

Evaluation of Double Locking Plate Construct with Modified Lapidus Arthrodesis in a Retrospective Series

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Statement of Purpose

Metatarsocuneiform arthrodesis has been used in pedal surgery for the treatment of hallux abductovalgus (HAV) deformity, along with other pathologic entities, including first ray hypermobility, arthritis, trauma and pes planovalgus deformity. While the Lapidus procedure is a widely accepted technique for treatment of hallux valgus, the optimal fixation method remains controversial. The purpose of this study is to evaluate the nonunion rate of a double locking plate construct in patients who underwent a modified Lapidus arthrodesis for correction of hallux valgus.

Methodology & Hypothesis

A retrospective review of 17 consecutive patients receiving a modified Lapidus fusion for correction of symptomatic HAV from two institutions are included in this study from the patient population of the senior author from 3/21/16 to 8/28/17. The inclusion criteria included patients whose hallux valgus correction was achieved and maintained utilizing a two locking plate construct in terms of fixation. The postoperative treatment protocol remained identical for all patients in regards to the time to weightbearing. Postoperative radiographs were obtained at clinical follow-up visits at 2 weeks, 6 weeks and 3 months to evaluate for osseous union by the lead author (Figure 1).

It is hypothesized that our construct of two locking plates without an interfragmentary screw would result in similar, if not increased, fusion rates and fewer complications. Furthermore, given the low profile nature of the locking plates utilized, we anticipate a lower incidence of hardware removal.

Procedure

Surgical technique consisted of a dorsal incision medial to the extensor hallucis longus tendon and lateral to the tibialis anterior tendon from mid first metatarsal shaft to the proximal aspect of the medial cuneiform. If necessary, the incision was extended distally to perform a modified McBride bunionectomy and/or an intra-articular lateral release. Dissection was then carried out to the level of the bone with the periosteum reflected as part of a full thickness flap. A sagittal saw was used to remove the articular cartilage from the base of the first metatarsal perpendicular to the long axis of the first metatarsal. Next, the articular surface of the medial cuneiform was prepared in a similar fashion with an orientation perpendicular to the long axis of the second metatarsal. A drill bit was used to fenestrate the fusion site. Next, transverse correction was obtained and the

first metatarsophalangeal joint (MTPJ) was observed under fluoroscopic anterior-posterior view and manipulated by pushing a metatarsal pin to rotate the first metatarsal in a varus direction until the first MTPJ was observed to be aligned both radiographically and clinically. Following temporary K-wire fixation, two locking plates was then applied in a standard fashion as per manufacturer protocol. The soft tissues were then closed in layers.¹

Results

The final study population consisted of 17 patients with 18 procedures being performed (8 left and 10 right). The average age was 53.4 years and 16 of the 17 patients were female. Other covariates (i.e. active nicotine status, osteoporosis, diabetes, previous treatment on the other foot) were balanced across the treatment groups.

One procedure resulted in malunion (5.9%). The patient was symptomatic and required revision. The revision procedure was fixated with a different technique consisting of an interfragmentary screw and locking plate, and was excluded from the present study. The revision arthrodesis went on to heal uneventfully. It should be noted that the patient admitted to early weightbearing against the medical advice of the surgeon. Four other patients encountered other minor complications, including 2 cases of wound complications, 1 case of hallux limitus and 1 case of recurrence. Each of these resolved without the need for additional surgery.

Figure 1



Discussion

Different methods of fixation for Lapidus arthrodesis have been used over the years for hallux valgus correction. Initially described by Paul Lapidus using screws, current variations include screw-only fixation, screws with a K-wire and a combination of plates with interfragmentary screws. Although the optical fixation method remains controversial, an ideal construct should ultimately provide rigidity, prevent excessive micromotion and decreases nonunion rates. Recent clinical studies demonstrate that locking plate fixation is associated with lower nonunion rates and less time before full weightbearing.² To date, published results on the use of a double locking plate construct have been lacking. The present retrospective study was completed to evaluate the nonunion rates of such a construct performed by a single surgeon along with corresponding radiographs.

In the literature, multiple methods have been described. Donnewerth et al completed a systematic review of nonunions after first metatarsocuneiform arthrodesis using joint curettage and 2 crossing screws. The results showed 30 nonunions (5.6%) in 537 patients (599 feet), and 17 (3.2%) of these patients were symptomatic.³ Furthermore, Menke et al retrospectively analyzed using an interfragmentary lag screw and a locking H-plate in 21 patients. The radiographic union rate was 90.5%, and 2 asymptomatic nonunions occurred.⁴

Additionally, multiple cadaveric studies have compared the stability of a locking plate with compression screw to 2 crossing screws. Klos et al noted that no difference was noted in initial stiffness but it was shown that the addition of a locking plate was biomechanically more stable than 2 crossing screws.⁵ Scranton et al evaluated intraplate compression screw fixation versus crossing screw fixation and found the intraplate compression screw fixation to have a higher load to failure (108 N versus 78 N).⁶

However, no cadaveric or clinical study to date focuses on the evaluation of nonunion rates and stability of a double locking plate construct without an interfragmentary compression screw. The strength of the present study resides in the continuity of the technique and postoperative care with no statistical significance noted with patient comorbidities. The weaknesses of the present study are consistent with those of most retrospective series.

In conclusion, the present study describes a modified Lapidus arthrodesis technique in which excellent joint compression and osseous union is obtained utilizing a double locking plate construct with overall patient satisfaction and few complications.

References

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