



## Wilson osteotomy stabilised by means of internal fixation for the treatment of hallux valgus

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The results achieved in 20 patients (32 feet) who underwent Wilson's osteotomy of the first metatarsal for the treatment of hallux valgus were reviewed. In all cases the osteotomy site was stabilised with one or two cortical screws. The patients' average age was 50.7 years (range : 34-74 years) and they were followed for a mean period of 33.1 months (range 12-63 months).

The average AOFAS score was 85.5 (range : 62-100) at the final follow-up and in 84.4% of the cases the final outcome was very satisfactory as far as symptomatic improvement was concerned.

Wilson's osteotomy stabilised with cortical screws was found to reliably give satisfactory correction of the hallux valgus and first intermetatarsal angles, while allowing safe patient mobilisation and early weight bearing. This effectively resulted in shorter rehabilitation time, early return to work or normal activities and a very satisfactory functional outcome.

### INTRODUCTION

A variety of operative procedures have been developed for the treatment of hallux valgus, a rather common deformity in the western shoe-wearing populations (5, 18). A great number of them are based on a distal osteotomy of the first metatarsal.

Wilson's osteotomy, first described by Wilson in 1963, is an oblique osteotomy of the first metatarsal with lateral transpositional displacement of the distal bony fragment, resulting in correction of the deformity and shortening of the first metatarsal (26). The original concept of this osteo-

tomy did not include any type of internal stabilisation ; the operation therefore frequently necessitated prolonged plaster cast immobilisation due to the lack of inherent mechanical stability.

Some authors have subsequently tried various types of internal fixation of the osteotomy site, in order to obviate the need for plaster cast immobilisation (1, 8, 21). In this paper the results of Wilson's osteotomy stabilised with one or two cortical screws are presented.

### PATIENTS AND METHODS

Twenty patients (32 feet) who underwent Wilson's osteotomy with internal fixation with one or two screws between 1995 and 2001 were reviewed. Twelve patients had a simultaneous bilateral osteotomy, while eight had a unilateral osteotomy.

Eighteen patients were female and two male ; their average age was 50.7 years at operation, ranging from

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Fig. 1. — Pre-operative radiograph in 47-year-old female

34 to 74 years. The patients were followed-up for an average time of 33.1 months (range 12-63). The main reason for surgery was predominantly pain (96.9% of cases), while other or concomitant reasons were shoe wear limitations in 9.4% and cosmesis in 6.2% (3.1% main reason). A family history preexisted in 53.1% of the patients. The preoperative duration of symptoms ranged from 1 to 15 years (mean 4.9 years).

### Operative technique

The operations were performed under general or regional anaesthesia using a pneumatic high-thigh tourniquet. A 5cm dorsomedial skin incision centered over the first metatarsophalangeal joint (MTPJ) was used. Following a Y-shaped capsular incision, an exostectomy was routinely performed and an oblique

osteotomy angled at 45° from distal and medial to proximal and lateral was carried out with an oscillating saw. The osteotomy started at the proximal end of the base of the exostectomy. The distal fragment was then displaced laterally and the osteotomy site was temporarily stabilised with pointing forceps and internally fixed with one or two 3.5-mm AO cortical screws perpendicular to the osteotomy. Care was taken to place the screws proximal enough to the osteotomy site in the proximal fragment to avoid spintering of the medial cortex. The projecting bony spike of the proximal fragment was subsequently trimmed out with a bone rongeur (fig I, 2a, b). A medial Y-V capsulorrhaphy was performed, and skin was closed with interrupted non-absorbable sutures. Dressings were applied and the foot was bandaged and kept elevated for 48 hours, before heel weight-bearing was allowed. Sutures were removed 15 days post-operatively, and the patients were followed clinically and radiologically 6 weeks, 3 months, 6 months and one year postoperatively. Full weight bearing was allowed as soon as callus was radiologically seen at the osteotomy site.

### Radiography

Twenty-six full sets of pre- and postoperative radiographs were available. Standard weight-bearing anteroposterior views were studied to measure the hallux valgus angle (HVA; angle between the axis of the first metatarsal and the axis of the proximal phalanx), and the first intermetatarsal angle (IM1-2; angle between the axes of the first and second metatarsals) (23). The same standard weight-bearing anteroposterior views were studied to measure the shortening of the first metatarsal ( $\Delta L-1$ ), after magnification was corrected as described by Zlotoff (28).

### Patient review

All patients were reviewed by the same reviewer. We used the AOFAS Hallux Metatarsophalangeal-Interphalangeal Scale (14, 15) (table I) and the scoring system used by Broughton and Winson (3) (table II). In the latter scoring system the result was regarded as *excellent* when the patient achieved Grade 1 in all categories, *good* when the patient had no more than two Grade 2's and no Grade 3's, and *poor* in any other case. At the same time, the active and passive range of motion at the first metatarsophalangeal joint was examined, and the patient was checked for the presence of callosities under the metatarsal heads.



Fig. 2a. — Immediate postoperative radiograph



Fig. 2b. — Radiograph 31 months postoperatively

## RESULTS

In our group the mean hospitalisation time was 4.1 days (range 2-6 days), and the rehabilitation time ranged from 5 to 12 weeks with an average of 8.3 weeks. The average passive arc of motion was  $62.3^\circ$  (range :  $50^\circ$ - $80^\circ$ ) and the average active arc of motion was  $51.7^\circ$  (range :  $35^\circ$ - $70^\circ$ ) at the time of final review (table III).

In 31/32 cases the patients were absolutely satisfied or had only minor reservations regarding the cosmetic appearance of their feet post-operatively. Persisting pain under the 1<sup>st</sup> MTP joint was a significant problem in only one case, while moderate lesser toe metatarsalgia was a problem in 12/32 (37.5%) cases post-operatively. Everyday functions

and activities were unrestricted in 30/32 (93.7%) and only slightly restricted in 2/32 (6.3%) cases. No patient required special shoes or had considerable difficulties finding shoes following the operative procedure (table IV). Calluses, although not always symptomatic, were present under the second or third metatarsal head in 17/32 (53.1%) cases (table III).

The AOFAS score was 85.5/100 points, ranging from 62 to 100, while the symptomatic score was *excellent* in 12 (37.5%) cases, *good* in 15 (46.9%) cases and *poor* in 5 (15.6%) cases, which brings the satisfactory results (*excellent* and *good*) to 27 (84.4%) (tables III, IV). From the patients with a poor result, one was reoperated due to persistent symptoms, which were resolved following a

Table I. — AOFAS Hallux Metatarsophalangeal-Interphalangeal Scale

– Pain (40 points)	
None	40
Mild, occasional	30
Moderate, daily	20
Severe, almost always present	0
– Function (45 points)	
Activity limitations	
No limitations	10
No limitation of daily activities, such as employment responsibilities, limitation of recreational activities	7
Limited daily and recreational activities	4
Severe limitation of daily and recreational activities	0
Footwear requirements	
Fashionable, conventional shoes, no insert required	10
Comfort footwear, shoe insert	5
Modified shoes or brace	0
MTP joint motion (dorsiflexion plus plantarflexion)	
Normal or mild restriction (75° or more)	10
Moderate restriction (30°-74°)	5
Severe restriction (less than 30°)	0
IP joint motion (plantarflexion)	
No restriction	5
Severe restriction (less than 10°)	0
MTP-IP stability (all directions)	
Stable	5
Definitely unstable or able to dislocate	0
Callus related to hallux MTP-IP	
No callus or asymptomatic callus	5
Callus, symptomatic	0
– Alignment (15 points)	
Good, hallux well aligned	15
Fair, some degree of hallux malalignment observed, no symptoms	8
Poor, obvious symptomatic malalignment	0
– Total	100

Keller's excision arthroplasty, while the remaining four had no further procedures.

The average preoperative hallux valgus angle (HVA) and first intermetatarsal angle (IM1-2) were 36.8° (range : 19°-54°) and 13.7° (range : 9°-30°), while the average postoperative HVA and IM 1-2 were 17.2° (range : 6°-29°) and 6.1° (range : 2°-10°) respectively. The correction achieved was 19.4° (range : 9°-48°) for the HVA and 7.4° (range 4°-20°) for the IM 1-2. The average shortening of the first metatarsal ( $\Delta L$ -1) produced was 5.2 mm (range 2-8 mm).

In the subgroup of 12 patients who underwent a simultaneous bilateral osteotomy hospitalisation time, rehabilitation and the AOFAS score were not shown to differ significantly from the corresponding overall values (4.4 vs 4.1 days, 8.5 vs 8.3 weeks and 84.6/100 vs 85.5/100 respectively).

The complications recorded were a case of delayed union, which eventually progressed to union 7 months post-operatively and a case of asymptomatic partial avascular necrosis of the first metatarsal head. In 8 cases the screw head was moderately painful and the screw was removed

Table II. — Symptom score according to Broughton and Winson

	Grade 1	Grade 2	Grade 3
Cosmetic appearance :	Happy	Slight reservation	Unhappy
Pain in first MTP joint :	None	Occasional	On normal activities
Metatarsalgia :	None	Slight	After < 3 h walking/standing
Function/Activities :	No restrictions	Slight restriction in daily activities	Severe restriction in daily activities
Shoe wear :	Any	Slight restriction	Difficulty in finding/ only special shoes

Table III. — Overview of our results

1. Radiography
Hallux Valgus Angle (pre) : 36.8° (range 19°-54°) Intermetatarsal Angle 1-2 (pre) : 13.7° (range 9°-30°) Hallux Valgus Angle (post) : 17.2° (range 6°-29°) Intermetatarsal Angle 1-2 (post) : 6.1° (range 2°-10°) Correction of HVA : 19.4° (range 9°-48°) Correction of IM1-2 : 7.4° (range 4°-20°) Shortening of first metatarsal : 5.2 mm (range 2-8 mm)
2. Patient review
Presence of Calluses : 17/32 (53.1%) Hospital Time : 4.1 days (range 2-6 days) Rehabilitation Time : 8.3 weeks (range 5-12 weeks) Metatarsalgia : 12/32 (37.5%) Passive Arc : 62.3° (range 50°-80°) Active Arc : 51.7° (range 35°-70°) AOFAS Score : 85.5 (range 62-100) Sympt. Score :   Excellent 12 (37.5%) Good 15 (46.9%) Poor 5 (15.6%) Complications :   Delayed union : 1 Avascular necrosis of 1 <sup>st</sup> metatarsal head : 1 Painful screw head ; screw removal under local anaesthesia : 8

Table IV. — Post operative score according to the patients' symptoms

	Grade 1	Grade 2	Grade 3
Cosmetic appearance	26	5	1
Pain in first MTP joint	22	9	1
Metatarsalgia	20	12	—
Function/Activities	30	2	—
Shoe wear	15	17	—

under local anaesthesia, 8 to 11 months post-operatively.

## DISCUSSION

Although there is evidence supporting the hypothesis that there may be familial predisposition towards hallux valgus, footwear is believed to be an important causative factor as well (18). More than 130 surgical procedures have been described for the treatment of hallux valgus (10). The common goals of all corrective procedures used are pain relief, permanent correction of the deformity and a biomechanically functional forefoot (5, 24). Several modifications have been made in the osteotomy techniques, in an effort to achieve adequate initial stability at the osteotomy site, by means of internal fixation, so as to allow safe mobilisation and early weight bearing (1, 2, 8, 21). One of them, the Scarf osteotomy, has lately gained popularity and some authors have reported excellent results although it is a technically demanding procedure with a prolonged learning curve (7, 25). Recent reports indicate that it has multiple potential pitfalls and should probably be reserved for moderate bunion deformities in young patients with good bone quality (4). Wilson's osteotomy on the other hand was originally described without any sort of internal fixation (26). Some authors however, advocate internal fixation, in order to decrease the risk of excessive shortening, loss of correction and delayed union or non-union; earlier mobilisation is thus allowed and better long-term results have been reported (1, 8). Although it has considerable theoretical advantages, internal fixation still remains controversial. Skeptics contend it renders the procedure more demanding technically and bears a considerable risk of bone fragments splintering (20).

The commonest cause of a poor result in the series of Klosok *et al* (17) was reported to be stiffness of the first MTP joint. Extensive soft tissue stripping is thought to be responsible for both joint stiffness and avascular necrosis in distal metatarsal osteotomies (11). Stiffness of the first MTP joint was not a significant problem in our series, as shown by the satisfactory arc of passive and active motion of the first MTP joint achieved in our

patients, while only one case of asymptomatic avascular necrosis was recorded. Careful handling of soft tissues around the first MTP joint, as well as early mobilisation achieved by internal fixation, are thought to be of great importance in order to avoid stiffness of the first MTP joint. Wilson's osteotomy has been shown to cause shortening of the first metatarsal and can result in concurrent dorsal displacement of the distal fragment (1, 10, 13, 16). Some authors believe that the above lead to a shift of the forefoot load distribution towards the lesser metatarsals, thus resulting in metatarsalgia and formation of callosities (2, 13, 21), while others, although considering first metatarsal shortening undesirable, could not find any direct correlation between the amount of shortening of the first metatarsal and the incidence of metatarsalgia (9, 12, 17, 19). Our results did not show a direct correlation between metatarsalgia and the amount of shortening of the first metatarsal. In this series though, the use of internal fixation did not help decrease the overall rate of postoperative metatarsalgia.

Unlike Broughton and Winson (3) and Das De and Kamblen (6), who believe that first metatarsal osteotomies should not be performed in patients over 55, our results were satisfactory in this population group. This is in agreement with other authors' reports that senior individuals with adequate pedal circulation and healthy MP joints do well after a distal metatarsal osteotomy (12, 27).

It has been proven by Shereff *et al* (22) in a cadaveric study that all distal metatarsal osteotomy constructs lack mechanical stability to a lesser or greater extent. The lack of inherent stability of Wilson's osteotomy is believed to be a reason for more frequent failure to maintain the corrected position achieved at operation, potentially causing more pronounced shortening and dorsal angulation of the distal fragment, which in turn might cause postoperative metatarsalgia (1, 10, 11, 12).

Taking into account the lack of inherent mechanical stability at the osteotomy site, it has to be protected either by cast immobilisation and non-weight bearing, or by some sort of internal stabilisation (22). Cast immobilisation though, offers only relative stability and comes at a price of delayed forefoot mobilisation, effectively increasing the

rehabilitation time needed post-operatively for the patients to return to work or normal activities (12). In this series fixation of the osteotomy site with one or two cortical screws resulted in considerably shorter rehabilitation time and early return to work and normal activities in comparison to that reported in other series (12).

In conclusion, Wilson osteotomy stabilised with one or two cortical screws was technically straightforward and has given satisfactory as well as dependable correction of hallux valgus angle and first intermetatarsal angle. Initial stability achieved by means of cortical screw fixation obviated the need for plaster cast immobilisation and allowed for earlier, although safe, patient mobilisation and weight bearing. This effectively resulted in shorter rehabilitation time, less time required to return to work or normal activities and a very satisfactory functional outcome and arc of motion.

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