

Short-Term Radiographic Outcomes for Minimally Invasive Bunion Correction

Kevin Grierson DPM*, Yevgeny Kats DPM**

*Resident Inova Fairfax Medical Campus, **Shenandoah Foot and Ankle Center

Statement of purpose and literature review:

There have been many procedures described in the literature for the treatment of symptomatic hallux valgus without a clinical consensus for the most appropriate treatment¹. More recently, minimally invasive approaches have been described with several advantages of a traditional open approach including decreased soft tissue trauma, faster recovery, ability to weight bear immediately, and shorter surgical time². There have been some concerns raised in the literature over ability to correct large deformities and increased complication rate such as infection, mal-alignment, and recurrence of bunion deformity³. In this study, we aimed to look at the short-term radiographic outcomes of a minimally invasive bunion procedure.

Methods:

We performed a retrospective analysis of 6 consecutive patients who had a minimally invasive bunion procedure performed by the same surgeon between March 2016 and August 2017. There was a minimum follow up of 12 months for each patient. Standard anteroposterior (AP) and lateral radiographs were taken pre-operatively, 6 weeks post-operatively, and at final follow up. Intermetatarsal angle (IMA), hallux valgus angle (HVA), and tibial sesamoid position were measured from the radiographs. No patients were excluded from this study. Statistical analysis was performed with a paired T test. Statistical significance was defined as the 5% ($p < 0.05$) level.

Surgical technique:

The patient was placed supine on the table and underwent monitored anesthesia. They were prepped and draped in the usual sterile fashion. A 2mm Steinman pin was placed from the medial tip of the hallux, skiving the capsule of the interphalangeal joint (IPJ) and metatarsal phalangeal joint (MPJ) to the level of the 1st metatarsal head. A small incision was then placed dorsomedially just proximal to the 1st metatarsal head. The incision was bluntly dissected down to periosteum to clear any neurovascular structures. A sagittal saw was then used to make a through and through transverse cut at the metaphyseal-diaphyseal junction of the 1st metatarsal with the aid of fluoroscopy. The capital fragment was then shifted laterally until desired correction was achieved. The K wire was then advanced into the medullary canal and across the 1st tarsometatarsal-cuneiform joint to hold the capital fragment in a corrected position. The pin was then bent, cut, and capped.

Post-operatively, patients were allowed to weight bear immediately in a controlled ankle motion (CAM) Boot. The pin was removed at 6-8 weeks and patients were transitioned to a regular shoe 2 weeks later.

Results:

Our study includes 6 patients with an average follow up of 18.33 months (range 12-29). All 6 patients were female with an average age of 58.8 years (range 50-71). There were 3 left feet and 3 right feet. 4 patients had rheumatoid arthritis, 2 patients were smokers, and 2 patients had type 2 diabetes. 3 of the 6 patients (50%) had a 2nd proximal interphalangeal joint arthrodesis as an adjunctive procedure. The average pre-operative, 6 weeks post-operative, and final follow up IMA were 16 (± 3), 6.3 (± 2), and 6.7 (± 1.8) respectively. The HVA was 31.5 (± 2.6), 5 (± 4), and 10.8 (± 4.3) respectively. Tibial sesamoid position was 5.3 (± 1.2), 1.7 (± 0.5), and 3 (± 1.3) respectively. The improvement in pre-operative and final IMA, HVA, and tibial sesamoid were statistically significant ($p < 0.05$). The change of the IMA between the 6 week and final follow up was not statistically significant ($p = 0.07$). The change of the HVA and tibial sesamoid position between the 6 week and final follow up was significant ($p < 0.05$). 1 patient had a delayed union, which went on to full union at final follow up. No other complications were encountered.

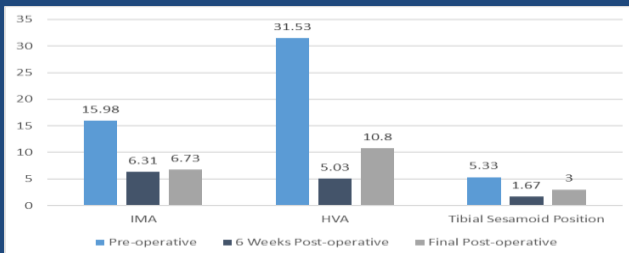


Figure 1: Pre-operative, 6 week post-operative, and final Intermetatarsal angle (IMA), Hallux valgus angle (HVA), and tibial sesamoid position



Figure 2: Pre-operative, 6 week post operative, and final follow up AP radiographs



Figure 3: Clinical photographs of surgical incision at final follow up

Discussion:

The minimally invasive bunion correction has many inherent advantages to a traditional open approach. One of the main concerns in the literature is the ability to correct large deformities, complication rate, and risk of recurrence. In our study we were able to correct mild to moderate deformities with average IMA and HVA of 16 and 31.5 which is on the upper limit of what is recommended for the minimally invasive procedure⁴. The initial correction of the IMA was maintained from initial post-operative x-rays until final follow up. The HVA and tibial sesamoid correction was gradually lost between the 6 week and final post-operative visit, however the final HVA of 10.8 was still within normal range. Incomplete reduction of the sesamoids and a large pre-operative hallux valgus angles have been shown to significantly affect the rate of recurrence^{5,6}. Due to the relatively short follow-up of this study, the maintenance of correction over a longer-term was not able to be evaluated. The patients selected for this procedure were often patients where the lead surgeon (Y.K) had concerns about incision and bone healing with a traditional open approach. 4 patients in this cohort had rheumatoid arthritis (RA) who have been shown to be at higher risk for surgical complications than the normal population with increased surgical time associated with impaired wound healing^{7,8}. One of the advantages of the minimally invasive approach is its decreased surgical time compared to an open approach⁹. Some of the limitations to this study were a small cohort of patients, a relatively short follow up for patients, and not evaluating functional outcomes. A longer follow-up period would be useful to determine the recurrence rate of hallux valgus in patients undergoing this procedure. In conclusion, the minimally invasive hallux valgus procedure demonstrated a short-term ability to correct radiographic parameters for hallux valgus, however the long-term recurrence rate was unable to be determined. There are theoretical advantages with decreased incision size and surgical time in patients who may be higher risk for wound healing such as with rheumatoid arthritis, however careful patient selection should guide treatment.

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