

Small Finger Flexor Tendon Rerupture Occurred 4 Months after Tendon Graft Surgery: A Case Report

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Abstract: Case report: A right-handed man in his 60s sustained a subcutaneous rupture of the flexor tendon of the left small finger while playing golf. At one month after the injury, a bridge tendon graft was performed using the ipsilateral palmaris longus tendon. A dorsal extension block splint was fabricated the day after surgery, and early mobilization programs were initiated. Referring to previous reports, active finger flexion and extension exercises were performed under wearing the splint until 4-6 postoperative weeks, and full power grip was not allowed until 12 postoperative weeks. However, at 16 postoperative weeks, the moment he swung a golf club, the tendon rerupture occurred.

Discussion: No studies have been reported on rerupture after 12 postoperative weeks. The author considered three factors of tendon rerupture. Firstly, it is weakening of the tendon due to steroid injection. Secondly, it is delayed tendon healing due to blood flow disturbance caused by synovial hyperplasia. Thirdly, it is the stress on the small finger flexor tendon of swinging a golf club.

Conclusion: Therapists need to plan rehabilitation programs based on analysis of not only past reports but the patients' background and lifestyle.

Keywords: Flexor tendon injury, Rehabilitation, Rerupture, Tendon graft.

INTRODUCTION

A bridge tendon graft is performed in the case of difficulty performing end-to-end suture: cases of flexor tendon defect in the palmar region and obsolete flexor tendon injuries. After tendon grafting, early mobilization is performed [1]. Several studies have been reported that early mobilization showed excellent results [2-4]. After free tendon grafting such as bridge tendon grafting, patients wear the dorsal extension block splint until 4-6 postoperative weeks and do finger flexion and extension exercises with that splint [5, 6]. Progressive resistance exercises are started 6-8 postoperative weeks, but full power grip is not allowed until 12 postoperative weeks to prevent the tendon rerupture [7, 8].

The author provided a rehabilitation program similar to that for a patient who underwent bridge tendon grafting, but the moment he practiced golf swing the tendon rerupture occurred at 16 postoperative weeks. No studies have been reported on rerupture after 12 postoperative weeks. Therefore, this paper discussed the cause of the rerupture and the points to note when therapists provided rehabilitation.

CASA REPORT

The patient was a right-handed man in his 60s who was playing golf as a hobby after retirement. After playing golf, he was unable to grip the golf club. 2 days later, he was examined and diagnosed with a subcutaneous rupture of the flexor digitorum profundus tendon of the left small finger. On the same day, he began passive finger exercises.

At 1 month after the injury, a bridge tendon grafting was performed using the ipsilateral palmaris longus tendon. The surgical findings showed that the flexor digitorum profundus tendon of small finger ruptured proximal to the A1 pulley. It was thought that the site of rupture would come into contact with the hook of the hamate when his small finger was flexed to its maximum. Synovial proliferation was observed from the distal carpal tunnel to the A1 pulley, and the proximal end of the tendon had adhered to the flexor digitorum profundus tendon of the ring finger. Since the tendon had not retracted much, bridge tendon grafting was performed at the palmar region. Interlacing sutures were applied to both the proximal and distal ends. The proximal portion of the A1 pulley was incised because it could interfere with repaired tendon gliding. Postoperatively, the patient was immobilized in fingers flexion and wrist palmar flexion position.

The dorsal extension block splint (Figure 1) was fabricated on the day after surgery, and an early

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mobilization program was started. The wrist was splinted in 20 degrees of flexion, the MP joints in 50 degrees of flexion, and the IP joints in 0 degrees. Besides, the patient had severe pain during movement, marked swelling of the small finger, and restricted flexion of the DIP joint. Therefore, his fingers were flexed by using rubber band traction. To prevent finger flexion contractures caused by the rubber band traction, the dorsal splint using nighttime (Figure 2) was fabricated, positioning the wrist joint in 40 degrees of palmar flexion and the MP and IP joints in 0 degrees. The fingers were immobilized in a tension-reducing position. These splints were used until 8 postoperative weeks. The patient was hospitalized for 3 weeks after the surgery. During the patient's hospitalization, the author explained to the nurses how to put on and take off the splints, and asked them to confirm that he could use the splints properly. During 2 postoperative weeks, the patient performed active finger flexion and extension exercises and passive finger flexion and hold exercises with the splint two to three times a day under the supervision of a therapist. He only performed passive finger flexion and active finger extension exercises by himself on the ward. At 2 postoperative weeks, the rubber band was removed and he began to

perform active finger flexion exercises by himself. From 3 postoperative weeks, he performed active wrist exercises and active finger flexion and extension exercises taking off the splint only during exercises. From 6 postoperative weeks, passive finger extension exercises were started. From 8 postoperative weeks, the injured hand was begun to use in daily life. At 8 postoperative weeks, active range of motion of his small finger is shown in Table 1. Total active motion (TAM) was 252 degrees, and %TAM, divided by TAM of the contralateral finger, was 90.0%. At 10 postoperative weeks, he hoped that he could grip a golf club. Therefore, grip strength exercises were started at 12 postoperative weeks. At 14 postoperative weeks, he was able to use his hand in daily life without difficulty, and continued muscle strengthening exercises to resume golfing. At 15 postoperative weeks, the active range of motion of his small finger is shown in Table 1. TAM was 266 degrees, and %TAM was 95.0%. The right-hand grip strength was 34 kg and the left-hand was 28 kg. He did not have any pain. He had not yet resumed golfing, hence he resumed to practice golf swing. However, 9 days after that, the moment he swung a golf club the tendon rerupture occurred.



Figure 1: The dorsal extension block splint. The wrist was splinted in 20 degrees of flexion, the MP joints in 50 degrees of flexion, and the IP joints in 0 degrees. The fingers were flexed by using rubber band traction.



Figure 2: The dorsal splint using nighttime. The wrist was splinted in 40 degrees of flexion and the MP and IP joints in 0 degrees. The fingers were immobilized in a tension-reducing position.

The second tendon graft surgery was performed at 6 months after first surgery. The surgical findings showed that his small finger tendon rerupture occurred at the distal suture of the grafted tendon. There was synovial proliferation in the area. Tendon grafting was performed using the contralateral palmaris longus tendon. The distal end of the grafted tendon was attached to the distal phalanx with two 4/0 sutures through the bone. The proximal end of the grafted tendon was sutured to the proximal end of the flexor digitorum profundus tendon of the small finger at the distal forearm through tendon sheath and carpal tunnel. Interlacing suture was applied to the distal end. Postoperatively, he was immobilized in fingers flexion and wrist palmar flexion position.

The same as after the first surgery, the dorsal extension block splint was fabricated on the day after surgery, and an early mobilization program was

started. Extension loss in the MP joint gradually increased from 3 postoperative weeks. Passive finger extension exercise was started from 8 postoperative weeks, but there was no improvement. Extension loss of 12° was still observed in the MP joint at 12 postoperative weeks. TAM was 226 degrees, and %TAM was 80.7% (Table 1). He resumed to practice golf swing from 6 postoperative months, to practice of hitting golf balls from 8-10 postoperative months, to play round on the golf course from 1 postoperative year. 1 year after the surgery, severe extension loss of 54° was observed in the MP joint (Figure 3), but he was able to play golf without any problem. TAM was 200 degrees, and %TAM was 71.4% (Table 1).

DISCUSSION

It is well known that there is a risk of tendon rerupture up to 12 weeks after surgery. However, no



Figure 3: Motion of the fingers at 1 year after the second tendon graft surgery. Severe extension loss was observed in the MP joint.

Table1: Range of Motion in the Finger Joints and %TAM Transition

Time Post Operation	MP joint		PIP joint		DIP joint		%TAM
	Extension	Flexion	Extension	Flexion	Extension	Flexion	
3wks	-2	70	2	92	-4	82	85.0
4wks	-6	76	2	94	-8	84	85.7
6wks	0	78	4	100	-10	84	90.0
8wks	0	78	6	98	-10	86	90.0
10wks	4	80	8	102	-4	88	95.0
12wks	2	86	10	100	-4	84	95.0
15wks	6	82	6	102	-2	84	95.0
rerupture	6	78	10	88	-4	24	66.4
12wks	-12	84	16	96	-12	70	80.7
1yr	-54	86	14	96	-12	84	71.4

studies have been reported on rerupture after 12 postoperative weeks. Therefore, the author considered three factors of tendon rerupture based on the literature.

Firstly, it is weakening of the tendon due to steroid injections. He had been diagnosed with tendinopathy of small finger flexor tendon a year before first rupture, and he had got steroid injections into the tendon sheath. Injection of corticosteroids can reduce inflammation of the tendon sheath [9, 10]. It can also reduce pain and improve finger motion. However, serious side effects such as tendon degeneration and rupture have been reported [11, 12]. It can interfere with tendon repair, delay healing of the tendon sheath, and lead to tendon degeneration [13]. Those are thought to be caused by collagen fragmentation and biomechanical changes [14, 15]. However the surgery didn't confirm it, these findings suggest that his tendon might have been weakened by steroid injections.

Secondly, it is delayed tendon healing due to blood flow disturbance caused by synovial hyperplasia. Sivakumar *et al.* suggested that tendon rupture in rheumatoid arthritis was caused by blood flow disturbance and hypoxia within the tendon due to synovial invasion into the tendon tissue [16]. As mentioned earlier, the patient had tendinopathy, and at the time of the first and second surgery, synovial proliferation was observed. It is unclear whether that improved or not after the first surgery. If the synovial

proliferation had not improved, tendon healing might have been delayed.

Thirdly, it is the stress on the small finger flexor tendon of swinging a golf club. Maddalozzo described that a golf club is mainly grasped with the long, ring, and small fingers of the left hand and that the flexor tendon was heavily stressed during swinging it [17].

These reports suggested that he needed to be less stressed on the tendon than usual in his rehabilitation program. Restart golfing is his goal, and the process to it should have been planned more carefully. Grip strength exercises were started at 12 postoperative weeks because it was not said to have a risk of tendon rerupture in the previous studies. However, the patient was suspected to have a weakened tendon or/and delayed healing tendon. Therefore, it was necessary to increase slowly the load intensity during exercises and to have recovered to the preinjury level of his grip strength before he restarted practicing golf swing. Furthermore, as mentioned earlier, because playing golf stressed on the flexor tendons, it was necessary to progress rehabilitation programs in stages to restart golfing. Specifically, below is my suggestions for resuming golf: the first step is the assessment of the basic golf performance, such as golf swing motion, the grip method of golf clubs, and so on, the second step is the practice of golf swing, the third step is the assessment of hitting golf balls, the fourth step is the practice of hitting golf balls, the fifth step is playing 1

hole of golf, the final step is playing round on the golf course. The author considered that it is especially necessary to evaluate the basic golf performance in the case of flexor tendon injuries to perceive stress on the tendon.

In conclusion, therapists need to plan rehabilitation programs based on analysis of not only past reports but the patients' background and lifestyle.

CONSENT

Following the Declaration of Helsinki, signed consent was obtained from the subjects after written and oral explanations.

DECLARATION OF CONFLICTING INTERESTS

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