

CASE REPORT

Entrapment of Extensor Hallucis Longus Tendon in Fracture Callus Leading to Dropped Hallux: A Case Report

Gautam Rava¹, Pranjal Mahanta²

ABSTRACT

Aim: The aim of this study is to describe a case of isolated extensor hallucis longus (EHL) dysfunction leading to dropped hallux, which to our belief is due to entrapment of EHL tendon in the fracture callus following open reduction and internal fixation (ORIF) and autologous bone grafting of nonunion of distal 1/3 tibia fracture.

Background: Dropped hallux due to EHL dysfunction is a problematic condition because during the swing phase of the gait cycle, the hallux drags across the ground surface leading to altered gait pattern. Isolated dysfunctions of EHL due to various causes are rarely described in the literature.

Case description: Dropped hallux in a 61-year-old lady with nonunion distal 1/3 tibia fracture, treated by ORIF with interlocking nail and autologous bone grafting, after the fracture was united, which got corrected after surgical release of the tendon from fracture callus and EHL anastomosis to extensor digitorum longus (EDL) tendon.

Conclusion: Awareness of the possibility of entrapment of long tendons in fracture callus leading to their dysfunction, where a simple release and anastomosis of tendon could correct their function, provided the tendon is viable.

Clinical significance: Tendon adherence to fracture callus leading to dropped hallux as a differential diagnosis in cases of isolated EHL dysfunction in distal 1/3 tibia fracture.

Keywords: Distal tibia fracture, Fracture callus, Tendon entrapment.

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BACKGROUND

Isolated dysfunction of extensor hallucis longus (EHL) tendon leading to dropped hallux is rare and has been reported to occur in a variety of conditions,¹ ranging from iatrogenic injury to common peroneal nerve during proximal tibia and fibula osteotomy, external fixator application, compartment syndrome, and prolonged use of tourniquet.

We describe a case of isolated dropped hallux without any foot drop due to probable injury to the branch of deep peroneal nerve (DPN) supplying EHL, along with entrapment of EHL tendon in fracture callus. Full function of EHL was achieved after release of the tendon from fracture callus and anastomosis of EHL to EDL tendon.

CASE DESCRIPTION

A 61-year-old lady presented to us with pain and inability to bear weight on left leg. She had a history of Gustilo and Anderson type 2 open fracture of both bones of the left leg treated elsewhere by debridement and external fixation, approximately 6 months before presenting to us. The fixator was removed at the same facility after 3 months. She did not have any comorbidities. On clinical examination, healed pin track scars were visible along with scar over the fracture site. No wound discharge or other signs of inflammation were noted. Fracture tenderness was present along with slight mobility. Active flexion and extension of the toes and the ankle was present, and distal pulses were palpable. Roentgenogram (Fig. 1) of the involved extremity was obtained which showed nonunion at the fracture site. Open reduction was performed after the freshening the fracture ends and ante grade interlocking the tibia nail with autogenous iliac crest bone grafting was performed. Postoperatively, toe touch weight-bearing using a walking frame was started the next day. The patient was discharged from the hospital after 4 days of uneventful hospital stay.

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Routine follow-up was scheduled after 6 weeks, 3 months, 6 months, and 1 year. During the last visit, the patient complained of inability to extend her great toe for a few months duration, which was also affecting her gait. On clinical examination, the



Fig. 1: Non union of shaft of distal 1/3 tibia

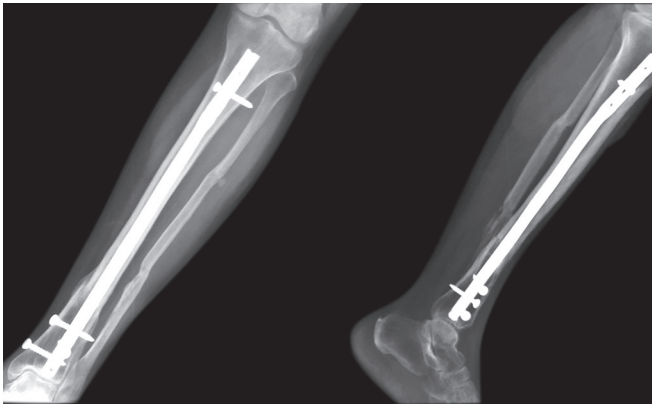


Fig. 2: Healed fracture over intramedullary nail

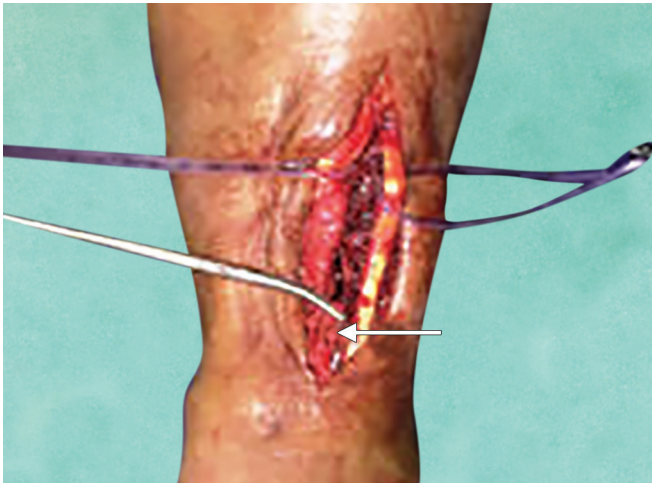


Fig. 4: White arrow showing hemostat holding the torn end of EHL tendon after separation from fracture callus. Adjacent to it on the right is the normal EDL tendon

patient was able to actively extend and flex all her toes and the ankle joint except the great toe. No sensory deficit was noted. Roentgenogram of the involved extremity was obtained, which showed completely healed fracture (Fig. 2). Nerve conduction study was done, which showed common peroneal neuropathy. However, in the absence of complete foot drop or any sensory involvement, a probable diagnosis of injury to branch of DPN supplying EHL was considered and the patient was started on physiotherapy. MRI was not considered necessary because of possible image interference due to the metal implant *in situ*. Due to patient's request for complete correction of the deformity, an informed decision was taken to explore the fracture site, with the view to repair, reconstruct, or perform a tendon transfer, to maintain the integrity of EHL function.

On exploration, the fracture was found to be well healed with satisfactory callus formation. Both the tibialis anterior (TA) and EHL tendon (Fig. 3) were found to be entrapped in the fracture callus. The tendons were separated from the callus slowly using an osteotome. The TA tendon was found to be intact, while the EHL tendon was found to be very frail and nonviable. On separation from the callus, it was found to be divided and, therefore, not amenable to repair (Fig. 4). Thereafter, the distal part of EHL tendon was anastomosed (Fig. 5) to the EDL tendon. This was done by passing the EHL tendon through a longitudinal slit on EDL and looping it distally. A running lock stitch with no. 2-0 polydioxanone suture was used to secure

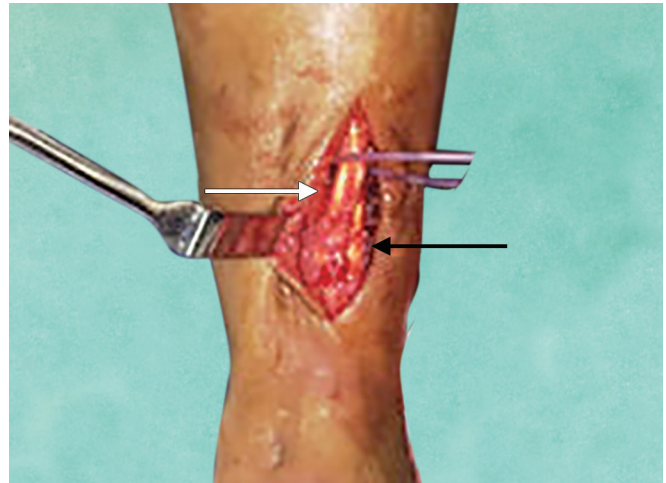


Fig. 3: Entrapped TA and EHL tendon in the fracture callus. White arrow showing TA tendon. Black arrow showing the fracture callus

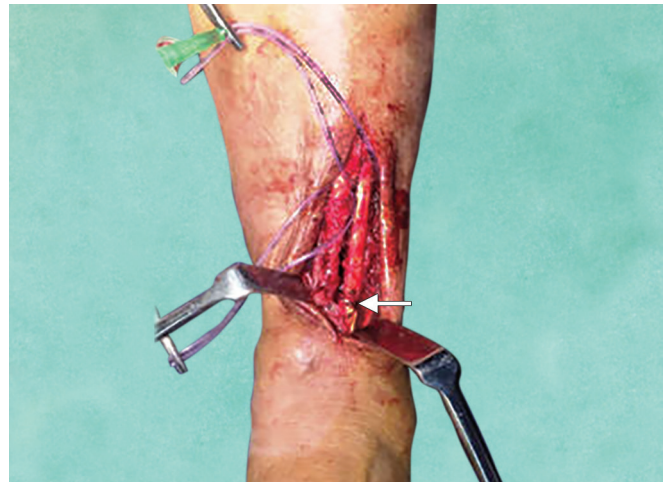


Fig. 5: White arrow showing the anastomosed EHL to EDL tendon

the anastomosis, with the hallux in neutral position. The wound was closed in layers and a below knee plaster slab was applied, supporting the hallux in neutral position. Postoperatively, the patient was put on non-weight-bearing mobilization. Clinically, dropped hallux was corrected along with normal ankle movement (Fig. 6). The patient was discharged 48 hours after uneventful hospital stay. Plaster slab was continued for 6 weeks and thereafter physiotherapy started.

DISCUSSION

The EHL originates from the anterior surface of the fibula middle and lower third and the interosseous membrane and is grossly inserted in the base of distal phalanx of great toe and plantar plate, although there are different variations in the insertion pattern.² The EHL is supplied by an isolated long motor branch from the DPN which runs inferiorly along the fibula periosteum until it reaches the muscle,¹ therefore, is more prone to injury during its course.

The EHL functions as a stabilizer to the first metatarsophalangeal (MTP) joint and interphalangeal (IP) joint, which allows the great toe to act as a rigid lever with dorsiflexed hallux on plantar flexed metatarsal, during the heel lift off phase, so that the great toe clears off the ground. Along with other extensors, EHL also functions as a dorsiflexor along with supinator of the foot.³



Fig. 6: Normal extensor function of hallux restored

Case reports of dropped hallux with varied etiologies have been described in the literature. Robinson et al. in their study attributed isolated lesions of the peroneal nerve after nailing in the absence of a compartment syndrome leading to the dropped hallux syndrome.⁴

Cicone et al. described a case of distal tibia and fibula fracture treated by ORIF, with dropped hallux, which was proved by an electrodiagnostic study to be due to injury to branch of DPN supplying EHL.⁵ The authors have concluded that nerve damage could occur intraoperatively from retraction, insertion of transverse screws, or ischemia from tourniquets, and postoperatively from the compartment syndrome or hematoma. Another case report states spontaneous closed rupture of EHL due to a talar neck osteophyte which was treated successfully with surgical repair.⁶

Treatment modalities for drop hallux include bracing, strengthening exercises, and in chronic conditions surgical repair, reconstruction, or tendon transfers.

Anastomosis of EHL to TA tendon was described in polio patients with an aim to convert EHL to be a more efficient dorsiflexor of the foot.⁷ A surgical technique of functional tendon transfer for the treatment of EHL rupture is described. By using the EDL tendon of the second toe, the patient regains active dorsiflexion of the big toe and the deformity of the toe is corrected.⁸ Another case report describes anastomosis of extensor hallucis brevis (EHB) and a slip of EDL from the second toe to the EHL, over the distal aspect of dorsum of the foot, to correct the dropped hallux which occurred after the proximal tibia fracture.⁹

Though the EHL tendon is more lateral than the TA tendon, it is slightly deeper and in contact with the lateral surface of tibia in the distal 1/3 aspect of leg. We believe that due to its deeper course and proximity to tibia, it was profoundly entrapped in the fracture

callus, whereas the TA being superficial was only partially engulfed by the fracture callus. The dropped hallux could also have been due to injury to branch of DPN supplying EHL also, as suggested by the nerve conduction study (NCS). Since the symptoms did not improve after more than 1 year of osteosynthesis and a course of physiotherapy, the fracture site was explored with an aim to repair, reconstruct, or perform a tendon transfer, to maintain the integrity of EHL function.

CONCLUSION

To conclude, in chronic cases of dropped hallux after a distal 1/3 tibia fracture, the orthopedic surgeon should be aware of the possibility of entrapment of EHL tendon in fracture callus leading to their dysfunction, where a simple release of tendon could correct their function, provided the tendon is viable. In case the EHL tendon is not amenable to repair, transfer of EHL to EDL tendon can provide good results.

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