Hallux Valgus Correction with Bunionectomy, Lateral Release, and Proximal Opening Wedge Osteotomy Using Wedge-Plate Fixation

Mark Glazebrook, MSc, PhD, MD, FRCS(C)

Based on an original article: *J Bone Joint Surg Am.* 2014 Oct 1;96(19):1585-92.

Introduction

Treatment of hallux valgus with an increased intermetatarsal angle (approximately 12° to 20°) involves surgical correction of the hallux valgus by performing a bunionectomy, lateral release, and proximal opening wedge osteotomy of the first metatarsal (Video 1). The surgical technique provides optimal surgical outcomes and may provide more precise correction, with better stability of the osteotomy site to maintain correction, compared with similar hallux valgus surgeries using a proximal metatarsal osteotomy. Alternatively, a Lapidus procedure (first tarsometatarsal arthrodesis) may be chosen instead of a proximal opening wedge osteotomy if there is clinical instability of the first tarsometatarsal joint, a very large intermetatarsal angle (>20°), or an oblique tarsometatarsal joint in the axial plane.

Hallux valgus with an increased intermetatarsal angle is corrected using three operations through three separate incisions (Fig. 1). First, a bunionectomy is performed through a medial metatarsophalangeal pyramidal capsulotomy (Figs. 2 and 3). Second, a lateral metatarsophalangeal contracture release is completed through a 1 to 2-cm web-space incision (Fig. 4) using an adductor hallucis tenotomy, transverse metatarsal ligament release, and lateral metatarsophalangeal capsulotomy. Third, the proximal opening wedge osteotomy is made using an oblique osteotomy, beginning approximately 1.5 cm distal to the first tarsometatarsal joint on the medial side of the first metatarsal and directed just distal to the lateral aspect of the first tarsometatarsal joint while remaining intracapsular (Figs. 5 and 6). The osteotomy is made perpendicular to the sagittal metatarsal axis, and the lateral cortex remains intact to serve as a hinge. The osteotomy site is opened, and the appropriately sized wedge plate (Figs. 7 and 8) is selected on the basis of the amount of the intermetatarsal angle correction desired. The wedge plate is inserted into the osteotomy site to maintain the corrected intermetatarsal angle. The plate is secured with 2.3-mm self-tapping screws (Low Profile Plate and Screw System [LPS]; Arthrex, Naples,

Florida), and 1 cm³ of autogenous bone graft or bone graft substitute is inserted in the osteotomy site.

Step 1: Bunionectomy

Perform a bunionectomy using a plantar and medial approach over the metatarsophalangeal joint.

- Position the patient supine with the foot and ankle prepared and draped.
- Make a 2-cm slightly plantar and medial longitudinal incision, beginning 0.5 cm distal to the metatarsophalangeal joint (Fig. 1).
- Make a distally based pyramidal capsulotomy centered over the bunion, taking care not to injure the dorsomedial nerve (Fig. 2).
- Resect the bunion with a sagittal saw just medial to the metatarsal head cristae.

Step 2: Lateral Metatarsophalangeal Joint Release

Release the contracted soft tissues lateral to the metatarsophalangeal joint to allow reduction of the noncongruent metatarsophalangeal joint using a 1 to 2-cm incision in the web space.

- Make a 2-cm web-space incision between the first and second toes (Figs. 1 and 4).
- Release the adductor hallucis tendon off the conjoined tendon.
- Release the transverse metatarsal ligament by passing a blunt instrument (e.g., a Howarth elevator) between the metatarsal ligament and underlying nerve, and then use a scalpel to cut the ligament from distal to proximal on top of the Howarth elevator.
- Release the metatarsophalangeal lateral capsule contracture using a limited longitudinal capsulotomy positioned just dorsal to the lateral

sesamoid bone to allow an elliptical opening of the lateral metatarsophalangeal capsule.

- Pass a blunt instrument (e.g., a Howarth elevator) from the medial metatarsophalangeal capsulotomy under the metatarsal head and above the sesamoids to exit the longitudinal lateral metatarsophalangeal capsulotomy to ensure complete mobilization of the sesamoid sling. Take great care to not damage the articular surfaces of the sesamoid-metatarsal articulation.

Step 3: Proximal Opening Wedge Osteotomy

Make the proximal opening wedge osteotomy through a dorsal medial incision.

- Make a 2 to 3-cm slightly dorsal and medial longitudinal incision, beginning 0.5 cm proximal to the first tarsometatarsal joint (Fig. 1).
- Insert a guide pin to guide the oblique osteotomy site, which then is created using a sagittal saw starting 1.5 cm distal to the first tarsometatarsal joint on the medial side to accommodate the L-shaped proximal portion of the LPS plate on the medial and proximal portion of the first metatarsal. Direct the oblique osteotomy proximally, and stop short of the lateral cortex, while ending at a position just distal to the lateral aspect of the first tarsometatarsal joint and remaining intracapsular (Fig. 5). The osteotomy must remain intracapsular in order to provide a soft-tissue hinge that will assist in preventing the lateral cortex from opening and subsequent loss of wedge and angular correction.
- Make the osteotomy perpendicular to the sagittal metatarsal axis to avoid dorsal or plantar deformity, and leave the lateral cortex intact to serve as a hinge (Figs. 5 and 6).
- Open the osteotomy in a very gradual fashion to allow stress relaxation of the remaining intact bone laterally and to prevent fracture with the opening of the lateral cortex. The technique involves stacking mini-osteotomes and using a custom metatarsal osteotomy distraction device that is supplied in the Arthrex LPS instrument tray.
- Select the appropriately sized wedge plate (Fig. 7) on the basis of the amount of intermetatarsal angle correction desired, with each millimeter of wedge corresponding to approximately 3° of intermetatarsal angle deformity correction. Custom wedge-sizing devices are supplied in the Arthrex LPS instrument tray to allow accurate estimate of the wedge-plate size required.
- Insert the wedge plate into the osteotomy site to maintain the corrected intermetatarsal angle.

The plate is secured with 2.3-mm-long LPS self-tapping screws (Figs. 7 and 8).

- If the lateral cortex is breached and the soft-tissue or capsular hinge does not maintain apposition of the lateral portion of the osteotomy, then reduce the lateral aspect of the osteotomy by applying a valgus force to the metatarsal, which is held by rigid internal fixation using the LPS mini-fragment, half-threaded, cannulated cancellous screws directed obliquely across the osteotomy.
- Insert 1 cm³ of autogenous bone graft (from the bunionectomy) or bone graft substitute into the wedge osteotomy space.
- Use intraoperative fluoroscopy to assess the osteotomy position, wedge plate and screw placement, intermetatarsal angular correction, and hallux valgus angular correction.

Step 4: Wound Closure

Close the wounds using nylon sutures, and apply sterile dressings and a cast.

- Irrigate the wounds using sterile saline solution, taking care not to dislodge the bone graft.
- Close the medial metatarsophalangeal capsulotomy using interrupted number-1 absorbable sutures tensioned to hold the proximal phalanx congruent with the metatarsophalangeal head.
- Close all incisions using 3.0 nylon sutures (Fig. 9).
- Apply sterile dressings over the wounds, and then apply a non-weight-bearing below-the-knee cast.

Step 5: Postoperative Course

Patients are restricted to non-weight-bearing and then are progressed to full weight-bearing.

- Patients are asked to remain non-weight-bearing for six weeks in a below-the-knee plaster of Paris cast (a cast change with stitch removal is performed at two weeks postoperatively).
- Patients remain non-weight-bearing for six weeks, are transferred to a boot walker for progressive weight-bearing until painless full weight-bearing is achieved, and then are weaned from the use of the walker boot.
- Finally, patients are encouraged to use a hallux valgus toe spacer and/or brace for up to six months.

Results

Hallux valgus surgical correction, using a bunionectomy, lateral release, and a proximal opening wedge osteotomy, was performed for the treatment of hallux valgus with an increased intermetatarsal angle in a randomized controlled trial¹. The proximal opening wedge osteotomy procedure was proven to be safe and to provide improved clinical outcomes with relief of pain and better function compared with the preoperative status. The proximal opening wedge osteotomy was shown to lengthen the first metatarsal, maintain the lateral talar-first metatarsal (Meary) angle (the angle between the long axis of the metatarsal and the long axis of the talus in the sagittal plane), and provide better first and second intermetatarsal angular correction. The complication rate was low, and there were fewer complications compared with other proximal first metatarsal osteotomies.

Surgeon feedback demonstrated a strong preference toward the opening wedge osteotomy with wedge plate. The ease of performing the opening wedge osteotomy and securing accurate intermetatarsal angle correction were cited as the main reasons for the preference.

What to Watch For

Indications

- A hallux valgus angle of $>20^\circ$ and an intermetatarsal angle of $>10^\circ$
- Persistent, incapacitating symptoms despite nonoperative treatment

Contraindications

- Degenerative arthritis of the first metatarsophalangeal joint
- Substantial neuropathy
- Poorly controlled diabetes mellitus
- Substantial peripheral vascular disease

- Active or recent foot infection
- Open foot ulcer
- Tarsometatarsal instability
- Severe ($>15^\circ$) oblique first tarsometatarsal joint malalignment in the axial plane
- Excessively large ($>20^\circ$) intermetatarsal angles
- Substantial arthritis of the first tarsometatarsal joint

Pitfalls & Challenges

- Failure to recognize large ($>20^\circ$) intermetatarsal angles

Clinical Comments

- When performing the proximal opening wedge osteotomy, one should take care to not cut through the lateral cortex of the first metatarsal to avoid gapping of the lateral cortices and thereby reducing the ability to create a wedge that is required to correct the intermetatarsal angle. If this occurs inadvertently, a lag screw inserted across the osteotomy site may be used to hold the opened osteotomy in a wedge configuration rather than a distraction osteotomy configuration.
- Do not make the bunionectomy resection too large (beyond the cristae), to avoid removing a portion of the metatarsal head that may result in a varus incongruity.
- Be sure to balance the sesamoids with adequate medial and lateral metatarsophalangeal capsulotomies to free the sesamoid sling.
- If the intermetatarsal angle is excessively large or there is substantial instability, obliquity, or arthritis of the first tarsometatarsal joint, one should consider a Lapidus procedure rather than a proximal metatarsal osteotomy.

Mark Glazebrook, MSc, PhD, MD, FRCS(C)

Dalhousie University, Queen Elizabeth II Health Sciences Center Halifax Infirmary, Suite 4867, 1796 Summer Street, Halifax, NS B3H3A7, Canada

Disclosure: The author received payments or services, either directly or indirectly (i.e., via his institution), from a third party in support of an aspect of this work. In addition, the author, or his institution, has had a financial relationship, in the thirty-six months prior to submission of this work, with an entity in the biomedical arena that could be perceived to influence or have the potential to influence what is written in this work. The author has not had any other relationships, or engaged in any other activities, that could be perceived to influence or have the potential to influence what is written in this work. The complete **Disclosures of Potential Conflicts of Interest** submitted by the authors are always provided with the online version of the article.

References

1. Glazebrook M, Copithorne P, Boyd G, Daniels T, Lalonde KA, Francis P, Hickey M. Proximal opening wedge osteotomy with wedge-plate fixation compared with proximal chevron osteotomy for the treatment of hallux valgus: a prospective, randomized study. *J Bone Joint Surg Am.* 2014 Oct 1;96(19):1585-92.

Fig. 1

Preoperative clinical photograph showing the position of the three incisions for hallux valgus surgical correction using a bunionectomy, lateral release, and proximal opening wedge osteotomy.

Fig. 2

Intraoperative clinical photograph showing the distally based pyramidal metatarsophalangeal capsulotomy.

Fig. 3

Intraoperative clinical photograph showing the bunionectomy.

Fig. 4

Intraoperative clinical photograph showing the metatarsal head after the lateral release to remove the lateral contracture and mobilize the sesamoid sling.

Fig. 5
Intraoperative fluoroscopy showing the sagittal saw orientation for the oblique metatarsal osteotomy.

Fig. 6
Intraoperative clinical photograph showing the sagittal saw orientation for the oblique metatarsal osteotomy.

Fig. 7
Intraoperative clinical photograph showing the low profile L-shaped wedge plate in position.

Fig. 8
Postoperative radiograph of the foot showing the corrected hallux valgus and intermetatarsal angle with the L-shaped wedge plate in position.

Fig. 9
Postoperative clinical photograph of the foot showing the hallux valgus correction.