**ABSTRACTS FROM BOFSS MEETING Holmes Chapel, Cheshire**
**4-6 November 2004**

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J Bone Joint Surg Br Proceedings 87-B: 375-e. **Abstract** 1 of 41
British Orthopaedic Foot Surgery Society Cheshire, UK – 4–6 November, 2004
President – Mr Peter LR Wood

## THE MEDIAL APPROACH TO TRIPLE ARTHRODESIS. INDICATIONS AND TECHNIQUE FOR MANAGEMENT OF RIGID VALGUS DEFORMITIES IN HIGH RISK PATIENTS

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We present our experience with a medial approach for triple arthrodesis for correction of severe rigid hindfoot deformity in patients who were at risk for wound complications with a standard lateral approach.

Between 1995 and 2002, we treated 17 patients with a rigid hindfoot valgus deformity, and for whom a triple arthrodesis was planned, using a single medial incision. The indication for surgery was pain refractory to shoe wear, orthotic and brace modifications. The severity of the hindfoot deformity itself was not sufficient an indication for this procedure, since during the same time period, 157 triple arthrodesis procedures were performed using a two incision technique, many of which were associated with severe hindfoot varus or valgus deformities. The medial incision was indicated specifically for patients who were at risk for wound complications following correction of the hindfoot valgus deformity due to stretching of the lateral skin.

There were 15 patients with rheumatoid arthritis (RA), and two patients who had deformity of the hind-foot following a crush injury associated with scarring of the lateral skin over the sinus tarsi. In addition to standard weight bearing radiographs of the foot and ankle, non-invasive vascular studies were performed in 5/17 patients pre-operatively who on clinical examination were considered to have peripheral vascular disease.

Immunosuppressant medication(s) were not discontinued prior to surgery for the patients with RA, and were renewed once wound healing occurred. The surgery was performed in a standard manner for each patient, with an extensile medial incision, the use of a laminar spreader to facilitate exposure and joint debridement, and removal of appropriate bone wedges to improve correction. Cannulated partially threaded 5.0 mm (for the talonavicular and calcaneocuboid joints) and 6.5 mm (for the subtalar joint) screws were used in each patient.

All 17 patients were examined a mean of 4.5 years following surgery (range 2.5–8), and the examination focused on the success of arthrodesis, the presence of ankle arthritis, as well as hindfoot deformity. Other outcome parameters were not specifically examined since these patients had multiple additional lower limb deformities, as well as arthritides of the foot and ankle unrelated to the performance of the triple arthrodesis. The correction obtained was compared with preoperative radiographs.

There were no wound healing complications in any patient. Arthrodesis was obtained in 16/17 patients. In one patient with RA, a non-union of the calcaneocuboid joint was noted radiographically, but had been present for 6 years, and was asymptomatic. There was no loss of correction, however hindfoot valgus was present in three patients, caused by arthritis of the ankle associated with valgus tibiotalar deformity. Two additional patients had since undergone a total ankle replacement for correction of arthritis not associated with deformity, and one had undergone an ankle arthrodesis 2 years following the triple arthrodesis for correction of severe arthritis as well as tibiotalar deformity. On the anteroposterior foot radiograph, the talus-first metatarsal angle improved from a mean of 26 degrees (range 15–45), to a mean of 5 degrees

(range 0–15). The talocalcaneal angle was not measured, since reproducible preoperative measurements could not be obtained. The axial talocalcaneal angle was not measured.

The medial approach to triple arthrodesis is a reliable procedure, and can be used with a predictable outcome in patients who are at risk for wound healing complications for correction of hindfoot valgus deformity.

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TIBIOTALOCALCANEAL ARTHRODESIS BY INTRAMEDULLARY NAIL IN PATIENTS WITH RHEUMATOID ARTHRITIS
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Tibiotalocalcaneal (TTC) fusion is indicated in rheumatoid patients with combined ankle and subtalar disease, particularly when severe deformity is present. In theory, if bone stock is good, a staged subtalar/triple arthrodesis followed by total ankle replacement (TAR) can be used. This is so rarely the case that the author has no experience of this. TTC fusion is also useful in rheumatoid patients with previous joint sepsis, to salvage a failed TAR and to salvage a non-united ankle fusion. It allows early weight bearing, which is valuable in those patients who have multiple joint, particularly upper limb, involvement.

In our study, 18 patients underwent 21 TTC fusions from August 1988 to September 2002. The average age was 48 years (range 23–90). Nine patients had undergone previous hindfoot procedures, five were smokers, one was diabetic and one had chronic renal failure. Surgery was performed under GA with tourniquet. Patients were reviewed using a modified American Orthopaedic Foot and Ankle Society (AOFAS) hindfoot score and with regard to their personal satisfaction. Follow up was 18–57 months.

Post-operatively, the oldest patient died due to fulminant sepsis. Seven patients had superficial wound infections but none required re-operation. Fusion was achieved in 18 limbs. Average time to radiological union was 36 weeks (range 9–68), two patients required nail dynamisation. In six cases it was necessary to remove irritating locking screws, either the posterior screw for heel rubbing, or the medial tibial screws for stress riser symptoms. One patient required complete nail removal. There were no amputations.

Fourteen patients were very satisfied, two reasonably so and one not. The average AOFAS pain score (max 40) improved from 11 to 32, and the average AOFAS functional score (max 28) from 4 to 21.

We feel that despite the relatively high complication rate, this technically challenging procedure is a very useful salvage option in these very disabled patients.

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SURVIVORSHIP OF TOTAL ANKLE ARTHROPLASTY IN RHEUMATOID ARTHRITIS
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Between 1993 and 1999, 119 total ankle arthroplasties (TAA) in 106 patients were performed. The prosthetic design in all cases was the Scandinavian Total Ankle Replacement (STAR). All patients have been reviewed annually.

Eight arthroplasties have been revised (see table for reasons for revision).

Twenty-four TAA were satisfactory at last review (4–87 months) in 19 patients who died. Annual review continues for 87 TAA. When last seen the average follow up was 72 months (48–123). The cumulative survival for all 119 TAA is 92% (see figure below).

Comment The complication of recurrent deformity causing 'edge loading' of the insert and failure can hopefully be avoided by not attempting arthroplasty in patients with more than 20 degrees of pre-operative valgus. The problem of aseptic loosening is harder to understand. Subsidence may be avoided by more accurate shaping of the talus to give better bony integration but osteolysis behind a well-fixed component remains an unsolved problem with respect to both its cause and treatment.

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THE COBB REPAIR AND ROSE OSTEOTOMY FOR STAGE II DYSFUNCTION OF TIBIALIS POSTERIOR TENDON
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Although the use of split tibialis anterior tendon transfer (combined with the Rose calcaneal osteotomy and reinforcement of the spring ligament) is a recognised procedure in the treatment of stage II tibialis posterior dysfunction, there is a paucity of data regarding its results. Forty-three patients who underwent reconstruction between 1997 and 2003 were evaluated pre- and postoperatively using the AHS scoring system. The average age was 57, and the mean follow-up time was 51 months (range 10–83).

The average AHS score pre-op. was 58 and post-op. was 85. Sixty-six per cent of patients achieved single heel raise. Eighty-four per cent expressed a subjective satisfaction rate, whilst 16% had no improvement. Seventy-eight per cent were able to use normal shoes and 58% did not require the use of any orthotics. The minor complication rate was 16% with no major complications. All osteotomies united uneventfully. Two patients have developed subtalar osteoarthritis, and six calcaneal screws had to be removed for prominence and tenderness.

Our results compare very favourably with other less anatomical reconstructions, but without the donor site morbidity and very low complication rates. A subjective satisfaction rate of 84% has been achieved.

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CLAYTON'S FOREFOOT ARTHROPLASTY IN RHEUMATOID ARTHRITIS. AN OUTCOME STUDY (1980–2001)
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We present a retrospective study on the outcome of Clayton's forefoot arthroplasty in 23 patients with rheumatoid arthritis.

The average age at surgery was 51.2 years (range 26–88). Pre-operative symptoms were pain, deformity, and footwear problems. Hallux valgus, lesser toe deformities and callosities were the common signs. One surgeon performed all procedures. All patients were assessed radiologically and clinically using American Orthopaedic Foot and Ankle Society (AOFAS) rating system.

Thirteen patients had bilateral correction, and 10 had single foot surgery, providing a total of 36 feet for analysis. Complications included eight wound infections, two toe tip ulceration, two ischaemic toes and two painful feet.

The AOFAS average score was under 45 before surgery and it improved to 83 (range 47–100) for hallux and 79 (range 40–100) for the lesser toes. Overall 91% patients were pleased with the procedure. Our results suggest that Clayton's forefoot arthroplasty is a procedure, which provides predictable comfort and immediate, functional improvement in advanced rheumatoid arthritis.

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A MODIFICATION TO THE STAINSBY TECHNIQUE FOR ARTHRITIC OR DISLOCATED METATARSOPHALANGEAL JOINTS OF THE LESSER TOES
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Introduction We report the experience of a district general hospital foot and ankle service, in performing a modified excision arthroplasty and tendon transfer to the metatarsophalangeal (MTP) joints of the lesser toes in both rheumatoid and non-rheumatoid patients. The procedure was carried out on 114 toes, in 58 feet of 55 patients over a 5-year period.

Background Historically, partial proximal phalangectomy was complicated by recurrence of the extension deformity. Stainsby (1990) described a technique of 7/8ths phalangectomy, repositioning of the plantar plate, extensor to flexor attachment and K-wire stabilisation to treat dislocated MTP joints of the lesser toes. However, it is recognised that the use of K-wires can be complicated by infection or premature removal. Angel reported the re-routing of the extensor tendon through a drill hole in the metatarsal head for MTP joint instability; this technique was attributed to Nigel Cobb. We have utilised the Stainsby technique and combined it with a Cobb tendon transfer to impart immediate stability to the toe, allowing K-wire fixation to be discarded.

Technique Following a percutaneous proximal extensor tenotomy, a radical partial proximal phalangectomy (via a dorsal incision) reduces a dislocated MTP joint and the plantar plate is repositioned beneath a mobilised metatarsal head. A drill hole is then placed in the metatarsal head and the extensor tendon is re-routed from a plantar to dorsal direction. This maintains the reduction of the toe and provides interposition between the cut end of the proximal phalanx and the metatarsal head.

Conclusion We believe that this modified combined technique is a reproducible alternative to the Stainsby procedure but, in addition, provides immediate stability of the MTP joint without the need for K-wire fixation.

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STAINSBY OPERATION FOR RHEUMATOID AND OTHER FOREFOOT ARTHROPATHIES
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Aim To assess the reliability of Stainsby's operation for dislocated lesser toe metatarsophalangeal (MTP) joints.

Method Seventy-four patients underwent this operation between 1998–2003. Sixty-nine patients (93%) were reviewed at mean follow up of 32 months (range 10–67) post-operatively. Forty-eight patients had rheumatoid arthritis, two had psoriatic arthropathy, 19 had other causes. Ninety-four feet were reviewed, 73 had had multiple lesser toe operations, 21 had single lesser toe operations, 52 feet had surgery to the hallux. Assessments were made of pre- and post-operative pain, shoe problems, callosities, alignment and function.

Results Out of 94 feet, 89 (95%) had severe or moderate pain pre-operatively. Only 19 (20%) had significant pain at review. Pain under operated toes was relieved in 78 feet (83%). Tender plantar callosities were reduced from 76 feet pre-operatively (81%) to 31 feet (33%) at review, these mainly under un-operated metatarsal heads. Shoe problems were reduced from 89 feet (95%) pre-operatively to 61 feet (65%) at review. American Orthopaedic Foot and Ankle Society (AOFAS) forefoot scores were increased from a

mean of 19 pre-operatively to 52 at review.

Residual valgus of big toe more than 25 degrees persisted in 33 feet (35%). Corrective osteotomy of 44 first metatarsals failed to prevent recurrent valgus in 16 feet (36%).

Conclusions The Stainsby operation was effective in relieving pain and skin callosities from under dislocated lesser metatarsal heads, and in reducing shoe problems but we found that varus osteotomy was unreliable in correcting valgus of the big toe. This was probably due to stretching of the repaired medial ligament.

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TRANSVERSE INCISION FOR LESSER METATARSOPHALANGEAL EXPOSURE. A WORKHORSE INCISION FOR THE FOREFOOT
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Introduction Exposure of the lesser metatarsophalangeal (MTP) joints is needed for many procedures e.g. forefoot arthroplasty and multiple Weil-type osteotomies. Traditionally collateral incisions and plantar incisions have been described. However exposure using these is often difficult and inadequate in the presence of rheumatoid arthritis (RA) and associated deformities. Transverse incisions offer excellent exposure, extensibilty, versatility and improved range of movements with decreased neurovascular compromise. Aesthetic wound healing is common. We describe our results following the use of a curved transverse incision for the Mann-Thompson type of arthroplasty and multiple Weil osteotomies. A single incision was used to expose all lesser MTP joints.

Method A total of 34 consecutive patients with either procedure were included, comprising 52 feet including 18 bilateral forefoot arthroplasty and 10 multiple Weil osteotomies. All patients were followed up for 12 months. A questionnaire was completed for each patient at conclusion of surgery, and then at 6 and 12 months. Ease of exposure, visualisation of target areas, wound healing, neurovascular complications and average range of movement were assessed. Four surgeons were involved in the study: one consultant, one NT middle grade, and two specialist registrars.

Results Three minor wound healing complications were noted, with no need for repeat surgery. No neurovascular complications were noted, cosmesis was good-to-excellent in all, a global range of movement of 30 degrees was achieved in 95%. Ease of exposure and visualisation of the target area was good-to-excellent in all patients. All surgeons reported satisfaction with the approach and rated it superior to the collateral and plantar incisions.

Conclusion We believe that this represents excellent results in this difficult group of patients. The curved transverse incision is a workhorse incision for the lesser MTP joints.

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# RHEUMATOID FOREFOOT RECONSTRUCTION. FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS WITH WEIL METATARSAL OSTEOTOMIES OF THE LESSER TOES

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Introduction Rheumatoid arthritis commonly produces disabling forefoot deformities. Surgical interventions include hallux metatarsophalangeal (MTP) joint fusion with lesser toe metatarsal head and/or proximal phalanx base excisions. Here we describe our experience of combining first MTP joint fusion using a plate with Weil metatarsal osteotomies (WMO) of the lesser toes. WMO preserve and reduce lesser MTP joints thus enhancing stability and relocating the plantar fat pads. Plate fusion of the first MTP joint protects against recurrent deformity. Our aim was to assess the outcome of this procedure.

Method Twelve female patients (21 feet) underwent the procedure with no loss to follow up. Informed consent was given and ethics approval obtained. American Orthopaedic Foot and Ankle Society (AOFAS) forefoot scale and visual analogue scale scores were recorded post-operatively only. Pre- and post-operative plain radiographs were compared.

Results Mean age at operation was 62.5 years (range 48–75). Mean follow up was 25.9 months (range 2–54). The mean post-operative AOFAS scale score was 70.6/100 (range 34–90).

The mean hallux valgus angle was reduced from 39.6 degrees to 31.8 degrees and the second MTP angle from 28.3 degrees to 19.4 degrees. Pre-operatively 28% of the lesser toe MTP joints were aligned compared with 83% post-operatively. All of the WMOs fused. Two first MTP joint fusions resulted in non-unions and required successful revision surgery. In five cases metalwork was removed from the hallux because of discomfort. In two cases, metalwork was removed because of superficial wound infection. Infection subsequently resolved after a course of oral antibiotics. Nine patients stated they would recommend the procedure.

Conclusion First MTP joint plate arthrodesis and WMOs of the lesser toes provides good symptomatic relief and restoration of forefoot mechanics. It is a useful procedure in delaying more radical and final surgery for this progressive, destructive disease.

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# THE WEIL OSTEOTOMY IN THE TREATMENT OF METATARSALGIA. DOES IT WORK?

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Introduction Surgical treatment of metatarsalgia remains controversial, with many different techniques described. Recently the Weil osteotomy is gaining in popularity because of its relatively simple technique and excellent union rates, however, it is well known that the procedure does lead to stiffness in the metatarsophalangeal (MTP) joint with a reduction in plantarflexion. The aim of this study was to evaluate the outcome of the Weil osteotomy from a radiological and patient-based perspective.

Method This was a retrospective review of 42 patients (110 Weil osteotomies), with mean follow up of 24.8 months (range 6–48). Clinical examination and X-ray assessment were performed at follow-up, along with completion of patient questionnaires, American Orthopaedic Foot and Ankle Society (AOFAS) Score and Lesser Metatarsal Scores (LMTS). Additional parameters including arc of motion of each metatarsal, metatarsal shortening, non-union, redislocation and requirement for further surgery were also recorded.

Results Results showed that the average arc of motion for the second metatarsal was 61.1 degrees, the third metatarsal 59.6 degrees, and the fourth metatarsal 69.8 degrees. In all cases there was a significant reduction in plantarflexion at the MTP joint, with the average combined plantar flexion of less than 5 degrees. The average shortening was 7.2 mm, and there were no cases of redislocation or non-union. Analysis of the scoring systems showed that with AOFAS there were 88% excellent/ good results and with LMTS there were 83% excellent/ good results. No patients had residual metatarsalgia and plantar callosities disappeared in almost all patients, with 91% of patients reporting excellent/good satisfaction.

Conclusion Formal scoring systems and patient satisfaction scores showed that dorsiflexion contractures post-operatively were not of concern to the patients. The study suggests that the Weil osteotomy remains a safe, reliable and predictable operation with excellent results, and may be of value in the treatment of resistant metatarsalgia.

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COMBINED ANKLE AND SUBTALAR JOINT ARTHRODESIS FOR DEFORMITY OF THE HINDFOOT
A Tavakkolizadeh; M Klinke; and M Davies
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Background Tibiotalocalcaneal (TTC) arthrodesis is a salvage procedure for patients with severe disease of the ankle and subtalar joints.

Method We report a series of 26 consecutive patients (26 feet) operated on by a single surgeon, in a single centre, over a 4-year period, with average follow up of 26 months (range 6–50). Mean age of the patients was 57 years (range 28–72). Subjects included 17 male and 9 females. Previously the patients had undergone between 0 to 6 operations,

which were unsuccessful. All these patients had combined ankle and subtalar joint arthrodesis by an intramedullary nail device. Indications for surgery were pain except the Charcot joints. Only five patients did not have severe deformity pre-operatively. Aetiology included post-traumatic osteoarthritis, rheumatoid arthritis, psoriatic arthropathy, avascular necrosis, Charcot Marie Tooth disease, primary osteoarthritis, failed ankle replacement and alcohol-and diabetic-induced Charcot neuroarthropathy. Patients were assessed radiologically and by American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Scale, SF-12 and by patient satisfaction scores.

Results Clinically and radiologically, 15 cases have solid union. Six patients have signs of radiological non-union/ delayed union but are clinically asymptomatic with no progressive deformity. Two patients required amputation (one non-union and one infected non-union). One patient is awaiting further surgery for infected non-union. Two patients have died of unrelated causes ~2 years post-surgery. Most patients (79%) are very satisfied with the procedure and 83% would undergo the procedure again.

Conclusion These results suggest that salvage is possible in the majority of cases with combined ankle and subtalar joint arthrosis and severe deformity.

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CLINICAL AND FUNCTIONAL OUTCOME AFTER PAN-TALAR NAILING FOR ANKLE ARTHRODESIS
Y R Shah; D O'Doherty; and S Hemmadi
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Introduction Pan-talar nailing for ankle arthrodesis has been advocated as a salvage procedure for post-traumatic arthrosis and Charcot's joint. This study evaluates the outcome of pan-talar nails over a 4-year period.

Method This is a retrospective study of 11 patients (13 ankles) who underwent pan-talar nailing between 2000 and 2004. Various factors including patient demographics, indications for surgery, operation details, complications, time to fusion and need for re-operation were recorded. Nine were reviewed at a mean follow-up of 22 months for clinical and radiological assessment; two patients had died. American Orthopaedic Foot and Ankle (AOFAS) hindfoot and SF-36 scoring systems were also used for evaluation.

Results There were seven males and four females, with a mean age of 57 and 71 years, respectively. Eight patients had a pre-operative diagnosis of Charcot's joint, one avascular necrosis of talus, one fixed deformity with polio, and one following fracture non-union.

All 13 nails were locked at both ends. The average duration of operation was 2 hours and tourniquet time 1 hour 8 minutes. All patients were kept non-weight bearing in cast post-operatively for an average of 6 weeks.

There were two cases of wound infection, one pulmonary embolism and one calcaneal fracture with infected non-union, which was treated with external fixation. There were no cases of nerve damage or septic arthritis.

All nine patients were satisfied with the operation outcome at follow-up with a mean fusion duration of 28 weeks and an average AOFAS score of 75.

Conclusion We conclude from this study that pan-talar nailing when performed for ankle arthrodesis as a salvage procedure produces a high rate of fusion with fewer complications.

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TIBIOTALOCALCANEAL FUSION WITH A RETROGRADE INTRAMEDULLARY NAIL
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Glenfield General Hospital, Leicester

Purpose To investigate the outcome of tibiotalocalcaneal (TCC) fusion using the retrograde intramedullary nail (IMN).

Method We reviewed clinical and radiological outcome of 42 patients who underwent TTC fusion with a retrograde IMN in a single health region from 1996 to 2003. Out of 42 patients, two patients died of unrelated causes and four patients were lost to follow up. Finally, 36 patients (20 males, 16 females) were followed up. Mean age was 63 years and the follow up averaged 10 months. Degenerative arthritis (primary and post-traumatic) and rheumatoid arthritis made up the majority of the preoperative diagnoses. Clinical outcome was assessed using the American Orthopaedic Foot and Ankle (AOFAS) hindfoot score and with three independent observers reviewing radiographs.

Results Radiologically 17 ankles fused, three probably fused whilst 16 (33%) had evidence of non-union. The majority of subtalar joints failed to unite, reflected by the high rate of distal screw breakage. Primary bone grafting appeared to aid union however smoking, age and the use of an open approach did not seem to be significant factors. Other than non-union complications included two nail fatigue fractures, two deep infections, seven screw breakages, six wound problems and one fractured tibia. Postoperatively the mean AOFAS score was 51, 25 patients were satisfied (of these 50% had radiological non-union) and 19 would undergo the same procedure again.

Conclusion Despite a high rate of ankle and subtalar non-union, most of the patients were satisfied with the procedure and would undergo the same operation again. Technical errors apart, the high rate of complications and non-union probably reflected the advanced nature of the disease process and deformity in this group of patients. Although IMN TTC fusion remains a viable option in the management of concurrent ankle and subtalar joint arthritis, patients should be warned of the potential for non-union and high complication rates.

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LONG TERM OUTCOME OF THE BUECHEL-PAPPAS TOTAL ANKLE REPLACEMENT
NJ Talbot; KT Trimble; IT Sharpe; and SW Parsons
Royal Cornwall Hospital, Truro

Introduction The Buechel-Pappas Total Ankle Replacement (BP TAR) has been used in Cornwall since 1991. The early results were presented to the Foot Society in 1997. The only published long term results of this pros-thesis are from the designer's unit.

Method We present the clinical and radiological outcome of a prospective series of 22 BP TARs implanted in 19 patients with a mean follow-up of 9 years (range 6–13). The primary diagnosis was rheumatoid arthritis (RA) in 11 and osteoarthritis in eight patients. Twelve patients were female. Mean patient age was 64 years (range 39–81). Patients were reviewed at yearly intervals. None were lost to follow-up.

Results At the time of review, four patients (six ankles) had died between 12 and 69 months post-operatively of unrelated causes with their prostheses in situ. One patient had a below knee amputation for chronic venous ulceration, 11 years after a BP TAR which was functioning well. One patient with severe RA had the implant removed at 8 weeks for deep infection. A second patient with RA had the TAR revised to a tibiotalocalcaneal fusion 59 months post-operatively for talar avascular necrosis. One patient has pain from impingement and another patient with RA has intermittent pain at 8 years following TAR. Every other implant remains asymptomatic. The New Jersey LCS ankle assessment scores increased from a mean of 35 pre-operatively to 82 post-operatively. The increases were largely due to pain relief and improved function with the pre-operative range of motion being preserved. These scores have been maintained in the long term. No surviving implant is radiologically loose.

Conclusion Our results suggest that the BP TAR offers good clinical and radiological long-term results to patients with often disabling ankle arthritis.

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THE MANAGEMENT OF FAILED ANKLE REPLACEMENTS
F Anwar; C Pasapula; PH Cooke; and RJ Sharp
Nuffield Orthopaedic Hospital, Oxford

The resurgency of ankle replacement in the last 10 years has prompted a need for effective management of failing prostheses. We present the early to mid-term results for revision surgery of 17 arthroplasties in 17 patients from our tertiary referral centre.

Between 1999 and 2004, two Consultant Foot and Ankle Surgeons revised failing ankle arthroplasties in 17 patients (age range 51–74 years). All patients were assessed with tissue cultures and histology that were harvested at the time of surgery and managed in conjunction with a specialist Bone Infection Unit.

Intraoperative frozen section was used to aid management, but usually pre-operative decisions had been made which included

one or two stage reimplantation

fusion with an intramedullary nail or Ilizarov frame

amputation, and

Ilizarov fusion combined with proximal tibial lengthening for excessive bone loss.

Many of the patients had had previous "revision surgery" such as change of meniscal components, arthroscopic debridements and excision of impingeing osteophytes.

Indications for implantation had been osteoarthritis in 59%, rheumatoid arthritis in 18% and post-trauma in 23%. Heel shift procedures to correct malalignment had been performed in 12%.

The implants comprised 15 Scandinavian Total Ankle Replacements (STAR), one Agility and one Buechel-Pappas. Three patients had fractured malleoli secondary to bone loss.

Cultures and histology confirmed the presence of infection in 24% (defined as positive histology and more than 2/6 positive cultures) with aseptic loosening in the remainder.

One infected patient underwent amputation at his request. Six non-infected patients had successful revision of two or three components, one infected patient had Ilizarov fusion and lengthening. The remainder underwent successful hindfoot fusion over a locked intramedullary nail, even in the presence of infection, with suppression to union.

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GAIT ANALYSIS OF PATIENTS WITH ANKLE REPLACEMENTS
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Wrightington Hospital, Wigan & Liverpool John Moores University

Aim We set out to see

whether ankle replacements were capable of maintaining a normal gait and

whether ankle replacements were superior to arthrodeses in maintaining a normal gait pattern.

Method We performed gait analysis on 15 patients, with 13 ankle replacements (mixture of Buechel Pappas and Scandinavian Total Ankle Replacement [STAR]) and three ankle arthrodeses. One patient had an ankle replacement on one side and an arthrodesis on the other. We used a standard seven camera infrared system and force plate at a frequency of 240Hz.

There were a mixture of patients with osteoarthritis and rheumatoid arthritis. We also looked at the 'normal' side of the patients with unilateral surgery.

Results We found that patients with ankle replacements had near normal gait parameters for both kinetic and kinematic data whereas patients with ankle fusions had significantly altered kinetic and kinematic data. This was both in respect to normal individuals and to the unoperated side. Patients with rheumatoid arthritis had some alteration in the gait pattern on the normal side – the presence of an ankle replacement on the other side maintained this pattern on the operated side, suggesting that this was not due to abnormalities within the ankle but in the rest of the foot and lower limb. Patients with unilateral osteoarthritis for which they had an ankle replacement had essentially normal kinetics and kinematics of both ankles.

Conclusion We have been able to show that an ankle replacement performs well in terms of restoring/maintaining a normal gait pattern, whereas ankle arthrodesis, although gives a functional and pain free foot, significantly alters the normal gait pattern.

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ILIZAROV TECHNIQUE FOR SALVAGE ANKLE ARTHRODESIS
K Nagarajah; N Aslam; R Sharp; and M McNally
Nuffield Orthopaedic Hospital, Oxford

Introduction Ankle fusion presents a difficult problem in the presence of infection and poor bone stock. The Ilizarov method provides stability with remote fixation and allows weight bearing.

Patients and method Fourteen consecutive patients were studied (10 males, 4 females). The mean age at onset of disease was 50 years (range 4–70). Thirteen of the patients had either clinical or radiological evidence of infection prior to ankle fusion surgery. Mean duration of problem was 52 months (range 8–372). Aetiology included traumatic arthritis in five, failed fusion in six, septic arthritis in one, infected ankle fracture non-union in one and avascular necrosis of talus in one. Local excision was followed by Ilizarov frame compression. Diagnosis of infection was based on microbiology and histology. Antibiotic treatment was continued until union. On radiological evidence of union the frame was dynamized and removed. A below-knee cast was applied for 4 weeks.

Results At a mean period of 5 months, complete ankle fusion was found in 13/14 patients. One patient who had partial fusion of the ankle had recurrence of infection requiring amputation. Complications included pin site infection, lateral impingement, deep infection, hind-foot pain and neuroma at amputation site.

Conclusion The Ilizarov ankle fusion is a reliable salvage procedure in difficult ankle problems.

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APPLICATION OF THE UMEX FRAME FOR COMPLEX CONGENITAL FOOT DEFORMITIES
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University Hospital of Wales, Cardiff

We report our initial experience with the Universal Mini External Fixator (UMEX) frame for the treatment of complex congenital foot deformities. This new frame is simple to apply and manage. It provides for multiplanar deformity correction in one stage.

The application of external fixators for the correction of foot deformities can be a complex procedure for the surgeon and cumbersome for the patient. Currently, five patients (mean age 10 years, range 4–18) have undergone application of this frame and have completed treatment. We illustrate the ease of its application, potential complications and the early clinical outcomes.

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DIABETIC FOOT CLINIC COHORT STUDY. A 10-YEAR FOLLOW-UP
C McLaughlin; G Lomax; GR Jones; K Eccles; S Clarkson; and J Barrie
Blackburn Royal Infirmary

Aim and method We report the outcomes of 100 consecutive diabetic patients who had been prescribed diabetic footwear for 10 years. A podiatrist and orthotist reviewed them at a dedicated clinic. The study aim was to assess footwear efficacy and prevention of ulcers, re-ulceration and amputations.

Conclusion Protective footwear is essential in maintaining healthy diabetic feet. Amputations were only due to vascular complications. All 56 patients who attended remained intact at 2 years. Of the seven ulcerations at 5 years, three went onto below-knee amputation. At 10 years, there were a further three ulcerations, resulting in one minor black toe and one further BK amputation.

Adherence with follow up including footwear review minimises risk. Re-ulceration at 5 years is associated with risk of amputation. Ten-year mortality is high due to vascular complications.

Summary Continued patient adherence with Orthotic therapy confers benefit and minimised re-ulceration. Follow up by Orthotists is an under-utilised resource.

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THE LISFRANC JOINT IN DIABETIC FEET. IS THIS WHERE IT BEGINS?
DT Rajan; and M Edmunds
King's College Hospital, London

Aim We asked the following questions:

Are there reliable clinical signs that herald an impending disorganisation of the Lisfranc's joint in a diabetic foot?

Does the Charcot changes begin at the Lisfranc's joint?

Is conventional radiography reliable in making the diagnosis?

Method Forty-five consecutive patients (63% male, 37% female) with a mean age of 59.9 years (range 38–80) were prospectively studied. All had either Type I/II diabetes (75% had Type II diabetes). Diagnosis of Char-cot foot was made using a standardised clinical protocol. Patients with a definite history of trauma/open injuries were excluded. All had a standard follow up programme. The mean follow up was 20 months (range 7–46).

Results In 75% of cases radiographs showed malalignment of the Lisfranc joint, 25% had navicular and 6% had fracture of the medial cuneiform. Thirteen per cent had fractures of the metatarsal and another 13% had fracture of the calcaneum. In all patients, Charcot changes were heralded buy a silent, red swollen foot and in few patients these features did exist in spite of no clear-cut radiological findings. As the Charcot changes progressed, more fractures were seen and in 80% of the patients we saw rapid disorganisation of the intertarsal joints of the midfoot. In 80% the earliest radiological change was seen at the Lisfranc's region.

Conclusion and significance of this study The pattern of changes in the Charcot foot varies with the type of diabetes. Conventional radiography is reliable if there is a high degree of suspicion. Charcot changes often appear first at Lisfranc's joint and usually there are no clear-cut signs in order to make a clinical diagnosis.

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OUTCOME OF ANKLE FRACTURES IN DIABETIC PATIENTS

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Aim To assess the outcome of ankle fractures in diabetic patients.

Method The case notes and X-rays of 39 patients with diabetes, who had sustained ankle fractures between 1994–2003, were retrospectively analysed.

Results There were 23 females and 16 males with mean age of 66 years in females and 51 years in males. The fracture was the result of a twisting injury in 37 of 39 patients. The average duration of diabetes prior to the fracture was 9.6 years. Thirty per cent of patients had systemic complications. Twenty patients had insulin dependent and 19 had non-insulin dependent diabetes. Fractures were on the left side in 21 patients. One patient had a Gustilo grade 2 fracture. Two had a single malleolar fracture, 28 had bi-malleolar fractures and the remaining nine had tri-malleolar fractures. Talus shift was present in 26 cases. The average time to surgery is 3.8 days. The mean ASA grade is 2.3. Twenty-one patients were managed operatively, of which seven had an infection. One patient underwent amputation. One had post-operative myocardial infarction. Nineteen were managed conservatively and in this group, four patients had infected pressure sores from the plaster, of which two needed plastic surgery care. One was managed with external fixator and developed osteomyelitis, and persistent talus shift and non-union.

Three patients died within 2 years of fracture due to diabetes-related complications. Union was achieved in 36 cases and 30 of the patients walked independently after union.

Conclusion There is a high complication rate following surgery for fractures of the ankle in diabetic patients, but conservative treatment also carries a significant risk because poor skin condition can lead to pressure sores while in plaster and these may need major plastic interventions.

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THE RESULTS OF EARLY SURGICAL INTERVENTION FOR INITIAL SUBOPTIMAL ANKLE FRACTURE FIXATION

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Ankle fractures are common injuries and commonly require operative stabilisation. The aim of treatment should be anatomical reduction as this will lead to good long-term results. Non-anatomically reduced fractures will lead to a poor functional outcome and development of osteoarthritis. Our aim was to determine whether revision of non-anatomical fixations within 12 months of initial surgery improved outcome.

We present eight cases of non-anatomical ankle fixations that were revised by the senior author over a 4-year period. There were 4 females and 4 males. The mean age was 45.6 years at review (range 28–63) and the mean time from initial fixation to revision was 5.25 months (range 2–11). Mean time at review was 26.6 months (range 7–45). Clinical scoring for functional outcome was performed using the American Orthopaedic Foot and Ankle Society (AOFAS) rating system for the ankle and hindfoot. Mean AOFAS score prior to revision was 40 (range 19–69) and the mean score at review was 80 (range 54–100).

All patients reported benefit in terms of function from the revision procedure. The aim of initial surgery is for anatomical reduction of the ankle joint. Should suboptimal fixation be encountered within 12 months of the initial surgery, we feel revision surgery is justified.

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QUANTITATIVE MRI OF ANKLE ARTICULAR CARTILAGE
S Millington; J Tang; S Acton; S Hurwitz; and J Crandall
University of Virginia, Charlottesville, USA

Aim Post-traumatic osteoarthritis and osteochondral injuries can cause significant pain and morbidity. Appropriate MRI sequences combined with image analysis techniques can be used to reproducibly measure quantitative cartilage parameters, hence offering a tool for monitoring and detecting degenerative change earlier than previously possible. We demonstrate the performance of a directional gradient vector flow (dGVF) snake segmentation algorithm on an isotropic MR sequence, which allows segmentation of the full articular surfaces (including malleoli) of the ankle.

Method Eight ankles were imaged using a 1.5T MRI scanner with an isotropic 3D T1 weighted FLASH sequence with water excitation, resolution 0.3 x 0.3 x 0.3 mm. A subset of five ankles were imaged four times with repositioning and re-shimming of the magnet between acquisitions. Images were interpolated to 0.15 mm3 and segmented using a dGVF snake. Following 3D reconstruction of the cartilage layers normal thickness from cartilage to bone was measured at each voxel on the cartilage surface.

Results The mean cartilage thickness (±S.D) was 1.80 mm (±0.05 mm); 1.83 mm (±0.07 mm) and 1.81 mm (±0.07 mm) for the talus, tibia and cumulative ankle cartilage respectively. To measure the technical precision of the segmentation method we determined the coefficient of variation of the four repeated measurements in five ankles. The mean coefficients of variation (min-max) from the repeated measurements were 1.74% (0.69%–3.57%); 1.20% (0.26%–3.06%) and 1.52% (0.26%–3.57%) for the talus, tibia and cumulative ankle cartilage respectively.

Conclusion We believe that the reported isotropic image sequence and segmentation algorithm is a valid tool for quantitative assessment of the entire ankle joint. A possible application is the early detection of cartilage injury and degenerative change due to injury

or illness.

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CARTILAGE THICKNESS MAPPING AND SURFACE TOPOGRAPHY OF THE ANKLE JOINT USING HIGH RESOLUTION STEREOPHOTOGRAPHY
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University of Virginia, Charlottesville; Technical University of Graz, Austria

Aim To characterise the mechanical properties of the ankle, it is essential to have accurate joint morphology and measurements of the cartilage thickness and its variation across the joint. Thickness and volume measurements are also useful tools for detecting and monitoring degenerative change, however baseline measurements are required, to act as a 'gold standard'. We present details of ankle cartilage thickness and distribution over the entire ankle joint, using a high precision stereophotogrammetry system.

Method Twelve cadaveric ankles surfaces with photo targets, rigidly attached, were imaged using a stereo-photographic system, which generates a dense 3D point cloud of co-ordinates on the surface (typically 70,000 points per surface, accuracy ±2 $\mu$m). After imaging the surface, the cartilage was dissolved using 5% sodium hypochlorite to reveal the subchondral bone and the process was repeated. The two surfaces were combined and the normal distance from cartilage surface to bone was calculated at every point on the cartilage surface.

Results The mean cumulative cartilage thickness of the ankle joint was 1.18±0.23 mm, the mean maximum cumulative cartilage thickness of the entire ankle joint was 2.17±0.46 mm. When considering the cartilage layers of the talus and the tibia-fibula complex separately, the mean and mean maximum thickness for the talus was 1.17±0.18 mm and 2.12±0.54 mm respectively. For the tibia-fibula complex, the mean and mean maximum thickness was 1.18±0.28 mm and 2.3±0.57 mm respectively. 3D cartilage thickness maps were also produced

Conclusion The cartilage maps show that the thickest cartilage occurs at the shoulders of the talus, as opposed to the talar dome, as reported in earlier studies, which were unable to assess the highly curved regions of the ankle. This method also provides a gold standard for validating MRI cartilage measurements.

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SCARF OSTEOTOMY AS A DAY CASE PROCEDURE. THE PATIENT'S PERSPECTIVE
JP Limbers; JRM Hutchinson; P Obey; and AHN Robinson
Cappagh National Orthopaedic Hospital, Dublin

Aim Pressure on inpatient beds can lead to high cancellation rates for inpatient elective orthopaedic surgery. The use of day surgery facilities is one way to overcome this problem. We set out to assess patient satisfaction after Scarf osteotomy, as a day case procedure, to help determine whether this is a valid routine practice.

Method Twenty-six consecutive patients (25 female and 1 male) undergoing Scarf metatarsal osteotomy, lateral release, medial capsulorraphy, and Akin osteotomy were prospectively followed up. Three patients had bilateral procedures resulting in 29 operations being performed. All had their surgery under midfoot block with intravenous sedation administered by an anaesthetist. All patients were discharged on the day of surgery with oral analgesia and contact details of the on-call orthopaedic registrar. A telephone interview and questionnaire were performed on day 3 and day 7 post-operatively.

Results Post-operative pain: seven patients (24%) had no pain, 15 (51%) mild pain, five (17%) moderate pain and two (6%) had episodes of severe pain. Twenty-eight patients (96%) were satisfied with their level of postoperative analgesia. Twenty-eight patients (96%) would have the surgery as a day case again. One patient would not due to post-operative nausea and vomiting.

Post-operative problems experienced by patients: 17 patients (58%) had no problems, six (20%) felt that their pain was a problem, five (17%) experienced bleeding/bruising and one (3%) felt faint.

Survey of medical services contacted by patients: 26 (89%) contacted no-one, one (3%) day surgery unit staff, two (3%) their GP and one (3%) the hospital.

Significance Scarf osteotomy can be successfully performed under midfoot block with a high degree of patient satisfaction. This has the potential to reduce cancellations due to inpatient bed shortage.

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PERI-OPERATIVE ASSESSMENT OF MICROCIRCULATION IN THE FEET
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Arrowe Park Hospital, Wirral

Aim The senior author observed over 15 years that if the foot became dependant during the first 48 hours following foot surgery, the patient suffered marked swelling and pain. This effect seemed less after about 48 hours. Aware of the work of Tooke and Rayman (1986) with postural effects on laser Doppler skin flow, we set out to see if there was a demonstrable scientific basis for this practice.

Method Laser Doppler flow meter was used to assess blood flow in 14 patients (16 feet), peri-operatively. Flow was recorded in the big toe, at heart level and on dependency, pre-

operatively, and at 24, 48, 72 and 96 hours post-operatively. Postural vasoconstriction (PV) was calculated using the formula:

Blood flow at heart level

Results PV was recorded for all 14 patients at 48 hours, for seven at 72 hours, and for two at 96 hours post-operatively. The mean PV pre-operatively was 51.31%; at 24 hours post-op. was 23.05%; at 48 hours post-op. was 36.62%; and at 72 hours post-op. was 44.24%. There was a significant difference between the pre-op. levels and the 24, 48 and 72 hours post-op. levels ($p<0.05$).

Significance of work It takes longer than 72 hours for microcirculation to get back to normal rather than 48 hours, but the return towards normality was evident by that time. This emphasised the importance of postoperative foot elevation for at least 48 hours due of this phenomenon. We believe that this practice minimises post-operative complications, such as oedema, wound breakdown and pain on dependency.

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PRE-SURGICAL FOOT PREPARATION. IS IT EFFECTIVE?
DA Evans; K Lim; SJ Cope; M Pereira; and L Read
The Alexandra Hospital, Redditch

Introduction Foot surgery has an increased risk of postoperative infection when compared with surgery of other anatomical regions. A pre-surgical foot bath in a bactericidal solution is thought to reduce the incidence of postoperative wound infection. We compared the incidence of post-operative wound infection in two groups, one undergoing a pre-surgical footbath and one group that did not.

Method We prospectively assessed 83 patients undergoing forefoot surgery under the care of two surgical teams. Forty-one patients underwent a pre-surgical foot bath in povidone iodine solution. Forty-two patients did not have a pre-surgical foot bath. All patients had microbiological swabs taken on admission and following surgical preparation and draping. These were cultured for bacterial growth. All patients were reviewed at 2 and 6 weeks after surgery and were monitored for signs of infection. The results for each group were analysed and compared.

Results There were seven post-operative infections in the pre-surgical foot bath group. This compared with only two infections for the group who did not undergo pre-surgical bathing. Correlation of infection with complexity of surgery, medical co-morbidities, operative time, method of closure and use of metalwork was examined.

Conclusions These results suggest that pre-surgical bathing in a bactericidal solution is not effective in preventing post-operative infection.

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## INTERMETATARSAL ANGLE FOLLOWING FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS

JP Limbers; J Cronin; S Kutty; and MM Stephens
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Aim When first metatarsophalangeal (MTP) joint fusion is performed in the presence of a high first intermeta-tarsal angle (IMA), an important question to arise is whether the first metatarsal varus will correct with MTP fusion alone or whether an additional basal osteotomy is necessary. We compared the pre-operative IMAs to the post-operative angles to answer this question.

Method Twenty patients had a first MTP fusion for severe hallux valgus deformity performed by the senior author over a 2-year period. All were female. Mean age was 54.2 years (range 42–78). Seven patients had rheumatoid arthritis. Their IMAs were retrospectively measured on weight bearing X-rays taken pre-operatively and 6 weeks post-operatively. They were recalled for an additional measurement at a mean of 13.72 months (range 6–30).

Results Pre-operatively the mean hallux valgus angle was 46.55 degrees and the mean IMA was 16.65 degrees (range 12–26). The mean 6 week post-operative IMA was 10.35 degrees (range 6–15) with a mean improvement of 6.3 degrees (range 0–12). The mean IMA at final follow-up was 8.67 degrees (range 5–12). The mean final improvement was 8.22 degrees (range 4–14). In eight patients with a pre-operative IMA of 15 degrees or less the mean improvement was 6.13 degrees. In 10 patients with an pre-operative IMA of 16 degrees or more, the mean improvement was 9.9 degrees.

Significance First MTP joint fusion in hallux valgus deformity permanently reduces the IMA. As the pre-operative IMA increases from moderate to severe, there is a significant increase in post-operative correction. An additional basal osteotomy is not indicated.

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## HALLUX VALGUS DEFORMITY. HOW DOES IT AFFECT QUALITY OF LIFE?

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Sunderland Royal Hospital

Introduction Hallux valgus (HV) is a common foot deformity with a prevalence of up to 48%. It usually affects females and its radiographic severity is expressed by various angles, such as the HV Angle, the Inter Metatarsal Angle (IMA) and the Distal Metatarsal Articular Angle (DMAA).

The aim of our study was to assess the impact that HV has on patients' quality of life and to correlate each of the above angles to SF-36 sub-scales.

Method Twenty-three female patients with a mean age of 48.5 years were included in the study. Diagnosis was established by clinical and standardised radiological examination. Patients were medically fit and the only pathology that could affect their SF-36 score was HV. They all completed in the SF-36 form on their first visit at the clinic. Statistical analysis was performed via SPSS 12.0.

Results Mean radiographic angular deformities measured 35, 13, and 17 degrees for HVA, IMA, and DMAA respectively. The HVA and IMA demonstrated significant association (p=0.018) as regarding their severity, indicating that they probably interact during the progression of the deformity. The Physical Component Summary score was significantly lower in our patients than the recommended norms for the same age (p=0.015). HVA significantly affected the General Health (p=0.023), IMA, the Role Physical (0.039), Role Emotional (p=0.056) and Mental Health (p=0.043). The coefficients were all negative indicating a worse health scenario as the deformity increases.

Conclusion These results suggest that HV deformity seriously affects peoples' quality of life. In addition, according to our data, surgical treatment is absolutely indicated and operative correction of the angular deformities would be expected to normalise those patients' SF-36 score. However, this remains to be proved.

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MITCHELL & SCARF OSTEOTOMY FOR HALLUX VALGUS. STUDY OF THE OUTCOME WITH PLANTAR PRESSURES
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Southern General Hospital, Glasgow

Introduction Hallux valgus (HV) leads to altered load-bearing function of the foot but there is no adequate evidence to show the restoration of load bearing function post-deformity correction where transfer metatarsalgia is the common complication. This study describes a retrospective review conducted on individuals who have undergone Mitchell and Scarf osteotomy for severe HV deformity.

Method Clinical records and radiographs were reviewed. Clinical evaluation was done using American Orthopaedic Foot and Ankle Society (AOFAS) scores and plantar pressures recorded using the Musgrave system analysing the average pressure, peak pressure distribution and contact time of the various regions of foot during the gait cycle. A control group of 15 individuals with 20 normal feet was included for comparison. Statistical analysis was carried out using ANOVA and correlation tests.

Results Twenty-two Mitchell and 22 Scarf osteotomies were performed on 28 patients with follow up ranging from 13 to 62 months. The average postoperative AOFAS scores

following Mitchell and Scarf osteotomy were 74 and 84 respectively.

Pedobarograph findings: Post-Mitchell osteotomy, an insufficiency of hallux was seen, which overloads the second and third metatarsal heads. Post-Scarf osteotomy resulted in reduced peak pressures under first, second and third metatarsal heads and hallux with reduced push off during late stance phase. More pressure is transferred through heel, midfoot and lateral metatarsal heads. The centre of pressure progression is central in both the study groups. The outcome of the procedure depends on the load bearing characteristics of hallux and not the first metatarsal head.

Conclusion Mitchell osteotomy leads to abnormal load bearing characteristics of the forefoot with an unfavourable outcome. However, the Scarf procedure does not restore the load bearing characteristics to normal. A prospective study may be more valuable.

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RADIOLOGICAL AND CLINICAL ASSESSMENT OF PATIENTS AFTER CHEVRON AND MITCHELL OSTEOTOMIES FOR HALLUX VALGUS AND ITS CORRELATION WITH PATIENT'S SATISFACTION
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Southport District General Hospital

Introduction There is no consensus on the superiority of either Chevron or Mitchell osteotomy in the treatment of hallux valgus. In the literature Chevron osteotomy is recommended for the mild and Mitchell's for the moderate hallux valgus (HV) deformities. We reviewed outcomes of two of the most common distal first metatarsal osteotomies.

Aims To compare the results of Chevron vs Mitchell osteotomy in the treatment of HV.

To evaluate the co-relation between clinical outcome and radiological correction achieved after the two osteotomies.

Method We reviewed clinical notes and pre- and postoperative radiographs of a total of 111 operations including 61 Chevron and 50 Mitchell osteotomies in 90 patients.

We designed a patient-focused questionnaire to evaluate clinical outcomes that addressed the main functional outcomes concerning patients after bunion surgery. These included pain, usage of footwear postoperatively, cosmoses, development of transfer metatarsalgia and the repeatability of the procedure they had undergone. These questions were point based and a final clinical score was calculated for comparison with the radiological correction. This was also used as a measure of success of the procedure.

Conclusion There is a statistically significant radiological difference in HV angle correction and the loss of first metatarsal height as seen post-operatively between patients treated with Chevron and Mitchell osteotomies for HV correction ($p=0.03$ and $p=0.0004$

respectively). There is no statistically significant difference (p=0.6) in the clinical outcomes based on the newly designed patient-focused questionnaire with either Chevron or Mitchell osteotomies at a mean follow-up of 27 months post-operatively. Clinical outcome determined by patient-focused questionnaire remains the same in-spite of radiological differences noticed post-operatively between the two osteotomies.

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OUTCOME OF MANAGEMENT OF PEDAL GANGLIA
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Between 1st March 1995 and 31st December 2002 we treated 69 patients for pedal ganglia. Review was carried out through a research clinic or by questionnaire by an independent reviewer. One patient had died of unrelated causes and one was housebound and deaf. Fourteen were lost to follow-up; final results are pending in 15.

Of the patients reviewed, 13 were treated by observation. Six were male, seven female, aged 16–76, median follow-up 59 months (range 40–106). Eight had no pain and five had occasional pain. None had interference with activities of daily living (ADL). Four chose shoes for comfort and nine could wear any. All had residual ganglia 3–5 mm in diameter but only five were bothered by them. One patient had undergone excision of the ganglion.

Twenty-one had aspiration and injection of ganglia. Eleven were male and ten female, aged 33–80, median follow-up 58 months (range 20–92). Ten had no pain and 11 occasional pain. Sixteen had no problems with ADL, four had interference with recreational activities and one interference with all ADL. Fourteen could wear any shoe and seven chose shoes for comfort. Eighteen were not bothered by their ganglion, two were occasionally bothered and one bothered often. Ten had no treatment other than aspiration and injection, four had repeat aspiration (one twice) and nine had the ganglion excised (two repeat excisions). Five had residual ganglia (three after surgery), two had tender scars and two altered sensation.

Four patients had primary excision. None had any pain, problems with ADL or shoe wear restrictions; one was occasionally bothered by the ganglion site. There were no recurrent ganglia but two had uncomfortable scars.

Many ganglia can be managed by simple treatment and surgery is often followed by minor residual symptoms.

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LATERAL LIGAMENT RECONSTRUCTION OF THE ANKLE USING A MODIFIED TECHNIQUE WITH PERONEUS BREVIS

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Introduction We report a modified technique using peroneus brevis for reconstruction of the anterior talofibular and calcaneo-fibular ligaments in the ankle for chronic instability.

Method The surgery was carried out using a double drill-hole in the distal fibula with either a complete or partial tendon graft. An examination under anaesthetic with ankle arthroscopy has been utilised to confirm the clinical diagnosis and assess the articular surfaces. In appropriate cases a translational os calcis osteotomy is added to correct varus hindfoot deformity.

Forty-five procedures were carried out over a 10-year period. The patients were retrospectively assessed with a case note review, and an updated clinical evaluation. The assessment focussed on pain, stability and impact on daily living.

Results Our results compare favourably with existing techniques for lateral ligament reconstruction, with most patients being satisfied with the improvement in pain relief and stability. These will be discussed in detail. Complications included superficial wound infections and sensory neurological symptoms. There were two failures following surgery both of which were associated with a high body mass index and joint laxity.

Conclusion This procedure provides anatomical reconstruction, is technically undemanding and gives adequate pain relief, stability and return to sporting activity. With careful patient selection, including treatment of intra-articular pathology and hindfoot deformity, it is a useful alternative to the methods currently available.

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## IS RECONSTRUCTION ALWAYS NECESSARY IN CHRONIC LATERAL ANKLE INSTABILITY?

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Aims Lateral ligament complex injuries are a common cause of chronic ankle instability. It has been found that functional and mechanical instability of the ankle joint can respond to arthroscopic debridement of the ankle alone and that not all structurally unstable joints require stabilisation. The aim of this study was to find out the role of examination under anaesthesia (EUA) and arthroscopy in the management of these problems.

Method We retrospectively studied 43 patients with chronic lateral ankle instability who had failed to respond to a functional rehabilitation programme. All patients underwent an EUA with stress views to determine instability, proceeded by arthroscopic examination of the ankle.

Results Intra-articular bony lesion was seen in 41.8% of cases. Fibrosis in the anterolateral gutter was found in 79.1%, 27.9% had osteochondral defect, 30.2% had osteophytes causing impingement and 9.3% had loose bodies. Structural instability was confirmed in 53.4% and functional instability in 46.6%. Arthroscopy demonstrated attenuation of the anterior talofibular ligament in 14%. Following arthroscopic debridement lateral reconstruction was required in only 14 (32.5%). Twenty-three patients (53.4%) went on to improve after arthroscopy alone and did not need lateral reconstruction. Three patients (6.9%) needed supplementary procedures for other associated problems.

Conclusion Arthroscopic assessment and treatment of intraarticular lesion in patients with chronic ankle instability can result in a stable ankle that does not necessitate a lateral ligament complex reconstruction.

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THE MANAGEMENT OF WOUND COMPLICATIONS FOLLOWING CALCANEAL FRACTURE FIXATION USING AN EXTENDED LATERAL APPROACH
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Background Open reduction and internal fixation for displaced intra-articular fractures of the calcaneum has become an established method of treatment. A recent randomised, controlled trial has questioned the benefits of surgery, in particular, pain relief.

Method We reviewed the cases undertaken in our department, complications which have arisen, and their treatment. We have devised a management plan in conjunction with the department of plastic surgery to minimise the effect of these complications. There were 124 procedures carried out over a 12-year period, 116 unilateral and 4 bilateral in 120 patients (106 males and 14 females, age range 18–66). Two further patients were included who had had surgery in another hospital and had been referred to our plastic surgery unit with significant wound complications.

The patients were retrospectively assessed with a case note review and an updated clinical evaluation. The assessment focussed particularly on wound complications including breakdown classified as either major or minor, and association with infection, haematoma and drainage. Neurological symptoms were also noted.

Results There were five major wound complications, three from our unit and two from another hospital. Infection was present in three cases. Four healed uneventfully but one of the infected group subsequently had a below knee amputation for refractory infection. Minor wound breakdown was more common. There was no association with haematoma or drainage but wound breakdown occurred more frequently in patients who smoked. Neurological complications were infrequent and temporary.

Conclusion This study confirmed that there is a significant morbidity associated with the surgical management of these fractures, although the vast majority of patients' wounds healed uneventfully. With a sensible management plan, which involves working in conjunction with plastic surgeons, even major soft tissue complications may be addressed.

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VISA-A. AN OUTCOME MEASURE FOR ACHILLES TENDINOPATHY
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Background Achilles tendinopathy is prevalent in athletes and individuals with an active lifestyle. It causes significant morbidity, which at times leads to changes in exercise habits. Recently, the VISA-A questionnaire, based on a visual analogue score to assess pain and activity, has been devised as a clinical tool to assess the severity of Achilles tendinopathy (minimum score – 0, maximum possible score – 100).

Aim To assess the clinical progress in patients with Achilles tendinopathy using the VISA-A questionnaire.

Method Thirty-four patients (18 males, mean age 44 years, range 23–67; 16 females, mean age 51 years, range 20–76) were selected to complete the VISA-A questionnaire, after a diagnosis of Achilles tendinopathy had been made at first and subsequent visits to a specialised outpatient clinic.

Results The average pre-treatment VISA-A score was 39 (SD 22.8, range 3–82, 95% CI: 31–47). The patients received intensive physiotherapy, including graded progressive eccentric calf strengthening exercises, and were offered a peritendinous injection of Aprotonin and local anaesthetic if physiotherapy was ineffective. Surgery was performed in six patients when six months of conservative management failed to produce improvements. The average post-treatment VISA-A scores at the latest follow up was 50 (SD 26.5, range 1–97, 95% CI: 40.8–59.3), with a mean difference between pre and post-treatment scores of 11.5 (SD 18.8 range -28.5–67.5, 95% CI: 4.9–18). The mean VISA-A score in patients offered surgery was 36, and 20 in patients who received a peri-tendinous injection of Aprotonin and local anaesthetic

Conclusion The VISA-A score can identify patients who need more aggressive management, and can be used to monitor their progress.

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OPEN REPAIR OF ACUTE MIDSUBSTANCE TEARS OF THE ACHILLES TENDON: EARLY WEIGHTBEARING AND ANKLE MOBILISATION

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Using a comparative, longitudinal study design, we studied the effects of early weight bearing and ankle mobilisation following acute repair of ruptured Achilles tendon.

Patients in Group 1 (22 males and 4 females; mean age 44.7 years [range 31–69], 11 right- and 15 left-sided ruptures) were immobilised with their ankle in gravity equinus, and encouraged to fully weight bear. They received a single cast change at 2 weeks, when the ankle was accommodated in an anterior splint, allowing full plantarflexion but not dorsiflexion above neutral.

Patients in Group 2 (23 males and 4 females; mean age 43.8 years [range 30–67], 11 right- and 16 left-sided ruptures) were immobilised in full equinus. They received a cast change at 2 and 4 weeks, when the ankle was immobilised in a plantigrade position. They were advised to weight bear 4 weeks after the operation.

Patients in Group 1 attended less outpatient visits and completely discarded their crutches at an average of 2.5 weeks after the operation. Group 2 discarded their crutches at an average of 5.7 weeks after from the operation ($p=0.013$). At ultrasound scan, the average thickness of the repaired tendon was 12.1 mm (SD 2), with no difference in the thickness of the ruptured tendon regardless of the method of post-operative management. There was no significant difference in isometric strength between the two groups of patients. A greater proportion of patients in Group 1 were satisfied with the results of surgery ($p=0.04$).

Early weight bearing with the ankle plantigrade is not detrimental to the outcome of repair following rupture of the Achilles tendon, and shortens the time needed for rehabilitation. However, strength deficit and muscle atrophy are not prevented.

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## ANTITHROMBOTIC PROPHYLAXIS IN FOOT AND ANKLE SURGERY IN THE UK

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Objective To survey current antithrombotic prophylaxis regimes of foot and ankle surgeons in the UK, and their self-reported rates of deep vein thrombosis (DVT) and pulmonary embolism (PE).

Method A postal questionnaire was sent to 180 members of the British Orthopaedic Foot and Ankle Society requesting regime and types of antithrombotic prophylaxis (if any) used for elective forefoot, elective midfoot, open elective ankle, elective ankle arthroscopy and ankle trauma surgery, and numbers of cases of DVT and PE.

Results Ninety surgeons responded (50%). Surgeons had been practising as consultants with a special interest in foot and ankle surgery for an average of 8.9 years, and performed an average of 24 foot and ankle cases per month. Ten per cent never used antithrombotic prophylaxis in foot and ankle surgery, 64/90 used it routinely for certain cases, and 17/90 used it routinely in all patients. The most common types of prophylaxis were low molecular weight heparin, aspirin and TED stockings. In an approximate overall total of 223,500 foot and ankle cases, the self reported DVT rate was 0.1%. There were 45 reported PEs (0.02%). There was no significant difference in the rate of DVT between those who never, sometimes or always used prophylaxis. Only 5.5% surgeons employed a specific screening protocol to identify high risk patients.

Discussion There is widely varying clinical antithrombotic practice among foot and ankle surgeons in the UK, with no significant difference in reported DVT rates. This has implications for clinical practice and medicolegal issues.

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AOFAS SCORES. TREND AND CORRELATION WITH QALY SCORE
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Background The American Orthopaedic Foot and Ankle Society (AOFAS) score is one scoring system used to evaluate and monitor the progress of patients following foot and ankle surgery. The aim of this study was to evaluate the trend of AOFAS score over a period of time and correlate with quality-adjusted life-year (QALY) score, which is a valid and reliable scoring system.

Method All patients undergoing surgery under one foot and ankle surgeon from a period of January 2001 to July 2003 were reviewed. The pre-operative AOFAS and QALY scores and post-operative at 3, 6, 12 months and yearly were collected prospectively.

Results This study includes 205 surgical procedures in 159 patients. This included 40 patients with 41 feet in the ankle-hindfoot group; 15 patients with 15 feet in the midfoot group; 83 patients with 114 feet in the hallux group and 29 patients with 35 feet in the lesser toes group. The mean age of the patients was 51.9 yrs.

The general trend of the AOFAS graph shows a mean of 45.3 pre-operatively which rises to 72.4 at 3 month and a peak of 77.1 at 6 months only to fall to 75.7 at 12 months. This fall though seemingly marginal was significant ($p<0.001$) Kendall's rank correlation was used to correlate the AOFAS and QALY score. The 6-month AOFAS score was found to have higher correlation with the final QALY score ( =0.423) than the 12-month AOFAS score ( =0.236).

Conclusion AOFAS score correlates with subjective and functional results as determined

by QALY score. The role of assessing AOFAS at 3 months does not seem to be justified. There is a deterioration in score at 12 months. Post-operative scores at 6 months should be sufficient to assess the outcome.

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ARTHROSCOPIC ANKLE ARTHRODESIS FOR HAEMOPHILIC ARTHROPATHY
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Background Recurrent haemarthroses in patients with haemophilia commonly affect the ankles. It can result in haemophilic arthropathy and necessitate arthrodesis. The purpose of this report was to present the results of arthroscopic arthrodesis performed for this condition and to highlight some of the potential difficulties encountered as part of the surgical management. The operative technique is also described.

Method Between January 2001 and May 2004, eight male patients underwent nine arthroscopic arthrodeses. The mean age was 34 years (range 19–44). The patients were identified retrospectively from a surgical database and the radiographs and outpatient notes reviewed. Patients were also contacted to determine their level of satisfaction with the procedure.

Results The mean length of follow-up was 9 months (range 3–18). All patients had united both clinically and radiographically by the time of maximal follow-up and all were satisfied with the result. One patient had minor post-operative bleeding which settled spontaneously. No other significant complications were encountered. Bony cysts were observed in three patients pre-operatively and these all resolved following the attainment of union.

Conclusion Arthroscopic arthrodesis of the ankle is a safe and reliable treatment for haemophilic ankle arthropathy. The union rate is high, the complication rate is low, the risk of disease transmission from patient to staff is lessened and the post-operative rehabilitation regime, including allowing immediate weight bearing is less arduous than with traditional open procedures. Factor requirements are lessened and the length of stay is also reduced compared with open arthrodesis. Collaboration with a haematology unit is essential for a good result to be achieved.

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THE GROSS ANATOMY OF THE INTERPHALANGEAL JOINT OF THE GREAT TOE: IMPLICATIONS FOR EXCISION OF PLANTAR CAPSULAR ACCESSORY OSSICLES
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Background Bony or cartilaginous ossicles appear at the plantar aspect of the interphalangeal joint of the great toe. The variation in pattern, prevalence and anatomic relationships of these structures is not clearly established in the literature, especially in a Caucasian population. Without this knowledge, pathology at this joint may be underestimated and surgical approaches may be poorly planned particularly as radiographs underestimate the incidence of ossicles at this joint. The aims of this study were to determine the incidence and pattern of ossicles at this joint and to establish their anatomical relationships in order to aid planning the approach for their excision.

Method The left great toe interphalangeal joint was dissected in forty British Caucasian cadavers and the pattern of ossicles and their anatomic relationships were established.

Results In 27.5% of specimens, there was no identifiable ossicle and in these cases, the tendon of flexor hallucis longus was adherent to the joint capsule. In the remaining specimens (72.5%), a bursa separated the tendon of flexor hallucis longus from the plantar joint capsule and ossicles were found embedded within the joint capsule. Over a half (52.5%) of the specimens had a single ossicle located centrally within the plantar capsule and the remaining 20% had two ossicles lying within the capsule.

Conclusion This study shows that a large proportion of the population have either one or two bony or cartilaginous ossicles at this joint. In addition, the study has clarified the anatomy of this joint and shown that, when present, ossicles do not lie within the tendon of flexor hallucis longus and could be most safely approached from either a medial or lateral approach.