



## The results of reconstruction of quadriceps and patellar tendon defect with peroneus longus tendon autograft

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### ARTICLE INFO

### ABSTRACT

#### Article History

Received 21 / 07 / 2016

Accepted 07 / 11 / 2016

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#### Keywords:

Autograft  
Medial retinaculum  
Patellar tendon tear  
Peroneus longus  
Quadriceps tendon tear

The aim of this study was to evaluate the results of repair with the peroneus longus tendon of ruptures which developed in the knee extensor mechanism following trauma or total knee arthroplasty. The results were examined of 9 knees of 7 patients who underwent repair of extensor system ligament injury with peroneus longus tendon autograft. The injuries were of the quadriceps tendon only in 2 knees, quadriceps tendon+ medial retinaculum in 4 knees and patellar tendon in 3 knees. The ipsilateral peroneus longus tendon was harvested and repair was made to the ruptured quadriceps tendon, medial retinaculum and patellar tendon. Technically, the peroneus longus tendon was wrapped around the torn quadriceps tendon and closed with the fan-out technique. In tears of the patellar tendon, repair was applied by opening 2 parallel tunnels lengthwise on the patella, then the two ends of the tendon were passed through the separate tunnels in the patella. All the patients operated on for ruptures of the patellar tendon, quadriceps tendon and/or medial retinaculum, returned to their daily life without any support by the 6<sup>th</sup> month postoperatively. Reconstruction with peroneus longus tendon can be considered a safe and effective method.

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### Introduction

The extensor mechanism of the knee includes the quadriceps muscle, quadriceps tendon (QT), medial retinaculum (MR), lateral retinaculum, patella, patellar tendon (PT) and tibial tubercle (TT). When this extensor mechanism is affected negatively, the quality of life of the patient is seriously affected

Delayed presentation or the presence of a defect creates a problem in the successful reconstruction of the extensor mechanism in ligament and tendon injuries around the knee joint. Impaired extensor mechanism is a worrying complication, particularly after total knee arthroplasty (TKA). The incidence varies between 1%

and 12% (Parker et al, 2003). Problems of the extensor mechanism following TKA surgery are generally examined in 6 groups (Nam et al., 2014):

1. Patellar tendon rupture
2. Quadriceps tendon rupture
3. Patellar crepitation and soft tissue impingement
4. Periprosthetic patella fractures
5. Patellofemoral instability
6. Patella osteonecrosis

In the repair of QT and PT, tendon autografts, fresh frozen or dry frozen Achilles tendon graft, allografts to the full extensor mechanism, synthetic grafts, and reverse muscle flaps are included within the repair

options (Cadambi et al., 1992; Springer et al., 2008; Browne et al., 2011).

In the current study, the results were evaluated of cases where repair was applied with peroneus longus (PL) tendon autograft to injuries of the knee extensor mechanism with a defect and which presented late.

## 2. Patients and method

In 9 knees of 7 patients, PL tendon autograft was used to repair tendon and ligament injuries between 2010 and 2016. The injuries were QT only in 2 knees, QT+MR in 4 knees and PT in 3 knees.

**Patient #1** was a 37-year old male. Following rupture of the PT from the patella inferior third attachment point in the left knee joint, repair was applied with the tenodesis method at another centre. Following this new trauma at 2 months after the first operation, the patient could not raise his leg. The patient presented after 7 months with the complaint of difficulty walking. The PT which had ruptured from the patella attachment site was repaired with PL tendon taken from the same side.

**Patient #2** was a 40-year old male who had undergone surgery at another centre for left knee ruptured PT. After a fall 2 months postoperatively, the patient had difficulty walking and presented at our polyclinic 6 months postoperatively. The ruptured PT was repaired with PL tendon taken from the same side.

**Patient #3** was a 40-year old female who presented at the Emergency Department because of a scythe laceration in the PT. Primary closure was applied to the skin laceration. After 3 months, the patient presented at the polyclinic with the complaint of inability to walk. The ruptured PT was repaired with PL tendon taken from the same side.

**Patient #4** was a 65-year old female with Parkinson's disease and Diabetes Mellitus. TKA had been applied at 2 separate sessions for a diagnosis of bilateral gonarthrosis in the knee joints. As the result of a fall at 6 months after the TKA operations, the left knee MR and QT were ruptured and repair was made with PL tendon autograft. After another fall 6 months later, ruptures of the MR and QT developed in the right knee and repair was applied with PL tendon autograft.

**Patient #5** was a 67-year old female. Revision TKA had been applied at an external centre. Following a fall, the patient was followed up conservatively and presented at our polyclinic with the complaints of loss of knee extension and pain. As the QT was ruptured, repair was applied with ipsilateral PL tendon graft.

**Patient #6** was a 66-year old female with Diabetes Mellitus. The patient presented at our clinic following a fall 1 month after TKA surgery. There was seen to be no active extension in the left knee and the patient could not stand on that extremity. Due to medical problems, the patient was admitted for surgery after 2 weeks. The QT was seen to be ruptured and repair was applied with

ipsilateral PL tendon graft.

**Patient #7** was a 68-year old female with Diabetes Mellitus and rheumatoid arthritis. Bilateral TKA was applied and because of recurrent urinary tract infections, long-term ciprofloxacin treatment was administered. QT and MR ruptures were determined in both knees. Repair was made with PL tendon graft at separate sessions (Table 1).

**Table 1.** Patient sistribution

No	Age gender	Diagnosis	Additional factors	Surgery (Reconstruction)
1	37, M	left PT rupture		PT
2	40, M	left PT rupture		PT
3	40, F	left PT cut		PT
4	65, F	Bilateral QT and MR rupture	Parkinson, D.M, Obesity	QT and MR
5	67, F	right QT rupture	Obesity	QT
6	66, F	left QT rupture	D.M, Obesity	QT
7	68, F	Bilateral QT and MR rupture	D.M, RA, Quinolone use	QT and MR

**PT:** Patellar tendon; **QT:** Quadriceps tendon; **MR:** Medial retinaculum

All patients were administered with 1st generation cephalosporin (cefazoline sodium) 1 hour preoperatively and this was continued for 48 hours. As the immobilisation period was long, low molecular-weight heparin was administered for 5 weeks as deep vein thrombosis prophylaxis.

A long-leg tubular plaster cast was applied to all patients for 6 weeks. Ankle exercises were started immediately postoperatively. After the plaster cast, an adjustable angle knee brace was applied for 6 weeks. Active and passive joint range of motion exercises were started. After 8 weeks, partial weight-bearing was permitted with crutches and after 3 months, full weight-bearing.

## Surgical technique

In patients with ruptured patellar tendon, the Insall Salvati ratio was examined in the healthy knee preoperatively and the length of the tendon to be used was calculated. The patient was positioned supine and after the appropriate cleaning of the surgical field and draping, the ipsilateral PL tendon was taken as a free graft (Fig. 1). Then the knee was entered with an anterior midline incision. The defect was exposed (Fig. 2). After debridement, a transverse tunnel was opened from 2.5cm posterior at the level of the TT. Two parallel longitudinal tunnels were opened extending from the inferior edge of the patella towards the proximal. After passing the PL tendon through the tunnel behind the TT, the 2 ends of the tendon were passed through the separate tunnels in the patella and were returned over. Ensuring that there was 1.5cm laxity in the PT when the knee was taken into extension, non-absorbable



**Fig. 1.** Intraoperative harvesting of the Peroneus Longus tendon

sutures were then applied. To strengthen the middle of the tendon, the remaining ends were wrapped around in a web form and a 2/0 absorbable suture was applied (Fig. 3).



**Fig. 2.** Image of a patient with a patellar tendon defect

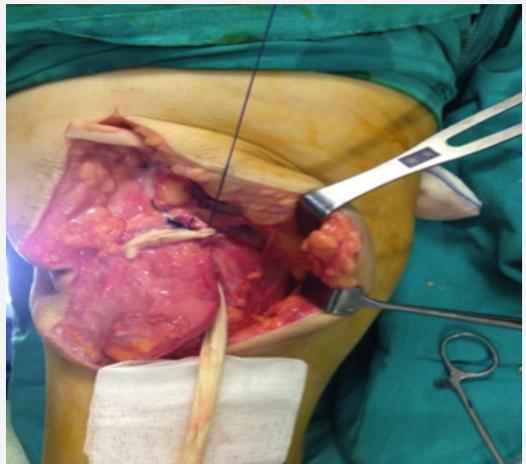
Patients with ruptured quadriceps tendon and medial retinaculum were positioned supine and after the appropriate cleaning of the surgical field and draping, the knee was entered with an anterior midline incision. Scar tissue was seen in the area around the patella where the ruptured QT was pulled towards the proximal and the MR was ruptured in the medial. After debridement of the scar tissue, the PL tendon harvested from the same side was sutured to the healthy tendon end of the proximal QT and to the surrounding tissue. By wrapping it around as far as the patellar upper pole, it was sutured passing from the tunnel opened from the upper edge of the patella, controlling the knee joint range of movement. From the medial patella, the PL tendon was placed with a peg clamp on the retinaculum stump in the medial. By paying attention to the patellofemoral joint compatibility and joint range of movement, it was wound through the tunnels and sutured. Before the peg clamp was opened, the end of the PL remaining in the distal was placed between the medial patella and the MR stump and fixed with



**Fig. 3.** Intraoperative image following repair with the Peroneus longus tendon

strengthening sutures passing along the length of the tendon and on the tendon edges. The PL end in the proximal was spread over the repaired tendon and again sutured. Non-absorbable number 2 sutures and absorbable number 0 sutures were used (Fig. 4).

In 4 knees of 2 patients who had undergone primary or revision TKA, a partial rupture of the MR was observed additional to the QT. For the defect in both the QT and MR, after the suturing of the PL tendon in the repair area, the remaining end was fanned out and sutured.



**Fig. 4.** Repair with the Peroneus longus tendon of ruptured quadriceps tendon and medial retinaculum

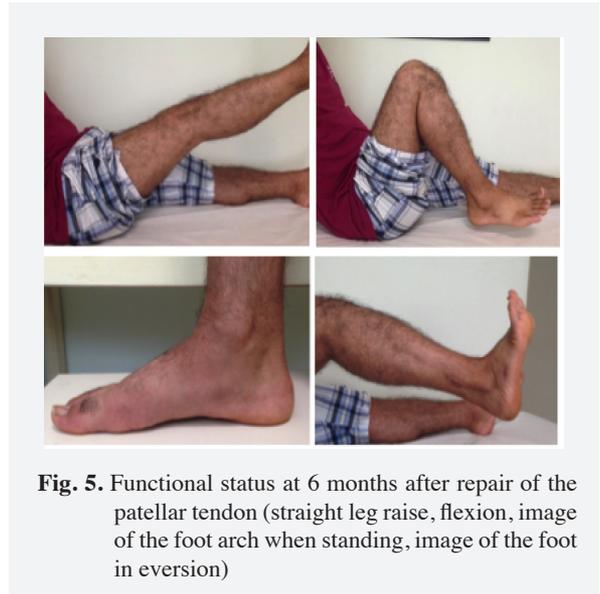
### 3. Results

In 3 patients with ruptured PT, fibrosis in the surrounding area was observed in addition to the tendon defect. In 2 patients with QT rupture, a partial or nearly total tear was determined in the MR. In 1 patient with QT and MR repair after TKA, the tip of the polyethylene insert was fractured, cutting the ligament. In another patient where ruptured QT and MR were repaired following TKA, revision TKA was applied because of loosening of the tibial component.

### 4. Discussion

The features primarily sought in tendon autograft are that the tendon which is harvested has sufficient resistance, that it can be harvested easily and safely and that no functional loss will be caused in the donor area. In the current series of patients with chronic ligament and tendon injuries around the knee, ipsilateral PL tendon graft was used. It has been shown that there is no impairment to gait after harvesting this tendon (Khalilallah et al., 2014). No problems affecting quality of life were encountered in the current patients in the initial or later stages (Fig. 5). When the sheath is left in the donor area, it has been shown on MRI that a tendinous structure developed again (Turhan et al., 2004; Kerimoglu et al., 2008).

Karahasanoglu et al. (2015) used PL tendon in a single case with neglected QT and PT rupture and the outcome was reported to be satisfactory. In the current series, there was no case with both PT and QT rupture. However, in cases with QT rupture and comorbidities (DM, Parkinson's disease, rheumatoid arthritis), there was observed to be a partial or large partial rupture of the medial retinaculum and these were repaired. A cylindrical plaster cast was applied to all the patients leaving the ankle free. The period of plaster cast application in the current study was similar to that reported in literature, after which full weight-bearing



**Fig. 5.** Functional status at 6 months after repair of the patellar tendon (straight leg raise, flexion, image of the foot arch when standing, image of the foot in eversion)

was permitted (Karahasanoglu et al., 2015). In the current study, no weight-bearing was applied until the 2<sup>nd</sup> month, but an active and passive exercise program was started. By gradually increasing weight-bearing, at the end of 3 months full weight-bearing was permitted. No infection, re-rupture, deep vein thrombosis or problems of patellofemoral instability were observed in any of the patients.

At 6 months postoperatively, the patients operated on because of PT rupture reached almost full extension and flexion and returned to their full daily life activities. The patients with quadriceps and/or medial retinaculum repair returned to daily life without support in the 6<sup>th</sup> month.

In cases with a late tendon and/or ligament injury around the knee joint and a defect, reconstruction with peroneus longus tendon autograft can be considered a safe and effective method.

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