Interposition of the Flexor Hallucis Longus Tendon Through the Subtalar Joint as a Late Complication of Pediatric Clubfoot Repair: A Case Report

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Interposition of the flexor hallucis longus tendon through the subtalar joint was identified intraoperatively during a triple arthrodesis for a symptomatic adult clubfoot in a patient who had a posteromedial release as a child. The mechanism for this occurrence is unknown, although it is likely that the flexor hallucis longus tendon deviated into the subtalar joint during the early postoperative period. Interposition of the flexor hallucis longus tendon has not been previously reported as a late complication of pediatric clubfoot repair. Level of Clinical Evidence: 4 (The Journal of Foot & Ankle Surgery xx(x):xxx, 2008)

Key Words: clubfoot, flexor hallucis longus, triple arthrodesis

Surgical correction of infantile or childhood clubfoot commonly includes posteromedial release or medial and posterolateral release, which involves a combination of the following procedures: ankle and subtalar joint release, Achilles tendon lengthening, flexor tendon lengthening, and muscle lengthening (1–4). Residual deformities may result from overcorrection, undercorrection, inadequate fixation, or inadequate postsurgical casting (1, 4–7). Undercorrection is the most common late effect and residual supination and adduction deformity may progress (4–9). Symptomatic misaligned feet may be physically disfiguring and also painful, leading some patients to undergo revision surgery, often involving a triple arthrodesis (10, 11).

We report on a case where the flexor hallucis longus tendon was interposed and functioning through the subtalar joint as a likely late occurrence after a posteromedial release. Although anatomical anomalies have been described associated with clubfoot deformity from musculature, vascular, neurological, osseous, and subtalar joint (3, 12–16), the authors' are not aware of any reports documenting congenital or iatrogenic flexor hallucis tendon placement within the subtalar joint.

Case Report

A 22-year-old female with a history of infantile bilateral clubfoot repair presented with complaints of disfigured feet, right rearfoot pain, and difficulty walking. She was born with bilateral clubfeet and, to the best of her recollection, underwent a soft tissue release at a young age. The procedure performed was unknown and the medical records were unavailable. She related no other surgery besides the aforementioned bilateral clubfoot correction as a child. She was taking etodolac 300 mg 3 times per day orally for relief of her foot pain. She also related intermittent smoking of one-half a pack per day for 7 years before presentation, although she had discontinued smoking prior to her evaluation; and she denied any alcohol use. She related a family history of clubfoot, as her older brother had been born with a unilateral clubfoot. She also indicated that she was not working due to an inability to stand for long periods of time secondary to her foot pain.

Physical examination of the right foot demonstrated an adult clubfoot. There were well-healed incisions posteriorly over the Achilles tendon and a medial incision over the rearfoot. The foot was adducted and supinated with semireducible hammertoes involving the second through fifth toes. Muscle strength of all pedal extrinsic compartments was full strength. Ankle joint range of motion was without

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FIGURE 1 Preoperative weight-bearing anteroposterior radiograph demonstrating a maligned adult clubfoot deformity. A skew foot is noted.

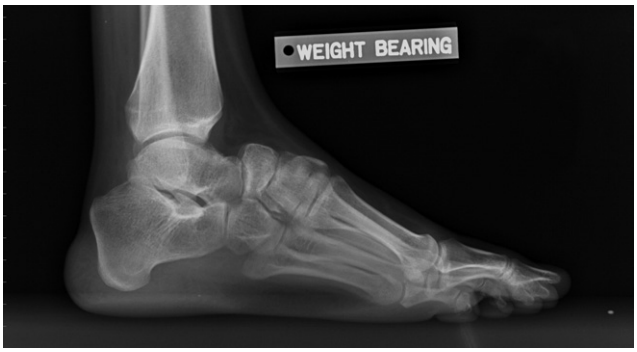

FIGURE 2 Preoperative weight-bearing lateral radiograph demonstrating a maligned adult clubfoot deformity. The calcaneus is somewhat hypoplastic and the talonavicular joint is dislocated.

crepitus and exhibited approximately 15° of dorsiflexion with the knee extended, and her rearfoot motion was severely restricted for both pronation and supination. There was mild tenderness upon palpation of sinus tarsi, and there was no evidence of Tinel's sign. The dorsalis pedis and posterior tibial pedal pulses were readily palpable. The resting calcaneal stance position was 2° of valgus on the right foot. Weight-bearing radiographs demonstrated a cavus foot architecture with adduction of the forefoot (Figures 1 and 2). The posterior tuber of the calcaneus was grossly hypoplastic and shortened. The talonavicular joint (TNJ) was dorsally subluxated approximately 25% and demonstrated subchondral sclerosis. The navicular was wider medially and narrower laterally, and a metatarsus adductus was present. No other diagnostic imaging was considered necessary. A trigger point corticosteroid injection (triamcinolone acetonide, 10 mg) was instilled into the sinus tarsi, which resulted in temporary partial pain resolution. In an effort to try to alleviate her pain on a permanent basis, and given the clinical and radiographic malalignment of her right foot, the decision was made to pursue triple arthrodesis to realign the foot in a more effective position.

The patient underwent triple arthrodesis via medial curvilinear incision and lateral Ollier approach. The TNJ was initially resected by means of curettage, after which the subtalar joint (STJ), via the Ollier incision, was prepared, again primarily by means of curettage. During the preparation of the subtalar joint, a tendon was noted coursing through the joint from posterior to anteromedial deep to the capsule. Traction manipulation of the tendon resulted in strong plantarflexion of the first metatarsophalangeal (MTP) and the hallux interphalangeal joints, indicative of the flexor hallucis longus (FHL) (Figure 3). An initial attempt was made to release the medial STJ capsule in an effort to extirpate the FHL tendon from the joint, however it was determined that by means of manipulation and direct inspection that this would be too disruptive so, therefore, the decision was made to sacrifice the tendon by means of resection proximal to the master knot of Henry. Thereafter, the calcaneocuboid joint (CCJ) was prepared for arthrodesis. The procedure was completed using interfragmental compression screws to fuse the prepared joints, after which standard layer closure and application of a Jones splint was undertaken.

The postoperative course progressed uneventfully to satisfactory healing. Muscle strength testing at approximately 1 month postoperative revealed full (5/5) strength plantarflexion of the first MTP joint and minimal plantarflexion of

FIGURE 3 Intraoperative photograph demonstrating the interposition of the flexor hallucis longus tendon through the subtalar joint. The tendon is placed over a curettee. (*arrow*). Note the plantarflexion of the great toe as the tendon is pulled proximally.

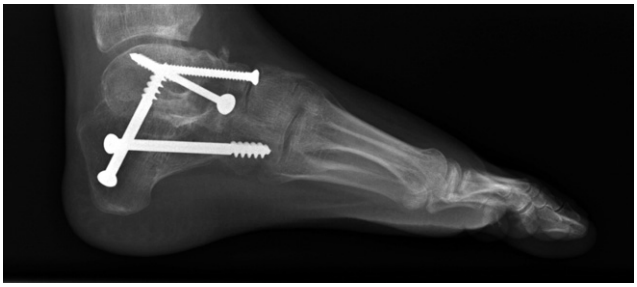

FIGURE 4 Postoperative lateral radiograph demonstrating a healed triple arthrodesis. Note the realigned talonavicular fusion.

the hallux interphalangeal joint (4-/5), suggesting that the FHL tendon function remained intact via the flexor digitorum longus action through the master knot of Henry. A short-leg non–weight-bearing cast was used for 8 weeks, at which time radiographs demonstrated satisfactory fusion of all 3 joints, and weight bearing was initiated with a removable immobilizing walker for 2 weeks followed by an additional 2 weeks in a stiff-sole shoe. Return to regular shoes was tolerated well at approximately 3 months after the operation, at which time the radiographs revealed a healed triple arthrodesis (Figures 4 and 5).

Discussion

Infantile clubfoot repair that does not respond to manipulation and casting may require surgical correction, most commonly involving an Achilles tendon lengthening, ankle and STJ release and, in some cases, flexor tendon lengthening (1–4). Some also advocate lengthening the abductor

FIGURE 5 Postoperative anteroposterior radiograph demonstrating a healed triple arthrodesis. Note the realigned talonavicular fusion.

hallucis muscle along with plantar muscles and fascia, identifying them as the main cause of residual forefoot adductus after the initial surgical procedure (8, 17), while others identified talonavicular subluxation as the main etiology and advocated internal fixation (6, 16, 18). During the medial release, the flexor tendons remain adjacent to the released

STJ and, to our knowledge, there are no published reports that describe the short- or long-term complication of flexor tendon interposition into the released STJ in association with clubfoot repair.

In this case, we identified interposition of the flexor hallucis longus into the subtalar joint intraoperatively while performing a triple arthrodesis for residual malalignment with pain after an infantile clubfoot repair. We hypothesize that the flexor hallucis longus tendon became routed through the subtalar joint as a result of the infantile clubfoot repair. We are not familiar with any clubfoot procedures that purposely interpose any one of the tendons through the STJ. In the case described in this article, it is likely that this event happened either as the result of iatrogenic intraoperative error or as the result of the early postoperative care during which the tendon may have deviated into the STJ during postoperative manipulation before adequate healing of the capsule. Anatomical variation must also be considered as a possible cause for the observed tendon interposition. Anatomical anomalies reported to be associated with clubfoot deformity include accessory musculature; increased fibrosis of muscle tissue; vascular malformation; and ischemic sinus tarsi area, talus, calcaneus, and navicular (3, 12–16, 19–21). There are, however, no reports of anatomical variation of the FHL tendon in association with either a clubfoot or a normal foot, wherein the tendon is interposed into the STJ.

Identifying the abnormality observed in the case that we described in this report, during the preoperative period, and/or attributing the patient's symptoms to the tendon's course through the STJ without direct surgical inspection, or magnetic resonance imaging (MRI), would be challenging. In this case, the clinical exam did not demonstrate any significant findings that would alert the surgeon to consider this, and we did not deem that a preoperative MRI was indicated, although such imaging may have been useful in identifying the tendon's course preoperatively. The patient demonstrated full FHL muscle power clinically and manipulation of the big toe did not elicit pain. Although the patient's complaints focused on the sinus tarsi, it was possible that the routine excursion of the tendon produced her symptoms. Diagnostic injections may not have offered additional insight, and in this case a sinus tarsi injection temporarily offered some pain resolution. In this clinical situation, moreover, the diagnostic value of an isolated subtalar joint injection is also unclear.

Furthermore, the surgical management of this type of tendon interposition is not straightforward, and this is especially true when the condition is not identified pre-operatively. In the case described in this report, the tendon interposition was identified intraoperatively as the subtalar joint was being prepared for triple arthrodesis. Because we approached resection of the STJ through the lateral incision, it was not possible to relocate the tendon anatomically from this approach. We were able to inspect the FHL tendon's course medially via the talonavicular fusion site, which was prepared prior to the lateral approach for exposure of the STJ. However, we felt that the additional dissection of the medial talocalcaneal capsule that would have been required in order to have anatomically relocated the FHL tendon would, in this particular patient, have compromised the vascularity to the talus and subsequently jeopardized the fusion along with possible avascular necrosis of the talus itself (22–24). Therefore, we elected to sacrifice the FHL tendon and remove the tendon ends from the fusion site. Because the FHL transection occurred proximal to the mater knot of Henry, no additional tenodesis was performed, as it was felt that the flexor digitorum muscle would maintain an effect of the hallux. In hindsight, had an isolated medial surgical approach to the talonavicular and subtalar joints been preformed, then rerouting the flexor tendon may have been a more appealing option. Although it has not been deemed necessary up to 1 year postoperative, a secondary repair of the FHL tendon may be performed at a later date if the patient ever becomes symptomatic.

In conclusion, interposition of the FHL tendon as a late effect after infantile clubfoot repair seems to be a very rare condition. We recommend that surgeons consider this as a potential cause of symptoms in the adult clubfoot that has been previously operated on during the patient's childhood. Additional imaging may be helpful if one suspects this late complication, especially as one considers reconstructive procedures that include arthrodesis. Also, in regard to infantile clubfoot repairs, surgeons should consider flexor tendon position intraoperatively and be cognizant of its final position prior to closure, as a preventative measure.

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