wide spectrum of operative procedures with patient responses less predictable than with major joint arthroplasty. We report the use of a sixteen point satisfaction-based questionnaire in order to investigate the nature of patient outcome after the processes of foot and ankle surgery.

Methods: A prospective series of 100 two-part Visual Analogue Scale (VAS) questionnaires was distributed to patients undergoing elective foot and ankle surgery at the Northern General Hospital under the care of four foot and ankle surgeons over a three-month period. The questionnaires were numbered to allow patient anonymity. The first part of nine questions enquired about pre-operative preparation and information and was distributed before surgery. The second part of seven questions, distributed at the first post-operative clinic sought to investigate their hospital and operative experience. Free text comments were requested in addition to the VAS responses, which were expressed as percentages.

Results: 97% of part one and 85% of part two questionnaires were returned completed. 82% had both parts completed and matched. The day case to inpatient ratio was 55:45. For part one, all clinically related questions scored more than 90% satisfaction, with only two scores for administration-based questions falling below this level. For part two, satisfaction for clinical questions again scored more than 90% and overall, all scored more than 80% satisfaction. Only 23% of pre-operative and 28% of post-operative questionnaires were returned with free-text comments.

Conclusions: A simple patient satisfaction-based questionnaire may be as useful as existing non-validated generic scoring systems used in foot and ankle surgery when assessing quality in the health service, particularly where regional demographics or referral patterns may be important factors influencing patient outcomes. Active dialogue with the surgical colleges and Department of Health should be pursued to avoid inappropriate outcome measures being imposed in foot and ankle surgery.

Proximal medial release of Gastrocnemius in the treatment of recalcitrant plantar fasciitis.

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Background: Isolated Gastrocnemius contracture has been implicated as the cause of a number of foot and ankle conditions. Plantar Fasciitis (PF) is one such condition that can be secondary to altered foot biomechanics as a result of gastrocnemius contracture. We perform an isolated proximal medial head of gastrocnemius release (PMGR) as a day-case procedure. This is to report our results of this procedure in the treatment of recalcitrant PF.

Material and Methods: We prospectively followed a consecutive series of 22 heels in 18 patients following a PMGR. To be included, at least one year of conservative treatment must have been tried and isolated Gastrocnemius contracture confirmed clinically using Silfverskiold's test pre-operatively. Outcome measures included the visual analogue pain score (VAS) and a 5-point Likert scale of postoperative success. Subjective and objective calf weakness was also evaluated. Final follow up was at an average of 25 months (range: 12 to 36 months) after the surgery.

Results: Two patients were lost to follow up. In the remaining 20 heels the average VAS for pain had improved from 9.4 to 1.8 ($P < 0.001$). Fourteen heels (70%) were pain free or significantly better at final follow up. There was no objective evidence of calf weakness and only one patient (5%) felt subjectively weaker on the released side. There were no 'major' complications and only 2 cases (10%) suffered a 'minor' complication. One was a case of superficial wound sepsis and the other was of prolonged calf pain following the surgery. Both resolved spontaneously and without further intervention.

Conclusions: A PMGR is a simple way of treating patients with PF who fail to respond to conservative management. The results, in our series, have been favorable and the morbidity low. We recommend the use of gastrocnemius release once non-operative management has failed.

Major complications following foot and ankle surgery – Analysis using national hospital episode statistics

Jameson S, James P, Oliver K, Townshend D, Reed M.

Northumbria Healthcare NHS Trust

Background: Diagnostic and operative codes are routinely collected on every patient admitted to National Health Service (NHS) hospitals in England and Wales (hospital episode statistics, HES). The data allows for linkage of post-operative complications and primary operative procedures, even when patients are re-admitted following a successful discharge. Morbidity and mortality data on foot and ankle surgery (F&A) has not previously been available in large numbers for NHS patients.

Methods: All HES data for a 44-month period prior to August 2008 was analysed and divided into four groups – hindfoot fusion, ankle fracture surgery, ankle replacement and a control group. The control group was of first metatarsal osteotomy, which is predominantly day case surgery where no above ankle cast is used. The incidence of pulmonary embolism (PE) and all cause mortality (MR) within 90 days, and a return to theatre (RTT, as a complication of the index procedure) within 30 days was calculated for each group.

Results: 7448 patients underwent a hindfoot fusion. PE, RTT and MR were 0.11%, 0.11% and 0.12% respectively. 58732 patients had operative fixation of an ankle fracture. PE, RTT and MR were 0.16%, 0.08% and 0.35%. 1695 patients had an ankle replacement. PE, RTT and MR were 0.06%, 0.35% and zero. 35206 patients underwent a first metatarsal osteotomy. PE, RTT and mortality rates were 0.02%, 0.01% and 0.03%.

Discussion: There is controversy regarding the use of venous thrombo-embolic (VTE) prophylaxis in foot and ankle surgery. Non-fatal PE in F&A surgery has previously been reported as 0.15%. NICE guidelines recommend low molecular weight heparin (LMWH) for all inpatient orthopaedic surgery. 94% of F&A surgeons prescribe LMWH to post operative elective inpatients in plaster according to a previous British Orthopaedic foot and ankle society survey. VTE events, RTT and mortality rates for all groups were extremely low, including inpatient procedures requiring prolonged immobilisation. We question the widespread use of LMWH.

Coding Issues In Foot And Ankle Surgery

Barrie JL, Taylor P.

East Lancashire Foot and Ankle Service

Introduction: Coding systems are important for epidemiology, research, audit, activity analysis and now remuneration. There have been concerns that the existing coding systems do not represent foot and ankle activity accurately.

Materials and methods: The senior author's logbook was analysed for 2 years. Each operation descriptor was recorded. A "simple descriptor" described an operation of one component ("scarf osteotomy"). A "multiple descriptor" described multiple instances of one component ("bilateral scarf osteotomy"). A "compound descriptor" described a procedure made up of more than one component ("scarf osteotomy and 2nd toe straightening"). We encoded the logbook using OPCS4.5 and the RCSED Electronic Logbook. We assessed whether simple descriptors could be coded unambiguously (ie there was a one-to-one relationship between descriptor and code so that distinct procedures could be identified) and whether compound descriptors contained ambiguous codes. We also considered whether the overall procedure was adequately summarised by the tabulated codes. Codes were converted to the HRG4 and BUPA payment codes and referenced to chevron osteotomy.

Results: There were 513 procedures with 157 different descriptors (3.27 cases/descriptor, compared with 4.44 in upper limb and 7.69 in lower limb). Fifty-four descriptors (321 patients) were simple, 18 (52 patients) were multiple and 85 (140 patients) were compound. Using OPCS, 57.4% of simple descriptors (46.1% of patients) were ambiguous, as were 82.4% of compound descriptors (85.7% of patients). In 27.1% of descriptors (33.6% of patients) the tabulated codes did not give the overall procedure clearly. Using the eLogbook, 48.1% of simple descriptors (25.2% of patients) and 74.1% of complex descriptors (70.7% of patients) were ambiguous and in 30.6% of descriptors (37.1% of patients) the codes did not summarise the operation well. Most remuneration compared reasonably with chevron osteotomy, with some idiosyncrasies. Overall remuneration was lower than procedures of comparable complexity in other specialties.

HRG 4 Codes – Does Surgeon Input Improve Coding Accuracy and Optimise Trust Income in Foot and Ankle Surgery.

Dunning M, Taylor H.

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Introduction: The HRG 4 coding system was introduced in April 2009 to allow the calculation of tariffs for all surgical procedures. At our institution we felt surgeon input could improve the accuracy of this coding and optimise trust income.

Method: A retrospective audit of one month's procedures under the care of a single consultant was performed. The hospitals coding and tariff, as performed by coding clerks, was reviewed and the procedures were re-coded by a foot and ankle fellow using the notes and the HRG 4 grouper. A comparison was made between the coding and income generated in the standard fashion and that achieved after optimisation by surgeon input.

Results: The codes of 51 patients were examined. 86% of major foot procedures were correctly coded. However, 56% of 'minor' procedures were recoded as 'intermediate', many of these involving hallux valgus surgery. 58% of procedures had a different code after surgeon input and 41% generated a different tariff. The total tariff for the coding clerk group was £79,192. The total tariff in the surgeon assessed group was £97,268 - a difference of £18,076. Extrapolated over the year this could represent a potential gain of over £200,000, for a single Consultant in a single Trust.

Conclusion: We believe surgeon involvement in coding is crucial to improve accuracy and to optimise trust income. We will discuss various issues surrounding the new HRG 4 codes and how best to use them in current practice.

The importance of getting coding right in foot and ankle surgery. An audit of current practise in our unit.

Hamilton P, Piper-Smith J, Singh S, Jones I.

Guy's Hospital

Introduction: Since the introduction of payment by results in the NHS in 2004, the accurate recording of services performed has played a crucial role in reimbursement to hospital trusts by primary care trusts (PCT). Failure to accurately charge for these services causes a shortfall in funding received. Under the new reimbursement system, similar treatments are grouped together under the same tariff and referred to as a Healthcare Resource Group (HRG). Coding is the assignment of procedures to HRG's. We aim to assess the accuracy of coding performed at our institution and link this directly to the funds received from the PCT. Foot and ankle surgery has a particular interest in coding due to the multiple codes that are utilised to code for one procedure.

Method: We looked at 40 consecutive operations performed at our institution. We compared the codes assigned by the surgeon placing the patient on the waiting list, which were the codes seen directly on the operating list with the final codes given to the PCT. We compared the two codes and looked at the difference in final costing.

Results: There were a total of 75 codes from the 40 operations assigned by the surgeon compared with 103 codes assigned by the coding staff. Although most of the codes were different when the final costing data was generated there was little difference in the overall costs.

Discussion: The importance of accurate coding has become paramount in the current national health service funding. We have shown large discrepancies between the codes the surgeon produces and the final code given to the PCT. Although, in our unit, this has not led to differing final reimbursement figures, it does have the potential to create inaccuracies with a failure to pay for work performed. We will present our data and describe the correct coding for common procedures in foot and ankle surgery, to allow accurate reimbursement.

Arthroscopic And Open Ankle Fusion In Haemophiliacs- A Tale Of Two Cities

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Introduction: Severe haemophilia affects 1 in 10,000 men. The ankle along with the hip and knee are commonly affected. Ankle fusion is the preferred surgery for end stage arthritis in the younger patient although debate exists as to the preferred technique. We conducted a retrospective review of the arthroscopic ankle fusions on haemophiliacs from Oxford and compared data with that of a specialist unit in London using an open technique.

Materials and Methods: We reviewed 22 ankles (22 patients) from Oxford and 10 ankles (8 patients) from London. 90% had Type A haemophilia with similar regular monthly Factor VIII usage: 17941 U/month (Oxford) compared with 17992 (London). 73% of patients in the Oxford Group and 100% of the London group had Hepatitis C and/or HIV.

Results: Union was achieved in all patients. The mean time to union in the open group was 9.1 weeks (Mode- 8 weeks, Range 7-14) compared to 12.2 weeks (Mode- 12 weeks, Range 8-24) in the arthroscopic group. Screw removal was required in 4 patients (3 arthroscopic v's 1 open). 1 patient in the arthroscopic group suffered a pseudoaneurysm of the dorsalis pedis artery. The arthroscopic group spent less time in hospital- 5.7 days compared to 9.5. Factor VIII usage was less in the arthroscopic group- 32,882 Units compared to 40013.

Discussion: Patients of this nature should be managed in centres used to dealing with their complex needs. Arthroscopic ankle fusion in haemophiliacs is safe for these patients. Although arthroscopic fusion may take slightly longer to unite, there are benefits in terms of reduced patient stay and factor VIII requirement and therefore costs.

Pinching from the Shoulder? Use of PHILOS plate or Blade plate as a Fixed Angle Device for Complex Tibiotalar and Tibiototalcaneal Fusion

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Background: Complex tibiotalar (TT) and tibiototalcaneal (TTC) fusions are performed for significant ankle and hindfoot arthritis and/or deformity. Literature suggests several methods of fixation including crossed screws, plates, nail and external fixation. These are technically difficult operations with reported complication rates as high as 30-80%. We present a retrospective cohort study of angle blade plate and PHILOS plate fixation for these patients in our hospital.

Methods: This study describes 21 consecutive patients with 22 TT or TTC fusions between December 2005 and May 2009. The surgery was performed for severe deformity or arthritis as a result of: osteoarthritis(2), post-traumatic arthritis(4), rheumatoid arthritis (7), Charcot arthropathy (5), avascular necrosis(1), and post traumatic avascular necrosis (3). The senior author performed all of the operations. In the first ten cases (two TT and eight TTC) an angle blade plate was used, A PHILOS plate was used in the subsequent ten cases (three TT and seven TTC). One patient had bilateral TTC fusions with a blade plate on one side and a PHILOS plate on the other. There were eight male and 13 female patients. All the procedures were performed through a lateral transfibular approach. The patients were followed up regularly with clinical and radiological evaluation until union or otherwise.

Results: Fusion was achieved in 19 out of 21 patients (90.5%) and 20 out of 22 arthrodeses (90.9%). All five TT fusions went on to union (100%). Fifteen out of 17 TTC fusions united (88.2%). One TTC fusion using an angle blade plate needed revision surgery for non-union of subtalar joint. In the PHILOS group one patient developed MRSA infection of the surgical site leading to non-union. This necessitated removal of metal and prolonged treatment with intravenous antibiotics. The patient now has a relatively painless fibrous ankylosis.

Conclusion: TT and TTC fusions are complex operations performed for severe arthritis and deformity, often on patients with significant co-morbidities. It is a salvage procedure to relieve pain and/or correct deformity of the foot and ankle. This study suggests that both the angle blade plate and PHILOS plate provide a stable fixed angle construct, which achieves a high rate of bony union with alignment correction.

Hindfoot arthrodesis: Effect of early weight bearing on union rate. One to six year follow-up.

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Introduction: Non-union occurs at a rate of 5-10 % following ankle and hindfoot arthrodesis, but the effect of early weight bearing on union rate in these patients has not been studied.

Materials and Method: We have looked at the union rate following ankle and hindfoot arthrodesis with an early weight bearing protocol in a single surgeon series between 2003 and 2008. Data was collected retrospectively on 108 patients with a total of 198 ankle and hindfoot joint arthrodesis.

Results: The non-union rate was 3.4% (9 in 154 joints) in the early weight bearing group and 18% (8 in 44 joints) in the late weight-bearing group. Union rate following revision surgery with bone graft was 100% in both groups.

Discussion: Early weight bearing following ankle and hindfoot arthrodesis has no adverse effect on the union rate.

A comparison of two night ankle-foot orthoses used in the treatment of plantar fasciitis.

Attard J, Singh D, Cullen N, Gemmell E, Cooper D, Smith K.

Background: Non-operative treatment for plantar fasciitis varies widely and includes the use of night ankle-foot orthoses (AFO's). Some studies have shown that this is more effective in the initial management of plantar fasciitis than anti-inflammatory therapy. During sleep the foot and ankle tend to assume a plantarflexed position, which results in tightness of the calf muscle group, accounting for the stiffness and pain experienced by patients as they take their first weight bearing steps in the morning. However, when the foot and ankle are kept in a dorsiflexed stretched position at night, stress relaxation occurs and the plantar fascia relaxes.

Aim: Compliance with night AFO's that dorsiflex the foot/ankle has always been a problem. This study compares the effectiveness of a posterior AFO, which dorsiflexes the foot, with an anterior AFO, which maintains the foot in plantigrade, asking whether it is absolutely necessary to dorsiflex the foot and ankle during the night to avoid early morning pain and stiffness, or whether it is sufficient just to maintain the foot in plantigrade.

Methods: 18 participants were recruited on a voluntary basis and at random from among those patients referred to the Orthotics department with plantar fasciitis to be provided with a night orthosis. The inclusion criterion was that the diagnosis was purely plantar fasciitis with no secondary diagnosis, symptoms or complications. Each participant was given a questionnaire to fill in; this evaluated how satisfied the participants were with the orthosis with regards to comfort, ease of use and appearance, and whether the pain in the foot was reduced and at what stage was it reduced. The two types of AFO's used in this study were: i) A posterior AFO that holds the foot in dorsiflexion. The amount of dorsiflexion could be adjusted. ii) An anterior AFO that keeps the ankle and foot in plantigrade, with no adjustment to the amount of dorsiflexion.

Results: 67% of the participants confirmed that morning pain and stiffness was less after wearing the AFO; this included 78% of those that wore the anterior AFO and 56% of those that used the posterior orthosis. 56% of all participants reported that the orthoses were uncomfortable and disrupted sleep. The most uncomfortable was the posterior AFO (89%), as opposed to the anterior one (22%). Both types of orthoses were reported to be relatively easy to don and doff (89% anterior AFO and 78% posterior AFO). On a scale of 1 to 10, the participants were asked to grade the pain before starting the orthosis treatment regime, after 6 weeks of wearing the AFO and again 6 weeks later. On average, the anterior AFO reduced the pain from 7 to 2.1, while the posterior orthosis only reduced the pain from 8.1 to 6.7.

Conclusion: In general, plantar fasciitis night AFO's are poorly tolerated orthoses, however, their use can be justified in that the pain levels are reduced. The anterior AFO seems to be more effective in achieving this, without dorsiflexing the foot/ankle beyond plantigrade. Thus, one could argue that there is no need to dorsiflex to achieve the goal. However, further investigation is necessary with a larger patient cohort.

Radiological diagnosis of degenerate change of the subtalar joint: a study comparing the reported degree of osteoarthritis in a plain radiograph when compared with a CT scan.

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Introduction: With increasing availability of CT scans their use in the investigation of the subtalar joint increases, whilst we continue to use plain x-ray. Using a standardised reporting protocol, we graded x-rays and CT scans to compare the diagnosis made using each modality.

Materials and Methods: An atlas and reporting system of the subtalar joint was designed using a modification of Kellgren and Lawrence's system. 50 consecutive CT scans of the subtalar joint were identified and saved along with paired plain x-rays of the foot and ankle. All investigations were anonymised. Scans were excluded if there were no plain films or there was evidence of previous trauma. Orthopaedic surgeons were asked to report on the 50 CT scans and 50 plain radiographs using the reporting protocol, commenting on two components for each investigation; the anterior and middle facets and the posterior facet of the subtalar joint.

Results: In 33% of cases the facets of the subtalar joint could not be appreciated from the plain x-rays. The difference between the modalities in reported grade of degeneration of the anterior and middle facets of the subtalar joint was statistically significant ($p=0.014$) but not for the posterior facet (0.726). When looking at the Spearman correlation coefficient, the anterior and middle facets had no correlation ($r = -0.067$) although the posterior facet did ($r = 0.029$).

Discussion: When looking at the posterior facet of the subtalar joint plain x-rays and CT scans give comparable results. When looking at the anterior and middle facets the information gained from the plain x-rays bears no resemblance to that gained from the CT scans.

Conclusion: The plain x-ray is an inaccurate, unreliable method of investigating degenerate pathology of the subtalar joint and should be superseded, and perhaps replaced, by the CT scan.

The Use of Thromboprophylaxis for Total Ankle Replacements

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Introduction: Thromboprophylaxis in Orthopaedic practice has long been a debated issue. The recent NICE guidelines have recommended low molecular weight heparins (LMWH) for all orthopaedic patients, although a number of authors have highlighted the low risk of thromboembolism in foot and ankle practice. We looked at our series of total ankle replacements (TAR) to identify the incidence of thromboembolism and any complications associated with chemical thromboprophylaxis.

Methods: All patients who had undergone TAR were reviewed retrospectively. Risk factors according to the NICE guidelines were identified as was the type of chemical thromboprophylaxis, if given. Complications including thromboembolism, wound ooze, swelling and delay in discharge were recorded.

Results: There were 45 TAR's in 45 patients. 20 patients (44%) had been given some form of chemical thromboprophylaxis. There were no cases of thromboembolism in either group. In the group receiving chemical thromboprophylaxis, nine patients (45%) had a wound complication. In the group receiving no chemical thromboprophylaxis only one patient (4%) had a wound complication.

Discussion: Thromboprophylaxis in total ankle replacement may significantly increase the risk of wound complications. We would recommend caution when prescribing chemical prophylaxis for patients undergoing total ankle replacement.

The distal branches of the sural nerve, and their relationship to the bony landmarks of the lateral part of the foot.

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Introduction: The sural nerve is commonly encountered in many operations on the lateral part of the foot and ankle, such as fixation of distal fibula, 5th metatarsal and calcaneal fractures, and fusion of the subtalar or calcaneo-cuboid joints. However there is no consensus and quantitative description of the branches of sural nerve distal to the ankle in the reviewed literature. This study aims to describe these branches and quantify their relations.

Methods: The distal course of the sural nerve was dissected in 30 embalmed cadaveric limbs.

Results: A fibular branch was found in close proximity to the tip of the distal fibula in 63% of specimens. A dorsal branch at the level of the cuboid was found in 80% of specimens, however, its point of departure from the main nerve varied considerably. More distally a series of plantar branches of varying number, and at varying distances to each other was found. These branches were then described in relation to the following bony landmarks: the tip of the distal fibula, the calcaneo-cuboid joint, the tuberosity of the base the 5th metatarsal, the shaft of the metatarsal and the 5th metatarso-phalangeal joint. The distances between these landmarks were quantified using digital analysis.

Conclusion: The sural nerve has a number of previously undescribed but potentially important branches distal to lateral malleolus in the foot. Identifying these branches during surgery with relation to the various bony structures should minimise the risk of nerve injury.

Popliteal nerve block for hindfoot surgery in a district general hospital setting

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Background

Postoperative pain following hindfoot surgery can be difficult to control with opioid analgesics. Popliteal nerve blocks have been shown in the literature to be effective in both delaying the onset of postoperative pain and reducing the intensity of the pain, with a variable duration of effect. In 2007 we established a 'block team' of anaesthetists available to administer popliteal blocks preoperatively.

Methods: Forty-nine consecutive patients undergoing hindfoot surgery were selected. Data was collected: The proportion of patients having a block; opiate requirement during surgery, in the recovery room and on the ward; pain score; time to mobilize after surgery; and length of stay.

We compared two techniques used for popliteal block and also compared post-operative pain control with and without a popliteal block.

Results: There was a considerable increase in the percentage of patients who had a popliteal block after the block team was established (40% to 91%). Six of 23 (23%) patients needed opiates in the recovery room in the nerve block group; compared to 12 of 20 (60%) patients who did not have a block. Comparing the two techniques used for the nerve block, ultrasound guidance reduced postoperative intravenous opiate usage compared to blocks given with the aid of a nerve stimulator ($p < 0.05$). Fifteen of 16 (94%) patients mobilized on the first post operative day in the ultrasound group compared to 16 of 23 (64%) in the patients who had no block. There were no complications recorded as a result of popliteal nerve blocks.

Conclusions: Establishing a block team has improved the proportion of patients receiving a popliteal block in hindfoot surgery in our hospital. The ultrasound guided technique gives superior results in terms of pain relief and earlier mobilization, when compared blocks administered using a nerve stimulator.

Continuous Infusion vs Single Bolus Popliteal Block Following Ankle and Hindfoot Surgery: A Randomised, Prospective, Double Blinded, Placebo Controlled Trial

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Introduction

Adequately managing post-operative pain following ankle and hindfoot surgery can be difficult. Conventional analgesics have significant side effects including nausea and gastric irritation. The results of a pilot study of continuous infusion v's single bolus popliteal block encouraged us to perform the full PRCT.

Method

The trial was approved by the local Research and Ethics Committee and registered with the European Clinical Trials Database. Approval was obtained from the Medicines and Healthcare products Regulatory Authority (MHRA) for the use of normal saline infusion as a placebo. The recommendations of Good Clinical Practice in the conduct of clinical trials on medicinal products for human use were respected.

Inclusion criteria were all patients who were undergoing significant hind foot or ankle procedures. Exclusion criteria included coexisting peripheral neuropathy and any inability to fill in the questionnaire.

The pilot study provided a standard deviation of pain scores which allowed us to calculate the sample size required; 25 patients in each group would have 90% power to detect a difference in means VAS scores of 3 which we considered to be clinically significant. A total number of 56 (to allow for 10% loss to follow-up) were recruited. The patients and the assessors were blinded to the treatment allocated. Sealed envelopes contained random allocations and were opened by the anaesthetist. A bolus of 20ml 0.25% bupivacaine was injected and then the catheter was inserted and connected to a pump. Patients were randomly assigned to receive either an infusion of normal saline or bupivacaine over the next 72 hours.

The patients were asked to complete a visual analogue pain chart, three times daily, for 72 hours postoperatively.

Data was also recorded regarding supplementary opiate analgesic requirements and any problems or complications. Statistical analysis was performed using MedCalc for Windows, version 9.6.4 (MedCalc software, Mariakerke, Belgium). A Mann-Whitney U test was used for the non-parametric data sets.

Results

Both groups had very low median VAS pain scores on the day of operation and there was no difference between the two; study 1.167, control 1.000 ($p=0.893$). On the 3 post operative days studied there were significantly lower pain scores in the study group; day 1: 1.67 v's 3.67 ($p=0.003$), day 2: 1.33 v's 2.83 ($p<0.001$), day 3: 1.11 v's 2.56 ($p<0.001$).

There was no difference in median milligrams of morphine usage on the day of operation; study = 10, placebo = 10 ($p = 0.942$). The morphine usage was lower in the study group on all post operative days and this was significant on days 2&3; day 1: 10 v's 15 ($p=0.054$), day 2: 10 v's 20 ($p<0.001$), day 3: 7.5 v's 10 ($p=0.02$). Median total morphine requirements over the 3 post operative days were 30mg for the study group compared to 52.5mg for the control group and this was significant ($p=0.012$).

The study group on average spent less nights as an inpatient with a median value of 1 compared to 2 for the control but this was not significant ($p=0.430$).

There were no major complications with the administration of the blocks or with the catheters.

Conclusion

The bolus of bupivacaine given to all patients prior to surgery meant that low pain scores were seen in both groups in the immediate post operative period with no significant difference between them. The continuous infusion of bupivacaine via a pain pump provided significantly better analgesia than normal saline with significantly less requirement for supplementary oral analgesic agents over the 72 hours after major ankle or hind foot surgery. This is a safe and effective method of managing post operative pain in these patients.

Ultrasonography in the diagnosis of foot and ankle fractures presenting to the emergency department

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Introduction: Foot and ankle injuries are common in the Emergency Department (ED)¹. Of those which require radiographs, in accordance with the Ottawa Foot and Ankle Rules, approximately 22% have a fracture.² In the last decade ultrasound has been developing as a tool for emergency musculoskeletal assessment – it is inexpensive, rapid and visualises soft tissue and bony structures.

Methods: This diagnostic cohort study was designed to determine whether ultrasound could detect acute bony and non-bony foot and ankle injuries. Ottawa Rules positive patients over 16 year of age without obvious dislocation/compound fracture were eligible. An ultrasound scan (USS) for bony injury was performed by a member of the ED, blinded to radiographic findings. Patient management was determined according to the radiographs. Significant fractures were defined as a breadth greater than 3 mm (as per the Ottawa Foot & Ankle Rules study group)³. All radiographic reporting was conducted blind to the results of the USS. All USS operators received a specific 2-day training in musculoskeletal ultrasound prior to the trial.

Results: One hundred and ten subjects were recruited. eleven had significant radiological fractures, ten of which were seen on ultrasound. The single missed fracture arose due to the operator not scanning proximally enough on the fibula. On re-scanning following radiographic review the fracture was clearly seen on ultrasound. To date the sensitivity of USS is 90.9%, with 95% CI (65.7, 98.3). The specificity is 90.9% with 95% CI (88.1, 91.7). The positive predictive value is 0.526, with a 95% CI (0.380, 0.569). The negative predictive value is 0.989, with a 95% CI (0.959, 0.998). The positive likelihood ratio is 10.00, with a 95% CI (5.526, 11.901) and the negative likelihood ratio is 0.100, with a 95% CI (0.018, 0.389).

Conclusion: Our pilot study demonstrates that ultrasound shows great promise for the sensitive detection of foot and ankle fractures.

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Radiographic Evaluation Of The Distal Tibiofibular Syndesmosis

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Introduction: Diagnosis of syndesmotom injuries is primarily based upon the assessment of ankle radiographs. Earlier studies examining normal radiographs are limited by small sample size and methodological issues.

Materials and Methods: One thousand four hundred and fifteen consecutive patients with ankle radiographs were reviewed. 1023 patients were excluded as a result of a history of ankle/hindfoot pain, trauma, or surgery; or radiographic evidence of ankle/hindfoot pathology. 392 patients (218 females, 174 males) with normal ankle radiographs were included. 83 of 392 patients had bilateral normal radiographs. All radiographs were reviewed independently by a fellowship-trained foot and ankle surgeon and a fellowship-trained musculoskeletal radiologist. Tibiofibular overlap and tibiofibular clear space were measured on anteroposterior (AP) and mortise radiographs. These four measurements were analyzed.

Results: Mean AP overlap was 8.3 mm (± 2.5). Mean mortise overlap was 3.5 mm (± 2.1), 7.7% patients had < 1 mm overlap and 4.9% of patients had < 0 mm overlap. Mean AP clear space was 4.6 mm (± 1.1), 7.1% patients had > 6 mm clear space. Mean mortise clear space was 4.3 mm (± 1.0), 4.3% patients had > 6 mm clear space. All measurements were significantly different between females and males ($p < 0.001$). Mortise clear space is the most accurate measure when obtaining contralateral radiographs. Intraobserver and interobserver reliabilities of all measurements were high (intraclass correlation coefficient range 0.820-0.983).

Discussion and Conclusion: Our data unequivocally demonstrates that basing treatment of syndesmotom injuries on previously reported radiographic criteria can lead to unnecessary operative intervention or failure to treat. Lack of overlap on the mortise view can represent a normal variant, which has not been definitively reported in prior investigations. Our data forms the basis for new radiographic criteria to evaluate syndesmotom disruption.

Ankle Tightrope syndesmosis fixation: a review of 38 cases.

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Introduction: Several methods for the management of syndesmosis disruption during ankle fracture fixation have been documented. The Tightrope anchor is a relatively new technique consisting of two buttons and a strand of Fiberwire which is looped twice through the buttons to create a pulley effect between the fibula and tibia, thereby stabilising the ankle syndesmosis. We have reviewed the outcomes in 38 patients treated with this technique.

Materials and Methods: Data including nature of operation, complications and the need for subsequent surgery were recorded for all patients receiving a Tightrope from May 2006 to September 2008.

Results: The mean patient age was 35 years, and 23 were male. 30/38 patients required no further surgery and had a good functional outcome. Two patients had prominent fibula plates removed but achieved good functional outcomes. For one patient a Tightrope was performed following diastasis screw failure: an improved but suboptimal outcome was achieved. A patient with fibromyalgia had a good range of movement but complained of discomfort. One patient with Poland sequence, who fell post-operatively, needed tightrope removal and syndesmosis debridement resulting in a good but painful range of movement. Another patient developed a pulmonary embolus following surgery and prolonged swelling and discomfort limited her functional capacity. Two patients required tightrope removal and significant wound debridement following osteomyelitis of the fibula and tibia.

Discussion and Conclusion: The Tightrope is an effective method of ankle syndesmosis repair, with a reduced need for subsequent diastasis related surgery (35/38) when compared to our diastasis screw method (100%). However, our significant rate of osteomyelitis is disturbing, warranting further investigation.

Pragmatic Treatment Of Fractures Of Uncertain Stability: Clinical Features And Risk Of Displacement

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The most important determinant of treatment of malleolar fractures is stability. Stable fractures have an intact deep deltoid ligament and do not displace with functional treatment. If the deep deltoid/medial malleolar complex is disrupted, the talus is at risk of displacement.

We developed clinical criteria for potential instability and applied them to a prospective series of patients. Criteria included: a medial clear space of <4mm; medial tenderness, bruising or swelling; a fibular fracture above the syndesmosis; a bimalleolar or trimalleolar fracture; an open fracture; a high-energy fracture mechanism. Patients with a medial clear space of < 4mm and none of these criteria were considered to have stable fractures, while those with a medial clear space of >4mm were considered to have a displaced fracture.

We studied 152 consecutive skeletally mature patients with undisplaced, potentially unstable malleolar fractures treated by the senior author between 1st January 1998 and 31st December 2007. Patients were treated in a below-knee walking cast (136 patients) or a functional ankle brace (16 patients) for six weeks. Weight bearing was encouraged throughout. Weight bearing radiographs were obtained at one week and six weeks. Displacement was defined as talar displacement with a medial clear space >4mm. Demographic, clinical and radiological data were collected prospectively.

There were 88 male and 64 female patients, with a median age of 43 years. Criteria for possible instability were: medial tenderness, 115 patients; proximal fibular fracture, 29 patients; bimalleolar fracture, 17 patients; other criteria, 15 patients. Three fractures displaced (risk of displacement 2.0%, 95% CI 0.4-5.7%). All displaced within the first week and were treated by open reduction and internal fixation. One bimalleolar fracture developed a symptomatic medial malleolar non-union which was treated by percutaneous screw fixation (risk of non-union 5.9%, 95% CI 0.1%-28.7%). All the other fractures achieved clinical union by 8 weeks.

A Prospective Comparison Study Assessing A Patient Centered Home Therapy Program For Unstable Ankle Fractures

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Ankle fractures are common injuries affecting all age groups and constitute a large proportion of the orthopaedic trauma caseload. Frequently a large number of bed days are utilized waiting for swelling to subside and a theatre slot to become available. We audited current practice and then implemented a home therapy program (HTP). If HTP criteria were met then patients with reduced, unstable ankle fractures were taught how to use crutches and allowed home from the emergency department in order to ice and elevate at home. They were then admitted from clinic for surgery the same day and then discharged when safe and comfortable.

The purpose of this study was to prospectively compare the local management of surgically stabilised ankle fractures before and after instigating a home therapy program.

43 consecutive patients met our inclusion criteria and underwent surgical fixation of unstable ankle fractures over a three month period (February to April 2008.) The average length of hospital stay was 8 days (1-18), 4.5 days pre-operatively and 3.5 days post operatively.

Forty-eight patients underwent surgical fixation of unstable ankle fractures over a four month period (November 2008 to February 2009.) Twenty-one met the home therapy criteria. The average length of hospital stay was reduced to three days, 1.6 days pre-operatively and 1.3 days post operatively. Additionally a patient survey revealed high levels of satisfaction with the HTP.

The home therapy program has effectively reduced hospital stay both pre and post-operatively. Patients mobilising at home pre-operatively mobilise earlier post-operatively and are discharged home earlier. Over the three-month period of HTP, 131 bed days were saved which equates to a saving of £30,000.

Preliminary Results of Closed Reduction of Intra-Articular Calcaneal Fracture With Ilizarov Frame

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Background: Closed reduction of intra-articular calcaneal fractures sometimes lack the accuracy desired for restoring the normal anatomy of the articular surface of the calcaneus. In this study, we evaluate the preliminary results of closed reduction of the intra-articular calcaneal fractures with an Ilizarov frame.

Patients and Method: Forty patients (25 males and 15 females) with 50 intra-articular fracture calcaneal fractures were treated with closed reduction and an Ilizarov frame. The mean age was 25.4 years (range from 19 to 65). Union was achieved after two months. The results were evaluated on the basis of combined clinical and radiological examination at the latest follow-up. Results were classified according to the protocol and scoring system used by Paley and Hall 1993.

Results: The mean follow up period was 1.9 years (range 6 months to 4 years). At final follow up there were 15 excellent feet, 26 were good, 6 fair and 3 poor. The mean Bohler angle postoperatively was 26° (range 17 to 35). Superficial infection occurred in seven feet and was controlled. Skin pressure necrosis of the posterior aspect of the heel occurred in three feet. One needed a skin graft.

Conclusion: This method is a minimally invasive technique. The technique has the ability to restore the normal anatomy, shape and length of the calcaneal body, especially in Sander's type III and type IV fractures . It is particularly useful for osteoprotic bone as it provides rigid fixation.

Association between glycosylated hemoglobin and the risk of lower extremity amputations in diabetes mellitus – review and meta-analysis

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Context: Diabetes is associated with a several fold increase in the risk of lower extremity amputation. Although a number of epidemiologic studies have reported positive associations between glycaemia and lower extremity amputation, the magnitude of the risk has not been adequately quantified.

Objective: To synthesize the available prospective epidemiologic data on the association between glycaemia as measured by glycosylated haemoglobin and lower extremity amputation in individuals with diabetes.

Data Sources: We searched electronic databases (MEDLINE and EMBASE) and the reference lists of relevant articles.

Study Selection: We considered prospective epidemiologic studies of cohort or nested case-control design that measured glycosylated haemoglobin level and assessed lower extremity amputation as an outcome. Of 2,398 citations identified, we included 14 studies comprising 94,640 subjects and 1,227 cases.

Data Extraction: Data were abstracted using standardized forms or obtained from investigators when published information was insufficient. Data included characteristics of case and control populations, measurement of glycaemia, assay methods, outcome, and covariates.

Results: The overall risk ratio for lower extremity amputation was 1.26 (95% CI, 1.16-1.36) for each percentage point increase in glycosylated hemoglobin level. There was significant heterogeneity across studies (I^2 : 76%, 67-86%; $p < 0.001$) not accounted for by recorded study characteristics. Among studies that reported the type of diabetic population, the combined estimate was 1.44 (1.25-1.65) for individuals with type 2 diabetes and 1.18 (95% CI, 1.02-1.38) for type 1 diabetes, but the difference was not statistically significant ($p = 0.09$). We found no significant publication bias.

Conclusions: There a substantial increase in risk of lower extremity amputation associated with every 1% higher HbA1c in individuals with diabetes, highlighting a potential benefit of blood glucose control. In the absence of evidence from clinical trials, this paper supports glucose-lowering as a component of overall care in the patient at high risk of amputation.

Long term Dynamic function of Tibialis Posterior tendon following Cobb procedure and Rose calcaneal osteotomy for Pes Planus

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Introduction: A Rose calcaneal osteotomy and Cobb procedure for treatment of acquired pes planus is gaining in popularity as a result of the advantages of anatomical reconstruction and reduced graft site morbidity. Although, its ability to provide long term dynamic function and effect on patient's symptoms remains to be seen.

Materials and Methods: Twenty-two patients with stage two and three Posterior tibialis tendon dysfunction underwent surgical reconstruction with a Cobb procedure and Rose calcaneal osteotomy between 2003 and 2008. The average age was 59 years (range: 20-80 years). There were 18 females and four males.

Results: We evaluated the dynamic function of the Tibialis posterior muscle tendon function by ultra-sonograms postoperatively at mean follow-up time of 36 months. Eighty three per cent of patients achieved a single heel raise. Seventy-three percent of the patients showed an intact and mobile tibialis posterior tendon on supination and pronation movements. There was no difference in the satisfaction of patients with a tenodesis or non tenodesis.

Conclusion: Our results suggest that Cobb procedure does provide dynamic Tibialis posterior function in majority of patients.

Management of early Tibialis posterior dysfunction by structured physiotherapy

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Introduction: Tibialis posterior tendon dysfunction is a common cause of foot pain and dysfunction in the middle aged patients. Initially, it presents as medial ankle pain and swelling, with or without a flexible flat foot, later progressing on to a fixed deformity. Operative management for the early stages of tendon dysfunction poses a significant workload on hospitals and physical burden on patients. We have evaluated non-operative management of early tibialis posterior tendon dysfunction (1).

Methods: This is a prospective study on patients with stage I and II tibialis posterior tendon dysfunction treated with a structured physiotherapy protocol. Twelve consecutive patients referred to a foot and ankle consultant with early tibialis posterior dysfunction from July 2008 were included in the study. The physiotherapy regime includes repetitive resisted active dorsiflexion, inversion, eversion, heel rise, and tip toe walking. The intensity of physiotherapy is progressively increased over the period of four months in four phases. Criteria for successful rehabilitation are ability to perform greater than ten single stance heel rises and tip toe walking for more than 100 yards. Patients who cannot achieve the expected progression were re-referred for surgical intervention. All the patients were referred for support with orthoses, however, only a few received the orthoses during the treatment period. The outcome was assessed using the validated outcome score Foot Function Index (FFI) before and after physiotherapy regimen.

Results: The study group consisted of 10 females and two males with 10 unilateral and two bilateral cases. The mean age was 59 years (48 to 79). The average number of physiotherapy visits was five. Prior to treatment the mean number of single stance tip toes performed by the patients was four. Out of 12 patients, ten successfully completed the rehabilitation. The mean FFI before rehabilitation was 55, which improved to 19 at the end of four months rehabilitation. On analysis using a paired t test 95% CI for mean difference: (25.07, 46.93) $P < 0.0001$. The improvement was consistent with all the three components of FFI (pain, activity and function) ($p < 0.0001$).

Conclusion: This study suggests early tibialis posterior tendon dysfunction can be treated effectively with structured physiotherapy.

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Adult acquired flatfoot: a 13-year prospective series

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Introduction: Adult acquired flatfoot is a common cause of foot pain. The majority of series describe surgery although important non-surgical series exist. This series of 166 patients gives an overview of the clinical spectrum of the condition and outcomes.

Materials and methods: Data was collected prospectively on 166 consecutive patients with adult acquired flatfoot between 1995 and 2005. 104 patients were reviewed at a median of eight years (range 3-13). A standardised clinical examination, AOFAS hindfoot and visual analogue satisfaction scores were performed.

Results: There were 40 men (median age 56 years) and 126 women (median age 60 years). 68% had other musculoskeletal problems. Patients were Truro staged at presentation; Stage 1: 26 patients. Stage 2A: 84 patients. Stage 2B: 25 patients. Stage 2C: 23 patients. Stage 3: 6 patients. Stage 4: 2 patients. Stage 1 patients were younger ($p < 0.001$). 133 patients had soft-tissue symptoms, but 33 had degenerative problems. Degenerative patients had a higher median age ($p = 0.0138$) and stiffer deformities ($p < 0.0001$). Most patients (131, 78.9%) were managed conservatively. Surgery was commoner in the arthritic group ($p = 0.001$).

Fifty-two conservatively treated feet were clinically reassessed. In 31 (59%) patients the Truro stage had not changed, 11 (21%) had improved and 10 (20%) had deteriorated. Twenty percent of patients treated with orthoses stopped using them after 18 to 24 months. In non-surgically treated patients, the median AOFAS score was 73/100 and satisfaction score 71/100. In surgically treated patients the median AOFAS score was 74/100 and satisfaction score 83/100.

Discussion: There is a young group of patients with adult acquired flatfoot, with soft tissue symptoms but no progressive deformity. There is a large group with a flexible deformity who can mostly be treated with orthoses, and an older group with stiffer, arthritic deformities who are more likely to need surgery.

Conclusion: Final outcomes and satisfaction were similar in surgically and non-surgically treated patients.

Flexor digitorum longus tendon exposure for flatfoot reconstruction. A comparison of two methods in a cadaveric model.

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Background: A novel method for harvesting the flexor digitorum longus (FDL) tendon has previously been described via a plantar approach based on a surface coordinate. The aim of this investigation is to provide a comparison with the traditional medial midfoot dissection for tendon harvest.

Methods: The FDL tendon was exposed in 10 cadaveric feet via a limited plantar approach and also medially as far as could be accessed via the knot of Henry. The FDL was marked with a metal clip in each approach. The lengths of the skin incisions were recorded and the distance between the two markers was measured. The morphology of the FDL tendon was observed including interconnections with the flexor hallucis longus (FHL) tendon.

Results: The mean additional length of tendon accessed via the plantar approach was 22.9 mm with a mean reduction in skin incision length of 15.6 mm. The FDL tendon showed some division at the site of the plantar exposure and there were FDL - FHL interconnections in nine of the feet with three distinct patterns observed.

Conclusion: Using the plantar exposure, a longer length of tendon can be obtained through a smaller skin incision, which has been quantified here. Observations on FDL tendon morphology and interconnections may have clinical significance.

The basal opening wedge osteotomy for hallux valgus, does it work?

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Introduction: An osteotomy in the proximal first metatarsal corrects the metatarsal head position with much less movement of the fragment than an equivalent distal osteotomy. Most described techniques are technically demanding and reported complications including non-union, mal-union and transfer pain. We present our results of an opening wedge osteotomy with a medial wedge plate. We also present the pitfalls and tips to avoid complications.

Materials and Methods: Thirty-four procedures in 30 patients were performed using the Arthrex wedge plate.

Demographic and clinical data, AOFAS scores and radiological measurements of standardised radiographs were collected for all the patients.

Results: All patients were females. The average age was 52 years. Twenty-seven were primary procedures and 7

patients had had previous, failed 1st ray surgery. No bone graft was used. Thirty-two feet showed clinical and radiological signs of union. Four complications occurred and one was treated with metatarsophalangeal joint fusion.

One had an infection. Two patients had broken screws. The average hallux valgus angle and inter-metatarsal angle corrections were 20⁰ and 9⁰ respectively. Average increase in AOFAS scores: preoperative 47 to postoperative 81.

Discussion: The spacer in the plate acts as a pillar and obviates the need for a bony strut. Keeping an intact lateral cortex and preventing any shaft displacement was important in avoiding transfer pain. 4.5mm or smaller plates appear to have fewer problems and better scores, although this was statistically unproven. Screw breakage in the absence of infection had no bearing on overall outcome. Some patients with poor fixation may benefit from non-weight bearing for the first 6 weeks.

Conclusion: The wedge plate osteotomy is a powerful tool to correct moderate to severe hallux valgus. It does not need additional bone graft and has a favorable clinical and radiological outcome. The prelude to optimum result was meticulous technique avoiding the discussed pit falls.

The treatment of the hallux valgus with a percutaneous chevron osteotomy.

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Introduction : Hallux valgus is a common foot deformity. A widely used method for correction of mild and moderate hallux valgus is a distal metatarsal (Chevron) osteotomy. The purpose of this study was to assess the results of a percutaneous chevron osteotomy two years after my first communication in Arcachon.

Patients and method : The operation is performed by one senior surgeon. The patient is placed in the supine position. The foot is allowed to overhang the end of the table. No tourniquet is used. The procedure is controlled by fluoroscopy. The chevron osteotomy is undertaken with a Shannon burr of 12 mm and a 20 mm for the last case. The axis of translation is determined preoperatively and adapted to the foot: more or less plantar displacement of the metatarsal head, or, more or less shortening of the metatarsal itself. The translation of the head is controlled by a temporary intramedullary K-wire inserted medially. The fixation is with an absorbable k-wire for one part and by screw for the other part. The medial exostosis is not systematically removed. The procedure is completed by an Akin osteotomy in 90%. A lateral release procedure is performed percutaneously.

Results: The mean age of the patients was 55 years at time of operation. At the follow-up of 3 months all patients are examined and X-Ray's taken. The Kitaoka score increased from 45 to 89. The hallux valgus angle decreases from 37° to 10° . The metatarsus varus is 10° . Three patients need a new surgery for a secondary displacement. Our results are comparable to those published for open chevron osteotomy in terms of correction of the HV and intermetatarsal angles.

Early Experience With A Minimally Invasive Modified Chevron and Akin Osteotomy For Correction Of Hallux Valgus

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Introduction: In most areas of surgery there has been a move in recent years towards less invasive operative techniques. However, minimally invasive surgery (MIS) is not automatically 'better' surgery. Several MIS techniques for correcting hallux valgus have been described. We present our experience with an MIS chevron type osteotomy, Akin osteotomy and distal soft tissue release. This technique utilises rigid internal screw fixation (without the need for k wire fixation). This is the first such series to be reported in the United Kingdom.

Patients & Methods: A consecutive series of twenty three patients (30 feet) with mild to moderate HV deformity were included in the study and were independently assessed clinically and radiographically and scored using the AOFAS scoring system, visual analogue score for pain and a subjective outcome score. All surgery was performed by a single surgeon (DR) using a high-speed burr to create the osteotomies. The osteotomy was fixed with a rigid screw. The mean age was 59 (24-75), and 90% were female. All patients had minimum follow-up of three months (mean 7.5, range 5 -12).

Results: The mean AOFAS score improved from 39.3 (median 44, range 25-57) preoperatively to 89.9 (median 92, range 77-100) postoperatively. The mean visual analogue score improved from 7 to 1. 82% of patients were very satisfied / satisfied with the procedure. There were no cases of infection, two cases of type 1 complex regional pain syndrome and two screws required removal.

Conclusion: This small series represents the senior author's learning curve with this new technique and as such, these early MIS results compare well with outcomes reported with modern open techniques for mild to moderate hallux valgus deformities. A randomised study to compare open and closed techniques is now being undertaken.

Hammer Toe correction: A comparative study of K wire versus bioabsorbable fixation

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The surgical correction of hammertoe deformity of the lesser toes is one of the most commonly performed forefoot procedures. In general, percutaneous Kirschner wires are used to provide fixation to the resected proximal interphalangeal joint. Although these wires are effective, issues such as pin tract infection as well as difficult postoperative management by patients make alternative fixation methods desirable.

The biomechanical studies suggested that the bioabsorbable implant would be a suitable fixation device for the hammer toe procedure. These wire are made of a copolymer of 82% poly-L-lactic acid and 18% polyglycolic acid, The aim of our study was to assess the clinical outcome of these two implants. We compared 100 consecutive proximal interphalangeal joint fusions performed with each implant. There was no statistically significant difference in the fusion rate at six months using either implant. However, there was significant statistical difference in cost, rate of infection, implant migration, recurrence of deformity, patient's return to driving, walking with routine foot wear and satisfaction. There was 11% rate of reactive inflammation in the absorbable wire group but no infection.

The study shows the absorbable wires are safe for fusion of proximal inter phalangeal joints.

Relationship Between Functional Foot Orthotic Use And Ankle Proprioception

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Introduction: Functional Foot Orthoses (FFO's) have been shown to improve one element of balance, postural sway, when prescribed for patients with ankle injuries. Little is known, however, about the effect of these devices on ankle stability/proprioception, or the changes which might occur as the patient becomes habituated to using the device. We studied these effects from the time of initial application of the FFO through to regular usage at six weeks.

Methods: Patients with musculoskeletal conditions affecting the lower limb that required custom made FFO's were evaluated. A standardised protocol, using the Biodex stability system (a balance platform), to assess several stability indices was performed. Patients were assessed before fitting the orthosis, at the time of fitting and six weeks later. The American Orthopaedic Foot and ankle Society (AOFAS) score was also used to evaluate the progress of these patients.

Results: There were 13 male and seven female patients, aged 10 to 64 years. Patients had a range of orthopaedic conditions and all been assessed by orthopaedic specialist and podiatrist as having correctable foot biomechanics. In 6 patients, proprioception deteriorated on initial application of FFO's. However, all patients exhibited improved over-all stability by a mean of 2.5 points (Normal range 0.82-3.35) at 6 weeks evaluation. The mean AOFAS on presentation was 72 and the final mean score was 97, both of which were clinically and statistically significant (t test, $p < 0.05$). Eighteen patients had complete resolution of symptoms of pain and instability.

Conclusions: FFO's alter foot biomechanics, and in doing so appear also to improve balance and proprioception. Proprioception deteriorated in 30% of cases on initial application of orthotics, but pain and instability improved in more than 90% of patients on extended use of foot orthotics, with this improvement becoming manifest by 6 weeks after starting use of the device.

Comparison of 1st MTPJ fixation between Hallu-fix plate and ACE screws

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We present a case control comparison between two methods of fixation for 1st metatarsophalangeal (MTPJ) fusion. From 2007-2008 sixty patients were treated with either 4.0mm ACE (De Puy) screws or a Hallu-fix (Integra LifeSciences) plate fixation. We found no difference between the two groups in regard to age, ASA grade, smoking status and non-steroidal anti-inflammatory use but there was a statistically significant difference in union rates. In the Hallu-fix group, nine patients went on to develop a non-union whereas one patient developed a non-union in the ACE screw fixation group, $p = 0.01$. Whilst there may be perceived advantages with the Hallu-fix system in regard to the accuracy of reduction, from our results we caution against its use, and have found a better outcome with cheaper 4.0mm ACE screws.

Imaging Plantar Plate Tears In Lesser Metatarsophalangeal Joints: MRI Versus Ultrasound Arthrography

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Introduction: Lesser metatarsophalangeal joint (MTPJ) instability is a common cause of forefoot pain. Instability is probably caused by tears of the plantar plate and collateral ligaments. We prospectively compared MRI and ultrasound with and without arthrography in the assessment of patients with MTPJ instability.

Materials and methods: MTPJ instability was diagnosed by the draw test. Nineteen patients underwent imaging with consent. One musculoskeletal radiologist performed MRI arthrography and a different musculoskeletal radiologist performed ultrasonography supplemented with arthrography. Each radiologist reported his own study, blinded to the results of the other modality. Where possible, the radiological diagnosis was evaluated at surgery.

Results: MRI identified four full thickness plantar plate tears. In five studies no contrast was seen in the MTP joint and in 10 contrast was contained within the joint.

Ultrasound identified six full thickness plantar plate tears as hypoechoic zones that extended through the whole thickness of the plate. Eleven studies showed partial thickness tears. Two studies showed thinning of the plate.

Ultrasound arthrography identified seven full thickness tears by extravasation of injected fluid into the flexor tendon sheath. Eleven studies showed partial thickness tears and one was normal. Ultrasound and ultrasound arthrography agreed in 14/19 patients. MRI agreed with ultrasound on 3 of 6 full thickness tears and with ultrasound arthrography in 4 of 6 full thickness tears. MRI gave additional information about the articular surfaces in four patients. Surgical comparison was available in 11/19 patients. Ultrasound with and without arthrography correctly predicted four partial thickness tears. Ultrasound arthrography correctly predicted 6/7 full thickness tears, MRI 3/7 and ultrasound 3/7.

Discussion: Ultrasound with arthrography appears the best modality to distinguish between partial and full-thickness tears. It is cheaper, simpler and can be performed in the outpatient setting. Larger studies with surgical confirmation are required to assess its value more precisely.

Lesser Metatarsophalangeal Instability: A Cohort Study Of Clinical Features And Outcomes

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Introduction: Lesser metatarsophalangeal instability is a common cause of forefoot pain. Previous studies were small and there is little data comparing surgical with non-surgical treatment.

Patients and methods: Metatarsophalangeal instability was diagnosed and staged with the draw test. We recorded the clinical presentation, involved toes, severity of instability, presence of toe deformity and management. Patients were followed-up in clinic or by telephone interview with visual analogue pain and satisfaction scores and AOFAS lesser metatarsophalangeal scores. Outcomes were assessed by an independent observer.

Results: We studied 154 patients: 127 (82%) female and 27 (18%) male. The median age was 56 years (range 33-85). One foot was affected in 107 patients (69%) and both feet in 47 (31%). The second toe only was affected in 99 patients (64%) and multiple toes in 52 (34%). Seventy-three patients (47%) had a complaint of generalised forefoot pain. Sixty-eight (44%) had pain and deformity localised to the second toe. Thirteen patients (8%) had toe deformity with significant MTPJ instability. 150 toes (52%) had grade 1 instability, 108 (37%) grade 2 instability and 21 (7%) grade 3 instability. Twelve toes (4%) presented dislocated with a history of instability. Ninety-nine patients (64%) were treated conservatively, using functional taping, shoe modifications, insoles and injections. Fifty-five patients (36%) had surgery, including lesser toe straightening, flexor-extensor transfer, plantar plate repair, Weil and Stainsby procedures. 79% of patients were reviewed at a mean of 65 months (range 14 to 138). Mean pain score was 31mm \pm 23.7mm for the conservative group and 23mm \pm 24.1mm in the surgical group. Mean AOFAS score was 69 \pm 16.3 for the conservative group and 67 \pm 17.8 in the surgical group. 39 (52%) conservatively treated patients were either satisfied or very satisfied compared to 31 (66%) surgically treated patients. No differences were statistically significant. (299 words)

Proximal interphalangeal Joint Fusions with Stay Fuse

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Purpose: We conducted a study of 72 hammer toes treated with proximal interphalangeal joint (PIPJ) fusions with a Stayfuse implant. The aim of the study was to assess the clinical results of PIPJ fusion carried out with Stayfuse implants.

Method: There were 10 males and 62 females. Average age was 52 years. Twelve cases had bilateral and 60 cases had unilateral foot involvement. Fifty-two second and 20 third toes were operated on. Mean follow up was twelve months. The results were assessed clinically, radiologically and with the American orthopaedic foot and ankle surgery society (AOFAS) score.

Results: All the joints fused clinically except two. There were ten PIPJ's which did not fuse radiologically. The AOFAS score improved from 42 preoperatively to 84 post operatively. There were two cortical breaches of the proximal phalanx, one implant breakage and one case of dissociation of the components of the implant at six weeks after the surgery, with a recurrence of deformity. There were two patients who complained of over-straight toes. Fifty-two patients were very satisfied with the procedure, seventeen satisfied and three patients were unsatisfied.

Conclusion: We conclude that the Stayfuse is a safe, reliable method to correct PIPJ deformity, although there is a learning curve. The main advantages of the implant are that there is no postoperative implant exposure, no violation of healthy joints, no risk of pin tract infection, rotational and angular stability, early rehabilitation and a high patient satisfaction. The disadvantages of the implant are dissociation of the components and the difficulty of removal, if this is needed.

The plantar approach to the foot: a new surgical approach for tarsometatarsal joint surgery

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Introduction: Tarsometatarsal joint (TMTJ) arthrodesis is traditionally performed through a dorsal approach and is associated with higher incidence of cutaneous nerve damage, prominent metalware and high non-union rates. It is postulated that applying fixation to the plantar (tension) side, rather than the dorsal (compression) side would create a more stable construct with higher union rates. A suitable surgical approach has not previously been described. The aim of this study is to define a plantar surgical approach to the TMTJ's.

Methods: We dissected 10 cadaveric feet, identifying nerves, vessels, muscles and their innervation on the plantar aspect of the 1st and 2nd TMTJ's.

Results: We found that in all specimens a plane of dissection could be created between the two terminal divisions of the medial plantar nerve between flexor digitorum brevis and abductor hallucis. Although exposure of the 1st TMTJ was relatively easy, access to the 2nd TMTJ was difficult due to its location at the apex of the transverse metatarsal arch and the overlying peroneus longus insertion. We found that the peroneus longus tendon had a variable insertion not only at the base of the 1st metatarsal but also at the medial cuneiform and the base of the 2nd metatarsal.

Discussion: This is a new surgical approach, following an internervous dissection plane. The feasibility of making an incision over the convex side of the rocker bottom deformity and the biomechanical advantage of a plantarly applied fixation device may make this an attractive surgical approach.

Results of Tarsometatarsal joint fusion using low profile locking plate

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Introduction: Tarsometatarsal joint (TMTJ) fusion is performed for arthritis or painful deformity. First TMTJ fusion may be performed as a part of corrective surgery for hallux valgus deformity. K-wires and trans-articular screws are often used to stabilize the joints. We present our experience with the use of locking plates (LP) for TMTJ fusion.

Patients and methods: Thirty-three TMTJ's in 19 patients were fused and stabilised with LP's between January and September 2008. The procedure was performed for Lisfranc arthritis in 13 patients and Lapidus procedures in six. Two out of 6 were revisions after failed fusion using transarticular screws. Iliac crest bone autograft was used in 26 joints in 12 patients. All patients post-operatively had below knee plaster immobilization and protected weight bearing walking for first 6 weeks. Clinical and radiological surveillance continued until bone union. AOFAS midfoot scale was used as outcome measure.

Results: There were 7 male and 12 female patients with average age of 51 (14 -68). The American orthopaedic foot and ankle surgery society (AOFAS) midfoot score showed a 42% improvement in pain, 30% improvement in function and 53% improvement in alignment. The average AOFAS overall score improved from 30 preoperatively to 67 postoperatively. All except one joint in one patient had clinically and radiologically fused joints. One patient underwent removal of the metalwork and four had delayed wound healing. The average satisfaction score was 7 out of 10. 86% said of patients said that they would recommend the surgery to a friend, and 91% would undergo the surgery again.

Discussion: Locking plates have been recently introduced for ankle and foot surgery. Biomechanical studies have shown that the plates are not as strong or stiff as trans-articular screw fixation, however, they are easy to use, have more flexibility for realignment and can act as a buttress for bone graft. **In our series all, except one, patients achieved bony union without loss of alignment.**

Conclusion: Locking plates provide satisfactory stability for TMTJ fusion, without complications.