MEDIAL PATELLOFEMORAL LIGAMENT RECONSTRUCTION TO TREAT RECURRENT PATELLAR DISLOCATION

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ABSTRACT

Objective: To present a new technique for reconstruction of the medial patellofemoral ligament (MPFL) in patients with recurrent patellar dislocation and to evaluate the clinical findings from this. Methods: Between January 2007 and January 2008, 23 patients underwent reconstruction of the MPFL with a free graft from the semitendinosus tendon. After a minimum of 24 months of follow-up, 22 patients were evaluated using the Kujala and Lysholm clinical protocols. Results: The mean follow up was 26.2 months. According to the Lysholm protocol, the patients had a mean score of 53.72 points preoperatively and 93.36 points postoperatively ($p = 0.000006$). According to the Kujala protocol, the mean score was 59.81 points preoperatively and 83.54 points postoperatively ($p = 0.002173$). Conclusion: Reconstruction of the medial patellofemoral ligament using the proposed technique showed excellent results over the short term, when evaluated by means of clinical protocols.

Keywords – Joint Instability; Knee Injuries; Patellar Ligament; Patellofemoral Joint

INTRODUCTION

Dislocations of the patella are common, and tend to occur as a result of contracting the quadriceps during weight-bearing, with valgus flexion of the knee and the tibia rotated externally.

According to McManus, the natural history of dislocating patella that is not treated, or is treated conservatively, involves, redislocation in one out six cases, and residual symptoms in 33%, with only half of patients becoming asymptomatic. In 25% of cases, there is a family history of dislocating patella[1].

The role of the medial patellofemoral ligament (MPFL) as the primary restrictor of dislocating patella has been described by various authors[2-6]. Studies on cadavers have proven that this ligament acts by blocking the lateral forces[2,5,7]. Rupture of this structure was found in eight out of 10 cases of experimentally produced dislocations in cadavers[2] and in 15 out of 16 cases studied in vivo[8]. Davis and Fithian demonstrated that insufficiency of this ligament is a determining factor of patellar instability, if any other predisposing factor is present[9].

The objective of this study is to present a new technique for reconstruction of the medial patellofemoral ligament, using a free semitendinosus tendon graft, and to evaluate the results of patients operated on through two clinical protocols.

METHODS

In the period from January 2007 to January 2008, 23 patients with recurrent dislocating patella were operated on by the authors, at the Hospital Madre Teresa (HMT) in Belo Horizonte. The average age of the patients was 28.6 years, with ages ranging from 16 to 45 years. Eight patients were male and 14 female. All the patients underwent radiological and tomographic evaluations before surgery. In all of the patients, isolated medial patellofemoral ligament reconstruction was performed using free semitendinosus tendon graft, operated according to the technique presented by the authors.

All the patients presented dysplasia of the femoral trochlea, as described by Dejour et al[10]. None of them presented a distance between the anterior tibial tuberosity and the trochlear throat (AT-TT) of more than 20mm, or high-riding patella, both of which were exclusion criteria.

Twenty-two operated patients were available for evaluation. All of them were evaluated pre-and postoperative, using the clinical protocols of Kujala et al[11] and Tegner and Lysholm[12].

The difference between the means was statistically analyzed using measures of central tendency by the Student-t test, through the program Epi Info version 6.04, considering a statistical significance of p less than 0.05.

The research project was approved by the Research Ethics Committee of the HMT.

SURGICAL TECHNIQUE

The procedures were carried out under epidural block or rachianesthesia, without concomitant block of the femoral nerve. The patients were positioned in the supine position, with a pneumatic tourniquet in the root of the thigh. After removing the tendon of the semitendinosus muscle through an access incision of 2 to 3 cm medially to the anterior tibial tuberosity, an incision of the same size was made in the medial side of the patella, in the proximal third (Figures 1a and 1b). Through this incision, two bone tunnels were created in the patella, 2 cm distal to the insertion of the quadriceps tendon. The first tunnel was made on the anterior side of the patella 1 cm from its medial border. The second tunnel was made on the medial side of the patella, joining the anterior tunnel at a 90 degree angle (Figures 1c and 2a). The diameters of these tunnels ranged from 3.5 to 4.5 mm, depending on the diameter of the semitendinosus tendon.

After preparation of the graft obtained, one of its ends was introduced into the patellar tunnels and the other in the tunnel created, with mixter forceps, in the medial and distal third of the quadriceps tendon, close to its insertion point (Figure 1d). The two ends were then sutured together and passed under the vastus medialis muscle, between the second and third layers of the retinaculum, and then to the medial epicondyle region, where a third access of 2 to 3 cm had been prepared (Figures 1e and 1f).

At this point, slightly proximal and posterior to the medial epicondyle (Nomura's point)[13], a guide

Figure 1 – Technique: preparation of the tunnels through which the graft is passed.

wire was introduced. After testing the isometry of the graft, a femoral bone tunnel was then prepared, with the same diameter as the sutured ends of the tendon. These were there introduced and tensioned with the knee at 60 degrees of flexion. The graft was fixed at this site, with an interference screw of the same diameter (Figures 2b and 2c).
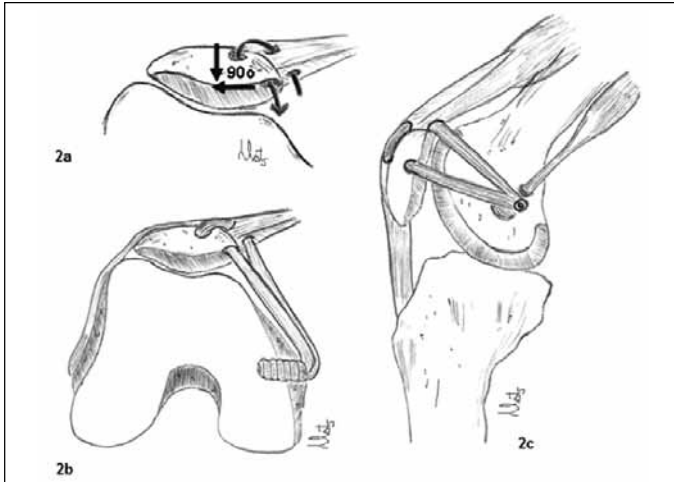

Figure 2 – Reconstruction of the MPFL with patellar tunnel and transquadriceps tunnel.

After the femoral fixation, the stability obtained and the range of motion were tested. There was no lateral retinacular release in any of the patients. After closing, the knee was then immobilized in extension with a removable immobilizer, which was progressively removed over a period of six weeks.

RESULTS

The mean duration of symptoms to surgery was 141 months, ranging from two to 360 months. The mean follow-up of the patients was 26.1 months, ranging from 24 to 32 months.

According to the Lysholm protocol, the average score of the patients prior to surgery was 53.72 points, ranging from 29 to 77. After surgery, the average score for the same patients was 93.36, ranging from 69 to 100 points. The difference between the average scores was statistically significant, with a value of $p = 0.000006$.

According to the Kujala protocol, the average score of the patients prior to surgery was 59.81 points, ranging from 32 to 88. After surgery, the average score for the same patients was 83.54, ranging from 71 to 96 points. The difference between the averages was statistically significant, with a value of $p = 0.002173$.

DISCUSSION

The medial stabilizers of the patella include the superficial medial retinaculum, medial patellofemoral ligament (MPFL), medial patellotibial ligament, medial patellomeniscal ligament, and the oblique vastus medialis[13,14]. Biomechanical studies have indicated the MPFL as the primary restrictor of lateralization of the patella, contributing to 50% to 80% of the medial contention, according to different authors[5,7,13,14-16].

Amis et al[17] demonstrated that the MPFL has a mean tensile strength of 208N. However, its limited lengthening capacity results in its total rupture in cases of complete dislocating patella, as shown in a biomechanical study by Mountney et al[18]. This fact was confirmed by other studies, in which rupture of the ligament was found in eight out of 10 cases of experimentally produced dislocations in cadavers[2] and in 15 of 16 cases studied in vivo[8]. Magnetic resonance exams have also confirmed lesion of the MPFL in the majority of cases of acute dislocating patella[19]. Ligament insufficiency is present in all cases of recurrent dislocation, according to the same authors.

More than a hundred procedures for the treatment of recurrent dislocation of the patella have been developed over the last century[13]. The majority of these techniques seek to realign the extensor mechanism, reducing lateralization of the patella when the quadriceps is activated[3,4,6,7]. However, distal realignment procedures, with medialization of the anterior tibial tuberosity, have shown limited clinical success[6,20]. Proximal realignment procedures depend on the contraction of the quadriceps to maintain the patella in the trochlear sulcus. By contrast, intact passive stabilizers, such as the MPFL, appear to have a predominant role, independent of misalignment[6].

In view of this evidence of the superiority of the use of the MPFL, various authors have defended its reconstruction for the treatment of patellar instability, as it appears to be more effective than proximal or distal realignment techniques[6,8,16,21,22].

The knowledge of the anatomy of the MPFL is crucial for its reconstruction. Nomura et al[13] are the authors who best describe its anatomy, and according to them, some fibers of the MPFL extend upwards, beyond the upper edge of the patella, directly into the quadriceps tendon. The ligament also receives the insertion of the oblique vastus medialis muscle at its patellar end, in a

portion extending for around 35% of its total length[13,17]. It is believed that when the muscle contracts, the MPFL can be pulled in a proximal direction, becoming more tense. This suggests that the oblique vastus medialis and the MPFL probably act together as a combined dynamic complex[13,23].

MPFL reconstruction techniques using free autologous graft of the flexor tendons enable its positioning in the anatomical points of the ligament. Schöttle et al[15] believe that these points cannot be reached with techniques with "tilted" tendons, but Camanho et al[24], through the technique with patellar tendon, have demonstrated otherwise.

The technique proposed here uses a narrow tunnel in a small area of the patella, enabling its passage at the medial and anterior borders of the patella to be controlled more easily, and minimizing the potential complications. The second tunnel is created through the quadriceps tendon, at the upper margin of the patella, thereby maintaining the anatomical insertion of the MPFL[13] and taking advantage of the dynamic combined action of the oblique medialis vastus muscle.

There is much discussion on the isometry of the native MPFL, and how the graft should behave during the arc of movement of the knee[16,23-28]. The normal ligament presents greater tension when fully extended with the quadriceps contracted, but the ideal variation in length for the MPFL graft has still not been established[29].

The angle of flexion of the knee during the fixation and tensioning of the graft is also a point of controversy.

Fixations at 0°, 30°, 45° and 90° have been recommended[15,21,31,39]. Nomura et al[16,32] evaluated the alteration in length of the MPFL throughout the arc of movement, and showed that its length is close to the maximum in extension, and at 60° of flexion. In extension, the patella is not inserted in the trochlear sulcus, and determining its correct position during surgery is difficult. However, at 60° of knee flexion, the trochlear sulcus is sufficiently deep and the appropriate position of the patella is easy to determine manually.

MPFL reconstruction has produced good patellar stability, regardless of the technique used. Lind et al[33], in a review article, observed an absence of new dislocations in five out of eight studies, and redislocation rates of less than 7% in the remaining three studies, which can be considered a successful result compared with other surgical patellar stabilization techniques, in which redislocation rates of 10% to 35% have been described[9].

This study presents the case studies and results comparable to other works in the literature, using the semitendinosus tendon graft[14,30,31,34-36]. With zero levels of redislocation and success rates based on clinical protocols achieving scores of 80-90 out of 100 possible points, as shown in Table 1.

CONCLUSION

Reconstruction of the medial patellofemoral ligament with free semitendinosus tendon graft has shown, in the short-term, excellent results when evaluated by clinical protocols.

Table 1 – Results of clinical trials evaluating MPFL reconstruction.

Author	Graft	Fixation	No. of patients	Follow-up	Redislocation	Clinical score
Ellera Gomes 1992	Artificial ligament	Patellar bone tunnel, metallic femoral screw	30	39 months	Zero	Crosby Insall 84% Good and excellent
Nomura and Inoue 2003	Artificial ligament	Patellar bone tunnel, femoral staple	27	5-9 years	4%	Crosby Insall 96% Good and excellent
Deie et al 2005	Semitendinosus	Suture, patella and femur	39	5 years	Zero	Kujala 92
Steiner et al 2006	Autologous graft of the adductor	Patellar bone tunnel, femoral suture	34	2-10 years	Zero	Kujala 90
Mikashima et al 2006	Semitendinosus	Suture and patellar bone tunnel, femoral screw	24	2 years	Zero	No difference between suture and patellar tunnel
Watanabe et al 2008	Semitendinosus	Patellar suture, femoral endobutton	42	4.3 years	Not mentioned	Lysholm 92
Christiansen et al 2008	Gracilis	Patellar bone tunnel, femoral screw	45	2 years	2%	Kujala 86
Gonçalves et al 2010	Semitendinosus	Patellar bone tunnel, femoral screw	22	26 months	Zero	Kujala 83.5
						Lysholm 93.3

Source: Bibliographic reference and SAME of the Hospital Madre Teresa

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