

## Case Report

## Contracture of extensor hallucis longus after fracture of distal tibia and fibula: A case report

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## ARTICLE INFO

## Keywords:

Abductor hallux tendon

Contracture

Extensor hallucis longus

Tibiofibular fracture

Z-lengthening

## ABSTRACT

Post-traumatic isolated big toe extensor contracture after tibiofibular fracture is uncommon and only a few cases have been reported. Major causes of it include anterior compartment syndrome, direct injury, entrapment or adhesion of the muscle or tendon.

We present an uncommon case of isolated extensor hallucis longus (EHL) tendon contracture following a distal tibiofibular shaft fracture without compartment syndrome of the affected leg or foot. The clinical outcome is good after Z-lengthening of the EHL tendon and abductor hallux tendon in 1-year follow-up.

*Level of clinical evidence:* 5.

## Introduction

There are various kinds of causes resulting in muscle tendon unit contractures. For example, checkrein deformity is commonly mentioned in many studies and it is a flexion deformity of the hallux. On the contrary, the extension deformity of the hallux, which will aggravate by ankle plantarflexion and get improved by ankle dorsiflexion, is rarer and is seldom reported. With the similar pathogenesis of the checkrein deformity, extensor hallucis longus tendon contracture is mainly caused by compartment syndrome, direct injury, and entrapment or adhesion of the muscle or tendon. Post-traumatic isolated big toe extensor contracture after tibiofibular fracture is uncommon and only a few cases have been reported [1–4]. Here, we present an uncommon case of isolated extensor hallucis longus (EHL) tendon contracture following a distal tibiofibular shaft fracture without compartment syndrome of the affected leg or foot. The clinical outcome is good after Z-lengthening of the EHL tendon and abductor hallux tendon in 1-year follow-up.

## Case report

A 40-year-old man presented with a 20-year-long medical history of hyperextension contracture of the right big toe. He had undergone an operation (open reduction and internal fixation with plate) at another hospital because of a right distal tibial and fibular shaft fracture caused by a traffic accident 20 years ago. After that operation, good wound healing was noted, and the patient denied any symptoms associated with compartment syndrome at that time. The implant was then removed 1 year after the operation

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<https://doi.org/10.1016/j.tcr.2020.100288>

Accepted 17 February 2020

Available online 24 February 2020

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**Fig. 1.** Extension contracture of right 1st toe is more evident while plantarflexion than dorsiflexion.

due to bone union. The patient's big toe extensor tendon tightness gradually developed and did not subside. This persisting tightness discomfort had not affected his daily activity until he slipped at a toilet 3 months ago. After that, he claimed that the hyperextension contracture of the right big toe got worse and he could not sustain it. Hence, he went to our orthopedic outpatient department to seek help.

On physical examination, there was an operative scar at the patient's anterior side of right lower leg. Extension deformity of his right hallux was noted. This hyperextension of right big toe became improved with dorsiflexion of the ankle and aggravated with plantarflexion of the ankle (Fig. 1). X-rays of right leg showed union of right tibia-fibular fracture (Fig. 2).

#### *Operative technique*

During the operation, the patient was placed in a supine position under general anesthesia. The incision site was at dorsal side of right foot. Z-lengthening of the EHL tendon and abductor hallucis tendon was then performed, followed by wound closure with 4–0



**Fig. 2.** Anteroposterior, Lateral view of union of distal tibia-fibula fractures.

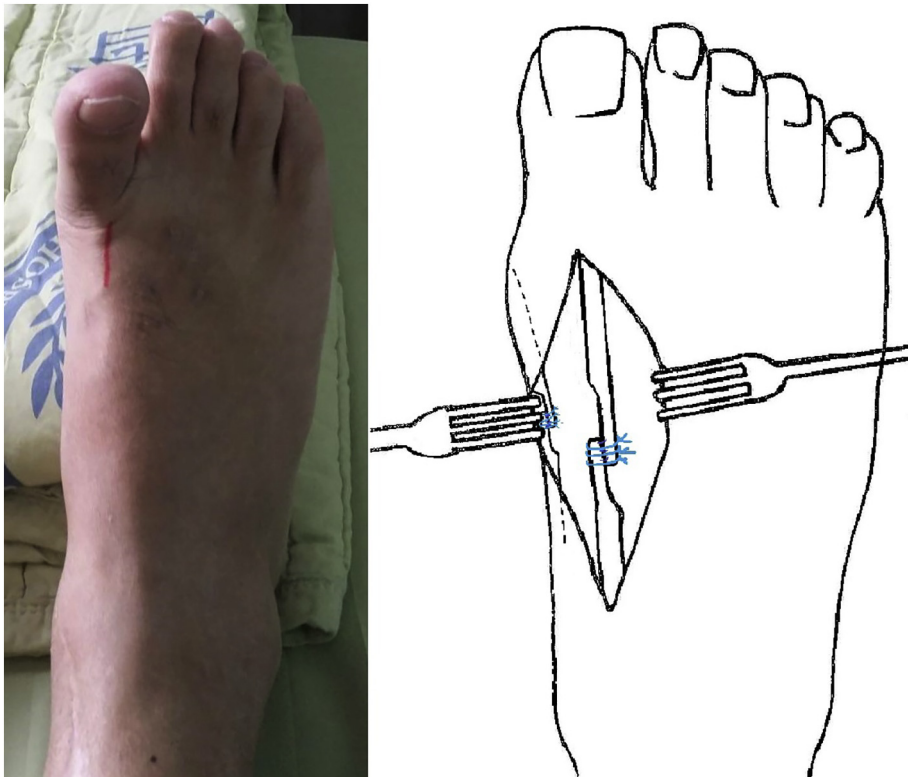


Fig. 3. Incision site at dorsal side of right foot and old operative scar at the anterior side of distal lower leg and Operation demonstration.

nylon sutures (Fig. 3).

*Postoperative period*

Short leg splint was applied for 3 weeks. After the operation, rehabilitation such as passive range of motion was arranged. After the splint was removed, the patient was educated to do active range of motion of the big toe. 1 month later, the operative wound healed well and there was no discomfort complained from the patient.

The patient came to our out-patient department 1 year after the operation. His hyperextension of right big toe had already subsided during plantarflexion or dorsiflexion of the ankle (Fig. 4).



Fig. 4. Improved 1st toe position after Z-lengthening operation while plantarflexion and dorsiflexion.

## Discussion

Our patient's hallux extension contracture was a dynamic extension deformity of the tendon of EHL. When the ankle was passively plantarflexed, the extension deformity of the interphalangeal joint became more obvious, and vice versa.

Muscle contracture can be caused by prolonged ischemia, myonecrosis, fibroblastic proliferation and myotendinous adhesion formation [5]. Compartment syndrome is the most common cause of musculotendon contracture; therefore, early detection of it is vital. In terms of anterior compartment of lower extremity, C. H. Rorabeck and L. Macnab in their study stressed that all of their patients with anterior tibial-compartment syndrome had normal peripheral pulses, as the interstitial pressure within the anterior tibial compartment can never rise sufficiently high to obstruct flow in the anterior tibial artery [6]. Local vascular perfusion impairment owing to compartment syndrome is unusual but was reported in the English literatures before [1,7]. In addition, some authors demonstrated that the direct force of fracture injures or entraps the EHL muscle and then causes subsequent adhesion and contracture [2–4]. Open surgery at the fracture site may be one of the factors causing peri-tissue vascular compromise and local ischemia change [4]. There is no evidence of compartment syndrome after the fracture of our patient. Since our patient received open reduction internal fixation with plating, this might explain why our patient's EHL muscle contracture occurred.

On the other hand, the anatomical location of EHL should be considered. Chao-Chih Lin et al. emphasized that fracture of fibula mainly accounts for subsequent EHL contracture due to the origin of EHL muscle [3]. The EHL muscle originates on the midportion of the anterior fibula and the interosseous membrane and inserts onto the base of the distal phalanx of the hallux. At the level of the ankle joint, the EHL becomes tendinous [8]. Leitschuh et al. reported a case of hallux flexion deformity secondary to entrapment of the tendon of FHL owing to adherent at the site of the healed fracture [9]. Our patient is in the similar situation. First, our patient suffered from distal tibial and fibular fracture, which is located nearly at the lower part of interosseous membrane as well as the origin of EHL muscle. Second, musculotendinous impingement of the EHL muscle might occur after the patient received the open surgery because the implant might attrite the patient's musculotendinous part of EHL muscle for a whole year before its removal. The factors mentioned above may contribute to the high possibility of insulting EHL rather than other extensors such as tibialis anterior and extensor digitorum longus in the anterior compartment of the lower extremity.

Most of the earlier-studied cases were patients with relatively shorter-term extensor contracture [2–4,7]. In comparing to other cases, our patient is a rare case who had a medical history of 20-year-long musculotendon contracture after the fracture.

Instead of releasing adhesions at the fracture site, we performed Z-lengthening of the EHL tendon and the abductor hallucis tendon at the dorsum of the patient's right foot. In order to completely release the contracture, we lengthened not only the EHL tendon but also the abductor hallucis tendon of the patient. Adequate rehabilitation after the operation was encouraged. Z-lengthening of contracture tendon is relatively simple and avoids scar tissue; hence, there is less chance of recurrence of adhesions [9]. In addition to Z-lengthening surgery, YF Leung et al. demonstrated a successful case of tenotomy of the EHL at the mid-tarsal level and tendon transfer with the extensor digitorum communis of the second toe [7]. However, intact function of the extensor digitorum longus of the second toe should be checked before the operation [10].

There are some limitations in this report. The exact mechanism of the patient's slipping at toilet, which caused the aggravation of EHL contracture, remained unknown. No obvious weakness of big toe extension was noted in one-year follow-up; however, further long-term follow-up would be necessary.

## Conclusion

Our patient is a rare case of 20-year-long extensor hallucis longus (EHL) tendon contracture following a distal tibiofibular shaft fracture without any symptoms or signs of compartment syndrome of the affected leg or foot. The clinical outcome is great after Z-lengthening of the EHL tendon and abductor hallucis tendon in 1-year follow-up. This case can provide more thorough understanding of extensor contracture of lower extremities in a long-term framework.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Declaration of competing interest

The author(s) declared the following conflicts of interest with respect to the research, authorship, and/or publication of this.

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