

A Plantarflexory-Shortening Osteotomy for Hallux Rigidus: A Long-Term Follow-up Study

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Statement of Purpose:

Plantarflexion and decompression are essential parts of a first metatarsal periarticular osteotomy to restore function of the 1st MPJ when treating hallux rigidus. This study investigates the long-term patient-reported and radiographic outcomes of a plantarflexory-shortening osteotomy of the first metatarsal.

Methodology:

We analyzed patients from January 2001 to December 2015 who had a plantarflexory-shortening osteotomy of the first metatarsal performed as described by the primary author. A retrospective chart review identified 120 patients (146 feet) who were contacted for follow-up. Patient reported outcomes, in the form of patient satisfaction questionnaires were performed, which included the need for any follow-up procedures. Radiographic measurements were also obtained, which included the central joint width, metatarsus primus elevatus, and the metatarsal protrusion distance.

Literature Review:

Surgical management of Hallux Rigidus (HR) is a difficult and controversial issue. Numerous surgical options exist that range from joint sparing to joint destructive procedures, including first MPJ arthrodesis which compromises the overall biomechanics of the foot and has non-union rates as high as 8-22%.^{3,4}

The benefits of distal first metatarsal osteotomies for HR are that it allows for joint preservation and improves range of motion, which is ideal in a more active patient. Multiple joint salvage procedures have been described and reviewed in the literature. Dickerson et al studied 24 Watermann-Green procedures, with 94% of patients reporting extensive pain relief and 75% experiencing increased range of motion in the short-term.⁵ Several other osteotomies including the Youngswick, Reverdin-Green, and distal oblique osteotomies show similar short-term results.⁵ However, there is still limited evidence showing long term clinical and radiographic relief, leading to ongoing reservations in performing these procedures.

Discussion:

The aim of this retrospective review was to assess the long-term outcomes following the previously described osteotomy for correction of HR. Several authors have described other novel osteotomies for the treatment of HR with varying degrees of success. In a recent systematic review of these periarticular osteotomies, a complication rate of 30.5% was found with 22.6% of patients requiring revision surgeries.⁶

In contrast, this study demonstrates that the described plantarflexory-shortening osteotomy has very good to excellent long-term outcomes with significant improvement in radiographic results, maintained over an average of 6.8 years. Statistically significant differences were noted between pre-operative and post-operative joint width and metatarsal protrusion. Clinically, no patients reported any residual pain to the joint higher than 3 out of 10 on average, with no "poor" results reported. Also of note, no patients in our study have required fusion or other joint destructive procedures, with only three feet (7%) requiring revisional procedures.

The results of this study reveal that the described plantarflexory-shortening osteotomy is an effective joint salvage procedure for patients with HR and facilitates the avoidance of joint destructive procedures for 5-17 years after the index procedure.

Results:

Follow-up for 38 patients (42 feet) was obtained. The average follow-up time for the patient-reported evaluation was 9.6 years (range 5.4-17.2) and for radiographic evaluation was 6.8 years (range 2.1-16.9). The patient questionnaire revealed 87% of patients reported "very good" to "excellent" results, with the remaining 13% reporting "good" results. 87% of patients reported pain to the 1st MPJ had "much improved" with an average pain level of 0.4 out of 10. Overall, 100% of the patients would undergo this procedure again. Radiographs were analyzed pre- and post-operatively (Fig 2, Fig 3). The average central joint widths were 1.59mm and 2.49mm respectively ($p=0.0002$). Average metatarsus primus elevatus was 4.26mm and 3.65mm respectively ($p=0.2804$). Average metatarsal protrusion was 3.45mm and 5.81mm respectively ($p=0.0099$). Three patients required an additional surgery, including removal of hardware or weil osteotomies.

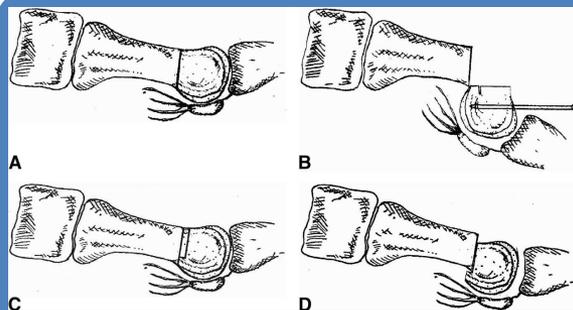


Fig 1 - Technique for the plantarflexory-shortening osteotomy

Procedure:

The following procedure was performed as described in the original paper by Derner et al.¹ A dorsal to plantar osteotomy was made at the level of the metatarsal neck and a 0.062 k-wire was used as a toggling device to plantarflex the metatarsal head. A second osteotomy was performed 3-4mm superior to the plantar aspect of the capital fragment that extended 2-4mm into the capital fragment. A third and final osteotomy was made parallel to the first, that extended into the plantar osteotomy to facilitate removal of a rectangle of bone. This allowed for plantarflexion and shortening of the metatarsal head. Osteotomies were fixated with one 4.0 cannulated, headless screw going from proximal-dorsal to distal-plantar. (Fig.1)



Fig 2
Pre-op

Fig 3
14 years post-op

References:

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