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A Minimally Invasive Surgery Technique for Closing Base Wedge Osteotomy with Fixation for Correction of Bunionette

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Introduction

The bunionette, also known as a tailor's bunion, can be a painful deformity causing excessive pressures to the lateral and plantar fifth metatarsal head. Clinically it is a lateral deviation of the fifth metatarsal head and adduction of the fifth digit at the metatarsophalangeal joint. This deformity can lead to an increase in pressure and frictional forces causing a keratotic lesion furthering the pain and friction and repeating the cycle.[2,4,6]

There are several descriptions of variations in the fifth metatarsal head associating pain with deformity.[1,4] A classification via radiographic analysis was developed by Fallat and Buckholz in 1980. This classification designated type 1 as an enlargement of the metatarsal head, type 2 as a bowing in the diaphysis or neck causing the head to be more lateralized, type 3 as an increase in the fourth intermetatarsal angle, type 4 as a combination of the prior classes.[3,8] Fallat and Buckholz results stated that their population's intermetatarsal angle was an average of 6.2 degrees and an average fifth metatarsal head width of 13 mm. Their findings also suggested that the average bowing angle was 2.64 degrees, and with symptomatic bunionettes they reported an average bowing angle to be 8.05 degrees. The classification system is still widely used today to describe morphologic variations.[3] Kitaoka and Leventen's[5] findings suggested that an increase in the intermetatarsal angle was the most culpable morphologic variant in symptomatic patients.

The literature is well encumbered with surgical techniques to correct the bunionette. It can be advocated that a partial head osteotomy, condylectomy, and fifth metatarsal head excision are appropriate choices of treatment in the elderly and low-demand patients and/or those with a type 1 bunionette.[1] More proximal osteotomies can range from neck and distal diaphysis to base procedures, with a further range of stabilization options from no fixation to robust plating techniques, all intended to medialize the metatarsal head. These have a greater effect on the type 2 and 3 bunionettes.[6-8] There are many treatment choices to choose from; discussion on the full scope of surgical options is beyond the scope of this technique tip.

Our aim of this article is to detail our minimally invasive technique for corrective osteotomy and fixation. Our technique is similar to that of Lui published in 2014.[7] He used an MIS technique in a closing medial wedge fashion of the proximal metatarsal; however, he did not use any fixation and the patient was nonweightbearing for 4 weeks minimum. Our fixation technique allows for immediate protective weightbearing.

Technique

Patients are selected on a radiographic and clinical diagnosis. Patients with pain at the lateral and/or plantar fifth metatarsal head and who have radiographic findings of an enlarged curvature of the metatarsal or increased intermetatarsal angle are considered for surgical treatment. In the surgical theater, the patient is placed in a supine position on the operative table and general anesthesia is induced, followed

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Figure 1. Anteroposterior intraoperative photos demonstrate guidewire placement just proximal to planned osteotomy site.

Figure 2. The starting point of the burr on the medial side of the fifth metatarsal. Note that the starting point is just distal to the guidewire.

by a popliteal and saphenous nerve block. The extremity is prepared in standard fashion. Using fluoroscopy, in standard fashion to a Jones-type fracture, a guidewire is inserted around 2 cm proximal to the fifth metatarsal tuberosity. The guidewire is then advanced into the tuberosity and just proximal to the planned osteotomy site, as shown in Figure 1.

Under fluoroscopic guidance, a No. 15 blade is used to create a stab incision just dorsal to the proximal metaphyseal medial cortex of the fifth metatarsal. A hemostat or freer is then introduced to dissect the soft tissue away from the dorsal and medial side of the fifth metatarsal. The Shannon Recta burr (Enovis Corp, Wilmington, DE) is inserted into the incision against the proximal medial cortex. The burr can be used at any point along the medial cortex between the metaphysis and metaphysis-diaphysis junction, as shown in Figure 2. Starting on the medial cortex, the burr is set to around 5500 rpm. The hand holding the burr then translates the burr lateral and is used to make a transverse to slightly oblique osteotomy to the lateral cortex without a full lateral cortex breach (Figure 3). If the bone void made by the burr is not sufficient to close down or correct enough deformity, additional passes can be performed until an adequate medial closing wedge is reduced. Next, the medial wedge is reduced medially in a greenstick fashion.

Figure 3. The Osteotomy cut made just distal to the guidewire in the anteroposterior view.

Figure 4. Correction of center of rotational angulation of the fifth metatarsal.

Figure 5. A lateral view with a modified burr cut to create a plantar-lateral cortex hinge to add a dorsiflexory reduction in addition to a medial closing reduction osteotomy.

The guidewire is now advanced into the distal diaphysis remaining in the medulla and as midline as possible in all planes, and if possible, advanced into the proximal side of the metatarsal head. A No. 15 blade is used to make a stab incision around the guidewire followed by a hemostat for dissection to the tuberosity. Screw length is determined in standard fashion. An underdrill is advanced over the guidewire. Next, a corresponding measured, typically 4.5-mm partially threaded (surgeon discretion should be used on screw width to fit the medulla), headed, cannulated screw is advanced into the base of the metatarsal over the guidewire. With the osteotomy site maintained in a reduced position from the guidewire, the screw threads are advanced past the osteotomy site and into the distal metatarsal, as shown in Figure 4. A minor modification can be made to the burr angle cut in a dorsal-medial to plantar-lateral fashion if a dorsiflexory reduction would like to be gained by leaving a plantar-lateral cortex hinge (Figure 5).

The stab incisions are closed, and soft sterile dressings are applied to the foot and ankle, followed by a CAM boot. The patient is allowed to weightbear as tolerated. If radiographic evolution demonstrates consolidation at the 4-6-week mark, the patient can transition to a supportive tennis shoe. The clinical difference is shown in Figure 6, with 2 other patient radiographic outcomes in Figure 7.

Discussion

The proximal osteotomy allows for creating a lever arm where little angular correction is needed to provide a powerful distal correction, which has been observed. Koti et al[6] states that a proximal osteotomy for a bunionette has the potential to correct most deformities, and only recommends a distal osteotomy if the normal fourth intermetatarsal angle can be created.

Most of the osteotomies from our experience fall within the zone 3, and although zone 2 and 3 can have a potential for decreased healing potential secondary to the watershed zone, the lateral cortex remains aiding in stability and healing.[9] Although the goal is to keep the lateral cortex intact. If it does fracture, the osteotomy site can still easily be reduced and the guidewire and screw be advanced as described above.

The technique described provides a stable method for correcting type 2, 3, and 4 bunionettes with minimal violation to the soft tissue. This allows for a reduction through the center of angular rotation as well as fixation to allow for maintained reduction and promote osseous healing. The percutaneous screw not only benefits in maintaining reduction and healing but allows for early weightbearing from the time of surgery.

Figure 6. Clinical presurgical (left) and immediate postsurgical (right) changes in lateral foot prominence.

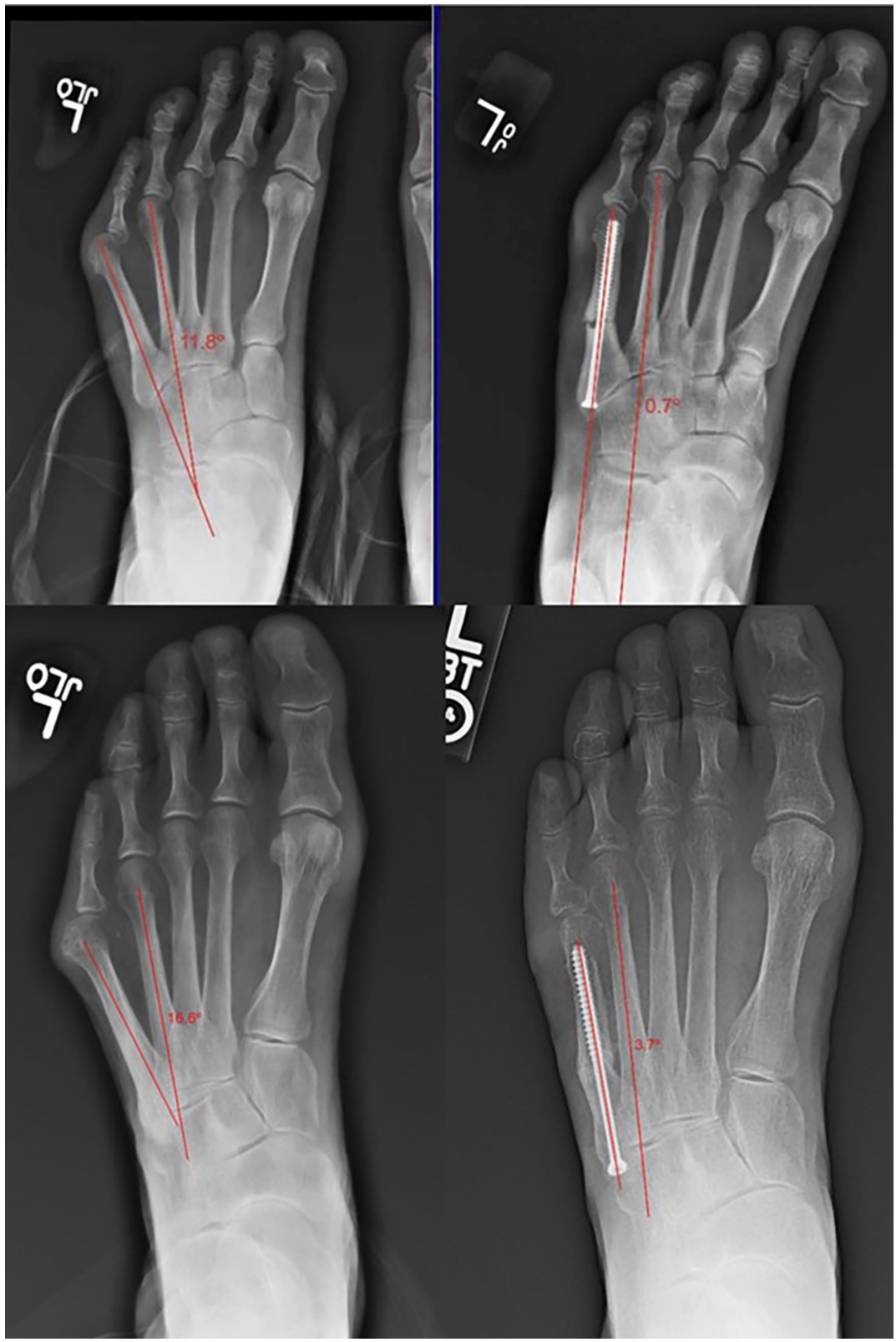

Figure 7. Two sets of pre- and postoperative radiographics. The left side shows an increased intermetatarsal angle in the preoperative state. The right side shows a reduction in the intermetatarsal angle in the postsurgical state.

Ethical Approval

Ethical approval was not sought for the present study because it is a technique guide with no impact or risk to the patient for the creation of this manuscript. Informed consent was obtained from the patient for the publication of this study and accompanying images.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Garret Strand, DPM, reports he is a consultant for Enovis/DJO. Jason Nowak, DPM, reports he is a consultant for Enovis/DJO. Disclosure forms for all authors are available online.

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