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President: Professor D. I. Rowley

The abstracts were prepared by Mr D. W. Wilson. Correspondence should be addressed to him at the "Oaklands", Selattyn, Oswestry, Shropshire SY10 7HU, UK.

Two Guest Lectures were delivered to the Society by Dr S.T.Hansen (Seattle, USA) -

I. RECONSTRUCTION OF THE FOREFOOT.

The speaker emphasised pathological changes in the first tarsometatarsal joint, where normally there is little movement. Hypermob--ility was recognised by a dorsal bump at the joint, absence of callosity under the first metatarsal head and hypertrophy of the second metatarsal. The reciprocal anatomical postures of forefoot and hindfoot were considered.

For hypermobility of the first tarsometa--tarsal joint he proposed arthrodesis with fixation with an AO screw and he varied the technique according to the anatomy:

1. For the joint in suitable alignment, parallel to the second ray, he recommended simple fusion by excision of cartilage, two screws (one longitudinal into the cuneiform and a second to the base of the second meta--tarsal) and the insertion of a small inlay bone graft across the joint gap to eliminate shear. This was accompanied by soft tissue reconstruction at the metatarsophalangeal joint to realign the sesamoid complex (lateral release and medial capsular plication, but not adductor tenotomy).
2. If the first ray did not lie alongside the second, excision of a small laterally and inferiorly based wedge of bone from the joint was added.
3. If the first metatarsal was too short, a tricortical block of iliac bone was inserted into the excised joint to lengthen the ray.

The lecturer continued by considering the multiple factors causing clawing of the lesser toes and metatarsalgia, together with their treatment:

Class 1, due to secondary overuse or contract--ure of the toe extensors and managed by transfer of extensor hallucis longus to the base of the first metatarsal, of extensor digitorum to second cuneiform and of toe flexors to toe extensors.

Class 2, due to toe flexor overuse or contracture and requiring either repair of a rupture of tibialis posterior (using flexor digitorum) or excision of contracted deep toe flexors and interphalangeal fusions.

Class 3, associated with weak intrinsic muscles, needing transfer of both toe flexors to the extensors, looped over the proximal phalanx from each side.

II. RECONSTRUCTION OF THE HINDFOOT.

The biomechanical problems associated with calcaneal fractures were discussed. The bone provides the rear of the lever arm of the foot, vertical support for the talus and horizontal support to the lateral column of the foot. The subtalar joint cushions heel strike (when it falls into the mobile position of pronation) and provides stability at toe-off (when rigid in supination), with its secondary function in adapting the foot to uneven surfaces.

After fracture the lever arm is short and the joint distorted. Fusion in situ is of no benefit. Vertical support required the calcaneum to be of normal height and to lie under the talus; the speaker had sometimes achieved this by translational osteotomy of the calcaneum. For loss of length of the lateral column, he recommended the insertion of a bone block.

If the subtalar joint did need to be fused the lecturer suggested a modified Gallie's operation through a long, straight incision, guarding the sural nerve. The bone block was cut to size and inserted into the excised joint (not into a trough in the bone) so that distraction posteriorly was maintained, thus re-plantarflexing the talus. A distractor placed medially prevented varus deformity while the block was positioned. Two screws, fully-threaded to avoid compression, were placed from the back of the calcaneum, up into the talus.

THE METATARSUS IN HALLUX VALGUS - J.L.Barrie, R.H.R.Soulsby and D.Byrne (Manchester).

The orientation of the first ray in hallux valgus was usually determined with respect to other elements of the forefoot. On standing dorsiplantar radiographs, the authors had measured the angles between the metatarsals and the midtarsal joint, between the first metatarsal and the cuneiform (metatarsus primus varus) and the hallux valgus angle; all in 43 patients with bunions and in 45 people with no such complaint.

The angles of hallux valgus and metatarsus primus varus were significantly greater in the bunion group (Table 1). However, there was no significant difference between the groups with respect to the angle between the first meta--tarsal and the midtarsal joint; the increase in metatarsus primus varus was due principally to a more valgus alignment of the cuneiform in the bunion group.

TABLE 1. Hallux valgus and metatarsus primus varus angles (degrees).

	Bunion		Controls		
	Mean	Range	Mean	Range	
H.V.	35.0	10-53	17.9	4-38	p<0.001
MT.P.V.	25.7	4-38	20.5	9-32	p<0.001

The lesser metatarsals were more valgus in the bunion group, although this was statis--tically significant only for the fifth meta--tarsal ($p<0.01$) and perhaps associated with laxity of ligaments.

DISTAL FIRST METATARSAL OSTEOTOMY PLUS LATERAL SOFT TISSUE RELEASE AS A TREATMENT OF HALLUX VALGUS - N.H.Courtman and F.J.Weighill (Manchester).

A retrospective study, covering a six year period, reviewed the results of a combined bony and soft tissue procedure for hallux valgus.

Forty-two patients were listed, but only 32 could be traced; these had had 52 operations performed. Twenty-five patients were reviewed in person and 7 by telephone. Ages ranged from 23 to 75 years (average 50 years) and follow--up from 8 to 65 months (average 34 months). Of the operations, 45 were carried out on women.

All patients underwent distal metatarsal osteotomy (initially oblique, later of the chevron configuration), lateral capsular release and division of adductor hallucis from the proximal phalanx.

Patients seen in person were re-X-rayed and the pre- and postoperative metatarsophal--angeal and intermetatarsal angles compared. Patients were questioned about the subjective result and clinical assessment of the objective outcome was made, (Table 1).

TABLE 1. Results.

	Excellent	Good	Fair	Poor
Subjective	32 (62%)	9 (17%)	7 (13%)	4 (8%)
Objective	37 (71%)	10 (19%)	2 (4%)	3 (6%)

Thirteen patients showed avascular necrosis on postoperative X-rays; of these 7 (54%) had an excellent subjective result, 3 (23%) a fair one and 3 (23%) a poor one. Other complications included hallux varus (4 feet), osteomyelitis (2 feet) and numbness over the dorsum of the big toe.

Age and the pre-existing deformity did not appear to influence the outcome. Overall 79% had an excellent or good subjective result and 90% a similar objective one.

The operation is not technically difficult but needs meticulous care, especially over the lateral soft tissue release, to minimise the risks of avascular necrosis and hallux varus.

THE MANAGEMENT OF THE PAINFUL FIRST METATARSO--PHALANGEAL JOINT IN THE OLDER PATIENT: A FIVE YEAR REVIEW.- J.P.Ivory and P.J.Gregg (Leicester).

A prospective randomised trial of the manage--ment of the painful first metatarsophalangeal joint, either due to hallux valgus or to hallux rigidus, was performed. Follow-up was to five years.

Eighty feet of 57 patients were allocated to one of two groups, one to have a Keller's arthroplasty and the other an arthrodesis. The two groups were similar in age (all over 45 years, average age 60 years), sex ratio and diagnosis (mostly hallux valgus).

In the 35 feet (26 patients) having arth--rodesis, fusion failed in 11(31%), but this was asymptomatic in each case. There was no statistical difference between the two groups in pain relief, correction of hallux valgus angle, cosmetic result, ability to wear shoes or improvement of walking.

However, painful metatarsalgia was more frequent following Keller's arthroplasty (55% compared with 40% after arthrodesis), but 80% of those having arthrodesis complained of a painful callosity on the medial aspect of the interphalangeal joint of the great toe.

There was good patient satisfaction with both procedures (Table 1). The authors suggested that, because Keller's arthroplasty is quicker and easier to perform, it is the operation of choice. However, arthrodesis should be preferred if the preoperative assessment reveals pre-existing metatarsalgia.

TABLE 1. Patient satisfaction.

	Overall satisfaction	Pain relief	Cosmetic result
Keller's	87%	89%	91%
Arthrodesis	89%	91%	92%

LOCAL ANAESTHETIC FOR POSTOPERATIVE PAIN RELIEF AFTER FOOT SURGERY: A PROSPECTIVE CLINICAL TRIAL - M.Needoff and P.J.Radford (Nottingham).

Peripheral nerve block with local anaesthetic was useful in operations on the hand, but was rarely used for bony operations on the foot.

The authors had set up a randomised, double-blind, ethically approved trial to determine if the addition of local nerve block to general anaesthesia gave satisfactory post-operative pain relief to patients undergoing forefoot surgery.

Thirty female patients between the ages of 16 and 70 years (average 58 years) underwent bony procedures on the first ray: Fusion of the metatarsophalangeal joint (14 feet), Keller's arthroplasty (18 feet) and Mitchell's osteotomy (8 feet).

After induction of anaesthesia, the contents of a syringe, prefilled and randomised by the pharmacy, containing either 20 ml of 0.5% Marcain or 20 ml of 0.9% saline, was injected as an ankle block of the usual five nerves. The operation was then performed under tourniquet.

Postoperative pain management was standardised. Pain assessments were made at 2, 24, 48 and 72 hours by questionaire, grading on a 10 cm unmarked line analogue scale and by assessment of analgesic consumption and of sleep disturbance. The wounds and the injection sites were checked at 10 days, 6 weeks and 3 months.

Pain assessments (Table 1) were significantly different only at the 6 hour stage. There was no difference between the groups in analgesic needs, sleep disturbance, nor in wound healing or injection site complications.

TABLE 1. Average pain scores.

	6 h	24 h	48 h
L.A.	28.4	43.7	43.2
Placebo	51.6	41.4	28.0

Rather disappointingly, the conclusion had to be drawn that there was little advantage to be gained from the technique.

GAIT PATTERNS AND ORTHOSES IN RHEUMATOID ARTHRITIS - I.Stockley (Sheffield) and D.I. Rowley (Dundee).

In patients with rheumatoid arthritis, although deformities of the forefoot formed the presenting complaint, studies had shown that, as the disease progressed, deformities of the hindfoot began to determine function and disability. Valgus deformity of the hindfoot was a common and disabling defect. The question was then posed: Could deformity be prevented and function preserved by orthotic treatment ?

Twenty women with classical rheumatoid arthritis and passively correctible valgus hindfoot deformities were studied. The mean valgus deformity was 13° (range 2 to 9° with SD=4.7°).

Patients were assessed while wearing their ordinary shoes, with medial wedge insole and with polypropylene heel cups.

Static radiographic measurements (using techniques previously described) showed that both orthoses corrected the deformity by a mean of 9° (ingole: SD=4° and range 0 to 16°; heel cup: SD=4° and range 2 to 19°).

Dynamic assessments were made with the measurement of temporal spacial parameters, kinetic studies with a Kistler force plate and kinematic analysis with twin axis flexible goniometers.

There were statistically significant differences between the rheumatoid study group and a normal control population ($p < 0.0005$). However, no differences were found when comparing walking in shoes alone with wearing an orthosis in either the temporal spacial or the kinetic assessments.

For the goniometers, statistically significant differences were found when measuring inversion/eversion between shoes alone and using an orthosis ($p=0.0002$). There was no difference between the two orthoses ($p>0.05$), nor were there any significant changes in respect of dorsiflexion/plantarflexion measurements.

This increase in the functional range of movement at the subtalar joint was thought to be due to the prevention by the orthosis of complete sag into full eversion, maintaining the joint in the middle of its range. This mechanism might have helped to prevent further deformity of the hindfoot by lessening the abnormal strains upon the soft tissues and joints.

CLAWING OF THE LESSER TOES AND THE PLANTAR PLATE: THE PLUNGER CONCEPT - G.D.Stainsby (Newcastle).

Claw deformity of a lesser toe could progress to subluxation or dislocation of the metatarsophalangeal joint. Frequently then the metatarsal head became prominent in the sole and a painful callosity developed. A single toe (usually the second) could be affected, or all the toes as in the rheumatoid foot.

It has been long accepted that the prominence of the metatarsal head in the sole results from distal displacement of the plantar pad and the downward, piston-like thrust of the proximal phalanx.

However, operative dissection has shown that a major deforming factor displacing the metatarsal head downward is the plantar plate. As the claw deformity progresses, the plate comes to lie on the dorsum of the head, tethered on each side by the deep transverse metatarsal ligament. This was confirmed by preoperative NMR studies.

Operation was undertaken through a dorsal V-shaped incision, dividing the extensor tendon at the metatarsal neck. The proximal two-thirds of the proximal phalanx were resected. The dorsally displaced plantar plate was freed from the dorsum of the metatarsal head and replaced beneath it. The joint was stabilised with a longitudinal Kirschner wire and the distal end of the extensor tendon sutured to the flexor tendon through the joint gap.

The results of the operation were reviewed independently by P.J.Briggs. For the lesser toes alone, 69 feet of 52 patients (of whom 46 were women) with average age 61 years. Combined with a Keller's procedure for the great toe, as a forefoot arthroplasty in 41 feet of 29 patients, 16 of whom had rheumatoid arthritis. Results are summarised in Tables 1 and 2.

It was suggested that understanding of the role of the plantar plate in clawing of the toes associated with depression of the metatarsal head should lead to sparing of the heads in forefoot operations for its correction.

TABLE 1. Results - General satisfaction.

	Excellent	Good	Fair	Poor
Lesser toe alone	42 (61%)	15 (22%)	9 (13%)	3 (4%)
Forefoot a'plasty	33 (81%)	5 (12%)	3 (7%)	0

TABLE 2. Results - Metatarsalgia & callosity.

		Metatarsalgia	Callus	Pain free
Lesser toe alone	Pre-op.	69	32	
	Post-op.	11	8	
Forefoot a'plasty	Pre-op.		35	1
	Post-op.		4	38

BIOMECHANICS OF THE FAT PADS OF THE HEELS - M.H.Jahss, F.Kummer, W.Buschmann, P.Desai, Y.Cheung and J.Michaelson (New York).

Studies had been done on the fat pads of the heels. The normal pad is rounded, plump and thick, flattening slightly and bulging laterally on weight bearing. It is a self-contained unit attached to the bone. Dye injected into the heel or blood from a fracture of the calcaneum tracks only deep to the pad. Injected dye does not disperse inside the pad.

MRI studies with the heel tied tightly to simulate weight bearing showed greater compression in atrophic heel.

Elastic fibres in the unloaded pad are normally interlaced and coiled. On compression they uncoil and align longitudinally. Under compression the septal units of the heel bend laterally, but the cells do not stretch.

Fatty acid chromatography studies showed that the ratio of unsaturated to saturated fat differed in specimens from different sites, being 4.4 in the normal heel, 4.3 in the heel of rheumatoid arthritis and 3.8 in the pad of peripheral neuropathy; contrasting with 2.5 in abdominal wall specimens.

MACRODYSTROPHIA LIPOMATOSIS OF THE FOOT - M.Greiss (Cumbria).

A rare case of macrodystophia lipomatosis in the foot was reported.

The patient presented a large painless rubbery swelling of the forefoot and had to walk in a posture of calcaneocavovarus. The skin was keratotic and sensation blunted.

X-rays showed an osteochondral mass at the distal end of the second and third metatarsals.

ARTHROSCOPIC TREATMENT OF OSTEOCHONDRITIS DISSICANS OF THE TALUS - C.Freeman (Augusta, USA).

The author defined osteochondritis dissicans of the talar dome and expressed the view that it was of traumatic origin.

Medial lesions were usually cup shaped and lateral ones wafer like. Medial lesions produce fewer symptoms. Early lesions were very difficult to diagnose, especially in cases with no recognised trauma. Diagnosis was made by plain X-rays, tomograms, CT scans and MRI scans.

Surgical treatment was recommended for all lesions of Stage IV (Berndt & Harty, 1959) and for lateral lesions of Stage III.

Use of tibial and calcaneal pins to allow distraction of the ankle by 8 to 10 mm permitted introduction of a larger arthroscope. The 2.5 mm telescope had proved unsatisfactory.

Twin anterolateral and anteromedial portals were used. Loose bodies were removed with a grasper. Synovium was excised to reveal the bed of the lesion, which was then shaved down to subchondral bone.

Some cases of the Wollin lesion (a posterolateral flap of cartilage lifted in old ankle sprains and seen only on arthroscopy) were noted.

PNEUMATIC ANKLE TOURNIQUET WITH ANKLE BLOCK ANAESTHESIA FOR FOOT SURGERY - N.S.Lichtenfeld (Mobile, USA).

The use of a pneumatic ankle tourniquet applied to the supramalleolar region was a safe and highly effective method of obtaining a bloodless field during foot surgery. Both clinical and electrophysiological evidence showed that no neurological or vascular damage occured. The pneumatic ankle tournique eliminates unnecessary ischaemia of the thigh and lower leg and allows accurate and reproducible control of circumferential compression. When used with regional ankle block, it permits of patient comfort while removing the morbidity associated with general or spinal anaesthesia.

Between March 1987 and October 1990, 84 foot operations were performed by this technique on 76 patients. Tourniquet ischaemia lasted on average 43 minutes (range 8 to 80 min). Tourniquet pressure was set to 100 mm.Hg above arterial systolic (average at 250 mm.Hg, range 200 to 350 mm.Hg).

Two patients reported mild pain directly beneath the tourniquet after 45 and 70 minutes respectively; neither needed deflation of the cuff to complete the operation. There were two patients with mild resolving paraesthesiae in the postoperative period.

The use of this technique seemed safe and a desirable alternative to the standard thigh tourniquet for use in surgery in the foot.

FORCE PLATE STUDIES OF "FLAT FOOT" PATIENTS - S.Khodadadeh (Oswestry).

Using a Kistler force plate (a multicomponent measuring platform with piezoelectric transducers), measurements were made of the horizontal (Fy), vertical (Fz) and transverse (Fx) components of the force between the foot and the ground surface on walking, together with the corresponding moments about the axes Y, Z and X. The trace of each force could be studied visually or after computer analysis.

Recordings were made from 20 normal adults of average age 42 years, who had no complaints, normal pedobarograph studies and normal great toe extension tests. An abnormal group were studied; 15 patients of average age 40 years, all with abnormal foot/ground pressure readings

and great toe tests - they might be high or low arched.

Among the abnormals, the vertical and the horizontal force curves followed those of the normals in general, but side to side components were usually abnormal, showing a large side to side force at heel strike and an unsteadiness of the curve in the leter stance phase. This reflected both failure of the musculoskeletal system to control the pressure distribution and an attempt by it to restore stability and to minimise the abnormal medial stresses, particularly by use of the long toe flexors.

FIRST METATARSOPHALANGEAL JOINT ARTHRODESIS USING INTERFRAGMENTARY SCREW AND SMALL PLATE FIXATION - G.B.Holmes (Philadelphia, USA).
This paper reported a new technique for arth--rodesis of the first metatarsophalangeal joint using both an interfragmentary screw and a small-fragment, 3-hole, one-third semi--tubular plate as internal fixation.

The technique was used in five patients (six feet), three men and two women, with an average age of 50 years (range 24 to 73 yr). Follow-up averaged 30 months (range 24 to 42 mo). Indications were rheumatoid arthritis, failed previous bunion surgery, hallux valgus associated with diabetes mellitus with first metatarsophalangeal joint plantar ulcer, hallux valgus associated with cerebral palsy, and severe hallux valgus associated with osteoarthritis.

Pain was reduced and walking tolerance improved in all cases. No patient reported symptoms at the interphalangeal joint. The postoperative hallux valgus angle averaged 10^{0} (range 5 to 15^{0}) and the dorsiflexion angle 11^{0} (range 5 to 15^{0}).

Arthrodesis was achieved in all patients at a mean of 10.6 weeks (range 8 to 12 wk). Only one patient required removal of a single screw due to dorsal prominence. In the two diabetic patients the ulcers healed completely after fusion, without recurrence or transfer lesion. Patient satisfaction was excellent in five feet and good in one.

The advantages of this method were secure fixation, rapid and uniform union, avoidance of any fixation device crossing the interphal--angeal joint and patient satisfaction.

TREATMENT OF PLANTAR FASCIITIS/PAINFUL HEEL WITH THE CHORLEY SPLINT - D.J.Pegg, F.P.Monsell, R.Thaxter and M.L.Porter (Chorley, Lancashire).
The Chorley splint was developed in conjunct--ion with the Department of Orthotics for use in this disorder.

It is a moulded shoe insert which dynam--ically unloads the plantar fascia between heel-strike and the foot-flat phases of the gait cycle. The polypropylene splint was made to a plaster cast of the foot and took the form of a heel cup with an extension forward and a bar across the front of the heel section at a carefully selected position.

The authors reported on the design principles of the device and preliminary results of its use in a group of 20 patients with a mean age of 44 years (range 22 to 79 yr). The average duration of symptoms prior to treatment was 21 months (range 3 months to 10 years) and the mean follow-up was 6 months.

Pain and disability were graded using a standard scoring system and on this basis improvement was noted in 18 cases (90%), with complete resolution in 25%.

The short term results were encouraging and the device provides an alternative manage--ment for this difficult condition.

THE RESULTS OF SCREENING THE FEET OF 1000 DIABETIC PATIENTS - D.Cogley, P.Laing, C.McCabe, S.Crerand and L.Klenerman (Liverpool)
Foot problems in diabetics cause much morbid--ity and mortality, and place a burden on scarce health resources. Prevention is more desirable than treatment of established foot problems and it is therefore important to identify those patients who are at risk of foot ulceration.

1001 patients attending the diabetic clinic at the Royal Liverpool University Hospital were randomly allocated to the study group. History included details of length and treatment of the diabetes, previous foot ulceration or operations, age, sex and smoking history. Examination included evaluation of foot hygiene, deformity and callosities, pedal pulses, and protective sensation under weight--bearing areas of the foot. Recent diabetic control was assessed by a glycosylated haemo--globin analysis.

Criteria for "at risk" status were: A history of previous foot ulceration; absence of both pedal pulses; loss of protective sensation, as assessed by the inability to feel a 5.07 (10 gram) Semmes-Weinstein nylon monofilament; the presence of severe foot deformity which prevented the wearing of ordinary footwear. The severity of the at risk status was graded according to fixed foot deformity and a history of previous ulcerat--ion.

The average age in the group was 59 years (range 17 to 92 yr, standard deviation 15.3 yr); 53% were male; 20% were classified as Type 1 (insulin dependant) diabetics and the remainder as Type 2 (non-insulin dependant).

25.9% of the group were deemed to be at risk. 21.8% of patients had sensory loss, 7.7% absent pedal pulses and 4.0% both. 2.8% gave a history of previous ulceration. There were five patients with Charcot joints in the foot. Bilateral involvement was seen in 17.3% and unilateral involvement in the remaining 8.6%. 11.9% were classified as high risk due to sensory loss and fixed deformity in the foot.

Further analysis of the at risk group showed that there were significantly more male patients at risk than female (58.3% male, 41.7% female: chi-2 at 1 d.f. = 9.66), more Type 2 than Type 1 diabetics at risk (88% Type 2, 12% Type 1: chi-2 at 1 d.f. = 17.21) and that the duration of diabetes was longer in the Type 1 diabetics at risk than in the Type 2 diabetics at risk (duration in Type 1 averaged 16.5 years, Type 2 7.8 years: t-test = 10.61). Surprisingly, there was no differ--ence in smoking history or in diabetic control between the at risk and the not at risk groups.

Diabetic sensory neuropathy was the commonest risk factor for diabetic foot ulcer--ation seen in this population.