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Case report

M. FLEXOR HALLUCIS LONGUS TENDON RECONSTRUCTION WITH M. PLANTARIS GRAFT – A CASE DESCRIPTION AND REHAB PROGRAM

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ABSTRACT:

Isolated m.FlexorHallucis Tendon (FHL) rupture is rare and uncommon. We looked for information on the topic of reconstruction of m.flexorhallucis longus and subsequent rehabilitation in the scientific databases of SCOPUS, Elsevier and Google Scholar, but the information found was scarce and partial. This provoked us to share our experience in surgical treatment and subsequent recovery from this type of injury.

Case description and patient's information: The considered clinical case concerns a 46-year-old woman with the inability to actively bend the big toe and altered sensitivity of the foot and its plantar surface. Ligamentotomyin the area of the tarsal canal and decompression of the n.tibialis sin was performed surgically. A thorough gentle debridement was performed in the tarsal canal with tenoplasty of the flexor halluces longus with a graft of m. plantaris.

Therapeutic intervention: The physiotherapy program was divided into three periods: I (1-6) postoperative week, II (6-12th) postoperative week and III (12-24$^{th)}$ postoperative week.

Follow–up and outcomes: The patient was tested three times - on the third postoperative day, at the end of the 12th and at the end of the 24th postoperative week. The test battery included centimetry, goniometry, visual analogue scale (VAS), and manual muscle testing.

Conclusion: Based on the difference in the values of the studied indicators in the initial postoperative and final results after reconstruction of FHL with plantar graft and postoperative rehabilitation, we believe that this combination of surgical technique and subsequent physiotherapy protocol is highly effective, with excellent functional outcome.

Keywords: m.Flexor Hallucis Longus, tendon rupture, physiotherapy,

INTRODUCTION:

Injuries to the tendons of the foot can be caused by direct, indirect trauma or be a result of a repetative strain [1]. Chronic tendon rupture can be a real challenge - from its reconstruction to its complete recovery [2]. Isolated rupture of the flexor halluces longus (FHL) is an unusual and rare trauma [3]. However, it is possible that it is underdiagnosed [4]. It is most common in athletes and ballet dancers [5].

The anatomical structure of the FHL is complex [6]. The flexor halluces longus tendon is one of the longest in the foot and is susceptible to trauma throughout its course. In addition, it is the tendon with the most anatomical sites of deformity possible in the area of the foot and toes [7]. According to the location of the laceration, which may be anywhere along the entire course of the tendon, it is classified into 3 zones [8].Zone 1 refers to a rupture distal to the sesamoids, zone 2 is a rupture between the sesamoids and knot of Henry (KoH), and zone 3 is proximal to the KoH. A zone 3 rupture may lead to the proximal retraction of the tendon, but ruptures in zone 1 and 2 do not, thanks to the fibrous slip connecting FHL and flexor digitorumlongus (FDL). The length of ostrigonum (OT) is also an important factor in the pathology of FDL, as the possibility of lesion increases with a bigger OT length [9]. Diagnosis of FHL rupture is simple and easy - by test and MRI, as well as by retromaleolar compression test [10]. Additionally, diagnostic ultrasound is used to evaluate muscle movement and identify potential impingement sites [11,12,13]. Reconstruction of the FHL tendon with a graft requires precise and adequate postoperative recovery [14]. Rehabilitation tasks are related to neuromuscular re-education, correction of improper sports equipment and physical training to minimize relapses [15]. We looked for information on the topic of reconstruction of m.flexorhallucis longus and subsequent rehabilitation in the scientific databases of SCOPUS, Elsevier and Google Scholar, but the information found was scarce and partial. This provoked us to share our experience in surgical treatment and subsequent recovery from this type of injury.

CASE DESCRIPTION/PATIENT'S INFORMATION:

The described clinical case concerns a 46-year-old woman that presented in the clinic with the inability to actively bend the big toe and altered sensitivity of the foot and its plantar surface. Examination by an orthopedic surgeon found extensor contracture in the left thumb, no active flexion in the same, paresthesias in the course of n. peroneus profundussinistra, hypoaesthesia in the course of n.tibialissinistra, no evidence of a vascular problem. Ligamentotomy in the area of the tarsal canal and decompression of the n.tibialis sin was performed surgically. A thorough, gentle debridement was performed in the tarsal canal with tenoplasty of the flexor hallucis longus with a graft of m.plantaris. At the site of the formation of the skin defect in the area of the thumb, a skin plasty with a local skin flap was made. The interphalangeal joint of the thumb was fixed with a K-wire. The leg was immobilized by plastic ankle-foot orthosis for a period of 6 weeks. Rehabilitation started immediately after the surgery.

THERAPEUTIC INTERVENTION:

The physiotherapy program was divided into three phases:

I phase (1-6th week) included: foot and lower leg massage, cryotherapy, anti-edema kinesiotaping, passive movements of the thumb, fingers and ankle, controlled active motions of the ankle, isometric contractions for the quadriceps and gluteus, appropriate mobility exercises for the hip and the knee. Wight bearing on the operated limb was forbiden, and the walking was with crutches.

II phase (6 – 12th week) included: foot and lower leg massage, cryotherapy, anti-edema kinesiotaping, active exercises for the thumb, fingers and ankle joint, active exercises for the ankle joint, resistive exercises for the quadriceps and gluteus, exercises for the knee and hip joints of the operated limb, instrument assisted soft tissue mobilization for the walking surface of the foot. Walking was performed with crutches and partial weight bearing of the operated leg, and from the 8th postoperative week, only one crutch was used.

III phase (12 – 24th week) included: - foot and lower leg massage, cryotherapy, active and resistive motions for the thumb, fingers and ankle joint, resistive exercises for the quadriceps and gluteus through teraband, free active motions along the anatomical axes of the knee and hip joints of the operated limb. Walking is free without the use of aids.

FOLLOW–UP AND OUTCOMES:

The patient was measured at three-time points - on the third postoperative day, at the end of the 12th at the end of the 24th postoperative week. The test battery included circumference measurement, goniometry, visual analogue scale (VAS), and manual muscle testing.

The results of the circumference measurement show initial postoperative edema at all levels at the first time point. At the end of the 12th postoperative week, a reduction of the circumference by 1 to 2 cm, indicating a reduction of the swelling, was observed at all measured levels. At the end of the study period, the edema was completely reduced, and the circumference measurement at the levels of MTFJ, foot, ankle joint, middle of cruris and knee joint did not show any difference with the same levels in the non-operated limb. (Table 1)

Table 1. Circumference measurements

	3rd postoperative day	12 postoperative week	24 postoperative week	unoperated leg
MTFJ	24,5	23	22	22
Foot	26	24,5	23	23
Ankle joint	31	29	27	27
Middle of cruris	38,5	37,5	37	37
Knee joint	44	44	44	44

For measuring the range of joint motion of the operated limb, we used goniometry of the interphalangeal joint of the thumb, metatarsophalangeal joint of the thumb, ankle joint and knee joint. On the 3rd postoperative day, there was a complete lack of active motion in the interphalangeal joint of the thumb, severe limitation in the mobility of the metacarpophalangeal joint of the thumb and contracture in the ankle joint with a lack of dorsal flexion. This deficit in the range of motion of these joints is due to the immobilization of the limb postoperatively in the splint and the restrictions on movements in the early postoperative period. A deficiency of 5p in the knee flexion of the operated limb, compared to the healthy one, is also reported, which we interpreted as a consequence of the long preoperative period with an antalgic gait. At the end of the 12th postoperative week, there was an increase in the range of motion in all examined joints, but there was still a deficit at all levels compared to the non-operated limb. Goniometry at the end of the 24th postoperative week showed that the operated limb reached the normal range of motion in all joints as compared with the non-operated limb (Table 2).

Table 2. Goniometry results

	3rd postoperative day	12 postoperative week	24 postoperative week	unoperated leg
ITFJ	S: 0 – 0 – 0	S: 10 – 0 – 20	S: 40 – 0 – 40	S: 40 – 0 – 40
MTFJ	S: 0 – 0 – 10	S: 10 – 0 – 25	S: 30 – 0 – 50	S: 30 – 0 – 50
Ankle joint	S: 0 – 0 – 15	S: 10 – 0 – 30	S: 20 – 0 – 45	S: 20 – 0 – 45
Knee joint	S: 0 – 0 – 125	S: 0 – 0 – 130	S: 0 – 0 – 130	S: 0 – 0 – 130

As expected, the pain level was high in the early postoperative period both at rest and in motion with digital values of VAS 6 and 9. With the progression of the rehabilitation process, the pain gradually began to decrease, as the reported values at the end of the 12th postoperative week are respectively 2 at rest and 4 in motion. At the end of the 24th postoperative week, the value of the VAS is zero, indicating an absence of pain both at rest and in motion (Table 3).

Table 3. VAS results

	3rd postoperative day	12 postoperative week	24 postoperative week
in rest	6	2	0
in motion	9	4	0

The manual muscle testing (MMT) results show significant differences in muscle strength at the beginning and at the end of the study period (3rd postoperative day - 24th postoperative week). Initially, m.flexorhallucis longus was not tested postoperatively to protect the reconstruction. There was a gradual recovery of muscle strength in the main muscles that move the ankle joint during the recovery period until their full recovery. This was also reported in the reconstructed m.flexorhallucis longus at the end of the 24th postoperative week. (Table 4)

Table 4. Manual muscle testing results

Muscle	3rd postoperative day	12 postoperative week	24 postoperative week
triceps surae	50%	60%	100%
tibialis anterior	50%	70%	100%
tibialis posterior	60%	70%	100%
fibularislongus et brevis	60%	65%	100%
flexor hallucislongus	-	60%	100%

CONCLUSION:

Based on the difference in the values of the studied indicators in the initial postoperative and final results after reconstruction of FHL with plantar graft and postoperative rehabilitation, we believe that this combination of surgical technique and physiotherapy protocol is highly effective, with excellent functional outcomes.

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