CHAPTER **27**

SESAMOID COMPLEX INJURIES: Evaluation and Management

Charles F. Peebles, DPM

Sesamoid injuries are very common in a variety of people. Athletes are especially prone to disorders of these bones due to the increased weight-bearing forces produced on propulsion. This is common in activities that require jumping or sprinting as well as in dancers of all types who spend a disproportionate amount of time on the forefoot. The diagnosis and eventual treatment of sesamoid injuries can be a challenge due to the complexity of the first metatarsophalangeal joint (MPJ).

INITIAL EVALUATION OF SESAMOID COMPLEX INJURIES

Pain in and around the first MPJ can arise from a variety of structures. The tibial and fibular sesamoid bones are the most obvious structures at the plantar surface of the first MPJ but the many soft tissue structures can also be the origin of pain in this region. Injuries to the long or short flexor tendons, even microtrauma, can result in increased pain as the initial diagnosis is difficult and may not be identified and treated aggressively. The plantar nerves can further complicate first MPJ pain as the edema and induration can result in impingement or entrapment.

Sesamoid injuries can result from many etiologies. Direct trauma is the most obvious and clearest to diagnose. It can result from either landing directly on the forefoot or from the surface rising up that may occur with various snow and water board related sports. Repeated motion without adequate support can result in a stress fracture of one or both of the sesamoids or with strain of the plantar ligaments or flexor tendons. Forced dorsiflexion injuries can result in damage to either the sesamoids or at the plantar ligaments/tendon. Indirect injuries result from the pull on the sesamoids and sesamoid complex from the proximal muscles and the stable distal ligaments. If any weakness is present in the bone, a stress fracture may develop. Bipartite sesamoids can also present similar to this as the syndesmois between the two fragments can be compromised and can produce long-standing symptoms in the absence of a fracture.

Clinical finding are often consistent with the time period of the injury. Acute injuries often have significant edema and hypersensitvity. Pain is present with direct palpation and can be elicited with dorsiflexion of the first MPJ while palpating plantarly. Attempts should be made to evaluate transverse plane laxity although relatively uncommon unless a twisting dorsiflexion mechanism of injury occurs. In chronic cases, the significant induration can cause nerve compression especially if a fracture or stress fracture has healed with hypertrophic bone.

Radiographic evaluation most commonly consists of plain film studies to identify initial osseous pathology. Dorsoplantar, lateral, and sesamoid axial images are the most widely used. Oblique views may be of benefit, especially evaluating the tibial sesamoid, as osseous overlap may be eliminated. Bone scans can show increased uptake although each view must be looked at as first MPJ arthritic pathology may give a false positive for sesamoidal injuries. Computed tomography scans are most beneficial in evaluating the integrity of sesamoid bones although magnetic resonance imaging is often the better choice if a stress fracture or avascular necrosis is suspected as a differential diagnosis. It is important to match up the clinical history and examination with the radiographic findings and view them independently to best evaluate the possible differential diagnosis.

CONSERVATIVE MANAGEMENT

The initial treatment of any sesamoid complex injury is to decrease the stress applied across the region. This is done to allow an acute injury to stabilize and heal or a chronic injury to remodel and heal. Both types of injury will take a prolonged time to resolve due to the location of the injury and the forces transmitted through the joint. The initial approach should be to reduce ground reactive forces, which can be managed with the use of a dancers pad. If pain persists, the use of plantar splinting of the toe will help to decrease range of motion and therefore let the region heal.

If no positive response occurs then immobilization is often necessary, with either a removable or permanent short-leg immobilization cast. Immobilization may be a first-line treatment in acute injuries. Injections can be used both diagnostically and therapeutically. Diagnostically an

injection given into the flexor hallucis longus (FHL) tendon sheath will reveal a FHL tendonitis and is given by injecting at the base of the proximal phalanx of the hallux directly down to the bone. This allows infiltration into the sheath and avoids injection into the joint non-specifically. Therapeutic injections can be given with soluble steroids into the first MPJ or peripherally. Care must be taken to avoid injecting directly into the tendon complex to limit the risk of rupture. Conservative measures are more beneficial if started at the time of the acute injury. Chronic sesamoid problems are less responsive to conservative therapy do to the delay initial treatment and continuation of the stress inducing forces.

SURGICAL MANAGEMENT

Surgical management of injuries to the sesamoid complex involves many decision processes. The primary choice of procedure is dependent on the specific nature of the injury. If soft tissue injuries are suspected conservative management is usually the mainstay. The acuteness of the injury must also be considered to allow potential healing. Internal fixation of sesamoid injuries is rare and would likely only be undertaken in the situation with an enlarged sesamoid with acute fracture or a large individual patient. Surgical management may involve removal of a part or the entire sesamoid.

The most common approach to sesamoid injuries is to remove the entire sesamoid bone including any fracture fragments. This is used to remove the pain associated with bone fragments moving in a psuedarthrosis and the enlargement of the bone surface contacting the first metatarsal cartilage. The goal is simple but the approach must be carefully considered due to the multiple soft tissue attachments and structures involved with the approach and postoperative healing.

The tibial sesamoid is more easily addressed although maintaining anatomic function is key in preventing complications. Surgical compromise of the medial structures may increase the risk of hallux valgus formation. The tibial sesamoid can be approached medially at the first MPJ with skin incision bisecting the dorsal and plantar medial digital nerves. A medial capsular incision is made dorsal to the sesamoid allowing the majority of the abductor hallucis to be maintained intact and leaving the entire flexor hallucis brevis (FHB) tendon intact. Attention must be directed to any cartilage defect of the metatarsal head caused by the enlarged sesamoid although the removal of the sesamoid should eliminate any pain produced by the contact of bones with this injury. The tendon disruption and capsular compromise must be repaired and the postoperative management including splinting and a period of nonweight bearing will assist in limited long term complications.

The fibular sesamoid is more challenging to approach although the goal of preserving soft tissue structures is the same. A dorsal approach is possible if there is an associated hallux valgus, otherwise it is difficult to remove the sesamoid if the first MPJ is in a rectus position. The plantar approach allows direct exposure to the sesamoid. The skin incision may be placed linearly slightly offset of the bone as weight-bearing stress will be absent when the bone is removed. Care must be taken to avoid the plantar nerve in the region and therefore the incision is made slightly more medial and over the lateral aspect of the FHL tendon.

Dissection is direct to the bone with consistent palpation to ensure direction. When the fibular sesamoid is exposed plantarly a central incision is made and the FHB lateral slip and adductor hallucis tendon are reflected with as much left intact as possible. Care must be taken when freeing the intersesamoidal ligament to prevent damage to the FHL tendon and this should be inspected to insure no compromise to it after removal of the sesamoid bone. The plantar metatarsal articular cartilage should also be inspected. The repair of the tendinous structures must be done anatomically to prevent any imbalance. Skin repair is done through a combination of simple and horizontal mattress sutures to limit scar production. Limiting movement of the toe postoperatively and non-weightbearing allows the soft tissue to heal adequately. Weight bearing begins in a removable cast at 2 to 3 weeks and initiation of range of motion at approximately 6 weeks is recommended to allow the tendons and soft tissue structures to heal.

Partial sesamoid removal may be a beneficial option if a distal fragment is avulsed or distal fracture involves less than 25% of the bone. (Figure 1) Removing a portion of the bone allows the proximal soft tissues to remain intact and with appropriate dissection can preserve the majority of the distal ligamentous and tendinous attachments. The approach is dependent on which sesamoid is involved and is approached in a standard manner. The fragment is removed and the remaining proximal portion is smoothed to insure no damage to the metatarsal cartilage due to a sharp edge of the remaining fragment. The first metatarsal cartilage should be inspected to ensure no damage or arthritic involvement as this can limit the benefits of leaving the sesamoid intact for weight bearing balance. This is a viable option for the isolated cases where a limited portion of the bone can be removed.

In certain situations, injury to both sesamoids may occur and necessitate the removal of both sesamoids. If both sesamoid bones need to be removed, the traditional process would be removal of both followed by hallux

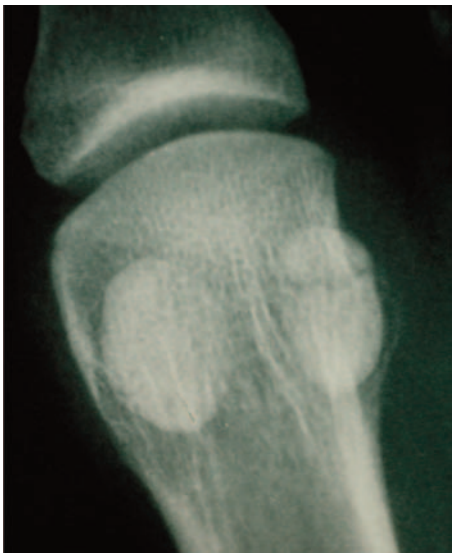

Figure 1. DP radiograph revealing fibular sesamoid fracture with distal fragment 25% of entire bone.

interphallangeal joint (HIPJ) arthrodesis to eliminate the possible hallux malleus formation. Another option is the removal of the bones through a plantar approach maintaining the function of short and long flexor tendons, without the need for HIPJ arthrodesis. The incisional approach is linear directly over the FHL tendon followed by exposure of each sesamoid individually once dissection is carried to this deeper layer. As is done with fibular sesamoid removal the bone is removed from the FHB tendon preserving its integrity and its function. Attention to maintaining the FHL tendon in its sheath is important and one sesamoid is removed and the capsule and tendon reapproximated prior to addressing the second sesamoid. The joint is inspected in both capsular incisions. The deep fascia is reapproximated to prevent the long flexor from dislocating out of place. Postoperatively, joint range of motion is limited for approximately 6 weeks to allow tendon healing and the patient is nonweight bearing initially followed by weight bearing in a removable cast.

The diagnosis and treatment of sesamoid complex injuries involves many factors. The physician must have a high index of suspicion for the various injuries that can occur to and around the sesamoids. Addressed effectively, a very painful condition can be alleviated and the patient can return to normal activities. Conservative measures are often effective if early diagnosis occurs. Surgical management must be considered and planned in a way to address the problem but also to maintain the function of the associated tendons. Sesamoid injuries are best addressed with early diagnosis and maintaining function with anatomic dissection if surgical intervention is necessary.

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