Moderate to Severe Hallux Valgus Correction with Minimal Incision Distal Metatarsal Osteotomy

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Purpose

This case series demonstrates that moderate to severe hallux valgus deformities can be corrected utilizing a Minimal Incision Distal Metatarsal Osteotomy (MIDMO).

Literature Review

Hallux valgus is a common triplanar deformity with a plethora of corrective surgical options.[1] Radiographic angles can be used to classify the deformity and to assess postoperative correction. An intermetatarsal (IM) angle of less than 9° is normal, mild deformity is 9–11°, moderate deformity is 11–16°, and severe deformities are >16°.[2] Hallux abductus (HA) angle is also used to assess the deformity. Normal values range from 0–15°.[2] Traditionally, open distal metatarsal osteotomies have been used to correct mild deformities, metatarsal shaft procedures for moderate deformities, and metatarsal base procedures for severe deformities.[3] These open osteotomies are often accompanied by soft-tissue procedures.

Minimally invasive techniques for hallux valgus correction utilize small incisions to perform an osteotomy and do not require additional soft-tissue procedures. Previous studies found that minimally invasive distal metatarsal osteotomies require less operative time and have similar AOFAS scores to open scarf procedures.[4] Bösch et al.[5] were the first to describe a minimal incision approach for hallux valgus correction. The Bösch technique consisted of a small incision over the metatarsal neck through which a burr was used to make an osteotomy and translate the capital fragment laterally. Bösch et al.[5] reported using a minimal incision approach to achieve an adequate reduction of IM angle in 98 feet from 13° to 10° after a 7- to 10-year follow-up.

Other studies have concluded that minimal incision approaches to hallux valgus deformities result in comparable radiographic and clinical outcomes to the traditional open approach.[6,7] The minimal incision distal metatarsal osteotomy allows for increased translation of the capital fragment along with three-plane correction and can therefore be considered as a method of correction for not just mild deformities but for moderate to severe deformities as well.

Methodology & Procedures

- Sixteen patients (17 feet) with IM angles of ≥12° underwent minimal incision distal metatarsal osteotomy for correction of hallux valgus deformity.
- IM and HA angles were measured on preoperative and postoperative weightbearing AP view radiographs. Postoperative radiographs were evaluated from the latest clinic follow-up appointment.
- The IM angle was the angle formed by the intersection of the mechanical axis of the first and second metatarsals.
- HA angle was the angle formed by the mechanical axis of the proximal phalanx of the hallux and the mechanical axis of the first metatarsal.

Procedure

- The MIDMO osteotomy is performed using a modified technique as described by Siddiqui.[1]
- A K-wire is placed in an extraperiosteal manner at the medial aspect of the great toe (distal to the hallux interphalangeal joint) and then advanced to the medial aspect of the first metatarsal head.
- A medial skin incision is made approximately 5–10 mm in length along the first metatarsal at the level of the metaphyseal-diaphyseal junction.
- A through-and-through transverse osteotomy is performed with sagittal saw or burr followed by lateral translation and frontal plane rotation of the capital fragment.
- The MIDMO osteotomy is then stabilized with K-wire or percutaneous screw fixation. A proximal phalangeal osteotomy (Akin) is utilized in select cases when deemed appropriate.

Results

- Our study showed correction of moderate to severe hallux valgus via the MIDMO technique in 16 patients (17 feet) with an average follow-up of 20 months (Table 1).
- The postoperative IM and HA angles decreased when compared with the preoperative measurements (Figs. 1 and 2).
- Average IM angle decreased from 14° preoperatively to 6° postoperatively, and the average HA angle decreased from 32° preoperatively to 14° postoperatively.
- Two occurrences of medial shelf pain were reported (addressed by conservative treatment and shoe modification).
- None experienced deep infection or nonunion.

Table 1. Preoperative and postoperative intermetatarsal (IM) angle and hallux abductus (HA) angles are presented for each patient, and mean values are shown for each measurement.

Patient	Preoperative IM Angle	Postoperative IM Angle	Preoperative HA Angle	Postoperative HA Angle
1	15	5	26	11
2	14	1	29	13
3	13	13	28	23
4	19	10	48	8
5L	14	12	40	26
5R	15	13	42	26
6	12	8	18	6
7	12	7	22	10
8	14	3	22	9
9	13	3	44	13
10	17	3	28	2
11	12	10	33	24
12	13	6	38	22
13	12	4	26	13
14	13	4	20	4
15	15	1	43	19
16	15	3	33	8
Mean	14	6	32	14

L, left foot; R, right foot.

Figure 1. Patient 4 in Table 1. **A and B,** Preoperative and postoperative AP view weight bearing radiographs. **C and D,** Preoperative and postoperative lateral view weight bearing radiographs.

Figure 2. Patient 5L (left foot) in Table 1. **A and B,** Preoperative and postoperative AP view weight bearing radiographs. **C and D,** Preoperative and postoperative lateral view weight bearing radiographs.

Analysis & Discussion

The Minimal Incision Distal Metatarsal Osteotomy is shown to be a viable procedure for correction of moderate to severe hallux valgus deformities. Several studies report good outcomes utilizing the MIDMO for bunion correction.[5–7] We provide radiographic evidence that the MIDMO technique can be utilized to reduce both the IM and HA angle in patients where more proximal procedures are typically considered. The MIDMO allows for triplanar correction with a through-and-through osteotomy, a minimal incision/scar, and the possibility of immediate postoperative weight bearing.

Giannini et al.[7] reported 20 patients who underwent bilateral bunion correction: the scarf procedure on one side and the classic SERI procedure on the other. They noted no significant difference in regards to radiographic and clinical outcomes. The average IM angle was 16° preoperatively in both groups and decreased significantly in both cases. Despite reports of good outcomes using the MIDMO, Huang et al.[6] discouraged the use of a distal metatarsal osteotomy in patients with moderate to severe bunion deformities (HA angle >30°). In their study, radiographic recurrence was observed in patients with higher degree of deformity.[6] Our study included patients with an average HA angle of ≥30°, and we observed no recurrences (defined by Huang as 20° HA at final follow-up).

Our case series evaluated only radiographic outcomes and did not include clinical patient satisfaction scores or functional outcomes. Future studies are warranted to evaluate patient satisfaction scores and perhaps compare the MIDMO technique with the proximal metatarsal osteotomy for moderate to severe hallux valgus deformity correction.

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