Case Reports and Series

Flexor hallucis longus rupture repaired with split flexor digitorum longus tendon transfer: A case report

Jake Eisenschink, DPM 1*, Rachelle Leveille, DPM 2, Dennis Leveille, DPM, FACFAS 3

1 Podiatric Medicine and Surgery Resident, Ascension St. John Medical Center, 22101 Moross Rd, Detroit, MI 48236, United States
2 Podiatric Medicine and Surgery Resident, Ascension Providence Hospital, 16001 W Nine Mile Rd, Southfield, MI 48075, United States
3 Great Lakes Podiatry, 126 S 25th St Ste A, Escanaba, MI 49829, United States

ARTICLE INFO

Level of Evidence:
4 case Report

Keywords:
Cock-up deformity
Flexor hallucis longus
Master knot of henry
Rupture
Tendon transfer

ABSTRACT

Isolated rupture of the flexor hallucis longus tendon is an injury rarely reported in literature. In this case report, a 47-year-old female presented 3 months after traumatic injury which resulted in rupture of the flexor hallucis longus. End to end repair was not possible due to substantial gapping provided by proximal retraction of the tendon proximally into the calf and disruption of the fibrous connection of the FHL and FDL. A split flexor digitorum longus tendon transfer was performed to restore function and prevent hyperextension of the hallux and the patient was followed for one year.

Introduction

Isolated rupture of the flexor hallucis longus (FHL) tendon is an injury rarely reported in literature. FHL ruptures have been classified based on three different anatomic zones. Zone 1 is the area just proximal to the tendon insertion and distal to the sesamoids. Zone 2 occurs between the sesamoids and the master knot of henry. Zone 3 is located proximal to the master knot of henry. Zone 3 usually results in maintaining the functionality of the hallux due to the attachments at the master knot of henry but may see retraction of the tendon proximally.1

The number of reported complete or partial FHL ruptures varies. Grispigni et al. reported 8 cases of completely ruptured flexor hallucis longus tendons in a closed injury.2 In 2012, Noda, et al reported there are as many as thirty-five case reports published.3 We present a complete closed rupture of the FHL tendon at the level of the 1st metatarsal head with destruction of the master knot of henry and retraction of proximal stump who presented 3 months after an abrupt dorsiflexion injury of the hallux. Three months after the injury the patient presented with hyperextension of the hallux with minimal plantarflexion of the hallux against gravity. The operative technique of split flexor digitorum longus (FDL) tendon transfer is presented and the post-operative protocol is discussed.

Case report

We present a 47-year-old female farmer who was seen for left great toe pain. She stated that symptoms began 3 months prior when she was climbing over a fence and caught herself when she started to slip with the left foot. She describes her foot as being in a hyper-dorsiflexed position. She states she felt a “pop” in the arch of her left foot. Over the last month the pain progressively increased and stated she is having a hard time ambulating and causing her difficulty with her occupation. Patient is a former smoker with a BMI of 41.35 with no other significant past medical history. On physical exam, there was pain with palpation along the course of the FHL tendon from the navicular tuberosity extending distally to the left hallux. There was erythema and edema noted to the left arch and hallux. Hyperextension of the left hallux was present at the metatarsophalangeal joint (Fig. 1). Patient was unable to plantarflex the hallux at the metatarsophalangeal joint or interphalangeal joint against resistance and with minimal plantarflexion against gravity. There was depression of the longitudinal arch. Syndactilization of the 2nd and 3rd digits of the left foot was present. Vascular and neurological status was intact. Radiographs were obtained and there was no evidence of fracture or bone injury. Magnetic resonance imaging of the left foot showed complete rupture of the FHL tendon with retraction to the level of the distal tibia with the distal stump visualized at the level of the proximal 1st metatarsal (Figs. 2, 3). Low dye taping was performed to assess the benefits that an orthotic may provide. At the next visit, the patient stated that the taping made symptoms worse. At this time the patient opted for surgical intervention due to progression of symptoms over the past three months.

Under general anesthesia, the patient was placed in a supine position and a thigh tourniquet was inflated. A 10 cm linear longitudinal incision...
was made in line with the proximal aspect of the 1st metatarsal. The dis-
tal stump of the FHL was noted just proximal to the sesamoids (Fig. 4). The 2nd FDL tendon slip was identified (Fig. 5). The medial 1/3 of the FDL tendon was split in an inverse L fashion and the distal aspect of the tendon was transferred to the proximal end of the distal FHL stump and sutured under tension with 5-0 nonabsorbable suture. The FDL tendon was reinforced using 4-0 absorbable suture (Fig. 6). The foot was loaded to stimulate weightbearing and the hallux was noted to purchase the weightbearing surface. The tissue layers were then reapproximated. A posterior splint was applied, and the patient was instructed to be non-
weightbearing. At the first post-operative visit, the patient was able to plantarflex her hallux. A short leg cast was applied and the patient was instructed to continue non-weightbearing. At 3 weeks post-op, the patient was transitioned to a CAM walker and was able to bear weight to her heel. At 6 weeks, the patient had no complaints of pain and was able to plantarflex the hallux against resistance. The patient was then transitioned to normal shoe gear and casted for orthotics. At 12 weeks, the patient was ambulating pain free. She has returned to work without limitations and is being seen on an as needed basis.

Discussion

There are several different surgical options available to treat this rare injury: Arthrodesis, tendon transfer, allograft, and end to end repair. Most of the injuries described in the literature were repaired with an end to end repair technique, oftentimes utilizing an allograft to bridge the gap (Mann; 4). However, this was not possible in our situation due to the retraction of the FHL tendon proximally and the master knot of henry not being intact. This case had a rupture in zone 2 with retraction of the proximal segment making this injury not fit into the current classification system. Due to the syndactylization of her second and third digits, an extensive incision would have been required to fully harvest the second extensor digitorum longus tendon for the originally planned tendon transfer. We noticed that there was adequate length available of the distal stump of the FHL tendon that we would be able to section the FDL tendon and transfer over to the distal stump while sparing the insertion of the FDL tendon.

It is important to discuss with your patients that surgical repair does not guarantee regained function. Frenette and Jackson repaired six FHL
Fig. 3. MRI showing rupture of FHL tendon.

Fig. 4. Isolation of FHL remnant from distal stump.
Fig. 5. Identification of FDL tendon.
lacerations in which four never regained any appreciable motion at the hallux interphalangeal joint. Floyd et al repaired twelve lacerations and three of the repairs never regained function of the FHL. However, in these cases the patients did not report significant disability. Likewise, Rasmussen and Thyssen stated that the FHL tendon function is not essential in achieving a satisfactory result. Weis et al. advocated for surgical repair if it is interfering with their daily activities and in attempt reduce the patient’s pain. In the present case, the injury was interfering with the patient’s occupation. After surgical correction, the patient has returned to her occupation with no complaints or restrictions. In conclusion, we present a technique in which the FHL was ruptured in zone 2 with disruption of the master knot of henry and proximal retraction of the tendon which was successfully repaired with a split FDL tendon transfer (Fig. 7).
Declaration of Competing Interest

None reported.

Financial Disclosure

None Reported. The research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Patient Informed Consent Statement

The authors declare that informed patient consent was taken from all the patients.

Acknowledgements

None.

References

1. In Coughlin MJ, In Saltzman CL, In Anderson RB. Mann’s surgery of the foot and ankle. 2014.
2. Grispiigni C, De Ponti A, Danasini P, et al. Closed subcutaneous rupture of the flexor hallucis longus tendon. Case report and review of the literature. J Orthop Traumatol. 2000;1:107–110.
3. Noda D, Yoshimura I, Kanazawa K, Hagio T, Naito M. Subcutaneous rupture of the flexor hallucis longus tendon: a case report. J Foot Ankle Surg. 2012;51(2):234–236.
4. Anastasopoulos N, Paraskevas G, Lazaridis N, Natsis K. Reconstruction of neglected flexor hallucis longus tendon rupture: a case report. J Foot Ankle Surg. 2018;57(6):1256–1258.
5. Frenette JP, Jackson DW. Lacerations of the flexor hallucis longus in the young athlete. J Bone Joint Surg Am. 1977;59(5):673–676.
6. Floyd DW, Heckman JD, Rockwood Jr. CA. Tendon lacerations in the foot. Foot Ankle. 1983;4(1):7–14.
7. Rasmussen RB, Thyssen EP. Rupture of the flexor hallucis longus tendon: case report. Foot Ankle. 1990;10(5):288–289.
8. 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(7):472–474.