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Acute Reconstruction of Traumatic Zone IV Re-tear of Extensor Hallucis Longus Tendon using Extensor Hallucis Brevis loop Technique - A Mid-term Follow-up Case Report

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Learning Point of the Article:

EHB is a good alternative in patients with chronic EHL tear due to its ease in harvesting, good functional outcome and synergistic action with EHL

Abstract

Introduction: The present case report describes an acute reconstruction of extensor hallucis longus (EHL) tendon with defect treated using looped extensor hallucis brevis (EHB) tendon graft.

Case Report: A 40 year male manual labor had an acute traumatic EHL tear which was repaired at a primary health care center. After 2 days, the patient felt a sudden click and a re-tear at zone IV of EHL. Since there was a defect of 3.5 cm which was not amenable for primary repair, EHB graft was used for the reconstruction in a loop fashion. The foot and ankle disability index score was 95.2 at 2 years follow-up with grade 4 + power.

Conclusion: EHB graft is a good alternative to other autografts for extensor hallucis longus reconstructions with good clinical and functional outcomes.

Keywords: Extensor hallucis longus tendon, fibrewire, loop technique, trauma, fracture.

Introduction

Ruptures of extensor hallucis longus (EHL) tendon is a relatively uncommon occurrence with an incidence of around 1–1.6% [1]. Majority of these tears are traumatic in nature due to injury by a sharp or deep penetrating object [1, 2] or due to forced dorsiflexion of the foot against resistance [3]. In addition, cases of atraumatic EHL ruptures due to local steroid [4], attrition due to talar neck osteophytes [5], iatrogenic injuries during ankle arthroscopy [6], post-traumatic degeneration or overuse in martial arts like Taekwondu [7] have been reported in the literature. Al-Qattan [1] has classified open lacerations of EHL based on their anatomical locations and occurrence which further helps in deciding the management of these injuries. Moreover, the treatment of EHL rupture is usually dictated by onset of the tear (acute or chronic), the extent of the tear (partial or complete), level of the tear (tendinous or musclulotendinous junction) tear, and degree of retraction.

Acute end to end repair remains the gold standard in cases where the complete approximation is possible. In patients with defect a variety of tendons such as extensor digitorum communis [7], Extensor hallucis brevis (EHB) [8], Extensor digitorum longus [6, 8], Peroneus tertius [9], Semitendinosus [10], Gracilis [11], Plantaris [9], extensor hallucis capsularis [6], or even allografts of fascia lata [12] can be used.

We describe a case of mid-term follow-up of young manual labor with traumatic zone IV EHL re-tear, which was repaired using

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Author's Photo Gallery

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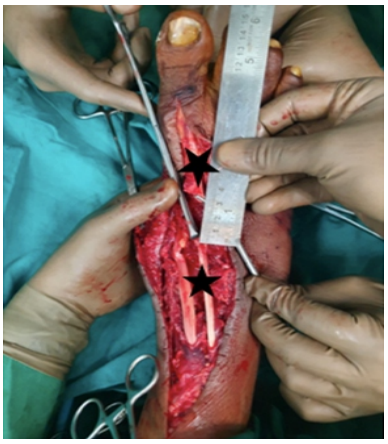

Figure 1: Retracted Extensor Hallucis Longus tendon.

Figure 2: Intact Extensor Hallucis Brevis tendon.

HB tendon by box loop technique.

Case Report

This report was written as per the CARE guidelines [13]. A 40-year-old male heavy manual worker presented to our emergency department with complaints of inability to extend the right great toe for 1 week. He had a history of injury to the right dorsum of the foot due to fall of a sharp heavy object, following which he had a wound over his right foot. He was taken to a primary health care center where exploration of the wound and primary repair was done. After 2 days of repair, the patient felt a sudden clunk and was unable to extend his right great toe.

On examination, there was a surgical wound with intact sutures extending from the base of first metatarsal ending just distally to the anterior aspect of the ankle joint. There was a complete loss of great toe extension with difficulty in ankle dorsiflexion. The neurological examination was within normal limits. The radiographs showed no bony involvement.

After a thorough discussion with the patient, a decision to re-explore the wound and repair/augment the tendon tear was made.

Surgical technique

The surgical wound was re-explored and a zone IV complete EHL tear with 3.5 cm retraction was seen which was not amenable for a repair (Fig. 1). Thus, a decision to reconstruct the EHL tendon was made. The EHB tendon was found to be intact and suitable for a tendon graft since it was already exposed with the wound proximally and distally (Fig. 2). The EHB tendon was incised just distal to its muscle belly, following which, it was passed through the substance of proximal EHL from lateral to medial direction, and then finally at the distal cut end of EHL tendon from medial to lateral direction and sutured distally at the junction of its entry at EHL tendon using number 2 Fibrewire (Arthrex©, Florida, USA) (Fig. 3). A soft-tissue tenodesis of the proximal part of musculotendinous junction of EHB was performed to the medial transverse retinacular band of the inferior extensor retinaculum.

Post-operative protocol

The patient was given a below knee extended back slab for 3 weeks which was later converted to a walking boot cast for 6 weeks. Passive extension of the great toe was allowed from the second post-operative day while the active movements were restricted for 6 weeks till cast removal. The foot and ankle disability index (FADI) score [14] was 95.2 at 2 years follow-up. The patient was able to perform all the activities of daily living without any difficulty with a strength of 4 + as per Medical Research Council scaling at the end of 2 years (Fig. 4).

Discussion

The present case supports the use of the EHB tendon as a graft to repair EHL tendon tears with tendon loss. Various modalities of treatment have been proposed to address the EHL tendon tears depending upon the time (acute or chronic), anatomical location, and degree of retraction. Dukes [15] and Kass et al.

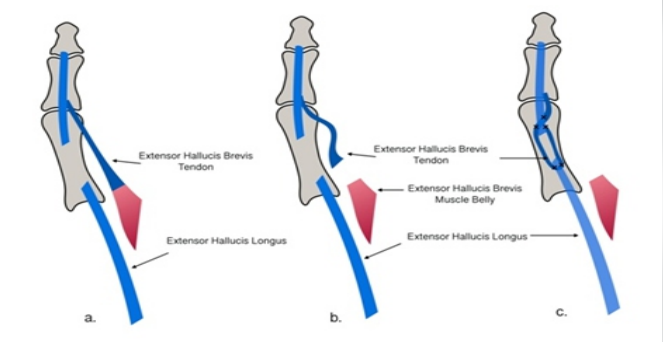

Figure 3: Tendon sutured using number 2 fibrewire.

Figure 4: Post-operative follow-up after 2 years.

[16] in their studies have observed that the great toe extension is usually preserved in patients with EHL tear distal to extensor expansion and thus, they can be treated conservatively. Moreover, conservative treatment can lead to some potentially late complications such as hammered toe and bunion formation which can affect the gait cycle and be frustrating for the patient [17, 18]. The EHL tears occurring distal to the superior or inferior extensor retinaculum expansions do benefit from surgical intervention due to their propensity for retraction leading to compromised results. As per the AI Qattan [1] classification for EHL lacerations, the zone 4 injury lies between the first metatarsophalangeal joint (zone 3) and the ones beneath the extensor retinaculum (zone 5) and usually retract, making it necessary for reconstruction. Acute EHL tears can be successfully treated with end to end repair while chronic tears (6 weeks) old that are usually associated with retraction are amenable for a graft reconstruction.

A variety of allografts and autografts are being commonly used for tendon reconstructions with the pros and cons of each. Although allograft prevents the donor site morbidity and is cosmetically better tolerated, increased cost, higher risk of infection, graft rejection risk, and limited availability makes its usage difficult [19, 20]. Autografts on the other hand alleviate these aforementioned disadvantages but can lead to some donor site morbidity and increased surgical time. Moreover, the autograft should be of adequate length and diameter for a successful outcome.

A myriad of autograft options has been described in the literature for chronic EHL reconstructions. The donor tendon diameter is an important aspect while selecting a graft to regain the strength and function of the compromised tendon [19, 20]. Thus, grafts such as plantaris, peroneus tertius, extensor hallucis capsularis, or extensor hallucis comminuis might be theoretically smaller in diameter to replace the EHL tendon. Furthermore, extensor hallucis capsularis or extensor hallucis comminuis tendons are not present in all individuals making it an uncommon source of graft. Grafts such as plantaris, peroneus tertius, or even an EHL split can be smaller in diameter and thus, options such as semitendinosus were proposed [10, 19]. Furthermore, grafts such as peroneus tertius, gracilis, or semitendinosus would lead to ankle or knee joint morbidities.

Options of using EDL have been described in the literature with good outomes [6, 19]. However, transposing the EDL to EHL can theoretically lead to decreased extension strength in the toes (most commonly the 2nd toe) at the donor site. The EDL graft can be used as a single [10] or double bundle [19] to avoid the diameter mismatch.

Since the patient in the present study did not have any accessory tendons, the choice of the local graft was limited to either EDL, EHB, or EDB tendons. The EHB was preferred over the other tendons because of the extensive surgical wound made by the primary physician which itself exposed the EHB tendon insertion and muscle belly.

Moreover, the EHB tendon acts in the same direction as the EHL tendon which does not alter the traction force which makes it a suitable choice of local graft. Berens [21] in his case report mentioned the use of autogenous EHB graft for a chronic EHL tear. To match the native EHL diameter, the author used a flap of EHL along with the EHB graft and reconstructed it using the Bunnel suture technique with excellent results.

The distal insertion of EHB in the present study was incised from its sheath and sutured through the substance of EHL at both ends to retain its strength and length. Duarte and Fradinho [21] reported good outcomes in two cases of zone 4 EHL reconstruction by EHL lengthening and EDL second toe EDL transfer. Although, tendon lengthening avoids donor site morbidity, theoretically, it may lead to some inherent weakness in already compromised tendon [22]. Thus, a graft augmentation is usually required to avoid these issues. We have no experience with tendon lengthening techniques. The FADI score at the end of 2 years in the present study was 95.4 with no signs of recurrence.

Conclusion

Autologous EHB graft for EHL tendon reconstruction is an easily reproducible technique with good clinical and functional mid-term results.

Clinical Message

Autologous EHB tendon graft is a good alternative for reconstruction of acute as well as chronic EHL tears with defect. The similar function and vector of force acting make it easy to identify without further need for compromising other tendons.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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