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Repair of Iatrogenic Rupture of the Flexor Hallucis Longus Tendon Following an Akin Osteotomy: A Case Report and Review of Literature

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Rupture of the flexor hallucis longus (FHL) tendon is rare in the absence of trauma and associated systemic disease. Rupture of FHL is also rare in hallux valgus corrective surgery. We present a case of FHL rupture after Akin osteotomy for hallux interphalangeus, a brief literature review and treatment options. We assert the benefit of exploration and primary repair of the FHL, especially if the rupture is distal to the knot of Henry. The aim of repair is to regain proprioceptive input from the joint and facilitate metatarsophalangeal (MTP) joint plantarflexion.

Key Words: Hallux valgus, bunion, flexor hallucis longus (FHL), hallux interphalangeus, FHL tear, FHL rupture, Akin osteotomy

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Flexor hallucis longus (FHL) rupture is commonly associated with trauma and occasionally systemic disease. Those patients with systemic disease, such as diabetes, lupus, gout, psoriatic arthritis, Systemic lupus erythematosus (SLE), kidney disease and Reiter's disease are susceptible due to weakness within the tendon structure. Trauma can be direct open injury causing laceration to the plantar aspect of the foot resulting in injury to the FHL tendon, or closed injury commonly associated with overuse in athletes and ballet dancers. Due to its contribution to maintenance of the longitudinal arch, damage may lead to pes planus.

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Rupture can occur at one of 3 sites or zones.[1]

- Zone 1; just proximal to the FHL insertion, distal to the sesamoids
- Zone 2: the area between the sesamoids and the knot of Henry.
- Zone 3; proximal to the knot of Henry.

Treatment options for disruption of the FHL include non-operative, primary open end-end repair, tenodesis to the FDL, tenodesis of the distal FHL to the remnant of FHB tendon, tendon transfer using a slip of the FDL tendon, or IPJ fusion.

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Figure 1 Post-operative radiograph of bilateral Akin osteotomies.

Case Report

An otherwise fit and well 45 year-old female patient was seen six weeks post bilateral Akin osteotomies (Fig. 1). There were no reported complications at surgery but at review, she was unable to plantarflex the right big toe, noticeable as she was able on the contralateral side. She had no neurological deficit. Her surgeon had recommended interphalangeal joint (IPJ) fusion. She was unconvinced by this and sought second opinion.

She was seen at eight weeks post-operation in a dedicated foot and ankle clinic where an ultrasound of her right foot was carried out. It suggested an intact flexor hallucis brevis (FHB) tendon and revealed a torn FHL tendon. The tendon distally appeared to extend to the base of the proximal phalanx which suggested the site of the rupture to be the base of the proximal phalanx, i.e., in close proximity to the akin osteotomy. She was counselled regarding the treatment options, namely non-operative, IPJ fusion or exploration with a view to repair of the torn tendon.

Figure 2 Intra-operative identification of FHL Tendon.

One of her main concerns was her inability to grip the floor with her toe and therefore non-operative management or fusion of the IPJ were unacceptable to her. She opted for exploration and repair and gave informed consent.

She underwent exploration and repair of the FHL tendon with re-alignment of the sesamoid mechanism of the big toe ten weeks post Akin osteotomy. A longitudinal lazy "S" incision was made in the plantar aspect of the right big toe, centred over the metatarsophalangeal (MTP) joint. The ruptured distal and proximal ends of FHL tendon were identified (Fig. 2). The flexor hallucis brevis tendon was found to be intact. The proximal tendon had retracted to the level of mid metatarsal. Following soft tissue release, the two ends of the FHL tendon were approximated and primarily repaired. Tendon transfer was not required.

The big toe was placed in a plaster of Paris with the toe flexed at the MTP Joint to reduce tension and kept initially for 2 weeks when her plaster was removed for wound check. The plaster was then reapplied for a further 2 weeks.

At 4 weeks post repair, she was advised on active mobilization of the big toe whereby she was shown how to mobilise the big toe herself and asked to actively flex and extend the toe. This period of active mobilization continued for 2 weeks. At 6 weeks post operation the physiotherapists then commenced additional passive mobilization, assisting the patient's own active movements of the great toe (active-assisted mobilization). This continued until her 6 month review post-repair when she was reviewed by the senior author. Functionally she is now walking normally. She has good plantar flexion of the MTP joint but no plantar flexion at the IPJ.

Anatomy

The FHL originates at the distal 2/3 of the posterior fibula, interosseous membrane and adjacent intermuscular septum within the deep compartment. It is supplied by the tibial nerve from branches of the S1/S2/L5 roots. The tendon passes through the posterior aspect of the fibro-osseous tunnel and plantar midfoot, known as the knot of Henry. It inserts on the plantar surface of the base of the distal phalanx of the greater hallux, passing between the medial and lateral sesamoid bones at the metatarsophalangeal joint. It passes beneath the sustentaculum in an oblique manner prior to inserting on the base of the distal phalanx.

The FHL flexes the great toe. It has a synergistic action with flexor hallucis brevis in assisting with plantar flexion of the foot at the ankle. In addition, it contributes to the distribution of forces at the plantar side of the forefoot and maintains the longitudinal arch of the foot along with the plantar fascia.[2]

Literature Review

A search of the literature was carried out on Embase and PUBMED using the search strings 1) "FHL rupture" "Flexor hallucis longus rupture", "FHL tear" "flexor hallucis longus tear" and 2) "akin osteotomy" "hallux valgus" "bunion". The two search strings were also combined to ascertain whether there was literature pertaining to the two conditions concurrently.

Although the search returned a number of case reports and series pertaining to FHL rupture,[3-18] there was only one case of rupture associated with hallux valgus surgery[19] found in the literature. They reported this as likely partial iatrogenic laceration at the time of surgery. Their patient was treated with surgical debridement of the distal stump of the FHL from under the first MTP joint and tenodesis of the proximal stump to the flexor digitorum longus (FDL) tendon.

Discussion

FHL and FDL have interconnections in the foot, so if it is cut proximal to knot of Henry (where the tendons cross), then the FDL has a mass action with FHL. This has implications for harvesting the FHL for tendon reconstruction; if harvested at this site it is safe to sacrifice. However, if the tendon is ruptured distal to Knot of Henry, then plantar flexion will be deficient and may be unacceptable to patients. This suggests repair of FHL should be attempted.

A high percentage of FHL ruptures are associated with nerve injuries (50% of patients had distal nerve lacerations), but our patient had an isolated FHL rupture. She also continued to have no plantar flexion at the IP joint which is in keeping with the experience of most authors who assert that primary repair of distal injuries are associated with minimal postoperative IP joint motion.

Following repair of FHL, patients may experience restricted IP joint motion, contracture of the IP joint due to a tight FHL tendon for which Coghlan & Clarke[20] suggest a Z-lengthening of the FHL to achieve acceptable results.

A literature search confirmed the rarity of rupture of the FHL in the absence of systemic disease. The paucity of case reports regarding iatrogenic rupture of the FHL tendon at the time of hallux valgus corrective surgery could be due to rarity of the event or reluctance to report.

Conclusion

The FHL is at risk during hallux valgus surgery and care should be taken to remember to protect it during Akin osteotomy. The authors postulate that iatrogenic rupture of the FHL is more common than the literature reflects, and paucity of papers is influenced by reluctance to report. If the FHL is cut during Akin osteotomy, treatment options are either non-operative, fusion of IPJ or repair. The benefits of plantarflexion of the MTP joint and proprioception input from the joint must be weighed against the morbidity of exploratory surgery and the inherent risks it carries.

This case illustrates repair of a cut FHL to be a viable alternative to fusion for treating this complication. Repair can result in some success in regaining plantar flexion of the MTP joint validating its consideration. Patients should be counselled that flexion at the IPJ is unlikely to occur, even after the surgery.

References

1. Couglan MJ, Mann RA, Saltzman CL (2007) *Surgery of the Foot and Ankle.* Vol 1. (8th Ed). Mosby Elsevier Philadelphia.
2. Hamel AJ, Donahue SW, Sharkey NA. Contributions of active and passive toe flexion to forefoot loading. Clin Orthop Relat Res 2001 393:326-334.[PubMed]
3. Boruta PM, Beauperthuy GD Partial tear of the flexor hallucis longus at the knot of Henry: presentation of three cases. Foot Ankle Int 1997 18(4): 243-246. [PubMed]
4. Frenette JP, Jackson DW. Lacerations of the flexor hallucis longus in the young athlete. JBJS 1977 59A: 673-676. [PubMed]
5. Grispigni C, De Ponti A, Danasini P, Sarto L. Closed subcutaneous rupture of the flexor hallucis longus tendon. Case report and review of the literature. J Orthopaedics and Traumatology 2000 1: 107-110.
6. Holt KW, Cross MJ. Isolated rupture of the flexor hallucis longus tendon. A case report. Am J Sports Med 1990 18: 645-646. [PubMed]
7. Inokuchi S, Usami N. Closed complete rupture of the flexor hallucis longus tendon at the groove of the talus. Foot Ankle Int 1997 18: 47-49. [PubMed]
8. Krackow KA. Acute, traumatic rupture of a flexor hallucis longus tendon: a case report. Clin Orthop Relat Res 1980 150: 261-262. [PubMed]
9. Rasmussen RB, Thyssen EP. Rupture of the flexor hallucis longus tendon: case report. Foot Ankle 1990 10: 288-289. [PubMed]
10. Romash MM. Closed rupture of the flexor hallucis longus tendon in a long distance runner: report of a case and review of the literature. Foot Ankle Int 1994 15: 433-436. [PubMed]
11. Sammarco GJ, Cooper PS. Flexor hallucis longus tendon injury in dancers and nondancers. Foot Ankle Int 1998 19: 356-362. [PubMed]
12. Sammarco GJ, Miller EH. Partial rupture of the flexor hallucis longus tendon in classical ballet dancers: two case reports. JBJS 1979 61A: 149-150. [PubMed]
13. Scaduto AA, Cracchiolo A 3rd. Lacerations and ruptures of the flexor or extensor hallucis longus tendons. Foot Ankle Clin 2000 5: 725-736. [PubMed]
14. Thompson FM, Snow SW, Hershon SJ. Spontaneous atraumatic rupture of the flexor hallucis longus tendon under the sustentaculum tali: case report, review of the literature, and treatment options. Foot Ankle 1993 14: 414-417. [PubMed]
15. Trepman E, Mizel MS, Newberg AH. Partial rupture of the flexor hallucis longus tendon in a tennis player: a case report. Foot Ankle Int 1995 16: 227-231. [PubMed]
16. Trevino S, Baumhauer JF. Tendon injuries of the foot and ankle. Clin Sports Med 1992 11: 727-739. [PubMed]
17. Van Jonbergen J, Faber F, Treurniet F. Non-traumatic isolated rupture of the flexor hallucis longus tendon related to an os trigonum: a case report. Foot and Ankle Surgery 2001 7: 109–111.
18. Wei SY, Kneeland JB, Okereke E. Complete atraumatic rupture of the flexor hallucis longus tendon: a case report and review of the literature. Foot Ankle Int 1998 19: 472-474. [PubMed]
19. Brand JC Jr, Smith RW. Rupture of the flexor hallucis longus after hallux valgus surgery: case report and comments on technique for adductor release. Foot Ankle 1991 11: 407-410.[PubMed]
20. Coghlan BA, Clarke NM. Traumatic rupture of the flexor hallucis longus tendon in a marathon runner. Am J Sports Med 1993 21: 617-618. [PubMed]