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Percutaneous reconstruction of patellar tendon using semitendinosus tendon in chronic patellar tendon injury — case series and outcome

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ABSTRACT

Background: Chronic patellar tendon injuries are rare. Patients with these debilitating injuries present with extension lag and quadriceps atrophy. Diagnosis is usually made on a clinical background. Various methods of reconstruction of torn patellar tendon have been described and the ideal method of treatment is a matter of debate.
Methods: We retrospectively reviewed the medical records of nine patients with chronic patellar tendon injury that came to us between June 2006 and July 2012. In all patients, the patellar tendon was reconstructed percutaneously using semitendinosus tendon. Picrusting of quadriceps was required in two patients to pull the patella down.
Result: Average follow-up was 4.5 years. At final follow-up Lysholm score, Siwek and Rao grading were good to excellent in all patients, and at 12 months, all patients showed quadriceps strength 80% or more of opposite quadriceps.
Conclusion: Percutaneous reconstruction of the patellar tendon in chronic patellar tendon injury using semitendinosus tendon gives excellent result. Picrusting of quadriceps along with lateral release may be required to pull the patella down.
Level of evidence: Level IV.

1. Introduction

Patellar tendon ruptures are rare injuries. It is the least common cause of disruption of extensor mechanism [1]. Two forms, namely acute and chronic ruptures, have been described. Spontaneous rupture of the patellar tendon can occur due to some underlying diseases such as chronic renal failure, diabetes, hyperparathyroidism, systemic lupus erythematosus, and rheumatoid arthritis. The spontaneous rupture of diseased patellar tendon is usually due to mid-substance tear. Traumatic rupture of the patellar tendon is most common in young athletes. It most commonly occurs at the patellar attachment, as the maximum deformative stress during load bearing occurs at the ends rather than at the middle [2]. Disruption at the tibial tubercle is also common.

Traumatic rupture of the patellar tendon usually occurs when a violent contraction of the quadriceps occurs in flexed knees in a jump or fall from a height, wherein the knees are flexed in order to cushion the fall of the body. Microtrauma from repetitive activity and degenerative tendinopathy has been proposed as the pathophysiological factor behind patellar tendon rupture [3,4]. Patients with chronic rupture usually present with extension lag and a visible infrapatellar depression (Fig. 1a and b). The definition of chronic tear is variable; in tears older than 4–6 weeks, the patella is retracted proximally due to soft-tissue contracture and presents difficulty in treatment. Siwek and Rao [5] in their large series reported that misdiagnosis of acute rupture is an important cause of chronic presentation.

Diagnosis of chronic patellar tendon rupture is mainly clinical. X-ray shows that patella alta (Fig. 1) and a bony fragment from the tibial tubercle may also be seen. Chronic presentation can mimic posterior cruciate ligament tear as infrapatellar depression (Fig. 2) can mimic posterior sag of the tibia. Magnetic resonance imaging (MRI) can be helpful in these cases. Management is essentially surgical. Various methods have been described in the literature including open repair and reconstruction using some tendon graft. In this series, we present percutaneous reconstruction of the patellar tendon using semitendinosus graft in nine patients.

2. Methods and material

We retrospectively reviewed the medical records of nine patients (Table 1) with chronic patellar tendon rupture presented to us between June 2006 and July 2012. We observed the definition of chronicity as more than 4 weeks old. No acute case was included in this study. One patient had proximal tibial fractures 8 months back and was treated with a locking plate elsewhere and two patients were diabetic. All

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Fig. 1. Showing patella alta in chronic patellar tendon rupture.

patients were operated by senior author (JVS). A standardized technique, described below, was used in all patients. Preoperatively, all patients were assessed by clinical examination including extension lag, range of motion (ROM), quadriceps atrophy, patellar movement, and by radiological examination including Insall–Salvati ratio and Merchant angle. For the diagnosis, the presence of extension lag and high placed patella, as seen in the X-ray, compared to the other leg with or without quadriceps atrophy was required. Passive side-to-side and distal movements of the patella were observed in all patients. Quadriceps atrophy was measured as the difference between thigh girth 15 cm above the superior pole of the patella in the affected leg and the corresponding point in contralateral leg. The patella was above the condylar notch in all cases. MRI was done occasionally to rule out associated meniscal and ligament injury. In the postoperative period, results were evaluated by Tegner–Lysholm score and the Siwek and Rao grading system [5]. The Siwek and Rao evaluation method is easy and readily applicable. It is based on ROM and quadriceps power. Excellent result includes normal ROM and quadriceps power equal to the contralateral leg. Good result includes ROM from 0° to 120° and quadriceps power against moderate resistance. Functional strength of quadriceps was assessed in all patients by a simple reproducible method [6]. We determine the maximal load a patient can lift once. Weight in increasing order of 0.5 kg was tied around the ankle joint. While sitting on a bench, the patient was asked to extend the knee from 90° to 0°, and the maximal load (kg) was recorded and compared with the normal leg. Preoperative patellar traction was not given to any patient. A common postoperative rehabilitation program was followed for all patients.

Fig. 2. Infrapatellar depression in characteristic of chronic patellar tendon rupture.

Surgical technique (Fig. 3).

After spinal anesthesia, all patients were operated in supine position. The affected leg was exsanguinated with an Esmarch bandage, and then a pneumatic tourniquet was inflated to around 300 mm Hg. After prepping and draping, ipsilateral semitendinosus graft was harvested and prepared at one end only using ethibond no. 5. A 10-mm longitudinal incision was made at the lateral aspect of the lower third of the patella. A tunnel was made in the lower third of the patella using a 4.5-mm cannulated drill bit. Using the same 4.5-mm cannulated drill bit, an osseous tunnel was made at the tibial tuberosity level. A 2.5-mm Kirschner wire (K-wire) was passed through the patella below and parallel to the first tunnel. Another tunnel using the same K-wire was made 5 mm below and parallel to the first tunnel in the tibia. A double-looped ethibond no. 5 was passed through the lower patellar tunnel using a K-wire with an eyelet. Now an assistant gives consistent patellar traction until it approximates the level of the contralateral patella (Fig. 4). If the patella could not be brought down distally adequately, then we made many small transverse cuts in the quadriceps (picrusting) to stretch it. Sometimes, a lateral retinacular release may be required if the patella cannot be pulled down. After pulling down the patella adequately, ethibond in the patellar tunnel was traversed beneath the subcutaneous tissues (through the infrapatellar fat pad) parallel to the patellar tendon using artery forceps and brought into the incision of the tibial tunnel on both sides (Fig. 5). Another ethibond no. 5 was passed through the lower tibial tunnel (Fig. 6). While maintaining traction on the patella, knots were tied between the tibial and patellar ethibond on both sides. Tightness was now checked by passive flexion of the knee. A semitendinosus graft was now passed using eyelet K-wire and ethibond no. 5 through the upper patellar tunnel. At the lateral end of the patellar tunnel, this graft was passed beneath the subcutaneous tissues to bring it at the lateral end of the upper tibial tunnel. This graft was then passed through the upper tibial tunnel and made to come out at the medial end of tibial tunnel. Now the upper end of the graft was passed beneath the subcutaneous tissues to bring it at medial incision of upper tibial tunnel (Fig. 7). With adequate traction, both ends of the graft were sutured to each other and also to the surrounding tissues. Intraoperatively, after repair passive knee bending up to 70–90° was possible without excessive tension on the construct in all cases. A knee brace locked in extension was given to all patients after surgery for 6 weeks. ROM was gradually increased from 30° flexion at the first week to beyond 90° at 4 weeks. Gradually increasing weight bearing active knee extension was started after 6 weeks. We routinely did arthroscopy in all patients to rule out associated injuries of ligaments and menisci. Arthroscopic release of suprapatellar pouch, medial and lateral gutter was done in two patients to enable movement (Table 1).

3. Results

Average age of patients was 31.5 years. Mean follow-up period was 4.5 years. All patients had extension lag at the time of presentation, but flexion was near 130° in seven patients. Average delay from appearance of signs of patellar tendon rupture to surgery was 17 weeks. Two patients had a flexion of 100° or less. Arthroscopic soft-tissue release in the suprapatellar pouch and gutters was done to enable movement in both of these patients. In one patient, picrusting of quadriceps was done, and in one patient, along with picrusting, lateral retinacular release was done to bring the patella down. Preoperatively, quadriceps atrophy was present in all patients except one patient. Average Insall–Salvati ratio was 1.80 preoperatively and 1.17 postoperatively. Hematoma, infection, and thromboembolic events were not seen in any patient in the postoperative period. At final follow-up, Lysholm score and Siwek and Rao grading were good to excellent in all patients (Table 1). One patient had an extension lag of >5° in the postoperative period which improved at the 3-month follow-up. In one patient, a postoperative X-ray showed patella alta but there was no extension lag in this patient at 1-year follow-up (Table 1). At 1-year follow-up, some quadriceps atrophy was still present in five (63%) patients, but no