CASE REPORT
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UDC: 617.3:617.58
DOI: https://doi.org/10.2298/VSP200914136N

Complication after the reconstruction of the old patellar tendon rupture

Komplikacija nakon rekonstrukcije zastarele rupture ligamenta čašice

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Abstract

Introduction. Chronic patellar tendon rupture (PTR) occurs rarely; its frequency and prevalence are unknown. There are very little data on the late patellar tendon reconstruction in rheumatoid arthritis and its complications. **Case report.** We presented a surgical repair of a PTR with early postoperative rupture of the contralateral patellar tendon for a 21-year-old woman with a past medical history of juvenile rheumatoid arthritis (treated with corticosteroids) who sustained initial injury 11 months prior to the presentation. The contralateral side was used for autograft harvesting. We used bone-tendon-bone (BTB) autograft and allografts followed by double-wire loop reinforcement and immediate postoperative mobilization. The patient was followed for 2 years, and the function of both knees was restored completely, with a full active range of motion. In this case, reconstruction of an 11-month-old chronic PTR (with complete resorption of the tendon and completely separated infrapatellar pads, complicated by the contralateral PTR) with BTB autograft and allografts and double wire loop reinforcement gave an excellent functional result. Two years after the surgical treatment, the extensor function of both knees was completely restored with a full range of movements. The patient reported satisfying outcomes and was able to return to all pre-injury activities without the assistance of orthopedic devices. **Conclusion.** This case report highlights the importance of the early diagnosis and describes operative techniques used in chronic PTR repair and treatments of the early postoperative complications such as rupture of the contralateral tendon.

Key words:
early diagnosis; orthopedic procedures; patellar ligament; postoperative complications; reconstructive surgical procedures; rupture.

Apstrakt

Uvod. Hronične rupture patelarne tetive (RPT) su retke, a učestalost i prevalenca su nepoznati. Podaci o kasnoj rekonstrukciji patelarne tetive kod reumatoidnog artritisa i njenim komplikacijama su oskudni. **Prikaz bolesnika.** Prikazali smo operativnu tehniku rekonstrukcije jedanaest meseci stare rupture ligamenta patele 21-godišnje bolesnice sa juvenilnim reumatoidnim artritisom i ranom postoperativnom komplikacijom – rupturom kontralateralnog ligamenta patele sa kog je uzet kost-tetiva-kost autograft. Koristili smo kost-tetiva-kost autograft i alograftove sa duplim žičanim ojačanjima uz postoperativnu mobilizaciju. Bolesnica je praćena u periodu od 2 godine pri čemu je funkcija oba kolena kompletno rekonstruisana, sa punim obimom pokreta. U ovom slučaju, rekonstrukcija 11 meseci stare, hronične RPT (sa kompletnom resorpcijom patelarne tetive i kompletnom separacijom masnog jastučeta kolena, komplikovanom kontralateralnom RPT) sa kost-tetiva-kost autograftom i alograftom i sa duplim žičanim ojačanjima, dala je odličan funkcionalni rezultat. Dve godine nakon operativnog lečenja, funkcija oba kolena (oba ekstenzorna aparata) je u potpunosti obnovljena sa punim aktivnim obimom pokreta i bolesnica nema strah dok hoda stepenicama, niti koristi ortopedska pomagala. **Zaključak.** Ovaj prikaz bolesnika ističe značaj rane dijagnoze, opisuje operativne tehnike korišćene u oporavku hronične RPT, kao i lečenje ranih postoperativnih komplikacija kao što je ruptura kontralateralnog ligamenta patele.

Ključne reči:
dijagnoza, rana; ortopedske procedure; patela, ligament; postoperativne komplikacije; hirurgija, rekonstruktivna, procedure; ruptura.

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Introduction

Chronic PTR (patellar tendon rupture) is a rare injury, and its frequency and prevalence have not been determined yet [1]. There is no consensual decision about criteria that defines PTR as a chronic condition, but the daily activities of patients with this lesion are significantly limited [2, 3]. Diagnosis is based on clinical findings, with the palpation of a tendon defect at the point of rupture and proximal migration of a patellar bone. Ultrasound and magnetic resonance imaging (MRI) are useful in recognizing this lesion, preoperative preparation, and establishing the associated injuries [4].

The operative treatment of the unrecognized PTRs is a surgically challenging procedure with unpredictable postoperative results based on many studies that tried to describe the surgical technique for this type of injury. There is no gold standard in the surgical treatment of these injuries [5]. Described techniques include the use of autografts [6–9] or allografts [10–13] and synthetic materials such as Dacron or Ligament Augmentation and Reconstruction System (LARS) [14–17]. The literature regarding chronic PTR in patients with rheumatoid arthritis is scarce [18–20], and common postoperative complications are infections, patellar fractures, and quadriceps muscle atrophy [5].

We presented a rare form of injury and an early postoperative complication. To our knowledge, such a postoperative complication and its surgical treatment are not reported in the treatment of chronic PTR in patients with juvenile rheumatoid arthritis. We presented an operative technique for the reconstruction of chronic PTR with the postoperative rupture of the contralateral patellar tendon from which bone-patellar tendon-bone autograft was harvested.

Case report

A 21-year-old female suffered a left knee injury after falling from the staircases. The patient felt severe knee pain, as if something “snapped” in her joint, and noticed that her knee was swollen. She has been suffering from juvenile rheumatoid arthritis for many years and has been treated with oral corticosteroids. The patient went to the Emergency Room (ER), where a knee X-ray was taken (Figure 1); she was diagnosed with a knee distortion and contusion. As a result, her knee was put in cast immobilization. Afterward, she underwent a course of physical therapy for 11 months. The passive range of motion was 0 to 130 degrees, with a knee extensor lag. The Lachman, McMurray, and Apley test, and *valgus* and *varus* stress tests were negative. The left knee (MRI) showed a complete PTR with a tendon almost completely resorbed by the surrounding tissue and infrapatellar pads completely separated (Figure 2). The patient underwent surgery under spinal anesthesia with a tourniquet applied. Firstly, a bone-patellar tendon-bone autograft was taken from the contralateral knee, similar to the graft in an anterior cruciate ligament (ACL) reconstruction. Simultaneously, two cadaveric bone-tendon-bone (BTB) allografts of appropriate



Fig. 1 – The X-ray imaging of the right knee after the injury: patella alta (arrow).

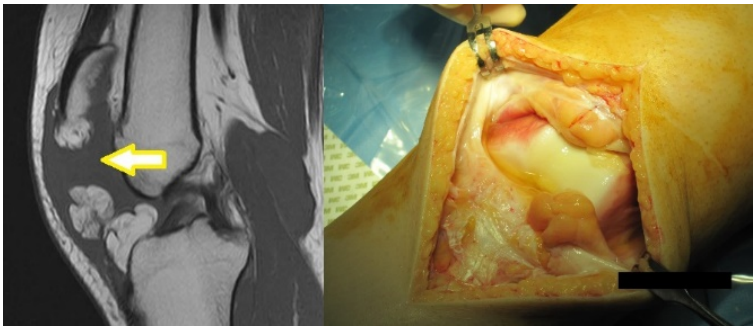


Fig. 2 – Magnetic resonance imaging (MRI) of the right knee: complete resorption of the patellar tendon by the surrounding tissue and separation of the infrapatellar pads (yellow arrow).

dimensions were taken from the bone bank of the Orthopedic Clinic in Novi Sad. A 15-cm-long skin incision was made on the anterior side of the left knee. After the surgical debridement, a 25-mm-long and 8-mm-wide bone trough was created in the tibial tubercle. Then, using a tibial ACL guide, a bone tunnel was made (also 25-mm-long and 8-mm-wide) in the central part of the patella, from its superior to its inferior pole (Figure 3). Afterwards, tibial and patellar bone tunnels of the same dimensions were made on both sides of the initially made tunnel. BTB autograft was set on the central position, press fit into the tibial trough, and stabilized with a 3.5 mm cortical screw; then, a prepared patellar graft was inserted into the centrally bored patellar tunnel, and also stabilized with a 3.5 mm cortical screw. Two cadaveric BTB allografts were set and stabilized using the same procedure; they were prepared to have dimensions identical to those of the contralateral knee autograft. Two metal wires were fastened around the patellar basis with a screw secured to the tibial tubercle to protect the patellar grafts (Figure 4). After tightening the wire loop, the passive knee range of motion was evaluated. A drain was inserted in the knee, and the wound was closed in layers.

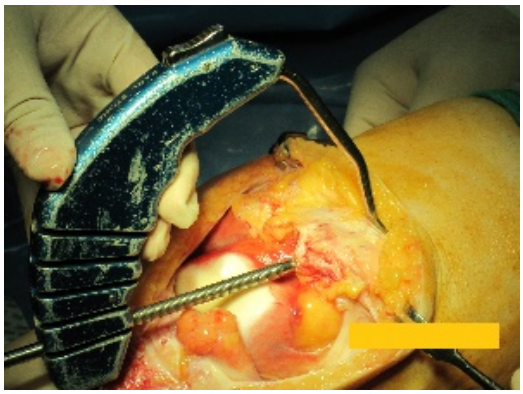


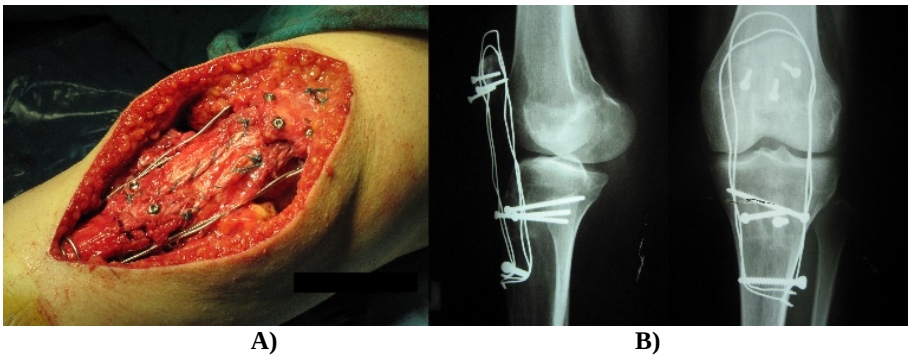
Fig. 3 – Tibial anterior cruciate ligament (ACL) guide for the drilling of the bone tunnels in the patella (from its superior to its inferior pole).

Postoperatively, a continuous passive motion (CPM) machine was used from day 1, and the patient was placed in passive flexion of 90 degrees for 6 weeks. On postoperative day 5, the patient slipped on her way to the bathroom and felt as if something "snapped" in her right knee, which was considerably swollen. A diagnosis of PTR of the right knee was made immediately, from which the BTB autograft was taken during the first procedure. Patella alta was found on the X-ray of the right knee, which was an indication of urgent surgical treatment.

The patient underwent a new procedure the day after this complication. The surgery was performed under spinal anesthesia with the use of a tourniquet. The same skin incision made for the BTB autograft was used to expose the point of rupture of the right patellar tendon. After the surgical debridement, the bone incisions on the tibia and patella (25-mm-long and 8-mm-wide), from which the autograft was taken, were covered with press fit of the prepared cadaveric allograft of the same dimensions and stabilized with two cortical 3.5 mm screws on patella and tibia, respectively. The degenerated remnants of the patellar tendon were sutured using Krakow stitches (Figure 5). Two metal wires were fastened around the patellar base with a cortical screw secured to the tibial tubercle to protect the patellar graft and newly sutured patellar tendon. After tightening the wire loop, the passive right knee range of motion was evaluated. A drain was inserted in the knee, and the wound was closed in layers.

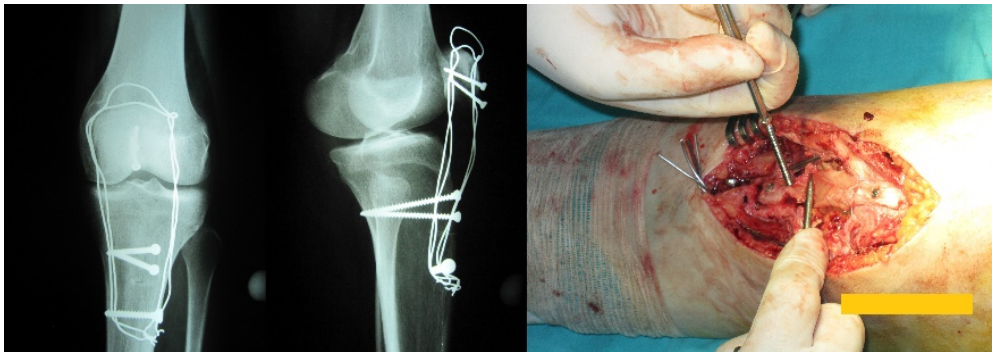
A CPM machine was used from the first postoperative day; the patient was placed in passive flexion of 90 degrees for the first 6 weeks. Simultaneous quadriceps strengthening and active extension exercises were performed during the physical treatment. While walking in the postoperative period, the patient had tutor orthosis on both knees in the full extension, and she was able to fully regain the appropriate footing. At three months of follow-up, the active range of motion on both knees was 0 to 130 degrees. Osteosynthetic materials were removed from her knees after a year and a half.

At two years of follow-up, the patient had a full range of motion on both knees, including both flexion and extension with the restored quadriceps strength and good results of isokinetic muscle testings (PrimaDOC multi-joint isokinetic dynamometer, Easytech, Italy), was able to perform knee bends, and was walking normally without any external support.



A) **B)**

Fig. 4 – A) Two cadaveric bone-tendon-bone (BTB) allografts and an autograft from the contralateral knee, with the cortical screws on the patella and tibial tubercle; B) two metal wires fastened around the patellar basis with a screw secured to the tibial tubercle to protect the patellar grafts.



A) **B)**

Fig. 5 – A) The bone incisions on the tibia and patella (25-mm-long and 8-mm-wide), from which the autograft was taken, were covered with press fit of the prepared cadaveric allograft of the same dimensions and stabilized with two cortical 3.5 mm screws on patella and tibia, respectively; B) Then, the degenerated remains of the patellar tendon were sutured using Krakow stitches, and two metal wires were fastened around the patellar basis with a cortical screw secured to the tibial tubercle to protect the patellar graft and sutured patellar tendon.

Discussion

Among all injuries of the knee extensor mechanism, approximately 3–6% are related to the PTR. Between 1.5% and 2% of all tendon injuries are related to the PTR [21, 22]. They are most common in young men under 40 (male/female ratio is 6:1), while the most frequent mechanism of the PTR is an eccentric overload of the knee extensor mechanism with a planted foot and flexed knee [23].

There are no clear data about the frequency of the chronic PTR or a general agreement about its definition, even though Siwek and Rao [24] consider lesions older than two weeks as chronic PTR. Bushnell et al. [25] reported that as much as 28% of PTRs may be unrecognized and undiagnosed. Ultrasound and MR imaging are not only useful in recognizing these injuries but also preoperatively and in diagnosing the associated lesions [4]. In young patients, chronic injuries are usually associated with systemic diseases (chronic renal failure, systemic lupus erythematosus, rheumatoid arthritis), corticosteroid administration, and treatments with fluoroquinolones [19, 20, 26].

The aggravating circumstances in the treatment of chronic knee lesions are a significant tendon retraction with patella alta, bad quality of the remaining fibers of the ligament, and quadriceps muscle atrophy. An end-to-end suture is usually not possible, thus synthetic fibers, allographs, and autografts are used in the surgical treatment [1, 2, 18, 26].

The use of artificial synthetic materials in the reconstruction of the patellar tendon started in the 1980s, but it was accompanied by complications, such as reactive synovitis and ruptures [27, 28]. The application of LARS was not adequately and timely tested, and due to the small number of randomized studies with LARS, its effects on the process of regeneration of the patellar tendon are still not known. In literature, only midterm studies about LARS augmentation could be found and are usually related to the older patients, so we decided to use a combination of autograft and BTB allografts [5, 17].

The use of BTB allografts is the gold standard that has been successfully applied in the treatment of knee ligament injuries. Milankov et al. [29] reported the use of contralateral BTB autograft for chronic patellar tendon rupture reconstruction, which resulted in an excellent knee extensor mechanism reconstruction.

Due to the long period between the injury and the surgical treatment of about 11 months, our patient had radiographic findings of a patellar tendon completely resorbed by the surrounding tissue and infrapatellar pads completely separated and partially resorbed. Therefore, it was necessary to use both an allograft and a contralateral BTB autograft which is used as a benchmark to correctly prepare allografts (in order to have a correct dimension of the graft and match it to the contralateral side). Burks and Edelson [11] were the first to use BTB allografts in the patellar tendon reconstruction. One bone plug was secured to the tendon insertion at the tibial tubercle with screws, while the other was secured to the patella using the “zuggurtung” technique.

Thus, using a contralateral BTB autograft, we were able to accurately reconstruct the extensor mechanism of the injured knee, which proved to be almost identical to the contralateral knee, with a strong autograft fixation. The main disadvantage of this technique is taking a graft from the non-injured knee, although Shelbourne and Urch [30] proved that taking BTB autografts from the non-injured knee does not affect its function. Long-term treatment with steroids in patients with rheumatoid arthritis may have a role in weakening the patellar tendon. However, due to the lack of studies dealing with complications after taking the autografts from the uninjured knee from patients with a history of corticosteroid treatment, we had a conversation with the patient in order to weigh out the risk and benefits of this procedure. As a result, we decided to proceed with this procedure in order to anatomically reconstruct the injured knee as previously described [19, 20, 26]. The adequate length and tension of the grafts are essential; if these parameters are not correct, the overly tensed graft will cause a defect in the knee flexion, while in-

sufficient tension of the graft will cause a defect in its extension. Palencia et al. [18] described a postoperative persistence of patella alta, and, therefore, it is crucial to determine patellar indexes preoperatively, such as Insall-Salvati Index or Blackburn Peel Index. A correct reconstruction of patellar length is possible only with the ideal size of the graft. That was one of the reasons, together with the resorption of the injured tendon by the surrounding tissue, to apply both allografts and a contralateral autograft because the slightest mistake in assessing the length of a tendon significantly reduces the postoperative range of movements of the knee.

PTR of the "donor" knee was also treated with the application of BTB allografts, double fire loops, and suturing of the ruptured tendon because it was an acute lesion. The double fire loop technique reduces tension on the repaired patellar tendon and contributes to the better regeneration and early mobilization of the injured knee, while the osteosynthetic material is removed after the complete functional restoration of the joint [31]. Our patient was on the long-term corticosteroid therapy with degenerative alterations on her tendon, and our opinion was that end-to-end sutures with no allografts would not be sufficient.

Postoperative immobilization is applied from 6 to 8 weeks [10, 16], or even longer in some cases [32], which may lead to consecutive knee contractures and the need for manipulation under anesthesia [8]. In literature, different types of postoperative external fixation are described, such as reinforced tendon repairs [24, 33–35], mostly with a single wire [6, 8, 13, 14, 36], with immediate CPM treatment in order to avoid quadriceps muscle atrophy and knee contractures. In our case, we used multiple wires described by Casey and Tietjens [31], which are mechanically stronger than a single circumferential loop and allow immediate mobilization without the use of postoperative casting or any other type of postoperative immobilization.

At eighteen months postoperatively, we removed the wires due to their breaking. Some authors [8, 13, 14] suggest the wire removal 6 to 10 weeks after the operation, but Casey and Tietjens [31] recommend the wire removal be postponed at least six weeks after the surgery. It allows a patient to regain the full range of motion in the injured knee, so that repaired tendon can strengthen sufficiently before the wire removal.

Conclusion

In this case, reconstruction of an 11-month-old chronic PTR (with complete resorption of the tendon and completely separated infrapatellar pads, complicated by the contralateral PTR) with BTB autograft and allografts and double wire loop reinforcement gave an excellent functional result. Two years after the surgical treatment, the extensor function of both knees was completely restored with a full range of movements. The patient reported satisfying outcomes and was able to return to all pre-injury activities without the assistance of orthopedic devices. Although additional surgery was needed to remove double wire loop reinforcement, it enabled an early mobilization and more secure healing of the repaired patellar tendons.

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Received on September 14, 2020
Revised on November 24, 2020
Accepted on December 2, 2020
Online First December 2020