CHAPTER 2

Minimally Invasive Bunionectomy: The Lam Modification of the Traditional Distal First Metatarsal Osteotomy Bunionectomy

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Hallux abducto valgus (HAV) or bunion is one of the most common problems seen by podiatrists. Many patients opt for surgical bunionectomy, although it is not as simple as removing the bunion like the name implies. There are a myriad of procedures a surgeon can choose in order to correct deformity. Coughlin describes causes of HAV that include hypermobility, hereditary, growth, pes planus, and intrinsic intermetatarsal angle abnormalities (1). When selecting a procedure to perform a bunionectomy, the intermetarsal angle is usually the primary variable. Coughlin and Mann suggest that mild deformity can be corrected by a chevron or Mitchell osteotomy, and a moderate deformity corrected by a Mitchell and Akin osteotomy. Severe deformities would benefit most from a proximal joint fusion or proximal osteotomy plus distal soft tissue release/reconstruction (2). Most bunion procedures involve exposure to the metatarsophalangeal joint ligaments and capsule, and most require internal fixation.

However, as our surgical world evolves, more emphasis has been put on efficiency while maintaining patient outcomes. There are many advantages to minimally invasive surgery with percutaneous fixation for a variety of foot and ankle procedures. Patients and surgeons have been increasingly interested in the appeal of less scarring and a possible reduction of complications with smaller incisions. Utilizing a minimally-invasive technique also allows for a shorter operative time. A smaller incision can produce less soft tissue trauma, less swelling, less pain and certainly leave a smaller scar. Using an osteotome and mallet instead of a power saw produces less heat and less bone necrosis. Percutaneous procedures with less bone trauma may allow for early weight-bearing and allow patients to have improved function during their recovery period.

Using power burrs for metatarsal osteotomies has certain disadvantages. The inadvertent trauma to skin, tendon, vessels, and nerves can be severe. The power burr can also be very destructive to bone with thermal necrosis. Lam et al report that 3-mm of shortening can occur with percutaneous burr osteotomy of the first metatarsal (4,5). Studies report good outcomes with the percutaneous use of an osteotome since its first reported use in the 1940s (3,5). Percutaneous procedures have been proposed by Kramer in 1975 and Peabody in 1931. Both reported good outcomes with their percutaneous use of an osteotome. The use of a temporary percutaneous medial buttress pin allows for minimal tissue dissection and provides splintage of deformity correction as the initial bone healing occurs. This procedure allows for correction of a wide range of intermetatarsal angles. Typically, a severe intermetatarsal angle requires Lapidus fusion and several weeks of nonweight-bearing (6). A percutaneous Mitchell technique showed good outcomes with temporary pin fixation and early weight-bearing (7).

TECHNIQUE

The Lam modification of the distal first metatarsal osteotomy bunionectomy utilizes the basic concepts of minimal skin incision, limited soft tissue dissection, less traumatic bone cuts, and temporary percutaneous fixation to improve this procedure. The patient is placed in the supine position on the operating table. A pneumatic ankle tourniquet is placed. Our technique for the minimally invasive bunionectomy includes a 6-mm incision just proximal to the first metatarsal head medial protuberance (Figure 1). Soft tissue structures are reflected dorsally and plantarly using a Freer periosteal elevator (Figure 2). The joint capsule is not opened and the medial condyle is not resected. This dramatically shortens the surgery, and also avoids the most common complication of joint stiffness after a traditional bunionectomy. The adhesions of the medial capsule to the exposed medullary bone are avoided. However, the option of an exostectomy and lateral release is still available if desired.

A Steinman pin and fluoroscopy are used to mark the orientation of the desired osteotomy. The angle of cut is then marked on the skin (Figures 3, 4). An osteotomy is made with an osteotome and mallet in the desired correctional plane under fluoroscopic guidance (Figures 5, 6). The osteotomy is completed through 3 passes of the osteotome (central, dorsal, and plantar) and then the lateral metatarsal cortex bone cut is completed. The capital fragment is manually manipulated and translated via a heavy hemostat and confirmed under fluoroscopy (Figures 7-9).

We are able to direct the capital fragment to create a decompressive, plantarflexory, or a parabola correcting direction with the angle of the osteotome. Once the desired position is confirmed, a Kirschner wire or Steinmann pin is placed lateral to the capital fragment and down the first metatarsal medullary shaft to buttress the metatarsal head (Figures 10, 11). The pin is then bent superiorly and cut, and the incision is closed with one simple or horizontal nonabsorbable suture (Figure 12). The average correction is show in the preoperative and postoperative radiographs (Figures 13, 14). Postoperatively, the foot is dressed with a mild compressive dressing and the patient is able to partially bear weight with a surgical shoe. The suture is removed in 2 weeks and patient is transitioned to a walking boot. The pin is removed in 4 weeks and physical therapy for joint mobility is begun at 6 weeks postoperative.

Figure 1. Incision placement.

Figure 2. Soft tissue structures are reflected.

Figure 3. A Steinman pin is used to mark the orientation of the osteotomy.

Figure 4. Fluoroscopic guidance is used to confirm orientation.

RESULTS

This minimally-invasive bunionectomy technique has shown to be effective in correcting deformity while minimizing surgery time. The average tourniquet time is about 11 minutes. Minimal dissection of periosteum, soft tissue, and no joint capsule incision allows for minimized scar risk, faster bone healing, and less postoperative swelling. Initial data collection from 25 patients, with at least 8-week follow-up, has shown our patient satisfaction to be very high with many patients returning for their contralateral foot within 1 month of the first bunionectomy. Preoperative intermetatarsal angles range from 8.1 degrees to 18.1 degrees. There has been no reduction of correction with removing the buttress pin at the 4-week mark. The average pain score at the 2-week follow-up is 2.5 of 10 (10 = highest amount of pain). There has been no bleeding, no hematoma, no nerve entrapment, and no hypertrophic scar complications. One patient had pin irritation but the pin was pulled at the regular 4-week

Figure 5. Osteotomy is made with an osteotome and mallet.

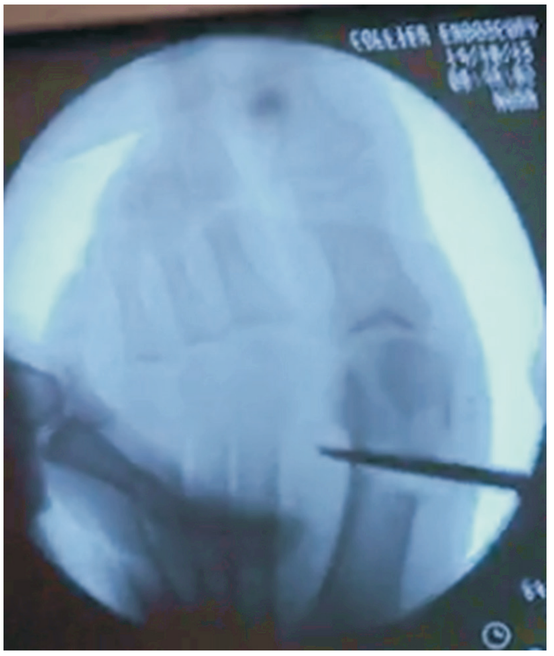

Figure 6. Fluoroscopic guidance is used.

Figure 7. The capital fragment is manually manipulated.

Figure 8. A heavy hemostat is used.

mark and the patient healed without infection. All patients have been able to walk with surgical shoe or surgical boot on the surgical foot immediately after surgery.

The Lam modification of the Peabody Bunionectomy utilizes the basic concepts of minimal skin incision, limited soft tissue dissection, less traumatic bone cuts, and temporary percutaneous fixation to improve this procedure. We will be continuing research in these techniques in terms of patient outcomes, bone healing, pain scores, and range of motion measures.

Figure 9. Placement is confirmed under fluoroscopy.

Figure 10. A pin is placed lateral to the capital fragment and down the first metatarsal medullary shaft to buttress the metatarsal head.

Figure 11. Placement is confirmed.

Figure 12. The pin is then bent superiorly and cut, and the incision is closed.

Figure 13. Preoperative angle.

Figure 14. Postoperative angle.

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