

Traumatic Open and Closed Injury to the Extensor Hallucis Longus Tendon - A Review of Three Case Reports

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Abstract

Rupture of the extensor hallucis longus (EHL) is an uncommon injury. The present series describe three different presentations of EHL rupture with their treatment and follow-up. The primary end-point of these cases is to remark the importance of a prompt diagnosis and the need of early surgery for revision and suture of the EHL tendon. The first goal of these surgeries is to avoid hallux plantarflexion if left untreated. A plantarflexed hallux not only may be painful but can impede walking normally. The second end-point is to remark the proximity of the deep peroneal nerve to the EHL and the possibility of a concomitant injury.

Keywords: Deep Peroneal Nerve Injury; Extensor Hallucis Longus; Hammered Hallux; Tendon Injury; Tendon Repair

Abbreviations

EHL: Extensor Hallucis Longus; ER: Emergency Room

Introduction

Injury of the extensor hallucis longus (EHL) tendon is rare, with most cases secondary to a direct penetrating trauma on the dorsum of the foot or repetitive overuse with predisposing factors such as corticosteroid injection [1,2]. The incidence of EHL tendon injury has been reported to be 2% for the general population, whereas athletes such as taekwondo have a higher incidence [3]. Possible sequelae of not repairing an EHL rupture include a hammered hallux, dorsal bunion, hallux flexus or mal perforans ulceration, in addition of affecting the gait by catching the hallux on the floor while barefoot and slipping on the floor [4], and the late literature recommend its early repair [5,6]. The subcutaneous course of the deep peroneal nerve renders it susceptible to trauma; injury to the distal portion results in sensory deficits or painful neuroma [7].

The purpose of this paper is to report three patients with traumatic rupture of the EHL tendon, open rupture after a penetrating trauma, chronic traumatic rupture and closed rupture due to a repetitive overuse, their treatment and postoperative protocol.

Case Report

First case is a 53-year-old male who attended the emergency room (ER) due to a stab incision on the dorsum of his right foot after a domestic incident. Physical exam revealed a plantarflexed hallux with loss of active dorsiflexion of the hallux interphalangeal joint (Figure

1). Patient also complaint of hypoesthesia over the first dorsal webspace, area of the medial branch of deep peroneal nerve. Initial X-ray ruled out any concomitant bone injury.



Figure 1: Preoperatively, showing a plantarflexed hallux (Case 1).

The patient was admitted to the hospital for urgent revision surgery. Surgical exploration of the EHL tendon was performed using the dorsal wound and extending it proximally. During surgery, a complete rupture of the EHL tendon and a complete rupture of the medial branch of the deep peroneal nerve were observed (Figure 2). The EHL was repaired with an end-to-end suture. An 8-0 non-absorbable suture was used to repair the nerve. Postoperatively, a posterior splint was placed to support the foot while maintaining the toes in slightly dorsiflexion, and non-weight bearing during three weeks. A bandage was placed during 5 more weeks, allowing partial weight bearing. Active extension of the hallux was achieved. The patient returned to sports activity 4 months after surgery and was pain free.



Figure 2: Intraoperative image showing a complete rupture of the medial branch of the deep peroneal nerve, which was sutured with an 8-0 non-absorbable suture.

The second case is a 49-year-old woman with no past medical history of interest. One month prior to the consult she had a stab incision over the dorsum of the first webspace of her left foot. As the incision was relatively small, she did not attend the ER and was left untreated. The patient finally consulted due to a plantarflexed hallux which impeded normal walking (Figure 3). An ultrasonography was performed to confirm complete EHL rupture and specially to locate the proximal ending of the ruptured tendon. The proximal ending was located distal to the inferior extensor retinaculum, guiding the incision to perform during revision surgery. An end-to-end suture was possible to perform after debriding fibrotic tissue surrounding both endings. Intraoperatively, it was observed that the proximal stump of the tendon was surrounding the deep peroneal nerve (Figure 4) and microsurgery was needed to separate the nerve with no damage. Postoperative care was performed equally as with the previous patient, and the patient did not complain of any neurological symptoms. Return to sports was allowed 6 months after surgery.



Figure 3: Preoperative image showing a plantarflexed big toe with loss of active dorsiflexion of the right foot (Case 2).



Figure 4: Intraoperative image showing proximal stump of the EHL surrounding the deep peroneal nerve.

The third case is a 42-year-old female with no past medical history of interest who attended the ER after a sharp pain at the right foot while running on the treadmill two days prior to the admission. Physical exam showed a plantarflexed hallux with loss of active dorsiflexion of the interphalangeal hallux (Figure 5). An ultrasound was performed to find the proximal stump of the EHL tendon, which was located distal to the inferior extensor retinaculum. Due to the delay in seeking attendance, the patient was advised that a transfer from the extensor tendon of the second toe would be performed in case an end-to-end primary repair could not be carried out. Fortunately, an end-to-end suture was able to be performed with no tension over the suture (Figure 6). Postoperative care was carried out with a posterior splint during 6 weeks, with no weightbearing allowed. Then, a boot was placed allowing for partial weightbearing and a bandage holding the hallux in a slightly dorsiflexed position for 4 more weeks. The patient returned to sports activity 5 months after surgery; pain free. Weightbearing and active movement was more restricted than in the previous patient due to the mechanism, although there was no predisposing factor; this was a closed injury compared to the traumatic previous injuries.



Figure 5: ER image showing a plantarflexed hallux (Case 3).



Figure 6: Intraoperative image showing the Krackow suture of the extensor hallucis longus tendon with non-absorbable suture.

In all cases the end-to-end tendon repair was performed with a Krackow suture with a 4-0 non-absorbable suture. All patients could fully extend the interphalangeal joint of the hallux and had full range of active and passive dorsiflexion of the first metatarsophalangeal joint. There was no loss of active or passive plantarflexion of the hallux. The first patient has recovered sensitivity.

Discussion

Open traumatic injury of the EHL tendon is far more common than closed rupture of the tendon such as concomitant injury of the deep peroneal medial branch is not yet described in the literature. Our third case was a patient with apparently no predisposing factors other than a repetitive trauma (treadmill).

Closed tendon ruptures, which are caused by active tendon contraction against resistance, are associated with mechanical overuse [8]. A previous case reported on a taekwondo athlete with closed EHL rupture and no predisposing factors other than chronic overuse, the patient presented with a rupture of the EHL muscle rather than the tendon, and open surgery was performed to repair it [1].

Imaging should include initial X-rays to dismiss any bone fracture and ultrasound or magnetic resonance imaging may be useful in closed ruptures for preoperative planning. As described previously, ultrasound imaging is an easily accessible, cost-effective method for dynamic evaluation of the ankle extensor structures and can be performed at the patient's bedside [6,8]. In the first case, only X-rays were performed as the patient was admitted for urgent surgery and presented with a penetrating trauma, which guided us to find the rupture. In the second and third case, a preoperative ultrasound guided us where to find the rupture, as the rupture was days before they attended the ER.

Regarding EHL tendon rupture, several surgeries have been proposed; from end-to-end, tendon transfer (from peroneus tertius), side-to-side tenodesis to extensor digitorum longus or allograft [1,6,9,10]. The aim of surgically repairing the EHL rupture is to avoid a plantarflexed hallux, which can lead to gait difficulty. Due to the few cases reported in the literature and the lack of scientific evidence, being most of them case reports, there is no consensus regarding the optimal treatment and the postoperative care. Lohrer and Nauck reviewed the different treatment and rehabilitation protocols described, and concluded that the available studies were unclear, needing further comparative studies [6].

Lacerations of the EHL tendon distal to the extensor retinaculum seem to have a more common retraction of the stumps, thus, early revision surgery or several surgical options should be considered with these cases [9]. All of these patients could be repaired with an end-to-end primary repair, including the second and third patient who had the rupture one month and two days respectively before their arrival.

Complete transection of the deep peroneal medial branch results in loss of sensibility within the first interspace. As the formation of a neuroma can result in considerable pain and disability, nerve repair is recommended [7]. In the first case the nerve was surgically repaired and the patient recovered sensibility. The second case did not have an injury of the deep peroneal nerve but the proximal ending of the tendon was in close contact. Therefore, possible neurological injury should be explained to patients with this injury despite the initial symptoms rule out nerve injury.

Conclusion

Traumatic or closed injury to the EHL is a rare condition. Surgical treatment is recommended to avoid gait problems, and should be early in time for being able to perform an end-to-end primary repair. If early revision is not possible, tendon transfers seem to be a good option of treatment. Associated deep peroneal nerve injuries are uncommon, preoperative exploration is mandatory and their surgical repair is recommended. Postoperative care is essential, maintaining the hallux dorsiflexed for several weeks.

Declarations of Interest

None (all authors).

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