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A Retrospective Study of 63 Hallux Valgus Corrections Using the Osteodesis Procedure

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ABSTRACT

Osteotomy procedures have been the most popular approach to hallux valgus deformity correction. Soft tissue approaches have, in general, been regarded as ineffective for moderate and severe hallux valgus deformities. Osteodesis is a soft tissue technique that has been shown to be effective in the past but is still seldom practiced. In the present report, we describe a retrospective study of 63 hallux valgus feet in 36 patients who had undergone the osteodesis procedure. Their mean age was 46 ± 12 years, and the mean follow-up period was 25.4 ± 9.6 months. The surgical technique consisted of metatarsus primus varus deformity correction by intermetatarsal cerclage sutures and hallux valgus deformity correction by rebalancing the ligaments. The first metatarsophalangeal angle improved from a mean of 32.5° ± 7.6° preoperatively to 18.4° ± 7° postoperatively, the first intermetatarsal angle improved from 14.6° ± 2.6° to 6.8° ± 1.8°, and the American Orthopaedic Foot and Ankle Society score improved from 59 ± 14 to 93 ± 8 points. The rate of patient satisfaction after surgery was 92% (33 of 36 patients, 59 of 63 feet). The complications included a second metatarsal stress fracture in 3 feet (5%), metatarsophalangeal joint medial subluxation in 3 feet (5%), and metatarsophalangeal joint stiffness in 5 feet (8%). This soft tissue, nonosteotomy procedure was a safe technique that effectively corrected hallux valgus and metatarsus primus varus deformities of various severities without osteotomy or fusion.

Hallux valgus (HV) deformity is closely related to several other abnormal developments in the foot, including metatarsus primus varus (MPV), ligament and tendon imbalance about the metatarsophalangeal joint (MTPJ), and sesamoid displacement. These anatomic misalignments are usually progressive. Surgical correction could be necessary when pain and compromised function of the affected foot become unmanageable by conservative methods. The typical surgical approach to HV deformity correction primarily entails first metatarsal realignment to correct the MPV deformity and soft tissue rebalancing to correct the HV deformity. MPV correction has been mostly achieved using first metatarsal osteotomy procedures. MPV correction is important to HV correction (1,2), and this is addressed by most HV surgeries. MPV correction by soft tissue techniques has not been popular among surgeons, perhaps because it has been considered less effective than osseous approaches such as osteotomy and arthrodesis (3–7), in particular, to correct moderate and severe deformities (8–10). Soft tissue procedures are not recommended for an HV angle >30° and an intermetatarsal angle (IMA) >11° (11). However, all osseous procedures carry the risk of complicating the first metatarsal normal anatomy by malunion and excessive shortening. In the past, the most popular soft tissue procedures have been the McBride procedure (12) and its modifications (13,14). The technique they used to realign the first metatarsal was to suture the adjacent first and second metatarsophalangeal joint capsules together and transferring the adductor hallucis tendon to the neck of the first metatarsal. Mechanically, such a technique might not be sufficiently strong enough to overcome the first metatarsal's varus deforming forces to correct and maintain its alignment. The use of bone-to-bone sutures to bind the first and second metatarsals together was then developed for greater intermetatarsal fixation strength and, thus, MPV correction force than soft tissue sutures.

An intermetatarsal cerclage suturing technique (osteodesis procedure) was reported with satisfactory results by Pagella and Pierelon (15) and Irwin and Cape (16). Weatherall et al (17) and Holmes and Hsu (18) more recently reported a similar concept in which they used bone-to-bone (first-to-second metatarsal) sutures to reduce the abnormally large IMA of the MPV deformity using the suture button technique. These intermetatarsal bone-to-bone suturing techniques had the advantage of realigning the first metatarsal without osteotomies, avoiding osteotomy-related complications and side effects.

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Conflict of Interest: Daniel Yiang Wu, MD, FRCS(C), is the owner of The Center for Non-Bone-Breaking Bunion Surgery, Hong Kong, SAR, China.

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However, stress fracture of the second metatarsal has been reported in association with such techniques.

I report my own experience with this seldom practiced osteodesis procedure to determine whether the satisfactory results reported by Irwin and Cape (16) could be reproduced using the same intermetatarsal cerclage suture method to correct MPV and HV deformities. I agree with Tanaka et al (19), who stated that HV is mainly the result of MPV deformity, and not of adductor halluces tendon contracture. They hypothesized that effective MPV correction would facilitate HV correction without having to release the adductor hallucis tendon (19). I also hypothesized that osteodesis between the first and second metatarsals would be relatively safe and result in a low incidence of complications after a minimum 1-year follow-up period. My primary aim was to demonstrate that MPV and HV deformities could be satisfactorily corrected primarily using a soft tissue technique without osteotomies. The secondary aim was to show that the clinical results were satisfactory to patients. Thus, I undertook a retrospective cohort study to evaluate the effectiveness of the osteodesis procedure and its complications.

Patients and Methods

From October 2008 to April 2009, 41 consecutive patients (Supplemental Table S1) underwent the osteodesis procedure, as described, under the guidance of the author (D.Y.W.) for correction of their HV deformity. These patients were identified retrospectively by the author (D.Y.W.) by a search of the medical records. The inclusion criteria were failure of conservative treatment to alleviate pain during stance and gait and when wearing shoes and radiographic evidence of an HV deformity >20° (hallux abductus angle). None of the patients had undergone previous HV surgery. For the present study, 5 patients (12%) were excluded because they had failed to return for a minimum 1-year follow-up examination. Of these 5 patients, 4 lived abroad. The fifth patient lived locally but was too busy and was fully satisfied with her result. Thus, 36 patients (63 feet) were available for the present study, for an 88% incidence of inclusion in the investigation. A statistical description of the cohort is given in Table 1. Most of the patients were female (35; 97%), accounting for 61 of the operated feet (97%). Their mean age was 46 (range 19 to 74) years. The cohort included 27 bilateral cases and 9 unilateral cases, for a total of 63 feet. The mean follow-up time was 25 (range 12 to 55) months. All the patients were examined by the surgeon (D.Y.W.), and radiologic measurements and photographic documentation were conducted by a nurse at the surgeon's clinic.

Surgical Technique

The surgical technique was very similar to that described by Pagella and Pierelon (15) and Irwin and Cape (16), except that the adductor hallucis tendon was not released and the fibular sesamoid was not excised. All the cases were performed with the patient in the supine position and under either general or spinal anesthesia. A mid-thigh pneumatic tourniquet was used in all cases and inflated to a pressure of 200 to 250 mm Hg. The distal first intermetatarsal space was exposed through a straight 1-in.-long dorsal incision. Its interosseous muscle was retracted laterally and partially resected if necessary to help expose the lateral capsule of the first MTPJ and the distal portion of the second metatarsal. A distal–lateral soft tissue release was then performed, with an inverted T capsular incision to transect the lateral metatarsophalangeal collateral ligament and lateral metatarsosesamoid and its suspensory ligaments. The distal one third of the first and second metatarsals was then exposed subperiosteally, and their cortices were "fish-scaled" with an osteotome. Three 2-mm diameter drill holes were made in the first metatarsal neck region about 0.5 cm apart in the dorsoplantar direction. Double stranded no. 1 PDS™ (Ethicon, Inc., a division of Johnson & Johnson, Somerville, NJ) sutures were then passed through the drill holes and around the neck of the second metatarsal (Fig. 1). The interosseous muscle was displaced in plantar direction by the sutures. The sutures were tied with 4 knots each, with the first and second metatarsals approximated by the assistant's hand gripping the forefoot (Fig. 2).

After the first metatarsal was realigned, a separate medial horizontal elliptical excision of the redundant skin, bursa, capsulotendinous tissue, and any bony overgrowth was undertaken. The deep soft tissue structures were then reapproximated with interrupted 2-0 Vicryl® (polyglactin 910®, Ethicon) in 1 layer without plication. After skin closure, a compression dressing was applied before the thigh tourniquet was deflated.

Postoperative Care

The patients were permitted weightbearing as tolerated and as needed any time after surgery using a postoperative Darco® shoe or shoes (Darco International, Inc., Huntington, WV) and crutches. As much elevation as possible of the operated foot, or feet, was advised for the first 2 postoperative weeks. A full-length, 2.5-mm-thick thermoplastic total-contact foot removable cast brace (Fig. 3) was custom made about 10 days after surgery when most of the operative swelling had subsided. All the patients were instructed to perform passive range of motion exercises hourly on their own from the day after surgery until 80° of dorsiflexion could be maintained. Reduced walking and a reduced pace were advised for 3 months. Standing foot radiographs were obtained monthly to detect any early loss of metatarsophalangeal angle (MPA) correction, possibly due to excessive walking. Crutches were optional at the patient's discretion. The foot brace was discontinued, and general walking in regular and comfortable shoes was resumed after 3 months. However, running sports and high-heel shoes were permitted only after another 3 months.

Radiologic Assessment

All radiographic examinations were conducted with the patient standing and with full weightbearing. The first metatarsophalangeal angle for HV deformity assessment and first IMA for metatarsus primus varus deformity assessment were measured using

Table 1
Statistical description of the cohort (n = 63 feet in 36 patients)

Variable	Value
Age (y)	
Mean	46
Range	19 to 74
Sex	
Female	
Patients	35 (97)
Feet	61 (97)
Male	
Patients	1 (3)
Feet	2 (3)
Laterality	
Right	31 (86)
Left	32 (89)
Bilateral	27 (75)
Unilateral	9 (25)
Follow-up duration (mo)	
Mean	25
Range	12 to 55

Data presented as n (%), unless otherwise noted.

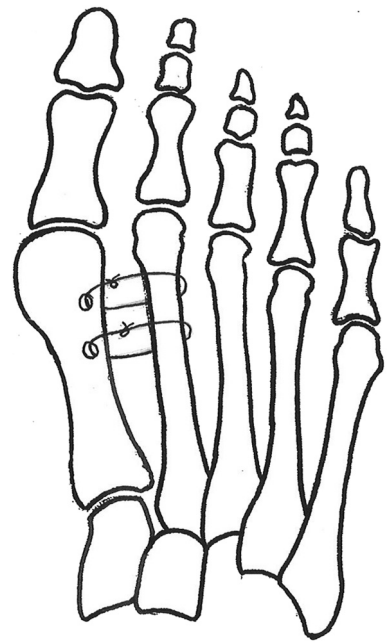

Fig. 1. Schematic illustration of intermetatarsal cerclage sutures. The sutures have been passed through drill holes in first metatarsal, wrapped around the second metatarsal, and tied dorsally.