CHAPTER **36**

THE P.I. FIBULAR SESAMOID ELEVATOR: An Instrument to Aid the Lateral Release Process in Hallux Valgus Surgery

Thomas F. Smith, DPM

INTRODUCTION

The sequential release of the contracted lateral first metatarsophalangeal joint (MTPJ) soft tissues within the first intermetatarsal space is an integral part of hallux valgus surgery. The lateral first MTPJ release aids correction of the first ray deformity of hallux abducto valgus on many levels. The lateral release promotes the reduction of transverse plane abduction deformity of the hallux at the MTPJ, which may secondarily promote reduction of any flexible component to an enlarged first intermetatarsal angle. An effective lateral first MTPJ release not only facilitates multi-level first ray deformity reduction, but promotes symmetrical first MTPJ dorsiflexory motion by eliminating the binding of the plantar lateral first MTPJ known as joint tracking. An overzealous lateral first MTPJ release can result in overcorrection of hallux contracture and the opposite deformity of hallux abducto valgus or hallux varus. In terms of the first MTPJ, the art of hallux valgus surgery involves appreciating that point in the lateral first MTPJ release process where effective correction is accomplished without overcorrection.

The P.I. Fibular Sesamoid Elevator (Delta Surgical Instruments, www.deltasurgicalinstruments.com) was designed as a surgical instrument to specifically aid the lateral first MTPJ release process by fostering a thorough and complete mobilization of the fibular sesamoid with limited soft tissue dissection in an attempt to avoid the further steps involving short flexor tenotomy and sesamoidectomy that can potentially result in overcorrection and hallux varus (Figure 1). The instrument, including its purpose and technical use will be described and reviewed.

Fgure 1. The distal blade portion of the P.I. Fibular Sesamoid Elevator.

LATERAL FIRST MTPJ RELEASE

The lateral release of the first MTPJ in hallux abducto valgus surgery involves careful and meticulous anatomic surgical dissection techniques to adequately release contracted structures, while preserving their integrity for other purposes such as tendon transfer, yet respecting vital neurovascular structures. In pain free propulsive gait, the osseous components of the first MTPJ including first metatarsal, proximal phalanx, and sesamoids must all move in concert yet with stability. The hallux abducto valgus deformity represents malalignment of the osseous joint structures of the first MTPJ with associated soft tissue deformities of contracture and binding laterally combined with loss of joint integrity and weakness medially. The lateral first MTPJ soft tissue contractures and associated fibular sesamoid displacement prevent deformity reduction, promote deformity progression, and limit hallux dorsiflexion at the plantar lateral aspect of the first MTPJ. The purpose of the lateral release is to both aid deformity reduction as well as promote any lost or dysfunctional first MTPJ motion.

The lateral first MTPJ release aids reduction of the deformity of the hallux in abduction at the first MTPJ level in the transverse plan concomitantly improving joint congruity through radiographic reduction of the hallux abducto valgus angle. Clinically, realignment of the hallux more linear to the first metatarsal reduces interdigital pressures and pain between the first and second toes and possibly even the adjacent more lateral lesser digits. Functionally, realignment of the hallux more linear to the first metatarsal improves joint congruity reducing the potential for the development of degenerative arthritis or aiding any arthrosis already present by improving joint

mechanics. Structurally, realignment of the hallux more linear to the first metatarsal can reduce secondarily any buckling influence of the hallux through the first MTPJ promoting an increase of deformity of the first metatarsal by increasing the first intermetatarsal angle.

Along with the malalignment of the osseous structures of the hallux abducto valgus deformity, the contracted lateral first MTPJ soft tissues and associated fibular sesamoid malposition can actually limit first MTPJ motion. This type of limitation of joint motion occurs more laterally on the joint than would be expected more globally throughout the joint in the arthritic condition of hallux rigidus. The proximal phalanx is restricted in more lateral first MTPJ dorsiflexion through the contracted lateral soft tissues about the fibular sesamoid even in the absence of arthritic joint changes. With forced first MTPJ dorsiflexion, the hallux motion is bound and limited more laterally, but more freedom of motion is appreciated more medially. The hallux dorsiflexes in the sagittal plane, but rotates into valgus in the frontal plane about the point of plantar lateral first MTPJ binding. This clinical finding has been termed joint tracking or defined as a track bound joint (Figure 2). The lateral first MTPJ release has evolved as a surgical technique to address the impact contracted lateral first MTPJ joint soft tissues have on both the deformity itself as well as any restrictions to free first MTPJ motion.

The lateral first MTPJ release has evolved from fibular sesamoidectomy alone to a sequential process of steps that permits a more logical approach of releasing only those soft tissue structures that are involved with the deformity. The classic fibular sesamoidectomy with associated soft tissue resections to permit excision may result in an overzealous release of structures beyond that needed for effective correction of the presenting deformity. An overzealous release can result in the complication of overcorrection and hallux varus. By employing a step-wise approach to the lateral release, only the deforming tissues are released. A degree of lateral joint integrity is thus maintained to prevent undue medial hallux migration and the resultant over correction of hallux varus.

After each step of the lateral first MTPJ release process with the first ray held in a corrected position, both the corrected position of the hallux at the first MTPJ level as well as the freedom of motion of the first MTPJ are carefully assessed intraoperatively. If the hallux position and motion are acceptable, the lateral first MTPJ release process is considered adequate and stopped at that point. If, as the first ray is held in corrected position, either the hallux remains adbucted at the MTPJ and is not easily reduced or there is valgus rotation of the hallux with dorsiflexion, the adequacy of the lateral release is questioned. The tissues released to this point are first carefully assessed to ensure completeness before proceeding to the next step. If the released tissues are not adequately freed, then the tissues are further incised until the release at that tissue level is complete. If the tissues appear adequately released to this

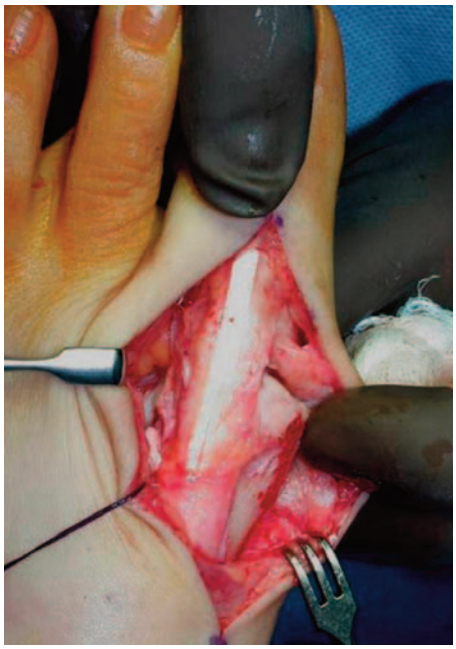

Figure 2A. Assessment of hallux position following lateral first MTPJ release with the first ray held in corrected position.

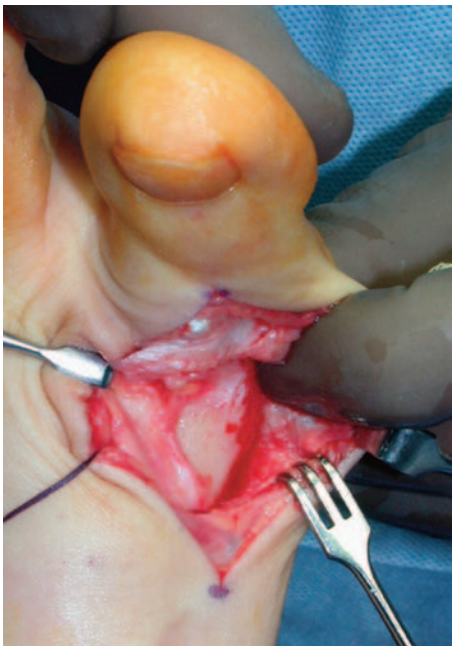

Figure 2B. Dorsiflexion of the hallux at the MTPJ to rule out a track bound joint with the first ray held in corrected position.

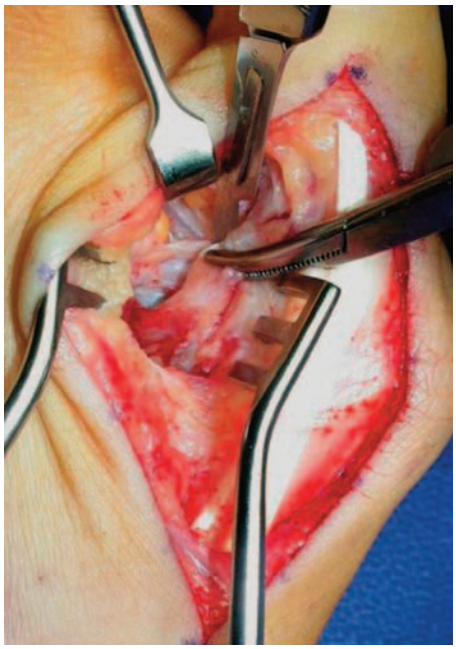

Figure 3. Dorsal view of a left first intermetatarsal space with the adductor tendon grasp in a hemostat about to be incised from the lateral base of the proximal phalanx of the hallux.

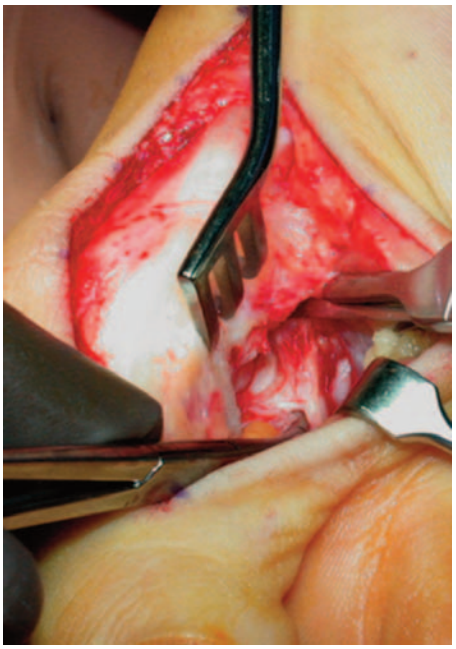

Figure 4. Dorsal view from a distal perspective of a left first intermetatarsal space as the soft tissues tethering the fibular sesamoid are released following adductor tendon release. The hallux is directed to the lower left.

point, then the lateral first MTPJ release process is carried on to the next step. Each contracted tissue level involved must be completely released before progressing to the next step as release of the next tissue level will not compensate for inadequate release of the previous tissue level.

The steps in the lateral first MTPJ release process begin with the incision of the transverse intermetatarsal ligament. Incising the transverse intermetatarsal ligament releases any contractory forces that may be holding the fibular sesamoid or proximal phalanx by extension of soft tissue interconnections into a deformed position. Sectioning of the transverse intermetatarsal ligament permits surgical access into the lower first intermetatarsal space area for possible further lateral first MTPJ soft tissue release steps. Next, if deemed necessary following clinical intraoperative evaluation, the adductor tendon is incised and dissected free from the proximal phalanx and lateral fibular sesamoid surface (Figure 3). Careful intraoperative assessment is again carried out of the hallux position and first MTPJ dorsiflexory motion. If lateral first MTPJ contracture persists or there is a track bound feel to the hallux first MTPJ dorsiflexion, incision of all soft tissues along the dorsal margin of the fibular sesamoid at the metatarsosesamoid joint is carried out (Figure 4). All soft tissues tethering the fibular sesamoid into the first intermetatarsal space are released (Figure 5). This step of the lateral release process does not include the lateral collateral ligament, which runs

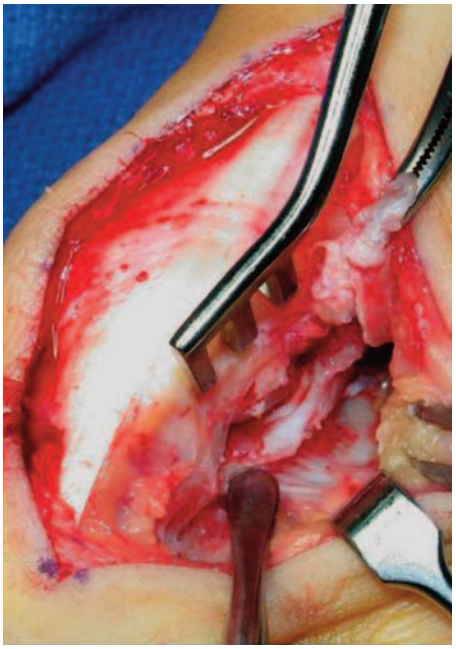

Figure 5. Dorsal view from a distal perspective of a left first intermetatarsal space following adductor tendon and lateral fibular sesamoid release. The adductor tendon is in the hemostat and incised metatarsosesamoid joint is distal to the freer elevator. The hallux is directed to the lower left.

from the lateral metatarsal epicondyle to the plantar lateral base of the proximal phalanx.

The next series of tissues to be released greatly enhance the possibility of hallux varus. Their release is only performed if after careful assessment the release at those levels is considered vital to the overall deformity correction. They include in order: the lateral slip of the flexor hallucis brevis released distal to the fibular sesamoid; the fibular collateral ligament of the first MTPJ; transfer of the adductor tendon into the medial capsule; and finally fibular sesamoidectomy. Good and adequate release of the fibular sesamoid is critical to permit hallux positional correction and unheeded dorsiflexory range of motion unrestricted at the plantar lateral joint level. Release must involve all contracted capsular and ligamentous soft tissues well proximal to the fibular sesamoid along the lateral metatarsosesamoid joint as well as any adhesions of the joint capsule proximal to the fibular sesamoid to the underside of the first metatarsal. If not adequately released and not appreciated, extending the lateral release process to the lateral slip of the flexor hallucis brevis and lateral collateral ligament will not only be ineffective, but further weaken the joint with the possibility of hallux varus. The P.I. Fibular Sesamoid Elevator was designed to aid the complete release of the fibular sesamoid with limited soft tissue dissection obviating the need for undue release of nondeforming soft tissue structures that can result in overcorrection and hallux varus.

INSTRUMENT DESIGN

The P.I. Fibular Sesamoid Elevator is specifically designed for the purpose of aiding a complete release of the fibular sesamoid as a deforming force in hallux valgus surgery (Figure 1). The instrument is modeled after the McGlamry Metatarsal Elevator with special modifications to accommodate its purpose and the special contours of the underside of the first MTPJ. The McGlamry Metatarsal Elevator was designed to release flexor adhesions on the underside of the neck of the lesser metatarsals as one of the final steps in the sequential release of extensor deformities of the lesser metatarsophalangeal joints. The shape of the blade is concave transversely on the upper surface to match the tubular shape of the metatarsals. The blade is concave longitudinally in the long access to compliment the curved shape of the underside of the metatarsal head to reach the plantar metatarsal neck area. The P.I. Fibular Sesamoid Elevator has a similar shape to compliment the underside of the lateral aspect of the first MTPJ. The blade is thicker, to deflect and separate the fibular sesamoid from the metatarsal head with use, to apply tension to the tissues to facilitate incising and release.

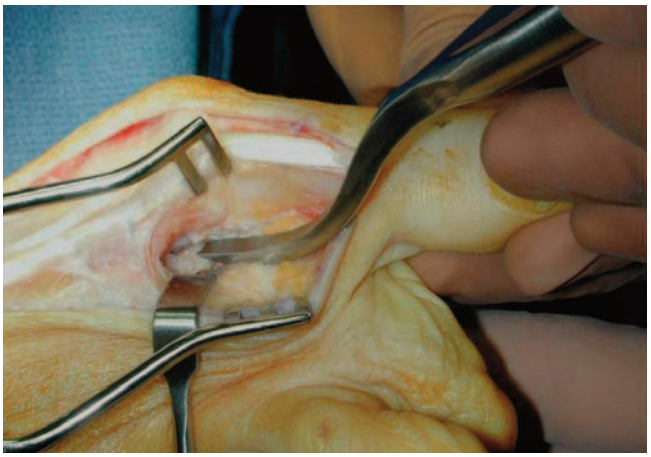

Figure 6. Dorsal view from a lateral perspective of a right foot with the hallux directed to the right with the metatarsosesamoid joint incised prior to insertion of the P.I. Fibular Sesamoid Elevator.

Figure 7. Dorsal view from a lateral perspective of a right foot with the hallux directed to the right with the metatarsosesamoid joint incised following insertion of the P.I. Fibular Sesamoid Elevator.

The distal tip of the McGlamry Metatarsal Elevator is convex and blunt as the instrument is not intended for incising, but elevating and separating soft tissue from bone much as a periosteal Freer-elevator would perform. The distal tip of the P.I. Fibular Sesamoid Elevator is concave and sharper. The concavity permits capture of the lateral first metatarsosesamoid joint capsular edge (Figure 6). Then with forward pressure and with the capsular soft tissue wall tensioned by the thickness of the instrument, the elevator is advanced to incise the capsular wall tissue safely beyond direct visualization well proximal to the fibular sesamoid (Figure 7).

As a second maneuver, the P.I. Fibular Sesamoid Elevator can then be redirected, if needed, to function more as a mini-McGlamry Metatarsal Elevator to release any flexor adhesions of the proximal joint capsule from the underside of the first metatarsal neck at the lateral fibular sesamoid level. The tissue released is limited to the area just behind

the fibular sesamoid, which is virtually inaccessible otherwise, preserving the remaining more medial flexor joint capsular attachments for both flexor joint stability and maintaining vascular supply to the metatarsal head.

The release effect of the P.I. Fibular Sesamoid Elevator, including both the metatarsosesamoid lateral capsular wall and lateral flexor capsular areas, respects and maintains the longitudinal integrity of the lateral head of the flexor hallucis brevis and associated soft tissues much as the McGlamry Metatarsal Elevator maintains the continuity of the lesser ray slips of the distal plantar fascia. If upon completion of this release process, including both the metatarsosesamoid lateral capsular wall and lateral flexor capsular areas, continued malalignment of the hallux in abduction or restricted track bound dorsiflexory motion is still noted, progression to the further steps in the first MTPJ lateral release process is indicated. The next step in the lateral release process is incising the lateral slip of the flexor hallucis brevis between the fibular sesamoid and the base of the proximal phalanx.

The P.I. Fibular Sesamoid Elevator permits complete and confident release of the fibular sesamoid preserving the sectioning of the lateral slip of the flexor hallucis brevis as both a discrete decision and maneuver respecting the instability that can result from these later steps in the lateral first MTPJ release process. The release of soft tissues possible about the entire fibular sesamoid with the P.I. Fibular Sesamoid Elevator can also greatly facilitate fibular sesamoidectomy, which can be challenging. With the relatively sharp tip and the thickness of the blade, the instrument can be directed about the fibular sesamoid to incise more completely and readily the multiple soft tissues that attach to this bone aiding its removal when indicated.

CONCLUSION

The P.I. Fibular Sesamoid Elevator was designed to enhance the lateral release process in hallux valgus surgery. The instrument is intended to facilitate the completeness of the fibular sesamoid release, including both the metatarsosesamoid lateral capsular wall and lateral flexor capsular areas, without undue soft tissue first intermetatarsal space dissection that could compromise the metatarsal head arterial supply or damage veins resulting in difficulties with hemostasis and the potential for hematoma. By effectively employing this instrumentation, ensuring a complete release of the fibular sesamoid, the further steps in the lateral first MTPJ release may be obviated decreasing the possibility of hallux varus deformity following overzealous lateral first MTPJ release of nondeforming soft tissue structures. The instrument is not intended as a substitute for lateral slip flexor hallucis brevis tenotomy; lateral collateral ligament release; adductor tendon transfer; or fibular sesamoidectomy, but only to help prevent undo progression to these steps in the lateral first MTPJ process by ensuring as complete as possible an adequate fibular sesamoid release.

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