



## Correction of Frontal Plane Rotation of Sesamoid Apparatus during the Lapidus Procedure: A Novel Approach

Lawrence A. DiDomenico, DPM, FACFAS<sup>1</sup>, Ramy Fahim, DPM, AACFAS<sup>2</sup>,  
Jobeth Rollandini, DPM<sup>3</sup>, Zachary M. Thomas, DPM<sup>3</sup>

<sup>1</sup> Private Practice, Ankle and Foot Care Centers, Boardman, OH; Section Chief, Department of Podiatry, and Surgeon, Department of Surgery, St. Elizabeth Hospital Medical Center, Youngstown, OH

<sup>2</sup> Private Practice, Naples, FL

<sup>3</sup> Resident, Heritage Valley Health System, Beaver, PA

### ARTICLE INFO

#### Keywords:

bunion  
first metatarsal  
fluoroscopy  
hallux abductovalgus  
medial cuneiform  
proximal phalanx  
sesamoids

### ABSTRACT

The Lapidus procedure affords correction of a multitude of first ray pathologic entities. When reconstructing the first ray using the Lapidus procedure, the relocation of the first metatarsal over the sesamoid bones with frontal plane rotation should be considered one of the key components. In the present technical report, we have described a bunion correction with emphasis on sesamoid reduction through indirect frontal plane manipulation. Our technique, borne from applied basic anatomy of the first metatarsophalangeal joint, uses intact soft tissues about the first metatarsophalangeal joint to reduce subluxed or dislocated sesamoids.

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Many factors contribute to the maintenance of hallux abducto valgus (HAV) correction. Adequate alignment, soft tissue balancing, an atraumatic technique, appropriate fixation techniques, and post-operative protocols all play a role in a successful outcome. We describe a bunion correction with emphasis on sesamoid reduction through indirect frontal plane manipulation (Figs. 1 and 2). Our technique, borne from applied basic anatomy of the first metatarsophalangeal joint (MTPJ), uses these intact soft tissues to reduce subluxed or dislocated sesamoids.

The sesamoid apparatus of the first MTPJ consists of the 2 sesamoids encased in a thick plantar plate and connected by an interosseous ligament. The sesamoids are connected to the first metatarsal head by a medial and lateral metatarsosesamoid ligament and suspensory ligaments and are connected to the first proximal phalanx by medial and lateral sesamophalangeal ligaments. The sesamoid apparatus is also enveloped on a nonarticular plantar surface by the flexor hallucis brevis, transverse and oblique segments of the adductor hallucis, the deep transverse metatarsal ligament, and fibers of the plantar aponeurosis. The tibial and fibular sesamoids are true synovial joints with hyaline cartilage interfaces (1,2). Our surgical rationale was anatomically based. Frontal plane rotation of the first

metatarsal head by manual reduction and ligamentotaxis provided by manipulation of the first proximal phalanx during the modified Lapidus arthrodesis can reliably reduce the sesamoids under the first metatarsal head, leaving the soft tissues intact. This differs from the translational approach, which relies on resection of the lateral soft tissue structures to translate into the transverse plane. Additionally, the standard techniques using typical anteroposterior radiographs provide static views of the deformity and do not foster consideration of the dynamic effects of the soft tissue around the osseous structures.

### Surgical Technique

A 4- to 6-cm incision is made over the metatarsal cuneiform joint, and the tarsometatarsal ligaments are resected to expose and prepare the joint. The first tarsal metatarsal joint is destabilized, distracted, and prepared using a combination of a power saw, osteotome, mallet, drills, and picks to ensure good subchondral bone exposure. In contrast to the procedures of the past, dissection of the MTPJ is eliminated, just as is the resection of the medial eminence and the lateral release (Supplemental Video S1).

The reduction maneuver is performed by grasping the hallux and derotating the hallux out of the valgus in a varus direction, which places the nail plate in a neutral position, parallel with the ground. The surgeon then dorsiflexes the first digit while maintaining frontal plane alignment, enabling correction of the sagittal plane. The first metatarsal is put into adduction, and the surgeon's thumb is used to put counterpressure on the first metatarsal head, thus correcting the transverse plane. This allows for the entire hallux, sesamoid, and first

**Financial Disclosure:** None reported.

**Conflict of Interest:** None reported.

Address correspondence to: Lawrence A. DiDomenico, DPM, FACFAS, Ankle and Foot Care Centers, 8175 Market Street, Boardman, OH 44512.

E-mail address: [ld5353@aol.com](mailto:ld5353@aol.com) (L.A. DiDomenico).


 Video online only at <http://www.jfas.org>



Fig. 1. Preoperative radiograph.



Fig. 3. Intraoperative view after destabilization of the first tarsometatarsal joint and reduction of valgus rotation of the first metatarsophalangeal joint, with the sesamoids rotated into rectus alignment in the frontal plane.

metatarsal complex to be rotated into a neutral position as 1 unit. The sesamoid correction can be observed under fluoroscopy (Figs. 3 and 4). The first tarsal metatarsal joint is pinned with a 2.0 Kirschner wire from dorsally and distally to plantarally and proximally.

If additional frontal plane rotation is needed, the Kirschner wire is backed out. An additional Kirschner wire is placed in the

proximal metaphysis of the first metatarsal, perpendicular to the weightbearing surface, and used as a “joy stick.” The original Kirschner wire is then reintroduced for temporary stabilization from the distal first metatarsal into the cuneiform. A third Kirschner wire is introduced as a second point of fixation from the first metatarsal head into the second while applying abductory pressure to the first



Fig. 2. Preoperative radiograph.



Fig. 4. Intraoperative view after destabilization of the first tarsometatarsal joint and reduction of valgus rotation of the first metatarsophalangeal joint, with the sesamoids rotated into rectus alignment in the frontal plane.

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