

Complete Great Toe Sesamoid Excision: A Case Series

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ABSTRACT

Background: Hallux sesamoids notably contribute to the biomechanics of the great toe. Although frequently ignored or forgotten, injury to the hallux sesamoids can be debilitating. Conservative management remains the initial approach for symptomatic sesamoid disorders, but surgical excision is an option. We performed a retrospective case series to examine the preoperative characteristics and postsurgical outcomes of patients who underwent great toe sesamoidectomy.

Methods: We reviewed medical records of patients who underwent great toe sesamoidectomy performed by a single surgeon (RAM) during a 10-year period (26 patients, 28 procedures). Data collected included smoking status, prior first ray surgical treatment, high-level athlete participation, diagnosis, preoperative treatment, length of time from symptoms to treatment, and visual analogue scale (VAS) pain score at final follow-up.

Results: The average length of symptoms before operative treatment was about 3 years. Pain at final postoperative visit averaged 1.35 (range, 0-7), with 23 of 26 patients rating pain 0 to 3 measured on a 10-point VAS. Additionally, eight of the nine patients in high-level athletics returned to sports. There were no surgical site infections or wound complications. Two patients with underlying nerve disorders required procedures for treating late-appearing cock-up deformities and great toe metatarsophalangeal pain.

Conclusions: The complete excision of the great toe sesamoid should be judiciously considered for recalcitrant pain attributable to the hallux sesamoids.

Keywords: Great Toe Sesamoid, Hallux Sesamoid, Sesamoid Excision, Sesamoidectomy, Forefoot

INTRODUCTION

The hallux sesamoids are every bit as interesting as their word origin. Roman grammarian, Sextus Pompeius Festus, reasonably claimed the great toe derived its Latin name “allus” from the Greek verb “αλλομαι”: “I spring, leap.”¹ As the language evolved into neo-Latin, “hallux,” started appearing in a medical context.² Our use of sesamoid is reportedly owing to the Greek polymath

Galen who noted the bones’ similar appearance to sesame seeds, derived from the Arabic word “semsem.”³

Anatomically, the sesamoid complex is centered over the plantar aspect of the metatarsophalangeal (MTP) joint of the great toe. The larger tibial sesamoid rests within the medial head of the flexor hallucis brevis (FHB), whereas the smaller fibular sesamoid rests within the lateral head of the FHB. Each tendon inserts into the base of the proximal phalanx, forming part of the plantar plate. Cartilage covers the dorsal facets of the sesamoids and articulates with the plantar aspect of the first metatarsal head. The strong intersesamoid ligament connects the two sesamoids, whereas the flexor hallucis longus tendon runs between them. Tendons from the abductor hallucis medially and adductor hallucis laterally also have fibrous insertions into the sesamoids. The lateral sesamoid additionally attaches to the deep transverse ligament.

These two seed-shaped sesamoid bones vitally contribute to the hallux MTP joint complex. Their functions include transmitting body weight, decreasing friction, powering plantar flexion of the hallux by increasing the moment arm of the FHB, cushioning the first MTP joint, and protecting the FHB tendons.⁴⁻⁸ Owing to considerable mechanical stresses and anatomical variations, the sesamoid complex can be involved in numerous pathological processes. Acute fractures, stress fractures, nonunions, osteonecrosis, chondromalacia, and various inflammatory conditions called sesamoiditis can disrupt the function of the hallux MTP joint complex. The hallux sesamoid complex is involved in 4% of foot and ankle injuries and in 1.2% of running injuries.⁹ The medial sesamoid is larger than the lateral sesamoid, more commonly injured, and receives a greater weight-bearing load.¹⁰

Conservative management remains the initial approach for treating symptomatic sesamoid disorders. If nonoperative treatment is unsuccessful, surgical procedures can be considered. The continuum of operative intervention includes sesamoid-preserving procedures, such as partial shaving to complete sesamoidectomy. During the last decade, the senior operating surgeon (RAM) has performed 28

complete sesamoidectomy procedures for treating 26 patients. We describe a retrospective case series that investigated preoperative characteristics and postoperative outcomes of these patients.

METHODS

After obtaining approval from our Human Research Review Committee (#18-379), we reviewed medical records and radiographs of all patients who underwent complete sesamoid excision from a single surgeon (RAM). In total, 26 patients were treated (21 female, 5 male) and 28 procedures were performed. The mean age of patients at surgical treatment was 44 years (range, 16-70 years). Particular note was made regarding diagnosis, preoperative treatment, length of time from symptoms to surgical treatment, and visual analogue scale (VAS) pain score at final follow-up. VAS pain scores were stratified by mild (score, 0-3), and moderate to severe (score, 4-10). Patient characteristics were noted such as smoking, prior first ray procedure, and high-level athletic participation. There were preoperative and intraoperative modalities frequently used to assess patients (Figures 1A through 1D).

Regarding surgical technique, the medial sesamoid was excised from a medial longitudinal incision made just plantar to the midline. The plantar-medial digital

nerve was retracted inferiorly, and the fascia overlying the sesamoid was incised and elevated circumferentially off the sesamoid to remove the bone. The incision in the fascia was closed with vicryl suture, and the skin was closed with nylon suture. No separate effort was made to reattach the FHB tendon. The lateral sesamoid was removed through a curvilinear plantar incision. After spreading the soft tissues to the fascia overlying the lateral sesamoid, the fascia was removed by incision and elevated off the sesamoid.

Postoperatively, partial weight bearing was advised until the sutures were removed, typically at the 2-week visit. Patients were then advised to progressively increase their weight bearing in a protective sandal for 2 weeks. At 1 month postoperatively, patients returned to using shoes and performing unrestricted weight-bearing activities.

RESULTS

Of the 28 procedures, a total of 26 involved an isolated medial sesamoidectomy. The other two involved an isolated lateral sesamoidectomy and a bilateral sesamoidectomy. The average time to the last follow-up was 4.9 months (range, 0.6-22.7 months). The average VAS pain score at the last postoperative follow-up was 1.35 of 10 (range, 0-7). There were six active smokers



Figure 1. A 29-year-old woman with pain due to medial sesamoid, showing (A, B, C) preoperative and (D) intraoperative imaging during post-sesamoid excision. A) Anteroposterior view of the foot. B) Sesamoid view shows medial sesamoid changes. C) Coronal magnetic resonance imaging with altered proton density signal in medial sesamoid. D) Intraoperative fluoroscopic image shows excision of the medial sesamoid.

during the time of the surgical treatment. At the last follow-up, there was no significant difference in VAS pain score between smokers and nonsmokers ($P = 0.294$).

The average time between initial pain symptoms to surgical treatment was 35.17 months. At final follow-up, patients with mild VAS pain scores ($n = 20$) had a mean of 23.3 months of pain before surgical treatment. This was significantly different ($P = 0.0357$) than patients with moderate to severe VAS pain scores ($n = 4$), who had a mean of 94.3 months of pain before surgical treatment. Two patients underwent previous surgical management, and the duration of their symptoms before undergoing sesamoidectomy was unknown.

Of the 26 patients, a total of 23 had undergone preoperative treatment. Two underwent surgical procedures (ie, great toe MTP fusion and bunion correction) and 21 underwent trials of nonoperative management (ie, physical therapy, cast boot, hard-soled shoe, padding, nonsteroidal anti-inflammatory drugs, and ultrasounds). Comparing postoperative VAS pain scores between patients treated operatively and nonoperatively before the procedure yielded no significant difference ($P = 0.827$).

Regarding return to sports, nine patients were potentially able to return to higher-level athletics. One patient, a professional football player, underwent two separate complete medial sesamoidectomy procedures. The remaining eight returned to sports such as collegiate basketball, cross-country running, dance, and professional football. Of the eight, one patient who previously ran marathons returned to an unspecified sport. There was no significant difference in VAS pain scores between patients that had potential return to sport versus the remaining 18 ($P = 0.399$).

Postoperative complications caused by the sesamoidectomy were not noted in any patient. There were no surgical site infections or wound complications. No patient developed hallux valgus or varus deformity. A 55-year-old woman developed great toe cock-up deformity at 5 months after her procedure and underwent revision great toe interphalangeal fusion. Notably, preoperatively, the woman had preexisting tethered cord, foot drop, and a nonunion great toe interphalangeal fusion. A 48-year-old woman with underlying polio, varus foot deformity, and preexisting extension deformity of all five toes underwent simultaneous complete great toe medial and lateral sesamoidectomy, and extensor tenotomies to all digits. She self-reported "minimal" pain at her 30-day follow-up; but 20 months after the sesamoidectomy, she developed MTP pain and subsequently underwent MTP fusion.

DISCUSSION

Although sesamoid injuries account for a minority of foot and ankle concerns, they can be considerably bothersome to patients. Sesamoid injuries include stress fractures, traumatic fractures, nonunions, and numerous

inflammatory pathological features.⁴ Nonsurgical management continues to be the primary method for treating complex sesamoid injuries, with surgical intervention in refractory cases.

Before the mid-1980s, excision was the main surgical procedure for treating sesamoid injuries.⁴ Recently, numerous surgical options have emerged to treat the sesamoid complex such as curettage and grafting, shaving of the plantar surface of the sesamoid, open reduction and internal fixation using screws, and percutaneous internal fixation. Yet, other authors continue to advocate for complete excision of the sesamoid as the primary surgical intervention.⁷

We contend that complete sesamoid excision may be a viable and beneficial surgical option for patients with sesamoid injuries recalcitrant to extensive nonoperative management. In the current study, our 26 patients reported an average of 3 years of persistent pain before undergoing sesamoidectomy. After undergoing the procedure, 23 patients (88%) reported mild levels of pain (VAS score, 0-3), which is promising.

As with any surgical procedure, sesamoid excision may result in complications. Hallux varus and valgus misalignment can result from lateral and medial sesamoid excision, respectively.⁴ Cock-up and claw deformities can also result from excision of both sesamoid bones.⁴ Other reported complications include stiffness, wound dehiscence, surgical site infection, scar pain, transfer metatarsalgia, and nerve injury (particularly the plantar digital nerve).^{4,11-13} To mitigate these risks, it is essential to incorporate a meticulous surgical technique and proper repair of the soft tissues. It is important to maintain the integrity of the plantar plate and avoid combined tibial and fibular sesamoid excision to decrease possible complications.¹⁰ In the current study, no clear complications resulted due to sesamoidectomy. If we include the two patients who underwent revision procedures (ie, great toe MTP and interphalangeal fusion), the complication rate remains low at 2 of 28 procedures (7.1%).

Although complications are possible, single sesamoid excision does not appear to alter the mechanics of the FHB, to which the sesamoids provide a mechanical advantage. Apter et al¹⁴ showed that removal of the entire medial sesamoid has minimal effect on the FHB moment arm, yet removal of both sesamoids resulted in a one-third drop in great toe plantarflexion. This finding supports high return to activity in active and non-active individuals alike. The following studies have subsequently reported high percentages of patients who returned to preoperative levels of activity in daily living and leisure: Saxena and Krisdakumtorn¹⁵ showed 83%, Bichara et al¹² showed 92%, and Lee et al¹¹ showed 90%. Biedert and Hintermann¹⁶ found that four of five patients (80%) returned to sports completely, with the last patient having mild limitation. The current study reinforces these outcomes, with eight of nine patients (89%) returning to high-level athletic activities

(ie, professional football, collegiate basketball, cross-country running, and dance).

The current study has several limitations. First, this case series describes outcomes of patients undergoing only sesamoidectomy; as such, there is no comparison of one treatment with another. Furthermore, the study is retrospective and therefore a direct and prospective comparison cannot be completed. Additionally, there is a wide range in the comparison of preoperative pain as well as time to follow-up, which may have skewed the reported averages.

Complete sesamoid excision may be a viable and beneficial surgical option for treating sesamoid injuries in patients with unsuccessful nonoperative management. Postoperative outcomes can include substantial pain relief and return to preoperative levels of physical activity, even with professional sports. Although present, risks of the surgical procedure can be minimal when meticulous surgical technique is employed.

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