Technical note

Arthroscopic suture repair of acute quadriceps tendon ruptures

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A B S T R A C T

Acute quadriceps tendon ruptures disrupt the continuity of the extensor mechanism and must be treated surgically [1,2]. Many of these patients also have risk factors for tendinopathy and comorbidities such as kidney failure, diabetes or gout [3–5]. In this multiple disease context, wound healing disorders and secondary postoperative infections are of particular concern [6]. Given that tendon reattachment with suture anchors has recently been shown to be biomechanically superior to reattachment through transosseous tunnels [7–9], arthroscopy is an alternative strategy that can limit postoperative wound healing and infectious complications, while ensuring functional outcomes that are equivalent to standard techniques. The goal of this technical note is to describe an original, reproducible method for arthroscopic reattachment of the quadriceps tendon with suture anchors. Four patients were operated using this technique in a pilot study. No wound healing, infectious complications or re-tears were observed. At 6 months’ postoperative, the mean subjective IKDC score was 85.8/100.

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1. Introduction

Acute quadriceps tendon ruptures disrupt the continuity of the extensor mechanism and must be treated surgically [1,2]. Many of these patients also have risk factors for tendinopathy and comorbidities such as kidney failure, diabetes or gout [3–5]. In this multiple disease context, wound healing disorders and secondary postoperative infections are of particular concern [6]. Given that tendon reattachment with suture anchors has recently been shown to be biomechanically superior to reattachment through transosseous tunnels [7–9], arthroscopy is an alternative strategy that can limit postoperative wound healing and infectious complications, while ensuring functional outcomes that are equivalent to standard techniques. The goal of this technical note is to describe an original, reproducible method for arthroscopic reattachment of the quadriceps tendon with suture anchors.

2. Surgical technique

The diagnosis of acute quadriceps tendon rupture is primarily clinical. Ultrasonography can help to confirm the diagnosis and MRI can provide further information on the width and thickness of the tendon tear. Our surgical technique is shown in the supplementary data, Video.

2.1. Patient set-up

The patient is supine and a bolster is placed under the buttocks; a tourniquet at the base of the thigh is optional. The femoral counter-support must not be placed on the operated site as this could limit the arthroscopy field.

2.2. Approach, arthroscopic debridement and tendon repair

A standard anterolateral arthroscopic portal is used with the knee maintained in 90° flexion by the assistant (Fig. 1A). The knee is extended and then the scope pushed into the suprapatellar bursa. Extensive joint irrigation/lavage is needed because of the post-traumatic hemarthrosis. Two accessory portals (medial and lateral suprapatellar) centered over the ruptured tendon are made with placement of arthroscopic cannulas. They are located 10 mm medial and proximal to the superomedial angle of the patella, and 10 mm lateral and proximal to the superolateral angle of the patella (Fig. 2). The latter portal can be guided by transillumination from the medial suprapatellar portal.

By using these three portals, the bursa is gradually released with a shaver and the free end of the ruptured tendon is trimmed (Fig. 1B). The patellar attachment area is debrided with electrocautery to get a good view of the bone ridge on the proximal patella, which is needed to properly position the transosseous anchors (Fig. 3). Tendon debridement is continued extra-articularly over the anterior side of the tendon until there is room for a suture passer (Scorpion®, Arthrex Inc., Naples, FL, USA). Once the quadriceps lip

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and the proximal edge of the patella have been identified, forces are used to verify that the quadriceps tendon stump can be mobilized to the proximal pole of the patella.

A fourth proximal lateral suprapatellar portal is made to insert a cannula. This portal is located 20 mm lateral and 60 mm proximal to the superolateral angle of the patella. This lateral proximal suprapatellar portal is lateralized 20 mm to make it easier to drill into the patella and insert the suture anchors (Fastin® anchor, DePuyMitek Inc., Raynham, MA, USA), parallel to the patellar axis. With external maneuvers, the patella can be held and oriented in a way that ensures the drilling is oriented correctly (Fig. 1C). Two anchors are screwed into the bone through this portal (Fig. 4). The sutures from the lateral anchor are externalized through the lateral suprapatellar portal and the sutures from the medial anchor through the medial suprapatellar portal, both of which are cannulated. A suture passer is used to pass the sutures, which are then reversed for retrieval inside the joint. The ruptured tendon is repaired using a single-row mattress suture (down under suture technique) [10] (Fig. 5). The cannulated medial and lateral suprapatellar portals are used alternately to tie the medial and lateral knots; tendon reduction is verified visually through the opposite suprapatellar portal. AP and lateral X-rays of the knee in extension are used to confirm good anchor positioning (Fig. 6).

2.3. Rehabilitation protocol

Weight bearing is allowed immediately while the patient wears a knee extension splint for 6 week. Passive range of motion work is initiated on D3 at 30° and gradually increased until the passive ROM is 90° after 6 weeks. The quadriceps muscles are reactivated with concentric and isometric work as soon as practical in the immediate postoperative period.

3. Pilot study

Four patients with a mean age of 56.7 ± 33.7 years (min 25, max 71) were operated using this technique. Mean operating time was 111.2 min (min 85, max 140); the operating time was shorter in the later procedures than the first ones. The last two patients, who were
operated in less than 90 minutes, were operated with a tourniquet, contrary to the first two patients.

No wound healing, infectious complications or re-tears were observed. At a mean follow-up of 9.3 ± 3.2 months, the mean passive flexion was 91.26° (min 45°, max 120°). All patients had 5/5 strength levels and could lock their knee during single-leg stance.

At 6 months’ postoperative, the mean subjective IKDC score was 85.8/100 (min 78.9, max 94.7).

4. Discussion

Surgical treatment of tendon ruptures is essential [1,2]. Open quadriceps reattachment through longitudinal transpatellar tunnels is still considered the reference treatment method [5]. This tunneling method was adopted by Saito et al. [11] when they performed their first two cases of arthroscopic quadriceps tendon repair. Our technique differs in that suture anchors were placed in the superior pole of the patella, which reduces the amount of prepatellar detachment and simplifies the arthroscopic procedure.

In a study of 12 cadaver knees, Sherman et al. [9] showed that suture anchors were stronger than transosseous tunnels. When up to 250 N was applied, there was less fiber separation in the reattached area with suture anchors than with transosseous tunnels, although the load at failure of the repairs was the same. Petri et al. [8] had previously done a similar study in 30 cadavers and found that the suture anchors were better at preventing re-tears. In our current practice, we already used threaded anchors during open quadriceps tendon reattachment.

According to the literature, the main complications are quadriceps muscle atrophy, stiffness and re-tears. The rate of these complications is significantly higher when the diagnosis or treatment is delayed [1,2,12]. In a study of 93 patients with a mean 10.3 years of follow-up, Negrin et al. [6] found an 8% rate of wound healing complications (dehiscence and infection) and 8% re-tear rate; the functional outcome scores (WOMAC, KSS, OKS) were significantly lower in these cases. We encountered no wound healing complications with this arthroscopic technique; however, the follow-up is not long enough to determine the re-tear rate.
We recommend placing a tourniquet at the base of the thigh in the high position. This does not interfere with the arthroscopic field or with anchor placement.

5. Conclusion

Arthroscopic reattachment of the quadriceps tendon is an effective, reproducible treatment option. Although we initially used it only in comorbid patients who have an increased risk of wound healing complications or surgical site infections, we now use it in every case of acute quadriceps tendon rupture.

Disclosure of interest

The authors declare that they have no competing interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.otsr.2016.12.018.

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