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Case report

Patellar and quadriceps tendons acute repair with suture anchors

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Summary. *Background and aim of the work:* Quadriceps and patellar tendon rupture are relatively uncommon but can result in a disabling condition if untreated. We retrospectively review all our cases treated with suture anchors from 2014 to 2018, to evaluate midterm outcome of this technique. *Methods:* Traumatic and atraumatic quadriceps and patellar tendon preinsertional lesions were acutely treated with Healix Ti and FaStin RC 5mm suture anchors and an aggressive rehabilitation protocol was prescribed to patients. *Results:* Good to excellent results according to the Modified Cincinnati Rating System Questionnaire was obtained at a mean 12 months followup, without major complications. *Conclusions:* Suture anchors are a promising alternative to transosseus suture for acute repair of quadriceps and patellar tendon lesions, but longer followups are needed for detect long-term complications. (www.actabiomedica.it)

Key words: quadriceps tendon, patellar tendon, rupture, suture anchors, acute repair

Background and aim of the work

The extensor mechanism of the knee is made by quadriceps femoris muscle, quadriceps tendon, patellar bone and patellar tendon. Tendon fibers from rectus femoris, vastus lateralis and vastus medialis muscles converge distally, insert on and overtake the base of the patella, while tendon fibers from vastus intermedius insert on the base of the patella and stop there. Moreover, fibers from vastus lateralis and vastus medialis muscle contribute to give raise to lateral and medial retinacula respectively, which help load sharing with quadriceps tendon and have a role in patellar tracking. Patellar tendon is predominantly made by fibers from rectus femoris, originating from the apex of the patella and inserting on anterior tibial tuberosity.

Complete rupture of knee's extensor mechanism is relatively uncommon with quadriceps tendon being more frequently involved (1,37/100000 per year) than patellar tendon (0,68/100000 per year), mainly affecting middle aged men (1).

Despite being a rare pathology, if untreated, this could results in severe disability for the patients (2).

Causes of extensor mechanism rupture can be divided in traumatic and atraumatic; the first group includes sports injuries and penetrating injuries, and the second group includes low energy traumas (eccentric quadriceps contraction during a simple fall) or no trauma at all in patients with predisposing factors like chronic tendinopathy treated or not with steroid injections, previous ACL surgery with use of autologous patellar tendon graft or systemic conditions such as diabetes mellitus, chronic renal failure, secondary hyperparathyroidism, gout, rheumatoid arthritis, systemic lupus erythematosus (SLE), calcium pyrophosphate deposition disease (CPDD), obesity and previous quinolone or steroid use (3).

Clinical presentation is typically represented by acute anterior knee pain, a swollen knee, a palpable gap in the involved tendon and difficulty or impossibility in rise the leg in extended position.

While clinical diagnosis is usually satisfactory,

adding imaging like X-ray, ultrasound and/or MRI is helpful in confirming the clinical diagnosis and avoiding false positive cases (4).

Many techniques are described in literature for acute quadriceps and patellar tendon repair, most of them being represented by tendon-to-tendon suture of mid substance tendon lesions, transosseus sutures for more eccentric lesions with or without cerclage reinforcement (5), synthetic augmentations like mersilene strips (6) or synthetic ligaments (7), tendon plasty (8), and finally suture anchors (9-11).

Materials and Methods

In our department we started routinely repair quadriceps and patellar tendon lesions with suture anchors since 2014, collecting 9 cases in 8 patients. We treated 7 quadriceps tendon lesions (in one case the lesion was bilateral, figure 1 and 2) and 2 patellar tendon lesions. One lesion was caused by a penetrating injury in a quadriceps tendon (figure 3 and 4); all the other lesions were caused by a low energy indirect trauma (eccentric contraction during a fall) in patients with history of systemic conditions like diabetes mellitus, autoimmune diseases and daily use of corticosteroids.

All the lesions were located at the tendon-bone junction.

All patients were men except one woman, and the patients age ranged from 38 to 63 years old at the time of the acute rupture.

We used either FaStin RC 5mm ORtHOCORD with needles or HEALIX TI™ Dual Threaded Suture Anchor for quadriceps tendon and patellar tendon repair.

We made clinical diagnosis with the addition of X-ray in AP and lateral view of the knee and ultrasound confirmation.

Surgical technique consisted of a longitudinal anterior approach to the knee, except in the case of penetrating injury where the transverse wound at the level of the quadriceps insertion was used, an accurate debridement of the hematoma and loose tendon ends was performed, the tendon's footprint was decorticated with a rongeur and multiple drill holes were performed until seeing active bone bleeding. Two anchors for quadriceps tendon repair was used and one for patellar tendon, suturing the tendon stump with a Krackow suture. A horizontal mattress reinforcement stitch on the tendon stumps was made with a 0 absorbable suture, as the repair of medial and lateral retinacula, after tensioning the suture anchor stitches. Confirmation of anchors placement and the hight of the patella was obtained by final fluoroscopy.

Figure 1. Bilateral quadriceps tendon lesion: suture anchors placement at the base of the patella

All the surgeries was performed under spinal anesthesia and mild sedation based on anesthetist's and patient preferences.

Postoperative rehabilitation protocol consisted of 4 phases: the first postoperative week the knee was

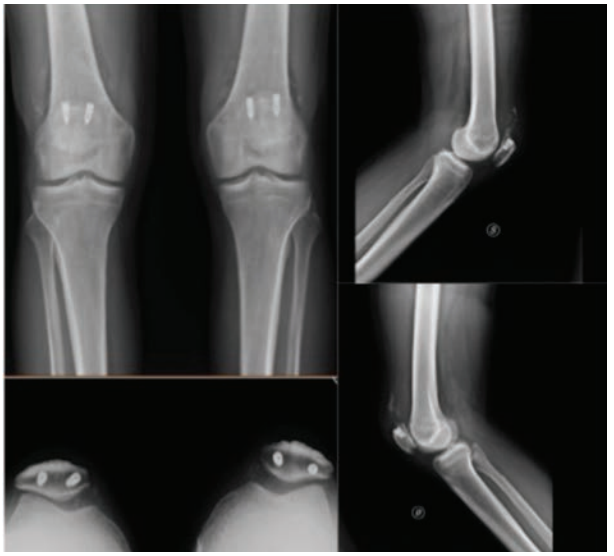

Figure 2. Postoperative X rays of bilateral quadriceps tendon lesion: lateral left and right knee view showing slight heterotopic ossifications

Figure 3. Transverse penetrating injury of the quadriceps tendon: suture anchors' stitches thightening before mattress suture reinforcement

blocked in an articulated brace at 0° to protect the surgical skin wound. At this time quadriceps settings and ankle pump was encouraged and cryotherapy was prescribed 20 minutes every 2 hours as the use of elastic stockings. Walking with crutches was allowed as tolerated. During the weeks 2 to 6 the brace was regulated on a 0°-90° range, prescribing a gradual regaining of ROM with passive exercises, keeping on quadriceps settings and ankle pumps; walking with crutches as tolerated and short arc active extension exercises. During the weeks 6 to 12 was prescribed brace discharge, gradual crutches discontinuation and discharge and active/passive ROM exercises to regain full ROM. After the 12th week, gradual and complete return to activities of daily living (ADL) was encouraged.

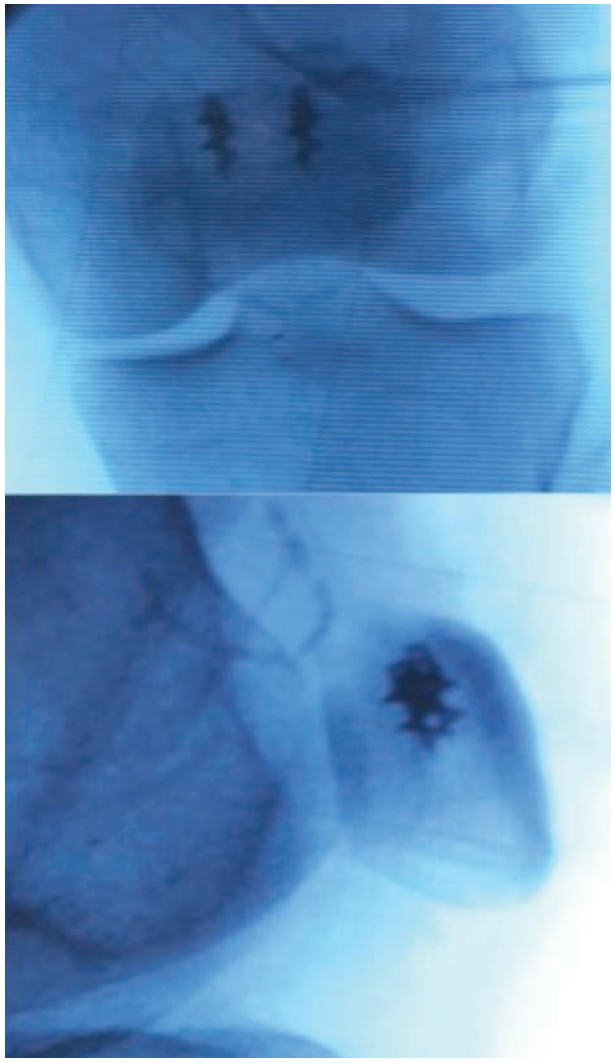

Figure 4. Transverse penetrating injury of the quadriceps tendon: intraoperative AP and LL fluoroscopy assessment of anchors placement

The followup period ranged between 9 and 15 months postoperatively.

Results

We evaluated the Modified Cincinnati Rating System Questionnaire for the injured knees after a minimum of 9 months postoperatively, recording a mean value of 81 points (excellent value >80 points), with the worst value recorded for the bilateral lesion (64 points) and the best one recorded for an athletic young man who returned to sport activities (90 points).

All patients were able to return to ADL, the mean loss of knee flexion related to the uninjured knee was 12° and no major complications like surgical wound complications, infections, deep venous thrombosis and reruptures were detected. Only one patient developed heterotopic ossification of the quadriceps tendons, apparently without clinical relation.

Discussion and Conclusions

Quadriceps and patellar tendon rupture are relatively uncommon pathologies but can result in a disabling condition if left untreated. Even when promptly surgically treated, some complications, related to postoperative immobilization like clinical relevant loss of knee flexion, quadriceps muscle atrophy, decreased patellar mobility, patellar stiffness and persistent pain are common (13).

The most common treatment for acute patellar and quadriceps tendons rupture involves the use of sutures through transosseus patellar bone tunnels. Because of the different types of rupture and the possibility of poor quality tendon tissue, the surgeon should always be prepared to combine different techniques to obtain the best repair possible, achieving a safe and early mobilization of the injured joint, to minimize the sides effects of open surgery like arthrofibrosis.

In our series we present the use of a suture anchor that is our first choice in treating this condition; we had no major surgical complications and all patients returned to a normal life in a mean period of 4 months.

The small sample size and the lack of a control group are main limitations of our study.

Use of suture anchors for primary repair of acute quadriceps and patellar tendon preinsertional lesions is a promising surgical technique that allows good results thanks to a great primary tensile strength (9) and advantages like simplicity, smaller skin incisions probably reducing the risk of surgical wound complications, shorter operative time, allowing an aggressive rehabilitation protocol, potentially avoiding specific complications of transosseus sutures like longitudinal patellar stress fractures (12).

Care must be taken to some points of the surgical technique: a good debridemnt of the tendon stumps and the corresponding tendon footprint until bleeding tissue is reached ensure long therm strength of the tendon scar tissue; avoid penetrating the articular surface of the patella with the anchors, checking under direct and fluoroscopy vision; ensure an adequate distance between the anchors, depending on the bone quality, to avoid intraoperative patellar fractures; and correctly place the suture anchors on the tendon footprint, to avoid changing in the native "Q angle" and potential patellar maltracking problems, though it seems to be more a theoretical than a clinical problem (5).

On the other hand the only disadvantage in relation to transosseus sutures appears to be the implant cost.

Anyway, despite good short and mid-term results, further studies should evaluate potential complications in long term follow-ups.

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