Surgical Revision After Failed First Metatarsal Closing Base Wedge Osteotomy

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Introduction and Purpose

The case presented describes the surgical revision of a closing base wedge osteotomy with failed fixation which was performed outpatient. During closing base wedge osteotomy a wedge of bone is taken out of the lateral aspect of the base of the first metatarsal leaving an intact medial hinge. When closing the osteotomy, the distal aspect of the first metatarsal is swung laterally decreasing the intermetatarsal angle. This procedure is usually indicated for a HAV deformity with an IM angle greater than 15 degrees. The osteotomy is fixated by two cortical screws. Traditionally the patient is non weightbearing for 6-8 weeks after the procedure.

Methods & Procedure

Figure 1

A 72 year old male presented to the podiatry clinic 7 weeks after receiving a closing base wedge osteotomy for treatment of a right hallux abducto valgus. Patient was referred to our office after he began to experience pain and discomfort during the post op period, stating that he felt there were "loose screws" in his foot. The patient admitted he had walked on his right foot during the post op period, because he could not tolerate crutches. Patient had a past medical history which was significant for Vitamin D deficiency, Hyperlipidemia and Tobacco use. Physical exam revealed a well healed scar on the dorsal aspect of the right first metatarsal. The hallux was in rectus position. The patient complained of pain around the base of the right first metatarsal. Radiographic findings included a displaced osteotomy with significant gapping and elevation of the distal fragment and a negative intermetatarsal angle (Figure 1). Revisional surgery was discussed with the patient, and the importance of future compliance.

The revision took place 2 months after the original osteotomy. The patient was medically cleared for surgery and consented. The patient was placed in supine position and given 2g Ancef prophylactically. The patient was given general anesthesia and a local block of 20 cc of 1% Lidocaine plain. A well padded ankle tourniquet was place around the right ankle, and was inflated to 250 mmHg. A linear dorsal medial incision was made from the neck of the right first metatarsal to the right MC joint. Blunt dissection was performed with Metzenbaum scissors, and neurovascular structures were retracted. A substantial amount of scar tissue was encountered during dissection. A periosteal elevator was used to reflect soft tissue to visualize the fracture line. A displaced comminuted fracture was visualized with a 3.0 and a 2.0 screw interposed between the fracture site. A freer was used to distract the fracture fragments to remove the previous fixation. Nonviable bone and tissue was removed from the fracture site by curettage. A bone clamp was used to reapproximate the fracture fragments with two .045 K wires for temporary fixation. Evaluation under fluoroscopy demonstrated that the first metatarsal, although reapproximated, was shortened due to previous surgery and curettage. Further distraction was applied across the fracture site to restore the metatarsal out to length.

Methods & Procedure (continued)

Figure 2

Figure 3

A second linear incision was made at the distal medial anterior tibia. Bone marrow aspirate (BMA) was obtained from the distal medial anterior tibia. The BMA was mixed with Porous Calcium Phosphate Synthetic Bone Graft (PCPSBG) and incorporated into the fracture site with an injectable Tetra Calcium based Self Setting Bone Substitute (TCSSBS). PCPSBG was also applied to the donor site. Position and length was confirmed under fluoroscopy. The IM angle was evaluate and found to be within normal limits. Fixation was achieved with a medial Y shaped plate with locking screws. The plate and screws spanned the distal fracture fragment, proximal fracture fragment, and medial cuneiform. For increased stability at the fracture site, the decision was made intraoperatively to apply a mini rail external fixation. Two half pins were applied into the navicular from dorsal to plantar and one half pin was applied to the first metatarsal neck from dorsal lateral to plantar proximal. Final fluoroscopic images were obtained which showed excellent alignment of the first ray with appropriate length. Additional local anesthetic in the form of 20 mL of .5% Marcaine plain was injected in a Mayo block as well as around half pins. The surgical sites were dressed with Xeroform, 4x4 gauze, Kling, web roll, and a posterior splint with sugar tongs and an Ace bandage. Patient was admitted for 23 hour observation and discharged when stable. Patient follow up in clinic after one week. The external fixation was removed after 5 weeks. Internal fixation was removed after 7 months due to pain.

Results

Correction of this unstable displaced first metatarsal osteotomy was successfully achieved with use of BMA, PCPSBG and TCSSBS followed by medial Y-plate and Mini rail external fixation. Evidence of correction of displaced fragment was noted both clinically and radiographically (Figures 2 & 3). Ultimately internal and external fixation devices had to be removed to due to internal irritation and natural course respectively. Patient was placed in a posterior splint and remained strictly non-weight bearing for 6 weeks. A bone stimulator was then applied about 2 weeks following removal of external fixation surgery. The patient was transitioned to partial weight bearing in a CAM walker 8 weeks final post op. At final follow up,10 week post op, final radiographs were taken and complete fracture healing was noted and patient was transitioned to full weight bearing in soft soled shoe (Figures 4 & 5). During course patient was also prescribed a course of vitamin D and encouraged to continue smoking cessation.

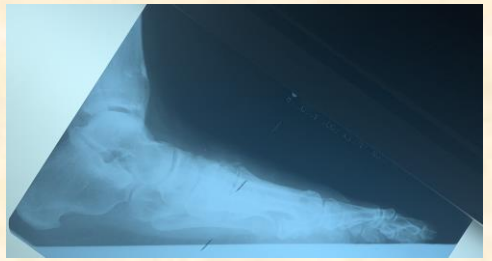

Figure 4

Figure 5

Analysis and Discussion

There is limited publication of the topic of surgical revision after failed first metatarsal closing base wedge osteotomy. One study demonstrated that rates for revision was highest for closing base wedge osteotomy (8.82%) when compared to Chevron-Austin osteotomy (8.19 %) and Modified Lapidus arthrodesis (5.56%). However, it was later stated that the differences in rates of surgical revision was not found to be statistically significant (P-value = 0.42). Complications which may result from Closing Base Wedge Osteotomies are malunion/nonunion resultant from early or frequent weight bearing during post op period, recurrent Hallux abducto valgus deformity, Hallux varus deformity and painful hardware. We believe that the need for surgical revision in this case was resultant of early/frequent weight bearing during the post-op period. This resulted in a dislocated comminuted fracture at the surgical site, displaced hardware, shortening of the first metatarsal and non-union of osteotomy (Figure 1). Surgical revision with use of PCPSBG, TCSSBS and BMA (to reestablish correct length), medial Y plate internal fixation and Mini rail external fixation (for adequate fixation and cortical realignment) successfully corrected this complication which resulted from early weight bearing. This case demonstrated the importance of strict non-weight bearing within post op period, in decreasing likelihood of surgical revision. Our case also lends further consideration to combining multiple fixation modalities in surgical revision of proximal osteotomy procedures especially in non-compliant patients.

References

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