

Patellar Tendon Avulsion at the Tibial Tubercle at Subacute Stage: A Case Report

Subakut Evrede Tibial Tüberkül Seviyesinde Gelişen Patellar Tendon Avulsiyonu: Olgu Sunumu

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ABSTRACT

The objective of this case report is to present a rare case of patellar tendon avulsion at the tibial tubercle in a 12-year-old male patient and describe the surgical treatment and rehabilitation process. A 12-year-old male patient with an otherwise healthy status presented with a rupture of the patellar tendon without bony involvement after sustaining a knee injury during a soccer game. Treatment involved a combination of end-to-end suture, support with anchors, and patellar reinforcement using a cerclage wire, a unique approach not previously documented for the pediatric population. Early range of motion exercises were initiated with the use of a functional knee brace. The patient's progress was assessed through Lysholm and Kujala Scores, as well as a visual analog scale (VAS) for pain. At the final follow-up, conducted 6 months after the surgery, the patient showed satisfactory knee function, with Lysholm and Kujala scores of 85 and a VAS pain score of 0. Radiographic examinations confirmed the successful healing of the patellar tendon with full range of motion in the knee joint. Patellar tendon avulsion at the tibial tubercle is a rare injury in the pediatric population, requiring early diagnosis and prompt surgical treatment to preserve the extensor mechanism and prevent functional loss. The presented combination of end-to-end suture, cerclage wire reinforcement, and anchor support proved effective in this case. This report contributes valuable insights into the treatment of distal patellar tendon avulsion in pediatric patients and emphasizes the importance of appropriate management of such injuries to ensure optimal recovery and knee function. Further research and prospective studies are warranted to validate the efficacy of this surgical approach in larger cohorts.

Keywords: Adolescent, extensor mechanism, knee, patellar tendon, avulsion, sleeve, fracture

ÖZ

Bu olgu sunumunun amacı, 12 yaşında erkek bir hastada tibial tüberkül üzerinde patellar tendon avulsiyonunun nadir bir vakasını sunmak ve cerrahi tedavi ile rehabilitasyon sürecini açıklamaktır. Diğer sağlık durumu normal olan 12 yaşındaki erkek hasta, futbol macı sırasında diz yaralanması sonucu kemik tutulum olmaksızın patellar tendon rüptürü ile başvurdu. Tedavi, uçtan uca sütür, ankor ile destek ve patellar güçlendirme için serklaj teli kullanımı gibi pediatrik popülasyon için daha önce belgelenmemiş, özgün bir yaklaşım içeriyordu. Erken dönem hareket açıklığı egzersizlerine, fonksiyonel diz ateli kullanılarak başlanmıştır. Hastanın ilerlemesi, Lysholm ve Kujala Skorları ile ağrı için görsel analog skala (VAS) ile değerlendirildi. Ameliyat sonrası 6 ay sonra yapılan son takipte hasta, Lysholm ve Kujala skorları 85 ve VAS ağrı skoru 0 ile tatmin edici diz fonksiyonu gösterdi. Radyografik ve fiziksel incelemeler, patellar tendonun tam iyileşmesini ve diz ekleminde tam hareket açıklığını doğruladı. Patellar tendon avulsiyonu, pediatrik popülasyonda nadir bir yaralanma olup, ekstansör mekanizmanın korunması ve fonksiyon kaybının önlenmesi için erken tanı ve acil cerrahi tedavi gerektirir. Sunulan uçtan uca sütür, cerclaj teli ile güçlendirme ve ankraj desteği kombinasyonu bu vakada etkili olmuştur. Bu rapor, pediatrik hastalarda distal patellar tendon avulsiyonunun tedavisi hakkında değerli bilgiler sunmakta ve bu tür yaralanmaların uygun yönetiminin optimal iyileşme ve diz fonksiyonu sağlama açısından önemini vurgulamaktadır. Daha geniş kohortlarda bu cerrahi yaklasımın etkinliğini doğrulamak için daha fazla araştırma ve prospektif çalışmalara ihtiyaç duyulmaktadır.

Anahtar Sözcükler: Adölesan, ekstansör mekanizma, diz, patellar tendon, avulsiyon, sleeve, fraktür

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INTRODUCTION

Complete extensor mechanism injuries are rare conditions in the pediatric population. However, participation in sports at a younger age exposes individuals to injuries of the musculoskeletal system. Patellar tendon injury makes up 3% of all extensor mechanism problems. Aseptic conditions such as Sinding-Larsen-Johanson's disease and Osgood-Schlatter's disease predispose severe patellar tendon injuries in adolescents. Patellar tendon rupture is rarer, with an incidence of 0.68 per 100,000 people. It usually occurs in male adults over the age of 40 (1). It has been reported in 7% of pediatric patients. Patellar tendon rupture usually occurs in the proximal insertion region in mature adolescents, and tibial tubercle avulsion injuries are rare in the pediatric population (2). The limited number of cases of distal patellar tendon rupture described in the literature has been reported in adults, and most of them are associated with additional intra-articular lesions (anterior cruciate ligament and medial collateral ligament tears, meniscal damage) (2-4). To our knowledge, there are few publications in the literature that report on the treatment and outcomes after distal patellar tendon avulsion in the pediatric population (5,6). Although distal patellar tendon avulsion is rare in the pediatric population, it can cause serious problems such as knee pain and loss of function in the extension mechanism. Therefore, it is important to be aware of these injuries. We describe here a case of patellar tendon avulsion at the tibial tubercle, with a fleck of bone acting as a sleeve from the epiphyseal bone of the proximal tibia, and its surgical treatment.

CASE REPORT

A 12-year-old male patient was admitted to our outpatient clinic with complaints of swelling and loss of knee extension after sustaining a knee injury 9 days prior to his visit during a soccer game. There was a gross hematoma, and he was unable to extend his knee due to the pain on the anterior aspect of the knee. On his x-rays, the right patella had migrated cranially, while the contralateral patella sat in its anatomically correct position (Figure 1). Magnetic resonance imaging revealed disruption of the patellar tendon at the tibial tuberosity (Figure 2). Although there was no sign of fracture at the tibial tuberosity, Osgood-Schlatter sign was visible on plain x-rays bilaterally. The Lysholm Score was 35, Kujala Score was 26, and VAS pain score was 4 before the surgery. Surgery was performed after confirming the pure avulsion at the tuberosity via magnetic resonance imaging. During surgery, a small flake of epiphyseal bone attached to the patellar tendon was observed. Cerclage wire was



Figure 1. Preoperative x-ray of the (A) healthy knee; (B) affected knee showing considerable increase in tendon length (TL) and increased Insall-Salvati ratio of 1.89 (tendon length divided by the patellar length (PL) for the affected knee

used during the approximation of the tendon to the tuberosity, while augmented polyethylene sutures with 2 footprint anchors (FOOTPRINT Ultra PK, Smith & Nephew, USA) were used to repair the tendon to the tuberosity medially and laterally (Figure 3). The knee was immobilized with an angle-adjustable knee brace set to keep the joint at full extension for 6 weeks, and the brace was removed for passive exercises. Brace was taken off at 12 weeks. The cerclage wires remained, and the control radiographs and physical examination showed successful healing of the tendon with full range of motion of the knee joint (Figure 4). The immediate postoperative



Figure 2. Preoperative (A) T2 weighted; (B) T1 weighted magnetic resonance images of the affected knee showing complete rupture of patellar tendon from the tibial tuberosity



Figure 3. Intra-operative photographs showing (A) a ruptured patellar tendon, (B) end-to-end suture of ruptured tendon and reinforcement of patella with a cerclage wire



Figure 4. Postoperative radiographs showing decreased tendon length and return of patella to its anatomical site

range of motion of the knee is demonstrated in Supplementary Video 1. At months follow-up, Lysholm and Kujala Scores were 85 and VAS pain score was 0.

Rehabilitation

Rehabilitation started immediately after the surgery. Full passive knee flexion and extension exercises isometric knee extension and hip abduction and adduction exercises were started immediately. Active-assisted knee extension exercise was started after 3 weeks and active knee extension was allowed after 6 weeks. Toe-touch weight-bearing with crutches was allowed after the third week postoperatively. Weight-bearing as tolerated was allowed 6 weeks after the surgery, and full weight bearing without crutches and a brace was allowed 12 weeks postoperatively. Sports-specific exercises were started gradually, and athletes returned to sports at 6 months.

DISCUSSION

Patellar tendon ruptures, common in the 3rd and 4th being the injuries of 3rd and 4th decade of life are rarely seen in the pediatric population and can be isolated, involve the inferior patellar pole or with accompanying tibial tubercle avulsion. Frequency of sustained patellar tendon injuries in children has increased with the rise of popularity of sports and recreational activities. The mechanism behind this injury is believed to be the increased strain on the tendon due to the forced extension of the knee while the leg is flexed (7).

Although the condition is rare, early diagnosis is necessary to provide the needed treatment as soon as possible, avoid functional loss in the future, and preserve the extensor mechanism. Early diagnosis may be hindered by acute swelling and pain, and delayed diagnosis there will be need for more complicated surgical methods (8). Radiological tools could be used to aid the diagnosis.

For the partial ruptures of patellar tendon, non-operative methods such as bracing may be used. In cases of total rupture and disruption of the extensor mechanism, operative techniques such as primary end-to-end repair should be used. Reconstruction with a tendon allograft is reserved for chronic conditions where ruptured ends could not be brought together (9). In the available literature, for the treatment of acute and subacute patellar tendon rupture, the use of the Krakow technique and anchoring, is endorsed, and a cerclage wire or a polydioxanone suture may be used to further stabilize the patella. The use of end-to-end suture and fixation of the patella with cerclage wire was reported to have satisfactory outcomes postoperatively in traumatic patellar tendon rupture without bony involvement (5). As Bushnell et al. (10) reported, using a suture anchor technique in primary repair improved the functional outcome considerably, but due to the lack of data for the comparison of methods, there might be a need for randomized trials. Usage of cerclage wire may benefit the outcome of the operation by providing stability for the patella and further security for primary sutures and footprint anchors used, when compared to other options. According to the tests conducted by İyigün et al. (11) support with a wire was shown to provide the most biomechanical support compared to other methods. Disadvantages of this procedure include a need for reoperation to remove the wire (12).

Additionally, Ravalin et al. (13) recommend the use of patellar tendon augmentation to decrease the risk of gap formation at the healing site, which, if formed, may lead to clinical failure and extensor mechanism lag. With patellar tendon augmentation, the patient may be mobilized earlier than patients treated without augmentation. Use of Achilles tendon allograft for augmentation yielded satisfactory results in massive ruptures, such as in the case of late repair of bilateral patellar tendon rupture by Muratli et al (8).

No standard postoperative rehabilitation protocol existed in current literature, except for our previous study, which addressed rehabilitation after tibial tuberosity fractures (14). In our case, an end-to-end suture, reinforcement with a cerclage wire, and fixation with footprint anchors were used. In our opinion, combination of all three methods was suitable to address the extensive rupture of the patellar tendon and could reduce the risk of tendon rerupture. Moreover, use of footprint anchors compared to the use of staples or K-wire fixation doesn't require reoperation for implant removal. In the follow-up of our patient, we were able to observe good functional and radiological outcomes following our approach. Informed consent was waived from the patient for inclusion in the study. All procedures in the studies involving human participants were performed in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Ethics

Informed Consent: Written informed consent was obtained from the patient and their legal guardians for publication of this case report and accompanying images.

Footnotes

Authorship Contributions

Surgical and Medical Practices: H.Ö., A.A., Concept: H.Ö., Design: T.Ö., R.D., G.B., Supervision: H.Ö., A.A., Resources: G.B., Material: R.D., Data Collection or Processing: A.A., Literature Search: A.A., T.Ö., R.D., Writing: A.A., R.D., Critical Review: A.A., H.Ö.

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REFERENCES

- 1. Haddad FS, Raja S. Knee extensor mechanism injuries. Traumatic injuries of the knee. 2013:77-86. Available from: https://link. springer.com/chapter/10.1007/978-88-470-5298-7_8
- Capogna B, Strauss E, Konda S, Dayan A, Alaia M. Distal patellar tendon avulsion in association with high-energy knee trauma: a case series and review of the literature. The Knee. 2017;24(2):468-76.
- 3. Chloros GD, Razavi A, Cheatham SA. Complete avulsion of the patellar tendon from the tibial tubercle in an adult without predisposing factors. J Orthop Sci. 2014;19:351-3.
- Cooper ME, Selesnick FH. Partial rupture of the distal insertion of the patellar tendon: a report of two cases in professional athletes. Am J Sports Med. 2000;28(3):402-6.

- Miyamoto S, Otsuka M, Hasue F, Fujiyoshi T, Kamiya K, Kiuchi H, et al. Acute traumatic patellar tendon rupture at the tibial tuberosity attachment without avulsion fracture. Case Rep Orthop. 2017;2017.
- Steiger C, Coulin B, Vendeuvre T, Tabard-Fougere A, De Marco G, Habre C, et al. Distal patellar tendon avulsion associated with an ACL tear in a teenager: A case report and review of the literature. Case Rep Orthop. 2021;2021.
- Frankl U, Wasilewski S, Healy W. Avulsion fracture of the tibial tubercle with avulsion of the patellar ligament. Report of two cases. J Bone Joint Surg Am. 1990;72(9):1411-3.
- Muratli HH, Çelebi L, Hapa O, Biçimoğlu A. Bilateral patellar tendon rupture in a child: a case report. Knee Surg Sports Traumatol Arthrosc. 2005;13:677-82.
- 9. Yousef MAA, Rosenfeld S. Acute traumatic rupture of the patellar tendon in pediatric population: case series and review of the literature. Injury. 2017;48(11):2515-21.
- Bushnell BD, Tennant JN, Rubright JH, Creighton RA. Repair of patellar tendon rupture using suture anchors. J Knee Surg. 2008;21(02):122-9.

- İyigün A, Kocadal O, İyidiker MA, Murad Pepe I, Kizilay O, Demir T, et al. Biomechanical comparison of repair and augmentation techniques in patellar tendon ruptures. Ankara Eğitim ve Araştırma Hastanesi Tıp Dergisi. 2018;51(1):33-9.
- 12. Kasten P, Schewe B, Maurer F, Gösling T, Krettek C, Weise K. Rupture of the patellar tendon: a review of 68 cases and a retrospective study of 29 ruptures comparing two methods of augmentation. Arch Orthop Trauma Surg. 2001;121:578-82.
- Ravalin RV, Mazzocca AD, Grady-Benson JC, Nissen CW, Adams DJ. Biomechanical comparison of patellar tendon repairs in a cadaver model: an evaluation of gap formation at the repair site with cyclic loading. Am J Sports Med. 2002;30(4):469-73.
- Baltaci G, Özer H, Tunay V. Rehabilitation of avulsion fracture of the tibial tuberosity following Osgood-Schlatter disease. Knee Surg Sports Traumatol Arthrosc. 2004;12:115-8.