ABSTRACTS FROM BOFSS MEETING Whipps Cross November 1999
List of contents in Plum
Abstracts in black

OUTCOME OF TARSOMETATARSAL ARTHRODESES

J. Kohls-Gatzoulis and J. C. Angel
The Royal National Orthopaedic Hospital, Stanmore, Middlesex. HA7 4LP England

WOUND HEALING FOLLOWING PARTIAL CLOSURE OF THE CINCINNATI INCISION FOR SURGERY OF CONGENITAL TALIPES EQUINOVARUS

R.H. Thomas and D.P. O'Doherty
Department of Orthopaedics, University Hospital of Wales, Cardiff

EXCISION and FLEXOR HALLUCIS BREVIS RECONSTRUCTION FOR PAINFUL SESAMOID FRACTURES and NON-UNIONS: Surgical Technique, Clinical Results and Histo-pathological Findings

J.W. Brodsky, A.H.N. Robinson, J.O. Krause, D.Watkins
Addenbrookes Hospital, Cambridge CB2 2QQ UK

THE DYNAMIC AND KINEMATATIC EFFECTS OF FOOTWEAR ON BIPEDAL LANDING FROM A HEIGHT.

K. Synnott, T. Higgins, P. Fleming, J. McKenna, B. Caulfield, M. Stephens
Department of Orthopaedic Surgery. Mater Misericordiae Hospital, Dublin, Eire.

CORRELATIONS BETWEEN HINDFOOT AND FOREFOOT ALIGNMENT

Eldridge JDJ, Winson IG, Hepple S, Whitehouse SL, Galvin F, Winson AGG
Southmead Hospital, Westbury on Trym Bristol BS10 5NB UK

EVALUATION OF IN-SHOE PLANTAR PRESSURES AND PATIENT SATISFACTION FOLLOWING FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS

GE. Thomson, E. Westland, D. Maguire, J.N.A. Gibson
Princess Margaret Rose Orthopaedic Hospital & Queen Margaret University College, Edinburgh

FRACTURES OF THE LATERAL PROCESS OF THE TALUS

E. Leibner., L. Marin, E. London, Y Matan, C.B. Howard, M. Nyska
Department of Orthopedic Surgery, Foot and Ankle Service, Hadassah University Hospital, P.O.B 24035, Mount Scopus, Jerusalem, 91240, Israel.

OPTIMUM TALAR PIN PLACEMENT IN EXTERNAL COMPRESSION ARTHRODESIS OF THE ANKLE. A 2D FINITE ELEMENT STUDY

C.J. Connor, F. Nabhani, R.J. Minns, P.J. Briggs
Dept. of Orthopaedics, Newcastle General Hospital, Newcastle upon Tyne, NE4 6BE

ANKLE ARTHRODESIS THROUGH AN ANTERIOR APPROACH

K. Doku, D. Singh, J.C. Angel
Royal National Orthopaedic Hospital, Brockley Hill, Stanmore Middx. U.K.

SUBTALAR DISTRACTION FUSION AFTER CALCANEAL FRACTURES USING "RAMP CAGE"

I. Zion, M. Nyska, L. Marin, E. London, Y. Matan, C.B. Howard
Department of Orthopedic Surgery, Foot and Ankle Service, Hadassah University Hospital, P.O.B 24035, Mount Scopus, Jerusalem, 91240, Israel.

OUTCOME OF TARSOMETATARSAL ARTHRODESES

J. Kohls-Gatzoulis and J. C. Angel
The Royal National Orthopaedic Hospital, Stanmore, Middlesex. HA7 4LP England

Arthrodesis has been used for the painful tarso-metatarsal joint (TMTJ). However, the best method of fixation remains unclear.

Methods: We reviewed 34 consecutive primary procedures performed in 31 patients between 1989 and Sept 1998 (single surgeon). In total 77 TMTJs were arthrodesed (average 2.3 TMTJs arthrodesed per procedure). Detailed surgical data were obtained from surgical records. Fixation was achieved with either screw compression (alone or with staples), or plate fixation. Current status was assessed from clinical reviews or patient contact.

Results: Improvement of symptoms occurred in 24 patients (77.4 %). Non-union- 8 procedures (9 TMTJs)was predictive of failure of symptomatic improvement ($p<0.002$, RR 3.8, CI 1.2-9.6).. Only one non-union patient was asymptomatic- 4 TMTJs were arthrodesed with only the fourth TMTJ failing to unite. Type of fixation used, implant manufacturer, or number of TMTJs arthrodesed were not predictive of non-union or outcome in this series. Of the 10 procedures failing to improve symptoms- 2 improved with revision, 5 are booked for revision, 1 recently had hardware removal, 2 are under follow-up review.

Conclusion: Improvement of symptoms and arthrodesis was achieved in the majority of patients. Non-union was associated with persistence of symptoms. Larger scale, prospective studies are needed to identify surgical risk factors for non-union.

WOUND HEALING FOLLOWING PARTIAL CLOSURE OF THE CINCINNATI INCISION FOR SURGERY OF CONGENITAL TALIPES EQUINOVARUS

R.H. Thomas and D.P. O'Doherty
Department of Orthopaedics, University Hospital of Wales, Cardiff

The Cincinnati incision is widely utilised in clubfoot surgery and allows excellent access to the medial, lateral and posterior structures involved. Closure of the skin at the end of the procedure without undue tension may be difficult. Wound necrosis and excessive scarring may occur and may lead to inadequate correction. One alternative is to splint the foot in an initial equinus position postoperatively with repeat cast changes to achieve optimal position once soft tissue swelling has decreased. The other is to leave the wound partly open and allow it to granulate.

We retrospectively reviewed 14 feet in 10 patients who had undergone partial closure of the Cincinnati incision following peri-talar release. All wounds were cosmetically acceptable both to the surgeon and the parents. The widest scar was 3mm and the average time to healing 4 weeks. No infections had occurred although two wounds were treated for over-granulation.

Partial wound closure avoids undue tissue tension and leaves cosmetically

acceptable scarring with minimal complications. Parents should be warned about the initial appearance of the wound but reassured regarding final outcome.

DOES ADDITION OF FOOT-BLOCK FOR DAYCASE FOOT SURGERY IMPROVE PATIENT SATISFACTION?

T. M. Clough, D.Sandher, A.S. Laurence, R.S. Bale
Department of Orthopaedics, Royal Preston Hospital, Fulwood, Lancs. PR2 9HT UK

Although foot-blocks can reduce post-operative pain, they may result in severe pain once worn off, which for daycase patients would be when they are at home.

Forty-two patients having daycase unilateral bony forefoot surgery were randomly allocated into two groups; general anaesthetic plus foot-block (GA+FB) or general anaesthetic alone (Control). Patients received a standard GA, to which the anaesthetist added supplementary intra-operative morphine or non-steroidal anti-inflammatory (NSAID) according to their routine practice. Those having foot-block received 20:mls 0.5% plain Bupivicaine to three nerves at the ankle (superficial peroneal, deep peroneal and posterior tibial). Patients, blind to their group, were reviewed by telephone questionnaire on the first and second post-operative day by an interviewer, also blind to their group.

There were no significant differences in age/sex of patient or duration of anaesthetic between the two groups. Those in the Control group received more intra-operative morphine. Despite this, patients having foot-block had a longer time to first pain (12 hours vs 5.5 hours). There was no significant difference in pain scores on the first night, first postoperative day or beyond and no difference in overall satisfaction scores.

We conclude foot-blocks are a good adjunct to early post-operative pain relief, are not detrimental in the daycase setting, but do not lead to an improvement in patient satisfaction.

EXCISION and FLEXOR HALLUCIS BREVIS RECONSTRUCTION FOR PAINFUL SESAMOID FRACTURES and NON-UNIONS:
Surgical Technique, Clinical Results and Histo-pathological Findings

J.W. Brodsky, A.H.N. Robinson, J.O. Krause, D.Watkins
Addenbrookes Hospital, Cambridge CB2 2QQ UK

A retrospective review of thirty-seven patients undergoing sesamoidectomy over a thirteen-year period was undertaken. The patients were reviewed clinically and radiographically. The histology specimens were re-examined.

Results: Twenty patients were clinically reviewed at a mean of 6.5 years following surgery. Eleven were lost to follow-up, and six were excluded, as follow-up was less than 2 years. Fourteen of the patients had medial and six lateral sesamoidectomy. The mean postoperative AOFAS score was 93 +/- 6. All patients were rated either excellent or good. After medial sesamoidectomy, four patients had a hallux valgus angle that increased by 5 degrees or more. The maximum increase in varus after lateral sesamoidectomy was 3 degrees.

The histology specimens of thirty-two patients were of sufficiently good quality

to allow meaningful interpretation. A non-united fracture was demonstrated in 28. Two patients had diastases of bipartite sesamoids, and two exhibited degenerate loss of cartilage. No patient had primary avascular necrosis. There was evidence of avascular necrosis secondary to fracture in nine patients. Of the fractures 16 were stress fractures, and in 12 the onset was related to a specific traumatic event. There was evidence of avascular necrosis in three of the traumatic and six of the stress fractures.

Summary: The clinical results of sesamoidectomy for chronic pain are good. The histopathology in the majority of cases is of non-union of a fracture. Primary avascular necrosis was not seen. There was no histological basis for the often-cited "osteochondritis" of the metatarsal-, sesamoid joint.

THE DYNAMIC AND KINEMATATIC EFFECTS OF FOOTWEAR ON BIPEDAL LANDING FROM A HEIGHT.

K. Synnott, T. Higgins, P. Fleming, J. McKenna, B. Caulfield, M. Stephens
Department of Orthopaedic Surgery. Mater Misericordiae Hospital, Dublin, Eire.

The incidence of calcaneal and other impact fractures amongst construction workers is well recognised. High-risk working conditions involving heights and various occupational health hazards undoubtedly play a major role in the pathogenesis of these injuries. We examined the effects the typical type of protective footwear worn by workers had on the peak ground reaction forces developed during bipedal landing from a height, the rate at which these forces developed and the pattern of development of these forces. We also looked at the kinematic mechanisms by which the lower limbs absorb these forces.

Twenty subjects performed a series of simulated landings from a standardised height of one metre onto a Kessler force plate. The ground reaction -forces in the vertical, antero-posterior and medio-lateral planes were measured at a frequency of 500Hz for the first 100msec after initial contact with the plate. The centre of pressure was calculated from these forces and plotted on a set of standard axes. Simultaneously kinematic data was sampled using limb markers to show the joint angles at the ankle and knee joints in the sagital plane over this tune. These measurements were taken with subjects barefoot, wearing standard footwear and wearing steel capped high cut protective boots. The mean peak vertical ground reaction was 3512 Newtons (range 2437-4198) for barefoot landing. This increased to 4276.7N (range 2241.55-5752.04) in shoes and to 5274.29 in protective boots. This represented an increase from 409% through 498% to 618% of body weight. This was statistically significant (p=0.003).

The time taken to reach peak round reaction force was considerably longer for barefoot landing (0.04 secs) than for either landing on shoes (0.012 secs) or boots (0.01 secs). This increased time to peak force reflects the greater shock absorption possible in barefoot or shoes.

When landing with either shoes or boots there was a bimodal development of force, which coincided with a progression of the centre of pressure from anterior to posterior. This confirms that force was initially taken on the forefoot with the ankle plantar-flexed and then on the heel as the ankle gradually dorsiflexed In boots and shoes these peaks are marked whereas in barefoot: landing there is considerable damping of this effect. Kinematic data showed development of a greater degree of

knee flexion during landing when barefoot which is one of the mechanisms by which this damping is produced.

The rigid sole and high cut uppers on protective work-mans boots limit the ability to use gastro-soleal pay-out to absorb the forces involved in landing from a height. This leads to a more rapid development of a ground reaction force of greater magnitude when landing. Because of this the energy absorbed by the calcaneus is greater and this may contribute to the incidence of calcaneal fractures in this group of patients.

CORRELATIONS BETWEEN HINDFOOT AND FOREFOOT ALIGNMENT

Eldridge JDJ, Winson IG, Hepple S, Whitehouse SL, Galvin F, Winson AGG
Southmead Hospital, Westbury on Trym Bristol BS10 5NB UK

The aetiology of hallux valgus has been the subject of much debate for many years. A poor correlation between valgus angle and age has been noted (Turan I) together with a high rate of maternal transmission in juvenile hallux valgus (Coughlin MJ). In the majority of cases an underlying predisposition could be expected. Many studies have focused on the correlation between various forefoot deformities, showing correlation between hallux valgus angle and distal metatarsal articular angle, intermetatarsal angle, metatarsal pronation and medial longitudinal arch angle. The interdependence of the hind and forefoot suggests that hindfoot malalignment predisposes the forefoot to malalignment. We have previously presented the normal distribution of hindfoot alignment using the tibio-calcaneal angle.

We present a prospective radiographic assessment of 157 feet to test the hypothesis that hindfoot alignment correlates with forefoot alignment. In the forefoot the metatarso-phalangeal, hallux valgus interphalangeus, combined hallux valgus and intermetatarsal angles were recorded and in the hindfoot the tibio-calcaneal, calcaneal pitch and talo-calcaneal angles. Confirmation of previously noted correlations and new observations are presented.

References:

Turan J. Correlation between hallux valgus angle and age. J Foot Surg 1990; 29:327-9

Coughlin MJ Roger A. Mann Award. Juvenile hallux valgus: aetiology and treatment. Foot Ankle Int. 1995; 16:682-97

EVALUATION OF IN-SHOE PLANTAR PRESSURES AND PATIENT SATISFACTION FOLLOWING FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS

GE. Thomson, E. Westland, D. Maguire, J.N.A. Gibson
Princess Margaret Rose Orthopaedic Hospital & Queen Margaret University College, Edinburgh

Metatarso-phalangeal arthrodesis is still the commonest surgical treatment for hallux rigidus. We assessed in-shoe plantar pressures and patient satisfaction in 20 patients (13 male, 7 female; age 21-77) two years after surgery. Pressures from both feet were recorded using the Pedar® inshoe system and the mean values from three

steps calculated for each of six areas defined by surface percentage.

The results of a patient questionnaire revealed that one in three of the patients had required some form of secondary surgery and that even following solid union, the majority still complained of some pain and felt that the cosmetic result was disappointing. Indeed, 30% needed either an in-shoe orthosis or a rocker sole.
In-shoe pressure analysis revealed that the majority of the patients took a diminished load along the line of their first ray (arthrodesis 9.6 Ncm^{-2} + 4.2 -v- control 13.0Ncm^{-2} ± 5.4, means ± SD, $p<0.05$) and increased load on the lateral border of their foot (13.0 Ncm^{-2} ± 5.4 -v- 9.1 Ncm^{-2} ± 4.9, $p<0.01$).

This study concludes that patient dissatisfaction with arthrodesis is high. Plantar pressure assessments following 1^{st} MTP joint arthrodesis indicate an unnatural tendency for the foot to supinate through the stance phase of gait. This alteration of the pressure distribution often gives rise to calluses increasing the need for an in-shoe orthosis and frequent podiatry appointments.

DEVELOPMENT OF CHARCOT JOINT FOLLOWING SURGERY IN HEREDITARY SENSORY MOTOR NEUROPATHY (Charcot-Marie-Tooth disease)

M. Nyska M.D., IM. Myerson M.D.
Department of Orthopaedic Surgery, Hadassah Medical Centre, Hebrew University, Jerusalem, Israel.

Charcot-Marie-Tooth (CMT) disease is a spectrum of peripheral neuropathy affecting motor and sensory nerves of the extremity. Most of these patients manifest with progressive distal weakness, pes cavo-varus and family history. In advanced cases surgical treatment to correct the foot deformity tendon transfers, soft tissue release, osteotomies, and arthrodesis is needed Destructive joint process compatible with Charcot changes may rarely appear mainly in weight bearing joints. The mechanism responsible for activation of the Charcot process is not-known but has been associated with neuropathy and fractures in diabetics. We present 3 cases having CMT who developed Charcot destructive process of ankles in two patients and midfoot in another patient. The process developed during recovery period for reconstructive surgery and may have been the trigger for initiating the process. The possible mechanisms for development of Charcot process in these patients are discussed.

FRACTURES OF THE LATERAL PROCESS OF THE TALUS

E. Leibner., L. Marin, E. London, Y Matan, C.B. Howard, M. Nyska
Department of Orthopedic Surgery, Foot and Ankle Service, Hadassah University Hospital, P.O.B 24035, Mount Scopus, Jerusalem, 91240, Israel.

Fractures of the lateral process of the talus are an uncommonly diagnosed injury, which, due to involvement of the subtalar joint, may cause significant morbidity. We have found less than 100 of these fractures in the English language literature in 17 reports. However, of these reports, the two largest describe series of thirteen cases,

some mention this fracture not in details some are case reports, and some dwell on radiographic appearance. Due to the limited experience with this fracture no consensus has been reached as to the optimal treatment for late-presenting fractures nor are there clear-cut guidelines for immediate treatment. We report our experience in 11 patients. Four patients were diagnosed initially and in all the other patients diagnosis was deferred for 3 months to 3 years. Two patients underwent open reduction and internal fixation of the fracture and all the others underwent resection of the fragment. In follow-up (1-4 years), two patients underwent subtalar fusion and all the others had improvement in pain and ability of walking. We classified these fractures using three parameters- location: Intra articular or extra articular, comminution: present or absent, large or small fragment, presentation: early or late and, involvement of the subtalar joint. The patients with subtalar joint involvement underwent subtalar fusion, small fragment or comminuted underwent excision and large fragments were openly reduced and fixed. Application these criteria and this treatment algorithm to the previously reported cases validated our method.

OPTIMUM TALAR PIN PLACEMENT IN EXTERNAL COMPRESSION ARTHRODESIS OF THE ANKLE. A 2D FINITE ELEMENT STUDY

C.J. Connor, F. Nabhani, R.J. Minns, P.J. Briggs
Dept. of Orthopaedics, Newcastle General Hospital, Newcastle upon Tyne, NE4 6BE

In ankle arthrodesis procedures it is presumed that it is important to achieve stability, and an optimum distribution of compression across the joint, in order to increase the likelihood of fusion. This study investigated the effect of pin location for an external fixation technique using 2-dimensional Finite Element Analysis.

Methods 2D models of the talus were developed, and forces applied to simulate arthrodesis compression loads achieved at surgery. These were the compression forces generated between the two fixation pins in the tibia and talus, and the Achilles Tendon loading. Appropriate material properties were applied to the model. Anterior and central talar pin positions were compared in order to see which gave the most even compression across the joint. This was done for simulated arthrodeses with flat bone cuts, and also for matching curved bone cuts.

Results More even load distribution was found if the talar pin placement was anterior to the centre of the arthrodesis. Pin placement needed to be further anterior for flat bone cuts than for curved cuts. Better load distribution appeared to occur in association with curved bone cuts.

Conclusions It is hoped that this analysis will help us understand the biomechanics of ankle arthrodesis. A more detailed 3D analysis is underway, which can be used to study other methods of fixation.

ANKLE ARTHRODESIS THROUGH AN ANTERIOR APPROACH

K. Doku, D. Singh, J.C. Angel
Royal National Orthopaedic Hospital, Brockley Hill, Stanmore Middx. U.K.

The aim of this study was to assess the fusion rate, function and patient satisfaction

following an ankle arthrodesis performed between 1992 and 1998 through an anterior approach, and to ascertain if those with osteoarthritis would have preferred Total Ankle Replacement instead. There were 43 patients (46 ankles), average age of 54.4years, (range 24-75 years). The aetiology was post-traumatic osteoarthritis, neuropathy, failed fusion, sepsis, congenital short leg. One died and 9 were lost to follow up. Approximately 73% were examined. The remaining 27% replied to the questionnaire only. Clinical and radiological evidence of union was seen in 97.5% of the ankles. 75% of those who responded were satisfied or very satisfied with the procedure and 27.3% of the patients had no pain at all. 84% of the patients had an AOFAS Ankle Hindfoot Scores (*American Orthopaedic Foot and Ankle Society*) of greater than 70. The osteoarthritic group of 26 patients (28 ankles), average age was 57.8years (range 34-75 years). There was a 100% union rate and a satisfaction rate of 88%. It is concluded that ankle arthrodesis through an anterior approach with lag screw fixation and/or anterior tension plate has good clinical and functional results.

RETROGRADE INTRAMEDULLARY NAILING FOR ANKLE ARTHRODESIS

Clough T M, Wood P L R, Barrie J L
Department of Orthopaedics, Wrightington Hospital NHS Trust, Hall Lane, Appley Bridge, Wigan Lancs. WN6 0DP UK

Retrograde intramedullary nailing for salvage cases of ankle arthrodesis is receiving increasing attention. We reviewed the results of 10 such arthrodeses on 10 patients. The pre-operative diagnoses were severe rheumatoid with gross valgus hindfoot deformity in 5 cases, osteoarthritic varus hindfoot deformity in 3 cases and arthrodesis of an aseptically loose failed total ankle replacement in 2. 4 cases had had previous failed attempts at ankle and/or subtalar arthrodesis and were thus revision arthrodeses. 9 of the 10 cases have radiographically and clinically united. 2 patients had delayed wound healing and in 1 patient the nail broke, requiring removal of the nail, bone graft and weight bearing below-knee plaster.
We highlight the advantages of the technique and demonstrate that retrograde intramedullary nailing for ankle arthrodesis provides effective union rates with a low complication rate. We suggest it should be considered for patients with severe ankle deformity and arthritis, concomitant subtalar arthrosis, failed total ankle replacements, failed ankle fusions or patients with severe osteopaenia such as those with rheumatoid arthropathy.

SUBTALAR DISTRACTION FUSION AFTER CALCANEAL FRACTURES USING "RAMP CAGE"

I. Zion, M. Nyska, L. Marin, E. London, Y. Matan, C.B. Howard
Department of Orthopedic Surgery, Foot and Ankle Service, Hadassah University Hospital, P.O.B 24035, Mount Scopus, Jerusalem, 91240, Israel.

A modification of subtalar distraction bone block fusion as described by Carr is demonstrated in this article. A "RAMP Cage" was utilised as an implant to restore the height of the posterior facet of the subtalar joint. A preliminary report of 4 cases with 6 months to 2-year follow-up is presented with satisfactory results. All cases were

approached with a posterior incision lateral to the tendon Achilles. After excising, the subtalar joint, elongation of the Achilles tendon was performed to enable sufficient distraction. Insertion of the cage stabilised the joint and bone graft was applied. The advantages of the "RAMP cage" are:

1) It restores and maintains the height of the sub-talar fusion.
2) It allows correction of valgus/varus deformity.
3) It keeps the fusion stable during bone healing period.
4) It reduces the amount of bone graft to be used.
5) The spacer itself is inert.