

CRITERIA FOR FIBULAR SESAMOIDECTOMY IN HALLUX ABDUCTO VALGUS CORRECTION

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Fibular sesamoidectomy is necessary in certain instances to achieve permanent correction of hallux abducto valgus deformities. The decision to remove the fibular sesamoid is usually based on the position of the tibial sesamoid (which is determined by clinical and radiographic examination).

If the fibular sesamoid is in positions 4 to 7, it is difficult, if not impossible, to maintain the correction of the hallux abducto valgus; if the position is 1 through 3, the sesamoids can be moved medially and maintained by the crista which is still intact.

Surgical Considerations

The question often arises as to whether to remove the fibular sesamoid in a capsule-tendon balancing surgery (McBride) for the correction of hallux abducto valgus. We usually judge whether to remove the fibular sesamoid by observing the position of the tibial sesamoid. The fibular sesamoidectomy is a must, in certain instances, if we are to attempt permanent correction of the deformity. It is imperative to assess the position of the tibial sesamoid as well as the status of the metatarsophalangeal sesamoid articulation.

Knowledge of the normal anatomy and function of the metatarsophalangeal sesamoid articulation is required for its proper appraisal. The first metatarsophalangeal joint articulation differs from the other metatarsophalangeal joints in its sesamoid mechanism. The head of the first metatarsal is grooved anteriorly and inferiorly for the articulation of the two sesamoids which are situated in a fibrous plantar pad. There is a ridge, or crista, between the two sesamoid grooves which seems to stabilize them and prevent displacement (Fig. 1). There are grooves in the metatarsal head for the sesamoids rather than facets because the metatarsal head rotates over the fixed sesamoids in the propulsive phase of gait. There is a jointlike relationship between the sesamoids and the head of the metatarsal. Synovium and synovial fluid are present at their articulation. The sesamoids develop in the two heads of the flexor brevis hallucis tendon as they pass to insert on the base of the proximal phalanx (Fig. 2). The tendons of the abductor and adductor hallucis muscles also insert through the sesamoids to the base of the proximal phalanx.

As the metatarsal tapers proximally, there is an epicondyle on each side of the metatarsal head. These epicondyles serve as the origin for some of the ligamentous structures of the metatarsophalangeal joint. The medial and lateral collateral ligaments and the medial and lateral sesamoidal ligaments have their origin from these

epicondyles. The sesamoidal ligaments run from the epicondyle plantarly to insert into the sesamoid. The collateral ligaments run from the epicondyle in a fanlike fashion (Figs. 3 and 4) to insert into the inferior aspect of the base of the proximal phalanx. The other ligaments of the first metatarsophalangeal joint are the anterior medial and anterior lateral sesamoidal ligaments and the intersesamoidal ligament. The anterior sesamoidal ligament runs from the sesamoid to the base of the proximal phalanx. The intersesamoidal ligament is a tough fibrous band connecting the two sesamoids. These seven ligaments account for the strength and stability of the joint.

Muscles influencing the first metatarsophalangeal joint articulation are the long and short extensors of the hallux, the flexor hallucis longus, and the conjoined tendon of the adductor hallucis (oblique and transverse) with the lateral head of the flexor brevis hallucis and the conjoined tendon of the abductor hallucis with the medial head of the flexor brevis hallucis.

Stability of the First Metatarsophalangeal Joint. Stability of the first metatarsophalangeal joint is necessary in the propulsive phase of gait. The first ray plantarflexes and rotates over the sesamoids. The extensors create a rigid beam so that the hallux may be stabilized against the ground by the flexors. The short flexors through their sesamoid fulcrum are now stabilizing the base of the proximal phalanx to the ground. The abductor hallucis and the adductor hallucis provide medial and lateral stability of the first metatarsophalangeal joint.

The motion of the first ray which normally occurs is dorsiflexion, inversion, and adduction above the transverse plane and plantarflexion, eversion and abduction below the transverse plane. In the propulsive phase of gait, the first metatarsal plantarflexes as it rotates over the sesamoids. The position of the sesamoids is important for stabilization of the hallux. When there is hypermobility of the first ray, the metatarsal is dorsiflexed, inverted, and adducted and

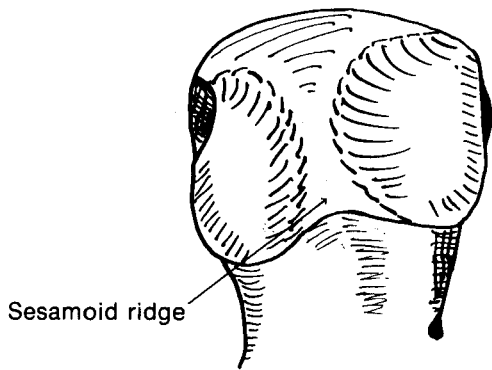


Figure 1. Metatarsal head with sesamoid ridge.

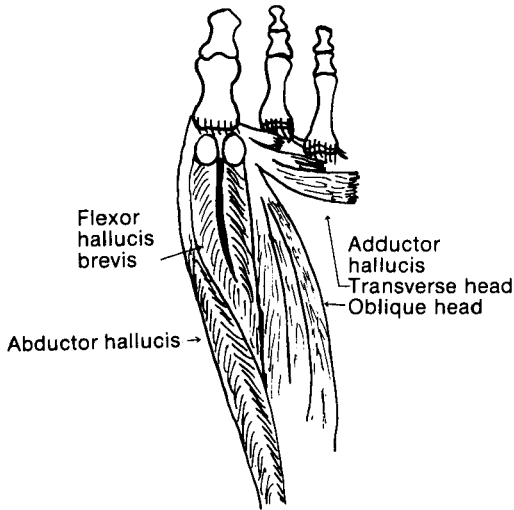


Figure 2. Sesamoid and intrinsic tendons of first metatarsophalangeal joint.

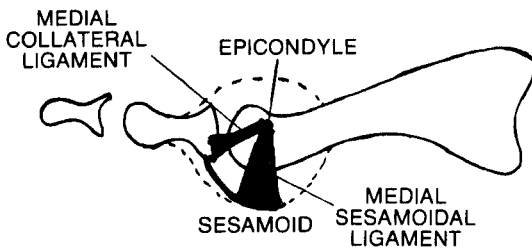


Figure 3. First metatarsophalangeal joint ligaments (tibial side).

displaced from the sesamoids (Fig. 5). The sesamoids appear to have moved laterally, but it is the metatarsal head that has moved.

As the deformity at the first metatarsophalangeal joint progresses, the groove for the tibial sesamoid becomes eroded as the sesamoid encroaches on the crista. As this progression continues, the tibial sesamoid flattens out the crista

and the medial sesamoid groove undergoes degenerative changes, forming the so-called medial sagittal groove. The lateral sesamoid groove becomes flattened and widened as the lateral sesamoid begins to articulate with the lateral side of the metatarsal head. As the deformity progresses, the crista becomes completely flattened and the metatarsophalangeal joint is subluxed. The crista has served as a buttress, preventing complete dislocation. Now the deformity progresses rapidly and the sesamoids appear to have been displaced into the interspace.

Criteria for Fibular Sesamoidectomy. The actual criteria for the fibular sesamoidectomy is established from both a clinical and radiographic examination. Two basic views are utilized—the standard dorsoplantar view and the axial or tangential view of the sesamoids. The tangential view should simulate the position of the foot in the propulsive phase of gait taken in the angle and base of gait. This gives clear visualization of the relationship of the first metatarsal head to the two sesamoids at that time.

It has been described previously that the two sesamoids are held together by the interseamoidal ligament. Because of this and other closely related soft tissue structures, the sesamoids move as one unit. Since all soft tissue structures connecting the sesamoids insert into the base of the proximal phalanx of the great toe, the sesamoids move with the toe. In hallux abducto valgus deformities, when there is abduction of the hallux and dorsiflexion and inversion of the metatarsal, the sesamoids appear to move laterally toward the first interspace. Therefore, in a number of hallux abducto valgus conditions, the medial sesamoid moves laterally under the crista; or in extreme deformities, it may move into the groove once occupied by the lateral sesamoid, after completely destroying the crista.

In this new position, the metatarsal head and the sesamoids are not congruous. The sesamoids become arthritic, lose their hyaline cartilage, become "mushroomed," form spurs, and may even fragment. The inferior surface of the metatarsal head can become arthritic, especially during the trauma to the crista by the sesamoids. This slow displacement of the sesamoids laterally is evident on the tangential view. This is known as tibial sesamoid displacement.

Measurement of Position of Sesamoids. The position of the sesamoids as related to the metatarsal head is measured by utilizing the position of the sesamoid to the long axis of the metatarsal. On x-ray, we note the long axis of the metatarsal head by observing the crista. There are seven basic possibilities of the tibial sesamoid position (Fig. 6A). In the first position, which is considered normal, the tibial sesamoid is on the medial side of the crista (Fig. 6B). On the other hand, in position 6 or 7, the tibial sesamoid is entirely

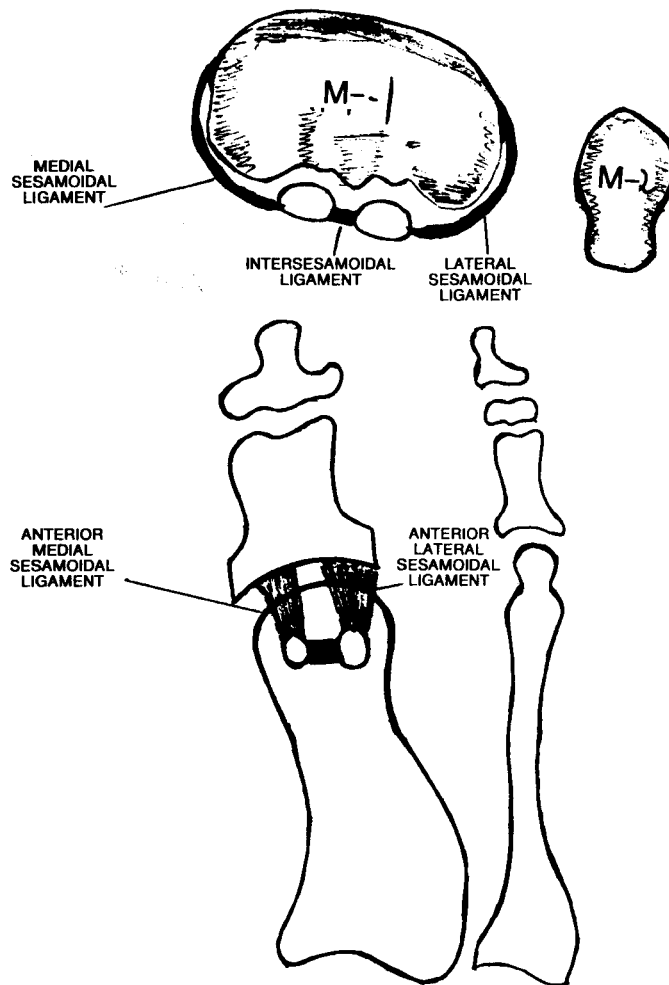


Figure 4. First metatarsophalangeal joint ligaments (plantar and axial views).

lateral to the long axis of the metatarsal head (Fig. 6C). As a result, the crista is destroyed.

Tibial sesamoid position varies with the degree of hallux abducto valgus deformity. Positions 1 through 3 do not demonstrate sesamoid encroachment on the crista, whereas positions 4 to 7 reflect crista destruction, as a result of encroachment by the tibial sesamoid.

Relationship between Hallux Abductus Angle and Position of Sesamoids. There is a relationship between the hallux abductus angle and the position of the sesamoids. A hallux abductus angle of 30 degrees or greater is usually associated with a tibial sesamoid position of 4 or more. If the hallux abductus angle is less than 30 degrees, the sesamoids usually appear normal.

The crista, acting as a buttress, tries to maintain the proper sesamoid position, but as it is worn away, the sesamoids move swiftly toward the interspace.

Removal of the Fibular Sesamoid. Therefore,

a prime consideration for removal of the fibular sesamoid is whether or not the tibial sesamoid is in positions 4 to 7. If the tibial sesamoid position is 1 through 3, the sesamoids can be moved medially with capsular correction and maintained by the crista which is still intact. If the fibular sesamoid is not removed in positions 4 to 7, maintaining the correction is difficult, if not impossible.

Metatarsophalangeal Sesamoid Articulation. The metatarsophalangeal sesamoid articulation is treated just like any other joint. Erosion of the crista is indicative of arthritic changes occurring between the metatarsal head-sesamoid articulation. If pathology exists, in this case arthritis, it must be corrected as you would any other arthritic joint. An arthroplasty of the metatarsophalangeal joint articulation is performed by removing the fibular sesamoid. The fibular sesamoid is removed because of the more severe state of contracture of the muscular and soft tissue

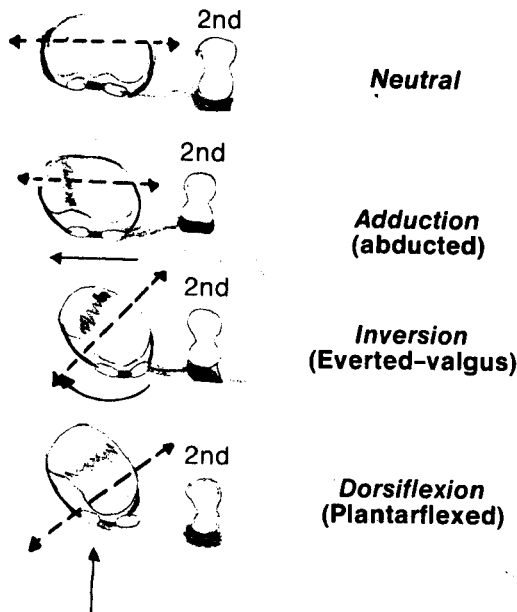


Figure 5. Range of motion of first metatarsal.

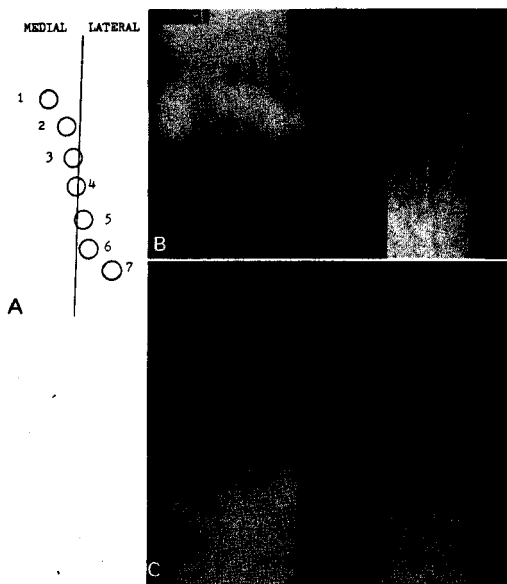


Figure 6. A, tibial sesamoid position; B, tibial sesamoid position 1; C, tibial sesamoid position 6.

structures. Therefore, the fibular sesamoid is removed because it acts as a fulcrum for the deformity and because there is no place for it anatomically.

Operative Procedure

The fibular sesamoidectomy is accomplished by careful, sharp anatomic dissection along

the lateral aspect of the first metatarsophalangeal joint through the subcutaneous tissue and into the interspace. Then bluntly dissect until the sesamoid is located and identified, just inferior but lateral to the first metatarsal head (Fig. 7A). The adductor hallucis, both the transverse and oblique heads, is then identified but not cut because it assists in the removal of the sesamoid. A self-retaining retractor is placed between the first and second metatarsal heads. The fibular sesamoidectomy is accomplished by properly utilizing approximately five sharp cuts. The first cut is about 2 cm. in length, just superior to the sesamoid and along the lateral longitudinal axis of the first metatarsal head, superior to the border of the adductor, to the base of the proximal phalanx (Fig. 7B). This frees the lateral collateral, lateral sesamoidal ligament and the lateral aspect of the capsule. The sesamoid is pulled into the interspace by virtue of the pull of the adductor muscle. The second cut undermines the sesamoid from the lateral and inferior aspect of the capsule by cutting upward (Fig. 7C). The third cut releases the sesamoid attachment posteriorly from the flexor brevis muscle (Fig. 7D). The fourth cut severs the anterior lateral sesamoidal ligament (Fig. 7E). The sesamoid is now only held by the intersesamoidal ligament. The final cut takes place as follows: If you are right handed, working on the right foot, you push the sesamoid laterally and inferiorly and cut distal to proximal. If you are right handed, working on the left foot, push the sesamoid laterally and inferiorly and cut proximal to distal (Fig. 7F). The sesamoid is now free (Fig. 7G).

It must be emphasized that careful dissection is imperative and that haphazard dissection can result in a complete laceration of the flexor hallucis longus tendon, which has its course just inferior to the sesamoids. Transection of the flexor hallucis longus could result in a flexion deformity of the hallux postsurgically. The adductor hallucis muscle can also be spared if so desired.

Conclusions

Therefore, the fibular sesamoidectomy is sometimes indicated for surgical correction of hallux abducto valgus deformities. It is felt that the fibular sesamoid should be removed when we can demonstrate moderate to severe arthritic changes (tibial sesamoid position 4 to 7) occurring between the sesamoid-metatarsal head articulation. Careful dissection and knowledge of the ligamentous structures can simplify its excision without needless trauma.

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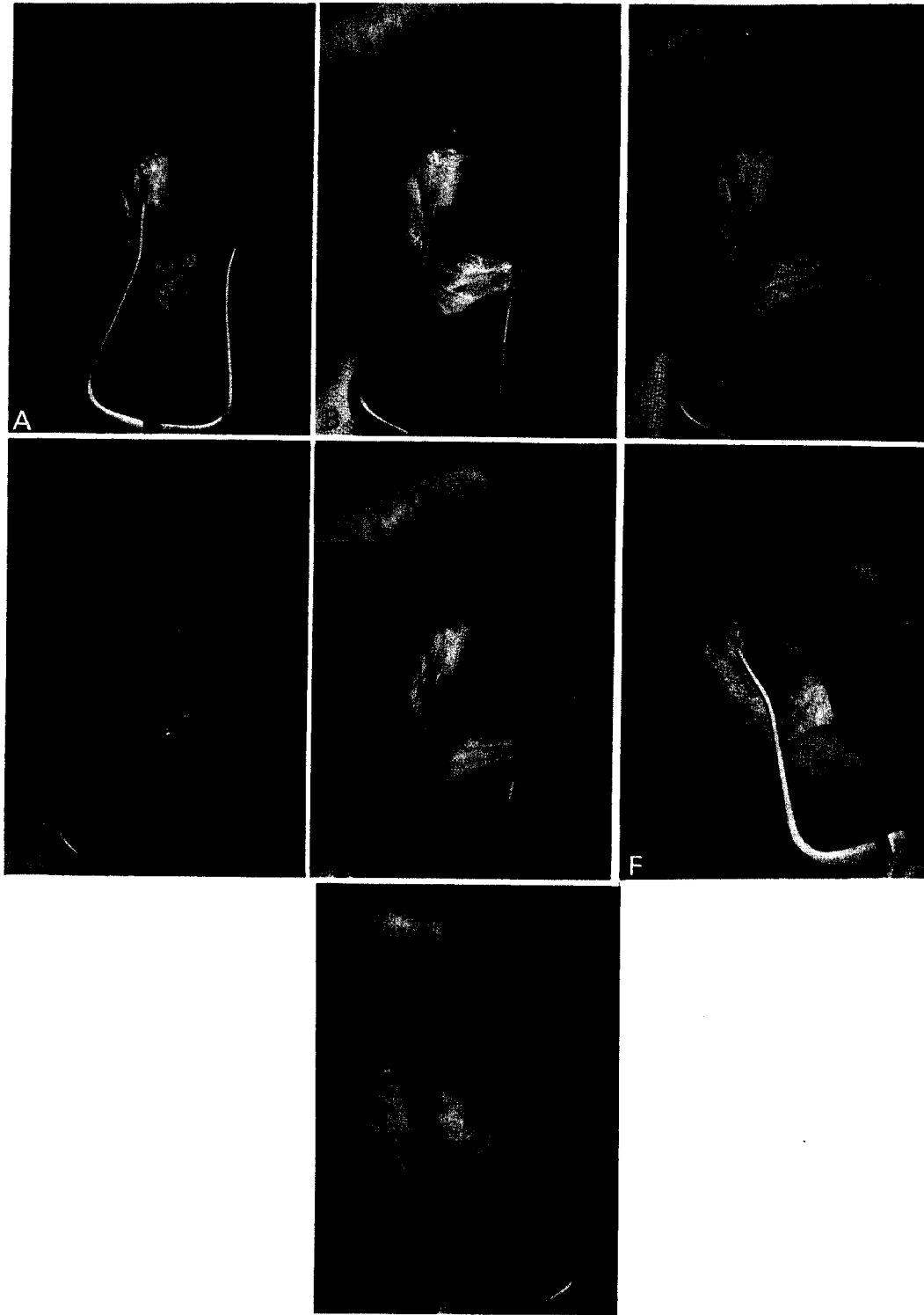


Figure 7. A to G, fibular sesamoid dissection for fibular sesamoidectomy.

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