

Reconstruction and restoration in acute rupture of the patellar tendon with semitendinosus augmentation sparing its distal attachment

Case report

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Abstract

Acute rupture of the patellar tendon with poor quality of the remaining tissues is a problem difficult to solve. There are several reports on techniques to repair or reconstruct the patellar tendon. The aim of this study is to report one case in which we carried out patellar tendon augmentation with ipsi-lateral semitendinosus autologous graft, with excellent functional results.

Key words: Reconstruction; augmentation; rupture; patellar tendon; semitendinosus

Level of evidence: IV

RECONSTRUCCIÓN Y RESTAURACIÓN DE LA ROTURA AGUDA DEL TENDÓN ROTULIANO CON AUMENTO DEL TENDÓN SEMITENDINOSO PRESERVANDO SU INSERCIÓN DISTAL. REPORTE DE UN CASO

Resumen

Las roturas agudas del tendón rotuliano con mala calidad del tejido remanente son un problema de difícil resolución. Se han descrito varias técnicas para reparar o reconstruir el tendón rotuliano. El objetivo de este trabajo es comunicar un caso en el cual se realizó un aumento del tendón rotuliano con injerto autólogo de semitendinoso ipsilateral, con excelentes resultados funcionales.

Palabras clave: Reconstrucción; aumento; rotura; tendón rotuliano; semitendinoso.

Nivel de Evidencia: IV

Introduction

Acute ruptures of the patellar tendon with poor quality of the remaining tissues represent a problem very difficult to solve, which impairs knee extension and causes dys-

function. They are complex injuries to repair due to tissue loss and involvement of the tear edges. The aim of the treatment should be to restore the extension mechanism both structural and functionally, so as to recover the active extension of the knee.¹

Conflict of interests: The authors have reported none.

There are several reports on techniques to repair or rebuild the patellar tendon.^{1,2}

In this article we present a simple technique of patellar tendon augmentation using autologous graft taken from the ipsi-lateral semitendinosus muscle, in which we highlight the low morbidity associated with graft gathering.

Case

Forty-five years old male patient with no relevant medical background, who suffers fall from height, bearing all his weight on his flexed left knee.

At the time of physical examination, he shows impairment in active knee extension, pain and edema on the frontal aspect of the knee. The patellar tendon cannot be palpated, and the patella is proximally displaced. X-rays show height patella and ultrasound confirms the rupture of the patellar tendon.

Surgical technique

Under spinal anesthesia and through a knee middle line approach, we left open the quadriceps tendon, the patella, the patellar tendon and the tibial tubercle, verifying the poor quality of the tendon tissues. We did curettage in the lower patellar pole and then inserted two 5mm-titanium anchorages with double suture, which we used to carry out the end-to-end stitching of the remaining tendon with Krackow's type suture.

Even though we got fiber tendon continuity with suture, due to the poor quality of the tissues we decided to carry out tendon augmentation.

Through the same approach, on the anterior-medial aspect of the proximal tibia we got to the semitendinosus tendon under the sartorius fascia; we caught it and released it proximally using open tendon denudation and sparing its tibial attachment.

The muscle tissue attached to the proximal tendon end should be removed, and such end of the tendon should be stitched, setting the suture ends free so as to let the tendon go through the patellar tunnel.

Afterwards, we drilled a horizontal bone tunnel from the lateral aspect of the patella to the medial one within the patellar distal third, using a 4.5 mm bit and taking special care with the joint surface (Figure 1). We sent the tendon carrier pin through the bone tunnel and the free end of the tendon went in the medial-lateral direction, tightening it and fixing it with a 5 mm double suture titanium anchorage on the lateral aspect of the tibial tubercle and giving reinforcing medial and lateral stitches to the graft on the patellar tendon (Figures 2-4).

Fluoroscopic control of the leveling of the patellar inferior pole and the Blumensaat line with knee 30°-flexion was kept at all times, checking the right position of the patella.



▲ **Figure 1.** The picture shows semitendinosus graft gathering sparing its distal attachment, and the tendon carrier pin in the lower half of the patella where the graft will go through.



▲ **Figure 2.** View of the semitendinosus graft augmentation. The forceps show the position of the anchorage on the lateral aspect of the tibial tubercle.



▲ **Figure 3.** Anterior-posterior X-ray. The position of the anchorages is verified.



▲ **Figure 4.** Lateral X-ray showing the anchorages in the lower patellar pole and lateral to the tibial tubercle, and the patellar bone tunnel.

Post-operative management

Immediately after the surgery the patient should be put into an extension immobilization splint; at post-operative week three, 0-30° flexion-extension exercises start; at week 6, 0-60° and, at week nine, 0-90°. Mobility above 90° is prescribed as from post-operative week 16 on, with full retaking of activities at post-operative month 6.³

Discussion

Acute ruptures of the patellar tendon are relatively infrequent; in general, they occur in young patients when the quadriceps undergoes sudden contraction with knee flexion. They are associated with tendinopathy by multiple microtrauma or co-morbidities such as diabetes mellitus, rheumatoid osteoarthritis, kidney failure or corticosteroid use.^{4,5}

Diagnosis is made by physical examination in view of the patient's inability to extend the knee, a high patella and a palpable defect on the lower patellar pole. Imaging studies such as X-rays, MRI and ultrasound help to confirm the diagnosis and to rule out other conditions such as quadriceps rupture or patellar fracture.

The principles of repair of an acute rupture of the patellar tendon are restoration of the quadriceps function to recover strength and range of motion, restoration of patellar-femoral joint congruity so as to avoid chondromalacia and decrease rates of painful patellar-femoral joint, restoration of the injured tendon blood supply so as to ensure

maximal functional strength in the tendon, and protection of the repaired tendon for early mobilization.¹

There are reports on numerous techniques for acute or chronic tendon ruptures aimed at solving both the structural and the functional components of the problem. Diverse authors have used allograft,⁵⁻⁷— the advantage of this type of techniques is that they do not add morbidity to the surgical area; the disadvantages are the risk of transmissible infectious diseases, patellar fracture and pain caused by the osteosynthesis material used to fix the allograft to the guest bone.

Dejour et al.⁸ and Miroslav et al.⁹ use the contra-lateral patellar tendon as bone-tendon-bone graft. The main disadvantage of this type of techniques is the unfavorable effects on the healthy contra-lateral limb. Associated benefits are the accurate reconstruction of the extensor mechanism due to the length of the graft, which is exactly the same as that of the healthy contra-lateral knee.

There are reports on other techniques with synthetic materials for tendon augmentation, such as Naim et al.'s¹⁰ who used artificial ligaments (LARS ligament, J.K. Orthomedic) in the case of chronic rupture in a patient of old age with low functional demand; they point out avoidance of morbidity in the area the graft is taken from, and highlight the patient's early mobilization.

Multiple authors⁶⁻¹¹ use wire cerclage to protect the tendon augmentation and allow the patient early rehabilitation; this technique disadvantage is the need of a second surgery to remove the implant.

We believe that an important factor in the stability of the tendon augmentation is sparing the distal attachment of the semitendinosus muscle and fixing the free end of the

graft to the anterior-lateral aspect of the tibial bone with bone anchorage. Moreover, in this procedure it was not necessary to use bank graft nor was it necessary to carry out a new procedure to remove implants.

By sparing the semitendinosus muscle distal attachment, additional stability is given at the first stages of tendon healing.

Chen et al.¹¹ report that, by sparing the tendon attachment, it is possible to keep blood supply, to preserve vitality and to avoid the processes of necrosis and revascularization that take place while using free graft.

One year after the surgery, the patient shows the same knee range of motion as that in the contra-lateral knee (Figure 5). The Lysholm¹² score for knee functional evaluation was 97. We took comparative knee X-rays in knee 30°-flexion with the contra-lateral knee to assess patellar height. We should highlight that, even though we were

precautions during the surgery so as to keep the affected knee patellar height the same as the contra-lateral one, we found (Insall-Salvati rate=0.75) differences =1 as compared to the contra-lateral knee. Anyway, functional results are excellent.

Conclusions

Patellar tendon augmentation with ipsi-lateral semitendinosus in acute ruptures with poor quality of the remaining tissues is a simple and reproducible technique which allows the patient functional and structural tendon recovery. We highlight the fact that it is not necessary to carry out a new surgery to remove the osteosynthesis material and the minimal morbidity in the area the tendon graft is taken from.



▲ **Figure 5.** Mobility is verified with full extension of the knee.

Bibliografía

1. Larson RV, Simonian PT. Semitendinosus augmentation of acute patellar tendon repair with immediate mobilization. *Am J Sports Med* 1995;23(1):82-6.
2. Nguene-Nyemb AG, Hutten D, Ropars M. Chronic patellar tendon rupture reconstruction with a semitendinosus autograft. *Orthop Traumatol Surg Res* 2011;97:447-50.
3. Labib SA, Wilczynski MC, Sweitzer BA. Two-layer repair of a chronic patellar tendon rupture: a novel technique and literature review. *Am J Orthop* 2010;39(6):277-82.
4. van der Zwaal P, van Arkel ERA. Recurrent patellar tendon rupture: reconstruction using ipsilateral gracilis and semitendinosus tendon autografts. *Injury* 2007;38:320-3.
5. McNally PD, Marcelli EA. Case report. Achilles allograft reconstruction of a chronic patellar tendon rupture. *Arthroscopy* 1998;14(3):340-4.
6. Magnussen RA, Lustig S, Demey G, Masdar H, Guindy AE, Servien E, et al. Reconstruction of chronic patellar tendon ruptures with extensor mechanism allograft. *Techniques in Knee Surgery* 2012;11(1):34-40.
7. Falconiero RP, Pallis MP. Case report, chronic rupture of a patellar tendon, a technique for reconstruction with Achilles allograft. *Arthroscopy* 1996;12(5):623-6.

8. Dejour H, Denjean S, Neyret PH. Traitement des ruptures anciennes ou iterative du ligament patellaire par auto greffe controlaterale. *Rev Chir Orthopedique* 1992;78:58-62.
9. Milankov MZ, Miljkovic N, Stankovic M. Reconstruction of chronic patellar tendon rupture with contralateral BTB autograft: a case report. *Knee Surg Sports Traumatol Arthrosc* 2007;15:1445-8.
10. Naim S, Gougoulias N, Griffiths D. Patellar tendon reconstruction using LARS ligament: surgical technique and case report. *Strat Traum Limb Recon* 2011;6:39-41.
11. Chen B, Li R, Zhang S. Reconstruction and restoration of neglected ruptured patellar tendon using semitendinosus and gracilis tendons with preserved distal insertions: two case reports. *Knee* 2012;19(4):508-12.
12. Lysholm J, Gillquist J. Evaluation of knee ligament surgery results with a special emphasis on use of a scoring scale. *Am J Sports Med* 1982;10:150-4.