

## TECHNIQUE

# Plantar Approach for Isolated Fibular Hallux Sesamoidectomy

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## ■ ABSTRACT

Fibular hallux sesamoidectomy via a plantar approach provides excellent pain relief and return to function. The surgical incision allows for direct visualization of the sesamoid and surrounding soft tissue structures, minimizes the violation of normal anatomic structures, and provides for repair of the flexor hallucis brevis tendon following sesamoid excision. Painful scar, hallux varus, and neuromas do not appear to be common clinically. Persistent pain is an uncommon complication.

**Keywords:** sesamoidectomy, plantar approach, hallux, metatarsophalangeal joint

## ■ HISTORICAL PERSPECTIVE

The sesamoid complex of the hallux is most consistently composed of the two sesamoid bones (tibial and fibular) within the tissues of the plantar plate.<sup>1</sup> The sesamoids are invested in the tendons of the flexor hallucis brevis, joined together by the inter-sesamoid ligament and suspended from the metatarsal head by the metatarsosesamoid and metatarsophalangeal ligaments. The sesamoid bones articulate with the plantar surface of the first metatarsal head and in this position function to increase the mechanical advantage of the flexor hallucis brevis tendon.<sup>1</sup> With more than 50% of body weight transmitted through the great toe complex, they are subjected to significant forces of impact loading and shear.<sup>2–4</sup>

Sesamoids of the hallux can be injured by a fall from a height, repetitive stress in runners and dancers,<sup>5</sup> or from forced dorsiflexion<sup>6</sup> or dislocation<sup>7</sup> of the hallux metatarsophalangeal joint. The tibial sesamoid is larger and more commonly affected than the fibular sesamoid.<sup>8</sup> Pathologic conditions affecting the sesamoids include nonspecific sesamoiditis, acute and stress fractures, osteochondritis dissecans, chondromalacia, degenerative joint disease of the sesamoid–metatarsal articulation, and osteonecrosis.<sup>5</sup>

Prior authors have recommended various means of treatment of sesamoid disorders, including percutaneous fixation as well as bone grafting procedures<sup>9,10</sup> For advanced deterioration of a fibular sesamoid, sesamoidectomy has been described through either a dorsal or plantar approach. No consecutive series of isolated fibular sesamoidectomy through a plantar approach has been reported. Rather than a dorsal approach that has previously been favored to prevent plantar skin pain and complications,<sup>2,11,12</sup> we recommend a plantar incision. Richardson et al showed a 96% satisfaction rate in 115 patients with 150 plantar incisions for various forefoot procedures.<sup>13</sup> Furthermore, Lin et al demonstrated the extent and reproducibility of adductor releases through a dorsal approach may be inconsistent and unpredictable, with injury occurring to surrounding structures due to difficulty in visualizing the appropriate anatomic structures.<sup>14</sup>

A plantar incision allows for direct visualization of the sesamoid and surrounding soft tissue structures, minimizes the violation of normal anatomic structures, and provides for repair of the flexor hallucis brevis tendon following sesamoid excision.<sup>15</sup> It should also be noted that preserving the adductor mechanism can be difficult through a dorsal approach.

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## ■ INDICATIONS AND CONTRAINDICATIONS

Indications for surgery include pain and tenderness after failure of greater than 6 months of conservative treatment. Conservative modalities include activity limitation, shoe modifications, orthotic devices, physical therapy, and immobilization. Diagnoses often include avascular necrosis, fracture nonunion, osteochondrosis, and chronic sesamoiditis. Contraindications include advanced degenerative arthritis of the first metatarsal phalangeal joint, advanced peripheral neuropathy, peripheral vascular disease, and significant hallux varus.

## ■ PREOPERATIVE PLANNING

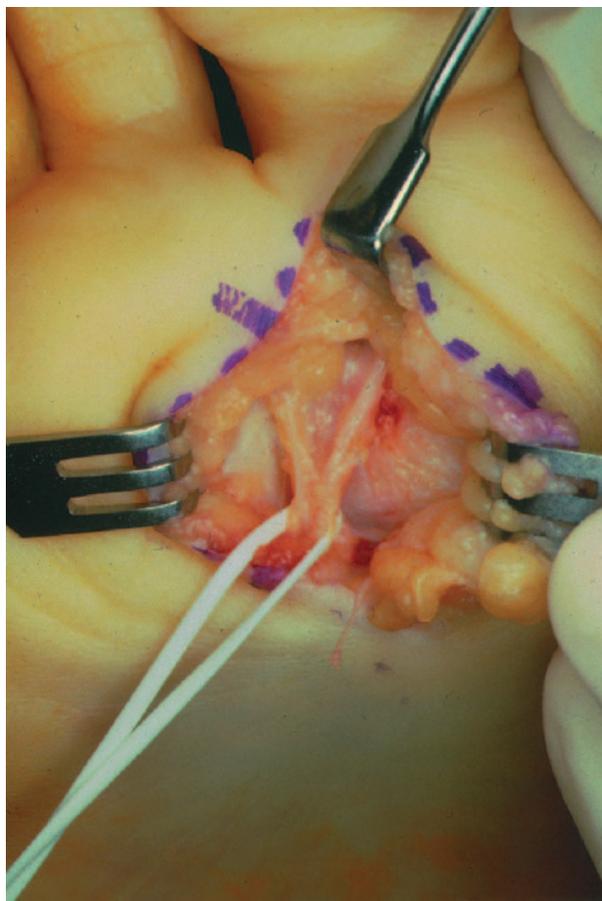
Preoperative evaluation includes thorough assessment of neurovascular status of the lower extremity. The presence of hallux valgus or varus must be identified. One should document the hallux metatarsophalangeal range of motion, noting limitation as well as any midrange painful motion. Differentiation between tibial and fibular sesamoid tenderness plantarly as well as the presence of transfer metatarsalgia must be obtained. Radiographic evaluation includes standing anteroposterior, lateral, and sesamoid views. Additional use of either magnetic resonance imaging (MRI) or bone scan with pinhole images can confirm the diagnosis.

## ■ TECHNIQUE

The procedure is performed in an outpatient setting with ankle block anesthesia and local esmarch ankle tourniquet. A plantar incision is made along the plantar hallucal crease. Dissection is performed with particular care to protect the flexor hallucis longus tendon and the lateral hallucal branch of the medial plantar sensory nerve (Figs. 1,2). The plantar hallucal nerve is protected throughout the case with gentle retraction using a vessel loop. The sesamoid is circumferentially dissected free with a beaver blade and removed. Meticulous soft tissue repair of the created defect is performed as well as preservation of the adductor hallucis tendon (Fig. 3). The skin is approximated with nonabsorbable sutures, avoiding subcutaneous nonabsorbable suture material beneath the plantar skin. The foot is placed in a bunion-type bandage/dressing with the hallux held in slight plantar flexion.

## ■ POSTOPERATIVE MANAGEMENT

Postoperatively, the patient is kept non-weight bearing for 2 weeks and protected for 6 weeks total in a postoperative walking shoe. Sutures are removed at 2 weeks



**FIGURE 1.** Plantar incision is made along the plantar hallucal crease.

postoperatively. A custom-molded orthotic device is used as necessary for return to activities.

## ■ RESULTS

Seventeen feet (16 patients) underwent isolated fibular hallux sesamoidectomies performed through a plantar approach on an outpatient basis. Indications for surgery were pain and tenderness from fibular sesamoid pathology after failure of greater than 6 months of conservative treatment. Exclusion criteria included ipsilateral forefoot surgery, diabetes mellitus, neuropathy, rheumatoid arthritis, and inability to obtain follow-up. All patients except 1 had a preoperative MRI or bone scan to confirm isolated sesamoid disease. Twelve patients available for follow-up had an age range of 21 to 62 years (mean: 32.8 years) and a 15-month to 7-year follow-up (mean: 2.5 years). Twelve patients (13 feet) were available for follow-up via interview or clinical examination.

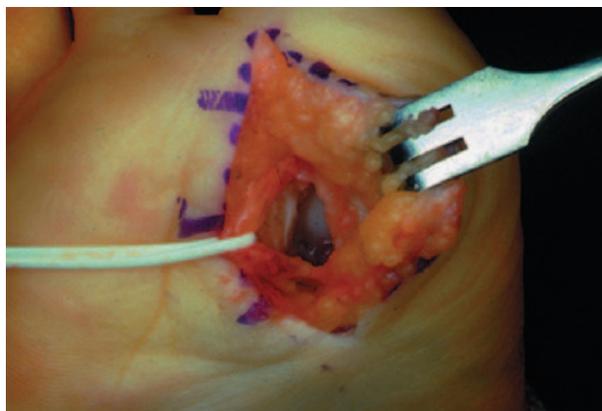
Nine women and 3 men underwent the procedure, which included 6 left feet and 7 right feet. One patient



**FIGURE 2.** The plantar hallucal nerve is protected throughout the case with gentle retraction using a vessel loop.

underwent bilateral sesamoidectomies 1 year apart. Diagnoses included 5 feet with osteochondrosis, 5 feet with chronic sesamoiditis, 2 patients with fracture nonunions, and 1 with intractable plantar keratosis. Four patients had abnormal preoperative MRI versus 7 with confirmatory bone scans. The patient with symptomatic intractable plantar keratosis had preoperative radiographs only.

Nine of 12 patients were very satisfied with their results. One patient was somewhat satisfied, and 2 patients were somewhat dissatisfied; both of these patients were men. Of the 12 patients interviewed, the mean preoperative visual analog scale score was  $8.875 \pm 0.18$  (Fig. 4). The mean postoperative visual analog scale score was  $1.96 \pm 0.78$  ( $P < 0.0001$  with paired  $t$  test). Time to maximal recovery averaged 6 months (range: 1–9 months). No patients had painful scars or neuromas. Three patients experienced transient paresthesias (which resolved in less than 1 month). One patient had difficulty



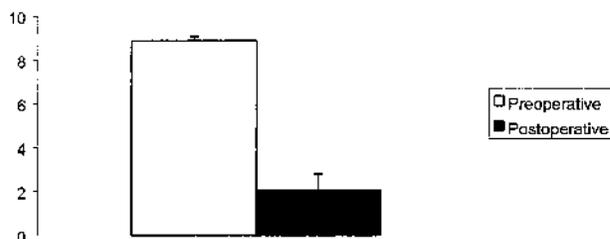
**FIGURE 3.** Plantar view showing defect after excision of fibular sesamoid.

returning to unrestricted collegiate football secondary to persistent pain unexplained by follow-up examination or radiographic studies. One patient continued to rely on nonsteroidal antiinflammatory drugs and orthoses for daily activities. Of the 6 patients available for clinical follow-up, there were no cases of long-term painful scar formation, intractable plantar keratosis, cock-up toe deformity, restricted hallux MP motion, or hallux varus. All patients would have the procedure again.

Overall, the majority of patients were very satisfied with their results. The 3 men available for follow-up have had less satisfying results, but would still have the procedure again. One of these men had no preoperative bone scan or MRI and has persistent pain. One of these patients, a collegiate athlete, is still suffering from diffuse forefoot pain and is still being treated conservatively with orthoses and nonsteroidal antiinflammatory drugs. On the contrary, the remaining patients were all able to return to a high level of activities. Two patients had returned to ballet dancing and 1 to playing collegiate softball. No patients suffered any long-term wound complications or suffered from neuritis.

## ■ COMPLICATIONS

The main complications addressed in the literature are migration of the hallux, incomplete relief of pain, and



**FIGURE 4.** Visual analog pain score. Pre and postoperative.

decrease in motion and strength. Mann and Coughlin reported an 8% incidence of hallux varus following a McBride procedure that includes a fibular sesamoidectomy and the release of the adductor tendon.<sup>16</sup> Mann et al found a combined incidence of valgus and varus deformity of 10% following tibial or fibular sesamoidectomies.<sup>11</sup> The authors emphasize preserving the adjacent medial and lateral capsular ligamentous structures and repairing the defect left from the sesamoid excision.

Pain relief following sesamoidectomy is often incomplete. In the early 1930s, Inge and Ferguson found that only 41% of patients achieved complete pain relief.<sup>17</sup> Mann et al reported complete pain relief in 50% of their patients.<sup>11</sup> Brodsky noted 6 of 23 patients had mild to moderate pain following surgery.<sup>18</sup>

Several reports document that surgical excision of a sesamoid may lead to significant metatarsophalangeal stiffness. Mann et al report that in 33% of cases, significant joint stiffness was observed. When they compared tibial and fibular sesamoidectomy, they found a comparable proportion of each cohort represented. They also found that 60% of patients undergoing sesamoidectomy noted plantar flexion weakness.<sup>11</sup> Brodsky, in a series of sesamoidectomies for fracture, noted 2 of 23 patients had postoperative weakness of plantar flexion.<sup>18</sup>

## ■ POSSIBLE CONCERNS, FUTURE OF THE TECHNIQUE

Although indications are limited, an isolated fibular hallux sesamoidectomy via a plantar approach provides excellent pain relief and return to function. The surgical incision allows for direct visualization of the sesamoid and surrounding soft tissue structures, minimizes the violation of normal anatomic structures, and provides for repair of the flexor hallucis brevis tendon following sesamoid excision. Painful scar, hallux varus, and neuromas do not appear to be common clinically. Persistent pain is an uncommon complication.

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