BJCR
Brazilian Journal of Case Reports

PCAA
Publicações Científicas de Acesso Aberto

Case Report

Chronic Quadriceps Lesion with Peroneus Longus Autograft - A Case Report

Diego Escudeiro de Oliveira [1], Bruno Arjonas Bononi [1,*], Juliano Malpaga [1], Marcos Vaz [1], Pedro Baches [1]

[1] Irmandade da Santa Casa de Misericórdia de São Paulo, São Paulo, SP, Brazil.

* Correspondence: bononi.bruno2@gmail.com.

Abstract: Chronic quadriceps tendon ruptures are challenging lesions due to persistent inflammation, scarring, and tendon retraction. Although this is a disabling injury, few surgical techniques have been reported for such cases. We describe a 50-year-old Caucasian male who suddenly experienced pain in the anterior region of the knee during skating practice, with no history of direct trauma or known risk factors for associated diseases. He was treated with a modified Wave Puvertalf technique and extensor autograft reconstruction using the peroneus longus tendon.

Keywords: Quadriceps Tendon Rupture; Chronic Lesion; Wave Puvertalf technique.

Citation: Oliveira DE, Bononi BA, Malpaga J, Vaz M, Baches P. Chronic Quadriceps Lesion with Peroneus Longus Autograft - A Case Report. Brazilian Journal of Case Reports. 2025 Jan-Dec;05(1):bjcr69.

https://doi.org/10.52600/2763-583X.bjcr.2025.5.1.bjcr69

Received: 3 November 2024
Accepted: 22 January 2025
Published: 23 February 2025

1. Introduction

Quadriceps tendon ruptures affect middle-aged males with an annual incidence of 1.37 patients per 100,000 persons [1]. Trauma mechanism is described as a sudden eccentric contraction of the quadriceps muscle group to prevent falls while climbing stairs or playing sports. These lesions impair the extensor mechanism of the knee and can be associated with total knee arthroplasty, patellar tendinitis, and systemic diseases (hyperthyroidism, osteomalacia, systemic lupus erythematosus) [2, 3]. Complete tears need immediate surgical intervention to ensure optimal clinical outcomes [3–5]. Acute lesions are diagnosed clinically and need prompt surgical repair and are commonly treated by primary repair surgical technique - the proximal and distal ruptures of the tendon are brought back to their anatomical position [5].

The treatment of chronic neglect ruptures is difficult, due to soft tissue retraction and muscular atrophy caused by inflammatory changes. Sustainable repair required grafts augmentation fill the gap. Several grafts can be used, including autologous semitendinosus and gracilis tendon grafts [6], iliotibial band autograft [7], Achilles tendon allograft. [8]. We report a case of a 50-year-old healthy man with no medical history of risk factors and no long-term medication who presents with a spontaneous tendon rupture during a skating practice. He was treated with the modified Wave Puvertalf technique and extensor autograft reconstruction with peroneus longus tendon [9].

2. Case Report

2.1 Case presentation

In July 2022, a 50-year-old male experienced pain in the anterior region of his knee during skating practice. He delayed seeking medical care for one month and continued to experience pain and difficulty fully extending the knee.

At the physical exam, he presented a muscle gap detected in the proximal area of the patella, measuring approximately 5 centimeters was unable to extend the knee, and exhibited signs of claudication and atrophy of the quadriceps muscle. Sensory, motor, and perfusion are normal. He has no history of direct trauma or known risk factors for associated diseases. We made the diagnosis of quadriceps tendon rupture using clinical examination, radiographs (Figure 1) and magnetic resonance imaging (MRI) (Figure 2). The therapeutic intervention involved a surgical tendon repair using a modified Wave Puvertalf technique with an autograft from the peroneus longus. The post-surgical exam patient can fully extend the knee with little limitations in strength and the range of motion of the knee.

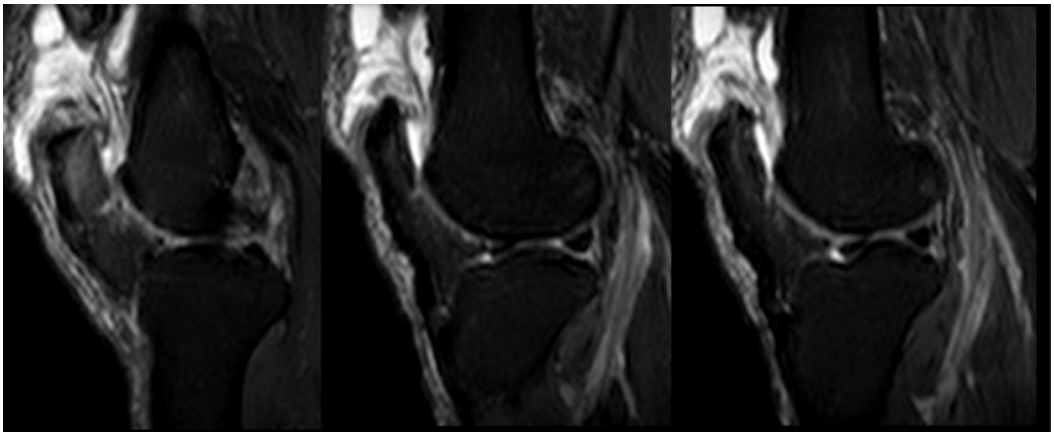
Figure 1. Pre-surgical x-ray quadriceps tendon rupture.

2.2 Surgical technique

Degenerative changes or extensive post-injury tendon retraction in chronic quadriceps tendon rupture makes the repair technically demanding and difficult to perform. Considering the limitations of accessing a tissue bank, and the availability of anchors. We set to use the modified Wave puvertalf technique to pass these barriers.

We perform the surgical procedure with the patient in the dorsal decubitus position, with a cushion fixed to the surgical table, placed under the middle one-third of the calf to maintain the knee joint in about 45 of flexion. Use chlorhexidine detergent for aseptic skin preparation, and alcoholic chlorhexidine for antiseptic skin. Perform surgical procedures with the patient under spinal anesthesia and with a femoral nerve block.

Figure 2. Pre-surgical MRI quadriceps tendon rupture.



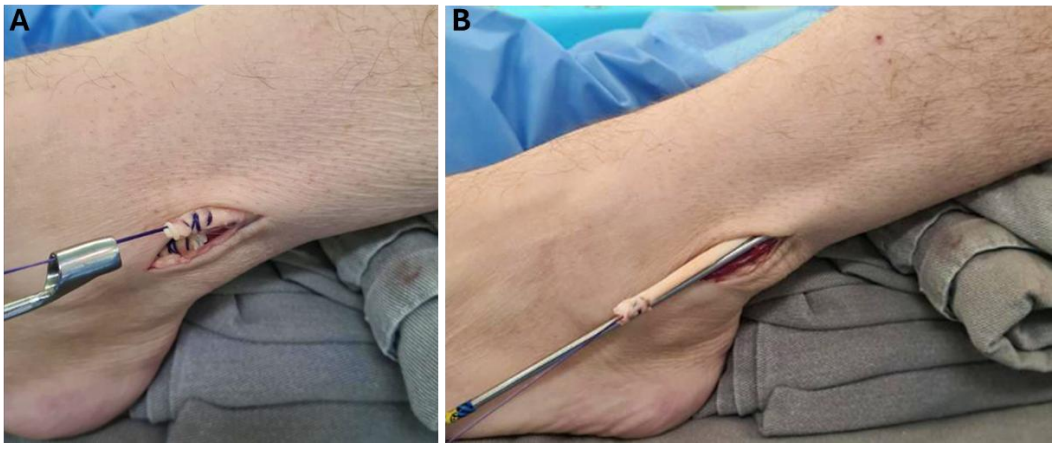
2.3 Surgical Procedure

2.3.1 Patient Positioning and Preparation

The surgical procedure is performed with the patient in the dorsal decubitus position, with a cushion fixed to the surgical table, placed under the middle one-third of the calf to maintain the knee joint in about 45 of flexion. Chlorhexidine detergent is used for aseptic skin preparation, and alcoholic chlorhexidine is used for antiseptic skin preparation. The surgical procedure is performed with the patient under spinal anesthesia and with a femoral nerve block.

Peroneus longus tendon harvesting: a single longitudinal incision of approximately 3cm, in the posterolateral region of the fibula, over the peroneus longus tendon. We made the incision from distal to proximal, starting 3 cm proximally from the most distal point of the lateral malleolus, in the skin and subcutaneous tissue. After separating the subcutaneous tissue, the peroneus longus tendon is identified and isolated using a hemostat (Mosquito/Kelly) after distinguishing it from the short fibular tendon. The bond of both peroneal tendons is performed in the most distal region of the incision through simple stitches with Vicryl 1.0 (Figure 3A). After the suture unifies the tendons, the peroneus longus tendon is incised, repaired with Vicryl 1.0, and with the aid of a tenotome, it is removed up to its proximal insertion (Figure 3B). Totaling a graft length of approximately 24cm (Figure 4).

Figure 3. Tenotone positioning to perform graft removal.



2.3.2 Graft Preparation

The flexor grafts were folded to form a single quadruplicate graft. The fibular longus tendon graft is incorporated into the flexors without any bending. Totaling a quintuple

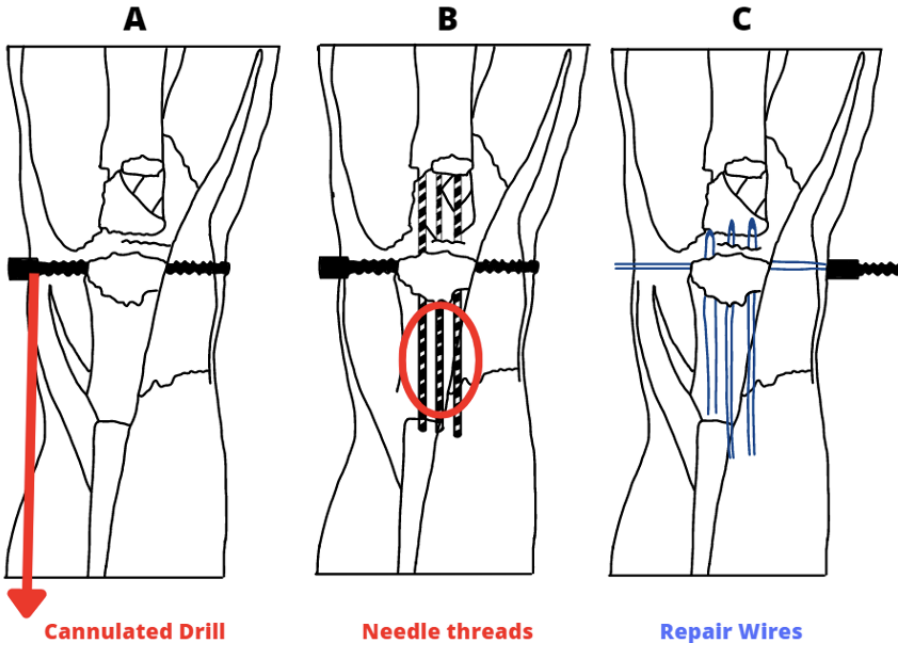
graft in the most distal region in continuity with a more proximal single graft, with the rest being the total length of the fibular tendon.

Figure 4. Peroneus longus tendon graft.

2.4 The approach of quadriceps

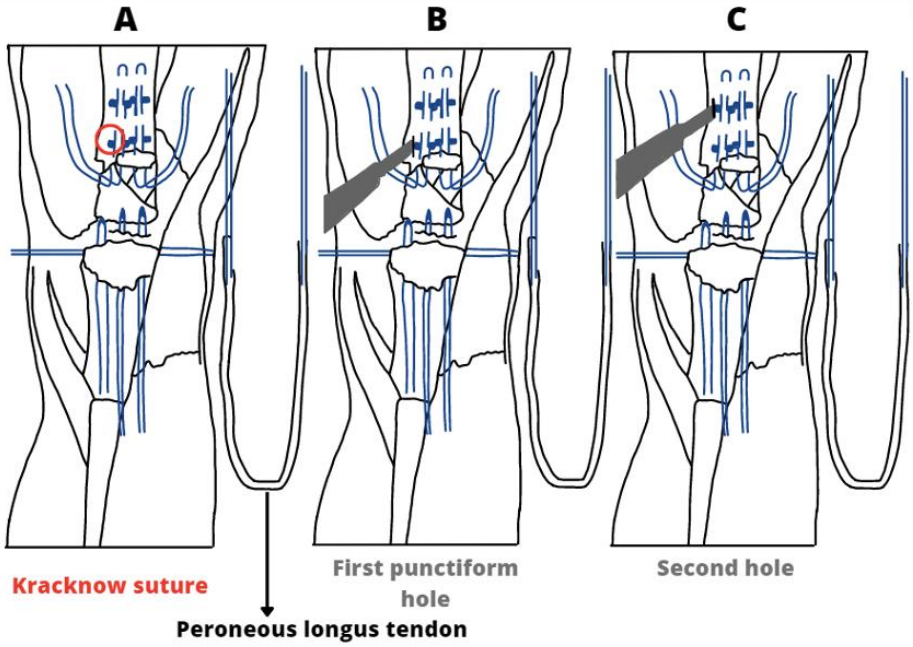
We make a blunt dissection of the proximal stump of the quadriceps tendon, with resection of the fibrotic tissue between the tendon and the proximal pole of the patella. A transverse bone tunnel, 5 mm in width, is created at the center of the patella, using a cannulated drill, from medial to lateral (Figure 5A). While a 5-gauge drill is still inside the patella, we create 3 parallel longitudinal tunnels to insert the threading needles (Figure 5B), leaving a repair wire on the carrying handle at the proximal end of each of these 3 tunnels (Figure 5C).

Figure 5. **A.** A transverse tunnel is created in the patella using a 5-mm cannulated drill. **B.** Three parallel longitudinal tunnels are created for threading. **C.** The repair wires are maintained on the carrying handle at the proximal end of each longitudinal tunnel created in the patella to facilitate the transport of the wires.



The middle section of the quadriceps tendon is then sutured, using Krackow sutures, with 2 polyester threads (No. 2 Ethibond; Ethicon); the 4 wires at the distal end of the quadriceps tendon are retained (Figure 6A). Three to four punctiform holes are created in the medial and lateral borders of the quadriceps tendon (Figure 6B and Figure 6C) to be used for the threading of the peroneus longus tendon.

Figure 6. **A.** Krackow sutures, using 2 threads of polyester suture (Nº 2 Ethibond), are placed in the middle portion of the quadriceps tendon, with 4 wires maintained in situ at the distal end of the quadriceps tendon. The prepared fibular tendon is shown by the arrow. **B.** Punctiform holes are created in the medial border of the quadriceps tendon. **C.** Punctiform holes are created in the lateral border of the quadriceps tendon. Of note, at least 3 holes should be created in the medial and lateral borders of the quadriceps tendon.



The peroneus longus tendon passes through the transverse tunnel, leaving 2 symmetrical extremities (Figure 7A). Each of these 2 ends is then threaded through the preformed holes in the medial and lateral borders of the quadriceps tendon, per the Pulvertaft technique, ensuring that the tip of the tendon after the final thread is directed anteriorly (Figure 7B). The distal ends of the peroneus tendon are then placed under traction, crossed over, and sutured over the quadriceps tendon (in a locking X formation) to reduce the anterior gap in the tendon, with only a residual gap in the central portion of the tendon (Figure 7C). This residual central gap is closed by pulling on the 4 polyester suture strands (from the previous Krackow sutures), forming a transosseous suture in the distal pole of the patella (Figure 8).

3. Discussion

Chronic ruptures of a quadriceps tendon are disabling injuries. Some techniques to treat chronic lesions of the patellar ligament, including direct repair with trans-bone points associated with cerclage with steel thread, and the use of allografts, autografts, or even synthetic grafts, are described in the literature [10]. Besides this, a few studies are comparing the techniques for the best approach [11, 12]. Early repairs are associated with better clinical outcomes [2, 13], but the population needs immediate access to healthcare in undeveloped countries. Thus, developing surgical techniques that contemplate the best approach must be stimulated.

Figure 7. **A.** The fibular tendon passes through the transverse tunnel, leaving two symmetrical ends of the graft, shown by the arrow. **B.** The two ends of the graft are weaved through the medial and lateral holes placed in the borders of the quadriceps tendon, using the Pulvertaft technique, ensuring that, ultimately, the tipoff the graft points anteriorly (arrow). **C.** The ends of the graft are placed under traction and sutured over the quadriceps tendon to reduce the anterior gap to the extent possible, with only a central gap remaining (arrow).

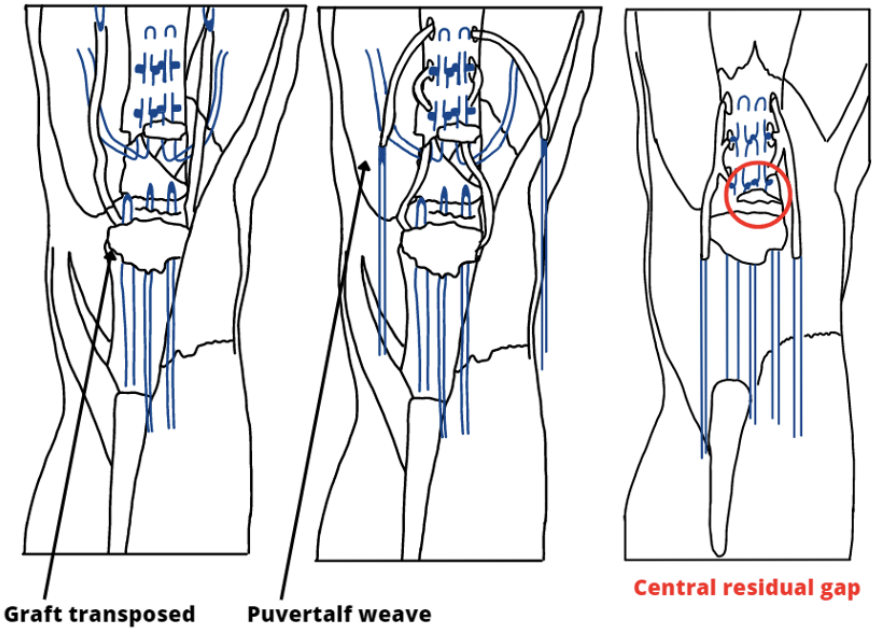
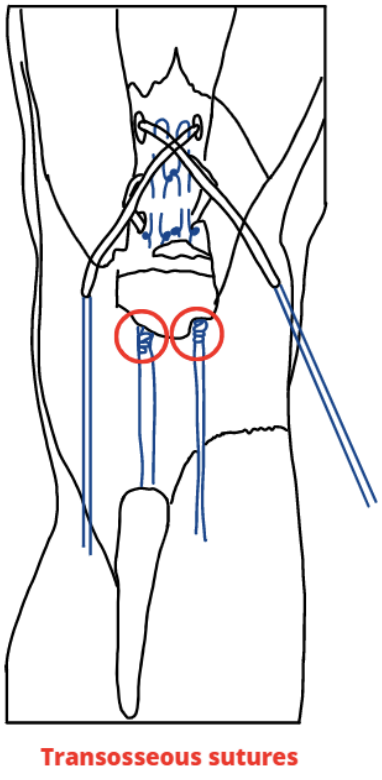


Figure 8. The distal ends of the fibular tendon are placed under traction, crossed over, and sutured over the quadriceps tendon (in a locking X formation) to reduce the anterior gap in the tendon by pulling on the four polyester suture strands (from the previous krackow sutures), forming a transosseous suture in the distal pole of the patella.



Due to the rarity of late (chronic) repair of quadriceps tendon ruptures, defined by a surgical repair more than three weeks after injury, a reliable assessment of clinical outcomes is poorly available. In a case series described by Faria et al. [9], we observe a significant improvement in knee joint range of motion, regain muscle mass, and decrease in extension deficit [9]. The modified Pulvertaft weave technique provides a viable alternative to conventional late repair of quadriceps tendon ruptures, which does not need allografts and anchors. Our approach could be better used in countries where access to health care and allografts may not be available.

The use of autologous tendon grafts can provide independence of tissue banks (that are not always available), extra biomechanical benefits, fewer taxes of re-ruptures [10], and fewer rejections compared with allografts. These better outcomes also can be seen in surgical treatments of other injuries most performed; a meta-analysis of anterior cruciate ligament (ACL) reconstruction demonstrates lower rates of graft rupture, lower levels of knee laxity, and improved single-legged hop test results and more generally satisfied postoperatively compared with patients undergoing reconstruction with allograft [14].

Surgical treatment of chronic (late) quadriceps tendon ruptures using our modified Pulvertaft tendon weaving technique, with the peroneus tendon used as an allograft, is reproducible and provides good clinical outcomes and fewer morbidities related to the stability of the knee. The peroneus longus tendon emerged as a graft alternative. It has a superficial anatomical position that facilitates surgical access and a good length, allowing versatility to perform different ligament reconstruction techniques. Studies indicate that patients submitted to ETFL withdrawal do not present significant changes in muscle strength, range of motion, load application, and gait compared to the non-operated side [15]. Thus, the importance of describing this technique is improving treatment aiming at better clinical results, and it should be part of the surgeon's arsenal of knowledge for a better and more flexible approach.

4. Conclusions

The Modified Pulvertaft weave technique using a peroneus tendon allograft provides a viable alternative to conventional late repair of quadriceps tendon ruptures, which does not require allografts and anchors, is reproducible, and has good clinical outcomes. Our approach could be valuable in countries with developing economies, where access to these materials may be difficult.

Autologous tendon grafts can provide additional biomechanical benefits compared with allografts suggested by this meta-analysis of patients undergoing ACL reconstruction autografts demonstrating lower rates of graft rupture, lower levels of knee laxity, and more generally satisfied postoperatively compared with patients undergoing reconstruction with allograft [14]. Our limitations were the lack of a report of the physical exam in the early moment of the lesion, the low number of patients.

Funding: Not applicable.

Research Ethics Committee Approval: We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

Acknowledgments: We want to thank José Leonardo Rocha de Faria for describing the surgical treatment of Chronic Rupture of the Quadriceps using a modified Pulvertaft Weave Technique that worked as a foundation for our article.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Clayton RAE, Court-Brown CM. The epidemiology of musculoskeletal tendinous and ligamentous injuries. Injury 2008; 39: 1338–1344.

2. Hassani ZA, Boufettal M, Mahfoud M, et al. Neglected rupture of the quadriceps tendon in a patient with chronic renal failure (case report and review of the literature). Pan Afr Med J 2014; 18: 55.
3. Ecker ML, Lotke PA, Glazer RM. Late reconstruction of the patellar tendon. J Bone Joint Surg Am 1979; 61: 884–886.
4. Kelikian H, Riashi E, Gleason J. Restoration of quadriceps function in neglected tear of the patellar tendon. Surg Gynecol Obstet 1957; 104: 200–204.
5. Zekcer A, Carneiro ACI, Minervini S, et al. Re-ruptura do ligamento patelar: uma proposta para o tratamento cirúrgico. Rev bras ortop 2001; 41–43.
6. McCormick F, Nwachukwu BU, Kim J, et al. Autologous hamstring tendon used for revision of quadiceps tendon tears. Orthopedics 2013; 36: e529-532.
7. Poonnoose PM, Korula RJ, Oommen AT. Chronic rupture of the extensor apparatus of the knee joint. Med J Malaysia 2005; 60: 511–513.
8. Hoang V, Anthony T, Quattrocelli M, et al. Quadriceps Tendon Reconstruction With Achilles Tendon Bone Block Allograft. Arthrosc Tech 2023; 12: e45–e52.
9. Rocha de Faria JL, Laett CT, Gavilão UF, et al. Modified Pulvertaft on Weave Technique Restores Full Active Knee Extension in Patients With Large Chronic Quadriceps Tendon Rupture: A Case Series. Arthroscopy 2022; 38: 2268–2277.
10. Gilmore JH, Clayton-Smith ZJ, Aguilar M, et al. Reconstruction techniques and clinical results of patellar tendon ruptures: Evidence today. Knee 2015; 22: 148–155.
11. Elattar O, McBeth Z, Curry EJ, et al. Management of Chronic Quadriceps Tendon Rupture: A Critical Analysis Review. JBJS Rev; 9. Epub ahead of print 6 May 2021. DOI: 10.2106/JBJS.RVW.20.00096.
12. Oliva F, Marsilio E, Migliorini F, et al. Complex ruptures of the quadriceps tendon: a systematic review of surgical procedures and outcomes. J Orthop Surg Res 2021; 16: 547.
13. Thaunat M, Gaudin P, Naret C, et al. Role of secondary hyperparathyroidism in spontaneous rupture of the quadriceps tendon complicating chronic renal failure. Rheumatology (Oxford) 2006; 45: 234–235.
14. Kraeutler MJ, Bravman JT, McCarty EC. Bone-patellar tendon-bone autograft versus allograft in outcomes of anterior cruciate ligament reconstruction: a meta-analysis of 5182 patients. Am J Sports Med 2013; 41: 2439–2448.
15. Rhatomy S, Asikin AIZ, Wardani AE, et al. Peroneus longus autograft can be recommended as a superior graft to hamstring tendon in single-bundle ACL reconstruction. Knee Surg Sports Traumatol Arthrosc 2019; 27: 3552–3559.