Wilson Bunionectomy with Internal Fixation: A Ten-Year Experience

One hundred fifteen feet that underwent a Wilson (lateral, transpositional, shortening) osteotomy for the correction of hallux valgus between 1979 and 1989 were retrospectively reviewed. All osteotomies were stabilized either with a single cortical or cancellous screw, or with crossed Kirschner wires. The Wilson procedure is not technically difficult and can allow for tri-plane correction. Of the 115 feet on which this surgical procedure was performed, 92 (80%) were graded in long-term postoperative recovery as excellent or good. Only one complication of hallux varus occurred, which required additional surgery. Survey of the results of the 10-year experience in utilization of this operative procedure has shown a high patient satisfaction with minimum of postoperative complications and a low failure rate.

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The Wilson osteotomy was originally described in 1963 (1) as an oblique osteotomy of the distal third of the first metatarsal combined with excision of the hypertrophied medial epicondyle. The distal fragment is then displaced laterally, the metatarsal shortened, and the position stabilized by placing the hallux into a position of over-correction in a below-the-knee non-weightbearing cast for 2 weeks and then in a weightbearing cast for an additional 4 to 6 weeks. The osteotomy begins at the proximal portion of the medial eminence and is at a 45° angle to the long axis of the first metatarsal. Wilson's study showed a 3-month to 8 year follow-up of 25 operations with one recurrence (1).

Since Wilson's original description, there have been several modifications of the osteotomy, as well as methods of internal fixation. Helal et al. (2) modified the original osteotomy by tilting it from dorsal-distal to plantar-proximal (Fig. 1). Since this double oblique osteotomy modification is oblique on two planes, dorsal tilting of the capital fragment is prevented, while the area of contact at the osteotomy site is also increased. Helal felt this modification was necessary because he experienced unfavorable results using the original technique, mainly from metatarsalgia associated with a dorsal shift or tilt of the first metatarsal head.

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Klareskov et al. (3) modified Wilson's osteotomy by plantarflexing the first metatarsal head as it is shifted laterally. The plantar displacement of the distal fragment allows the first metatarsal to bear more of the weightbearing forces, thus reducing excessive pressure on the lateral metatarsal heads. It was discovered that, even with this modification, some dorsal angulation of the distal fragment did occur. The authors attributed this effect to a technical error resulting from poor bandaging or casting technique.

Grace et al. (5) modified the Wilson procedure by reinforcing the medial capsule. They accomplished this by suturing a flap of medial capsule under tension either to the periosteum or through a drill hole in the metatarsal shaft medially. It was found that even with the addition of this modification, 10 patients experienced a loss of position after the metatarsal head had been displaced laterally.

Allen et al. (6) modified the procedure in two ways. First, they used a cancellous screw for rigid internal fixation. Second, in a number of cases, they fashioned a medially based wedge which, after removal, allowed for correction of a laterally deviated cartilage. Their

Figure 1. This lateral line drawing demonstrates Helal et al.'s (2) modification of the Wilson osteotomy. This distal-dorsal to plantar-proximal orientation of the osteotomy was performed to prevent dorsal tilting of the capital fragment.

study was the first to use internal fixation with Wilson's osteotomy. The addition of rigid internal fixation reduced the risk of positional loss.

The technique of this paper's senior author combined the salient features of both Helal's and Allen's modifications. This technique enjoys the advantages of an angulating, plantarly displaced capital fragment in accordance with Helal, and rigid internal fixation in accordance with Allen. The first metatarsal is now restructured to bear greater ground reactive force even after the intended shortening. In addition, rigid internal fixation assures placement of the capital fragment and, therefore, a greater surgical success rate (Figs. 2, 3).

Methods

The modified Wilson bunionectomy was performed on 115 feet between 1979 and 1989, with follow-up ranging from 9 months to 10 years. The patients originally presented with complaints of painful bunions, a foot that was too wide for shoes because of metatarsus primus adductus and a hallux valgus deformity.

A standard operative technique was followed in these cases. After removing the medial hypertrophied epicondyle, an oscillating saw was used to create the osteotomy 45° to the longitudinal axis of the metatarsal, immediately proximal to the epicondyle in the metaphyseal bone. The saw was angled so that the osteotomy was created from distal-dorsal to plantar-proximal. This was done in order to prevent any dorsal tilt of the capital fragment. After displacing the capital fragment, the osteotomy was provisionally stabilized with a 0.062-inch Kirschner wire. A 3.5-mm. cancellous screw was inserted under standard Association for the Study of Internal Fixation technique to provide rigid internal fixation. The screw was placed perpendicularly to the osteotomy and oriented from dorsal-proximal-medial to plantar-distal-lateral, proximal-lateral to the most lateral aspect of the articular cartilage. The provisional Kirschner wire, affording stability for the screw insertion, was then removed. Figures 4 through 6 show, respectively, the preoperative anteroposterior, immediate postoperative with screw in place, and a 2-year follow-up view with the screw removed. In certain instances, percutaneous crossed Kirschner wire stabilization was substituted for screw fixation. Note the restructured alignment and consolidation of osseous segments.

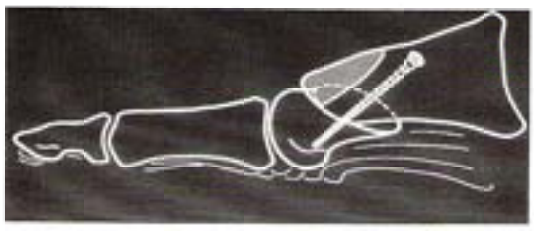

Figure 2. This lateral line drawing allows one to appreciate the placement of the screw from proximal-dorso-medial to distal-plantar-lateral. Also, orientation of the osteotomy is demonstrated.

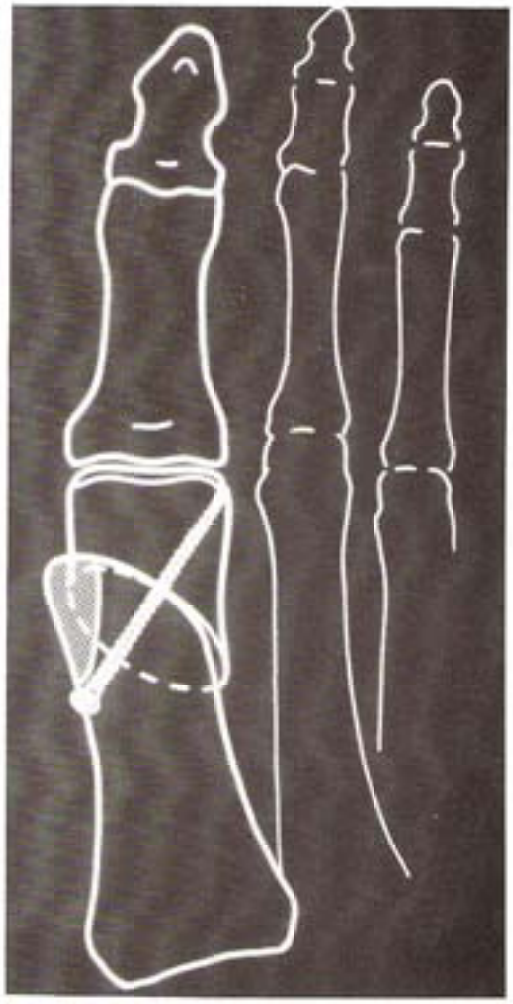

Figure 3. An anteroposterior line drawing demonstrating a 45° angle with which the osteotomy is created, as well as placement of the screw immediately lateral to the lateral joint margin.

When dealing with a short first metatarsal, the osteotomy was created at 35° rather than 45° to the longitudinal axis of the metatarsal. This adjustment in angulation allowed the capital fragment to be transpositioned laterally with a reduced amount of metatarsal shortening. The osteotomy can also be created from dorsal-medial to plantar-lateral, so as to plantarflex the metatarsal head as it is moved laterally (Fig. 7). This technique is used primarily to compensate for shortening of the metatarsal in order to increase weightbear-

Figure 4. Preoperative anteroposterior weightbearing view.

Figure 5. This postoperative anteroposterior weightbearing view demonstrates placement of the 3.5-cm. cancellous screws.

Figure 6. Two years postoperative after removal of the fixation.

ing under the first metatarsal. If necessary, a medially based wedge may be removed to correct for proximal articular set angle deviations.

Various studies have documented the use of postoperative below-the-knee casting with differing time periods (Table 1). Helal et al. (2) placed the patient in a nonweightbearing below-the-knee cast for 2 weeks, then in a walking cast for 4 additional weeks. Allen et al. (6) used a below ankle cast for 8 weeks. For patients in the present study, postoperative immobilization included a wooden soled shoe with full weightbearing for 3 to 5 weeks. The length of time that the shoe was to be worn depended on radiographic and clinical findings. In some cases, when maximum correction was needed and the metatarsal head was displaced greater than 50% of the shaft diameter, a nonweightbearing below-the-knee cast was applied for as long as 4 weeks. Further, if the osteotomy cut was more perpendicular to the first metatarsal on the frontal plane, *i.e.*, less oblique on the dorsal-distal to plantar-proximal plane, a cast was applied for additional stabilization.

Results

Each patient was contacted for a follow-up session. Each foot was examined regarding cosmetic appearance, recurrence of deformity, and first metatarsophalangeal joint range of motion. Radiographic analysis consisted of measuring the hallux abductus angle, the intermetatarsal angle, and the amount of first metatarsal shortening.

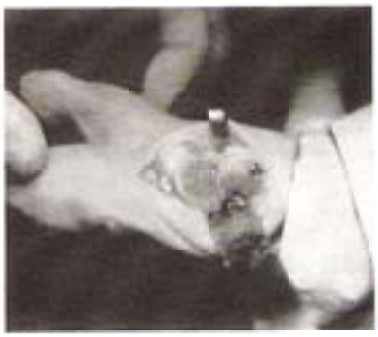

Figure 7. Intraoperative photograph showing the amount of plantar flexion which is obtained when the osteotomy is created from dorsomedial to plantar-lateral.

The modified Wilson bunionectomy was performed on 115 feet. There was only one complication of hallux varus, which was corrected by additional surgery. Of this total, 80% reported alleviation of symptoms, relief from pain, and narrowing of forefoot width, while 20% reported dissatisfaction with the results. Dissatisfaction was due to persistent pain, over-correction requiring additional surgery, inability to purchase the ground with the hallux, a lateral transference of weight, interphalangeal joint medial irritation, or hallux extensus. The lack of hallux purchase appeared to occur with greater than six mm. of shortening of the metatarsal. This problem is due to a relative lengthening, and therefore slack created, in the plantar soft tissue structures, predominantly the flexor hallucis brevis tendon.

Radiographic findings include an improvement in hallux abductus angle from an average of 33° preoperatively to 11° postoperatively. The average reduction in hallux abductus and intermetatarsal angle is comparable with other investigations (Table 2). There was an average shortening of the first metatarsal of 6.5 mm.

Overall grading of the feet was classified in accordance with criteria defined by Bonney and MacNab (4) (Table 3). Final grading of the 115 feet was as follows: 52 excellent, 40 good, 23 poor (Table 1). Hence, an excellent or good grading was obtained in 80% of the feet on which the surgery was performed. A second surgery was required for 80% of the patients for screw removal because it became a source of irritation.

Previous studies on the use of the Wilson procedure showed a similar high percentage of successful outcomes. Helal et al. (2) reported on 57 feet using his modified osteotomy. His analysis resulted in 52 feet being rated as excellent, and 5 feet as good, according to the criteria set by Bonney and MacNab.

Comparative evaluations of the Wilson bunionectomy from more recent studies can be examined by referring to Table 1. Klareskov et al. (3) reported that, of 77 feet undergoing the Wilson operation, 45 could be classified as excellent in result, 17 as good, and 15 as poor. Grace et al. (5) undertook a study of 31 such procedures and reported 11 as excellent in result, 13 as good, and 7 as poor. Cetti and Christensen (7) studied

TABLE 1. **Results, complications, and postoperative care**

	Cetti and Christensen (7)	Allen et al. (6)	Wilson (1)	Klareskov et al. (3)	Grace et al. (5)	Geldwert
Complications	0	1 delayed union		2 delayed union 2 Non-union	1 delayed union	1 Hallux varus
Below knee cast	6 weeks	8 weeks slipper cast	8 weeks	6 weeks	8 (6–10) weeks	0–4 weeks
Excellent	52			45	11	52
Good	5			17	13	40
Poor	0			15	7	23

TABLE 2. **Comparison of postoperative radiographic results in present study with previous studies. * Numbers outside of parenthesis are the averages.**

	Cetti and Christensen (7)	Allen et al. (6)	Wilson (1)	Klareskov et al. (3)	Grace et al. (5)	Geldwert
Number of feet in study	57	56	34	89	31	115
Length of follow-up	20 weeks	4 years	3 m–8 years	3 (3–4 years)	6.5 (1–20 years)	9 to 10 years
Hallux abductus angle (degrees) preoperative	35 (12–60)	29		31 (14–46)	32 (23–54)	33 (22–42)
Postoperative	10 (2–22)	11		19 (0–40)	11 (8–27)	11 (4–20)
Intermetatarsal angle (degrees) preoperative	13 (2–27)	10		12 (2–24)	11.4 (5–20)	12 (9–17)
Postoperative	8 (0–16)	6		8 (0–17)	9.1 (1–21)	6 (1–10)
Reduction in forefoot width (mm.) postoperative average	3–20	7 mm.		5 mm.		
Shortening of 1st metatarsal average	5 mm.			8 mm.	6.3%	6.5 mm.

TABLE 3. **Criteria for results classification—Bonney and MacNab (4)**

Results	Hallux Abductus Angle (Degrees)	Intermetatarsal Angle (Degrees)	Range of Motion of 1st Metatarsophalangeal Joint	Symptoms	Function
Excellent	0–20	0–12	Full Range	Nil	Full
Good	0–30	0–16	Some limitation of dorsiflexion active plantarflexion	Occasional ache in the 1st metatarsophalangeal joint after use. No bunion	Satisfactory
Poor	More than 30	More than 16	Marked limitation of movement or no movement	Frequent pain in the 1st metatarsophalangeal joint or foot. Bunion present	Impaired

57 Wilson procedures they performed, and reported 52 as excellent, 5 as good, and 0 as poor.

Discussion

Helal et al. (2) pointed out that the main objectives of any osteotomy should be rapid and consistent union, correction of the deformity, and relief of pain. However, to achieve these aims, he also noted most surgeons generally employ only one type of first metatarsal osteotomy to the exclusion of others. The Wilson osteotomy should be employed as one of several types of first metatarsal osteotomies by the podiatric surgeon, when indicated, in accordance with the surgical solution that would lend itself to an optimal correction of the hallux valgus. This procedure, as others of its kind, presents certain drawbacks as well as advantages with which the surgeon should be acquainted in order to make an informed judgment whether it should be performed in a given surgical case.

One of the major drawbacks of the Wilson procedure is the amount of shortening that inherently occurs. The surgeon has the ability to control shortening of the first metatarsal by regulating the obliquity of the osteotomy. The less oblique the osteotomy, the less short the first metatarsal becomes after the capital fragment is displaced laterally. On the other hand, shortening may be desirable when dealing with cases of hallux rigidus/limitus. Plantar displacement of the capital fragment is essential in order to prevent lesser metatarsalgia, and

TABLE 4. **Combined results from previous series of commonly performed osteotomies for hallux valgus (Grace (9))**

Operation Eponym	Details of Procedure	Technical Difficulty*	Non-Unions	Avascular Necrosis of 1st Met Head	Shortening of 1st Metatarsal	Satisfactory Results (%)
Wilson bunionectomy	Oblique sliding: distal shaft osteotomy	1	None of 118	None of 118	7.3 mm.	98
Austin bunionectomy	Horizontal "V" osteotomy: distal neck	5	None of 394	2 of 394	4 mm.	93

* 1, Least difficult; 5, most difficult.

to increase weightbearing under the first metatarsal. Sojberg and Sommer (8) recommended a plantar shift of at least 3 mm. to prevent metatarsalgia.

The authors have found that when the first metatarsal was shortened 6 mm. or more, the hallux failed to purchase due to slack created in the flexor hallucis brevis tendon, which normally stabilizes the proximal phalanx against the ground. This lack of toe purchase leads to lateralization of weightbearing, and an increase in loading under the second metatarsal. Long-term, the long flexor will plantarflex the distal phalanx at the interphalangeal joint and create a hallux malleus.

The Wilson osteotomy is an inherently unstable osteotomy. It is, therefore, deemed necessary to stabilize it with rigid internal fixation. AO/ASIF[5] screw fixation was used in the majority of the authors' cases. This method of fixation stabilized the osteotomy while reducing the possibility of positional loss and allowing for primary bone healing. In a few cases, crossed Kirschner wire stabilization was used.

Technically, the Wilson procedure is not difficult to perform. Since there is no lateral release, limited dissection is required. Also, the osteotomy is performed extracapsularly and produces less chance of avascular necrosis of the metatarsal head, and of restricted range of motion postoperatively. The surgeon may also correct for proximal articular set angle deviations by using a medially based wedge, or by placing the distal aspect of the screw more medial to pull the capital fragment medially.

The modified Wilson osteotomy has the same indications as those for an Austin osteotomy, with these additions: a first metatarsal that is at least as long as the second, and the wider the shaft the better. Its contraindications include: a first metatarsal greater than 4 mm., shorter than the second, osteoporosis with cystic changes in the first metatarsal, and a severe increase in the proximal articular set (trackbound) or intermetatarsal angle.

[5] Association for Osteosynthesis/Association for the Study of Internal Fixation.

Table 4 describes combined results from a study performed by Grace et al. (5) comparing the Austin with the Wilson bunionectomy. Major differences lie in the area of technical difficulty. The Wilson procedure was considered least technically difficult to perform. The amount of shortening encountered with the Austin was 4 mm., as compared with 7.3 mm. with the Wilson. A high percentage of patients expressed satisfaction with each procedure: 93% for the Austin and 98% for the Wilson.

Conclusion

This study has shown the modified Wilson osteotomy with screw fixation to be a fairly consistent and reliable operation. Its merits lie in technical simplicity, minimal damage to soft tissue, and adequate correction of the deformity. The operation narrows the forefoot, relaxes soft tissues, and maintains excellent mobility of the first metatarsophalangeal joint. The present study spanned a 10-year period, with 115 procedures. Excellent or good results were obtained in 80%.

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