



Isolated avulsion fracture of the fibular head

Izolovani avulzioni prelom glave lisnjače

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Abstract

Introduction. Rupture of lateral collateral ligament of the knee is most often joined with other ligament ruptures. Isolated rupture of this ligament is rare and there are few papers about treatment options and results. Here we reported a case of isolated lateral collateral ligament rupture and the treatment outcome. **Case report.** A patient, 22 years old male, injured his left knee while playing American football. While landing on the outstretched left leg, he felt a sudden pain in his knee. The patient could not continue the competition. Initial orthopedic examination revealed lateral opening and further diagnostic procedure (magnetic resonance imaging) revealed isolated grade III rupture of lateral collateral ligament with avulsion fracture of the fibular head, and distension of anterior and posterior cruciate ligaments. Patient was surgically treated with metal sutures passed through conjoined tendon and proximal fibula. Postoperatively patient worn above knee cast for 6 weeks and after that he was included in rehabilitation. Three and six years after this injury, the patient has still been professional football player with no symptoms and no clinical instability of the knee despite radiological and computed tomography verified pseudoarthrosis of the fractured fibular head fragment. **Conclusion.** Early diagnostic and absence of additional injuries of the knee leads to a faster and full functional recovery of patients with isolated avulsion fracture of the fibular head, while surgical treatment provides knee stability with no residual ligament instability during sports activities.

Key words:

knee injuries; ligaments; fibula; fractures, avulsion; orthopedic procedures; athletic injuries.

Apstrakt

Uvod. Prekid spoljašnjeg bočnog ligamenta kolena najčešće je udružen sa prekidima drugih ligamenata. Izolovan prekid ovog ligamenta retko se sreće u kliničkoj praksi i u literaturi se nalazi svega nekoliko objavljenih slučajeva. Ovde smo prikazali jedan takav slučaj iz naše prakse sa načinom i ishodom lečenja. **Prikaz bolesnika.** Bolesnik, star 22 godine, zadobio je povredu levog kolena u toku igranja američkog fudbala. Povreda je nastala pri doskoku na ispruženo koleno, kada je osetio bol. Nije nastavio sa utakmicom. Inicijalni pregled kod ortopeda otkrio je postojanje spoljašnje bočne nestabilnosti, dok je naknadno uređena magnetna rezonanca pokazala postojanje izolovanog prekida spoljašnjeg bočnog ligamenta 3. stepena, sa avulzionim prelomom vrha glave lisnjače i postojanjem istegnuća prednjeg i zadnjeg ukrštenog ligamenta, ali bez prekida kontinuiteta vlakana. Bolesnik je operisan, pri čemu je fiksacija ulomka postignuta žičanim koncem. Postoperativno je postavljena imobilizacija natkolnim gipsom u trajanju od 6 nedelja, posle čega je pacijent uključen u rehabilitacioni tretman. Tri i šest godina posle povrede i dalje se profesionalno bavio američkim fudbalom, bez ikakvih subjektivnih tegoba kao i bez kliničke nestabilnosti kolena, i pored toga što su kontrolni radiogrami i kompjuterizovana tomografija pokazali postojanje pseudoartroze ulomka glave lisnjače. **Zaključak.** Rano postavljanje dijagnoze i odusustvo drugih povreda kolena bitni su preduslovi za brz i potpun oporavak ovih bolesnika, dok operativno lečenje obezbeđuje stabilnost kolena i povratak sportskim aktivnostima.

Ključne reči:

koleno, povrede; ligamenti; fibula; prelomi, avulzioni; ortopedске procedure; povrede, atletske.

Introduction

The fibular collateral ligament (FCL) is the primary varus stabilizer of the knee^{1,2} and its injuries are frequently associated with anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) and posterolateral corner injuries. Isolated grade III

tears of the lateral collateral ligament (LCL) with avulsion fracture of the fibular head are rare and these fractures have been called the “arcuate” sign³. The “arcuate” sign is used to describe an avulsed bone fragment related to the insertion site of the arcuate complex, which consists of the fabellofibular, popliteofibular, and arcuate ligaments⁴.

Although avulsion fracture of the fibular head associated with ACL, PCL and posterolateral corner injuries, is well described and primary repair has been recommended⁴⁻¹⁰, limited data exist in the literature on surgery techniques and clinical results¹¹⁻¹³.

The purpose of this paper was to present results of surgical treatment of the patient with isolated grade III LCL injury with avulsion fracture of the fibular head.

Case report

A patient, 22 years old, injured his left knee while playing American football. While landing on the outstretched left leg he felt a sudden pain in his knee. He could not continue the competition. In the emergency room, orthopedic surgeon noted the lateral opening of the knee during varus stress test. Lachman test could not be performed due to pain. Neurocirculatory status of the leg was normal. Four days later magnetic resonance imaging (MRI) of his left knee was made re-

vealing a distension of ACL and PCL (Figure 1), with no rupture, and avulsion of the head of the fibula (Figure 2).

Seven days after the injury, the patient was admitted to the hospital, and after four days more he was operated on. In the operating room, Lachman test was performed under general anesthesia and showed firm end point. Anterior and posterior drawer's tests were negative, and varus stress tests at 0 and 30 degrees of knee flexion were positive. After placing a tourniquet, a slightly curved skin incision was made on the lateral side of the knee from fibular neck to the level of lateral femoral epicondyle, and the fibular nerve was identified. Common attachment of biceps tendon and LCL to the dislocated fibular head fragment was prepared, and metal suture was passed through. One drill hole was placed through proximal fibula, 1 cm distal to the fracture level and the wire was pulled through this hole. After anatomic reposition of the fibular head fragment, the cerclage was tied with the knee in 30 degrees of flexion and neutral rotation. The tourniquet was deflated and bleeding was controlled. The wound was closed in layers with interrupted sutures.

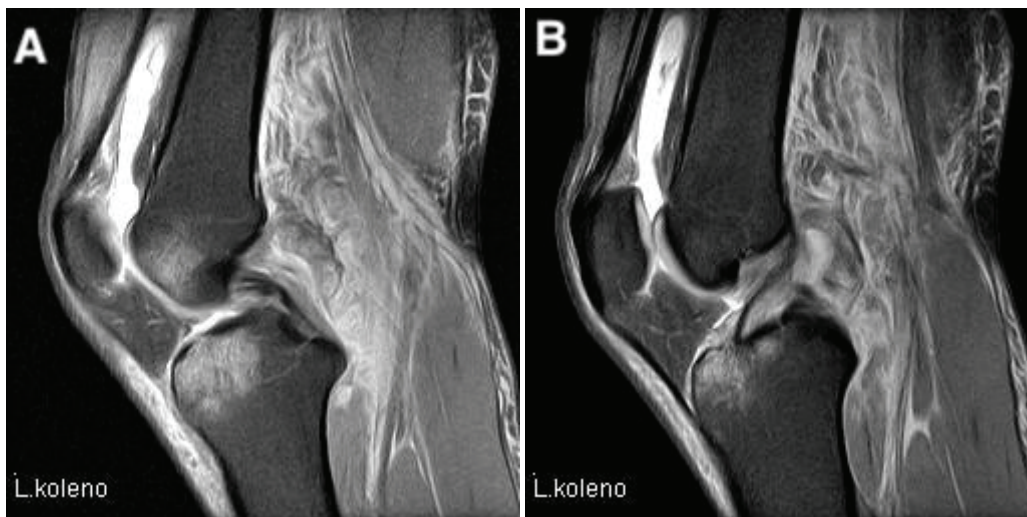


Fig. 1 – Preoperative magnetic resonance imaging (MRI): A) posterior cruciate ligament; B) anterior cruciate ligament.

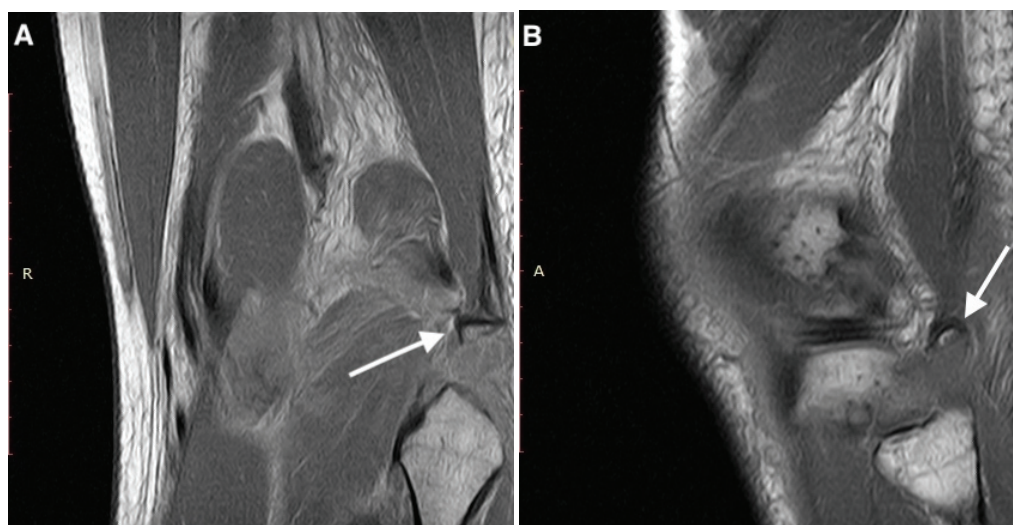


Fig. 2 – Preoperative magnetic resonance imaging (MRI): A) antero-posterior view of avulsed fragment; B) profile view of avulsed fragment.

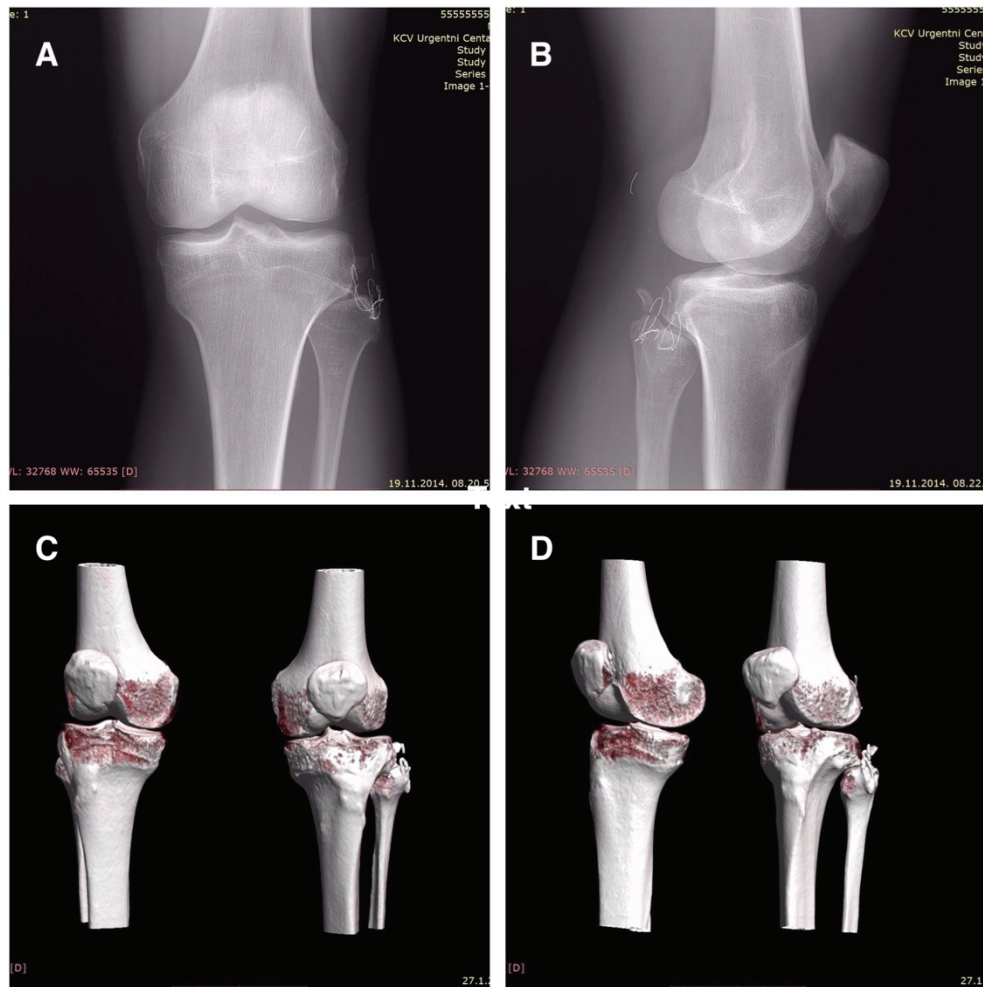


Fig. 3 – Postoperative radiography (X ray) and computed tomography (CT) findings:
A) postoperative X ray finding, anteroposterior view; B) postoperative X ray finding, lateral view;
C and D) postoperative CT scans.

The above-the-knee plaster cast was applied. Six weeks later full weightbearing was allowed and physical therapy started. Six months after the injury, the patient was back to preinjury sports activity level.

On the follow-up 3 and 6 years later the patient was still professional American football player. He had full range of motion, with no pain and no swelling. Lachman test was with firm end point without differences in relation to the other knee. Anterior and posterior drawer's tests were negative, as on the other knee. Varus stress test was without lateral opening in despite of pseudoarthrosis of the fibular head revealed by radiography (X-ray) and computed tomography (CT) examination (Figure 3).

Discussion

According to the literature, avulsion of the head of the fibula is described as a possible indicator of posterolateral instability of the knee mostly associated with other knee structure injuries¹⁴. These injuries can occur when anteromedial region of the tibia sustains direct hit while the knee is fully extended¹⁵. Rarely, grade III of LCL tears can be isolated and these result from forces of lower magnitude³.

High intensity force applied to the knee usually affects additional structures in the area. Only Phadnis et al.¹⁶ reported isolated avulsion fracture of the fibular head which occurred during a primary total knee replacement.

Physical examination right after injury does not have any specific findings. Specific orthopedic examination most often reveals posterolateral instability of grade 2 or more. These specific clinical tests are: varus opening at 20 degrees, posterolateral drawer test, external rotation at 30 degrees and 90 degrees (Dial test), and the reverse pivot shift. Next step should be making anteroposterior (AP) and lateral X ray which could reveal so-called arcuate sign a small fragment of the proximal fibula. As to the results of Huang et al.¹⁵ this fractures fragment most often is horizontally oriented, no more than 1 cm in length, and displaced medially and superiorly by traction of conjoined lateral collateral ligament and biceps femoris tendon. This small fragment usually is overseen and masked by other knee joint bony structures, but CT scan or MRI can easily visualize its size, and adjacent soft-tissue injuries as we did in this case.

When isolated grade III LCL rupture is present, further treatment could be operative or non-operative. Bushnell et

al.³ compared operatively and nonoperatively treated nine football players with grade III isolated LCL injuries. As to results, both groups had good functional outcome, but those players treated nonoperatively returned to play 9 weeks earlier. In the operated group three out of four patients had avulsion fracture of the fibular head, and in non-operative group only one out of five. Phadnis et al.¹⁶ reported isolated avulsion fracture of the fibular head treated nonoperatively with good results. This fracture occurred during a primary total knee arthroplasty with no late varus instability.

Avulsion fractures of the proximal fibula are well described and primary repair has been recommended when occurring with other knee injuries. However, very limited data exist in the literature about surgical technique and clinical results of isolated LCL injuries. Our patient was professional football player with clinically significant knee instability on

varus stress test and that is why we decided to treat him operatively. We didn't want to take chance of having remaining knee instability in young professional football player. Fixation was achieved with metal sutures and in despite of pseudoarthrosis of avulsed fragment, there was no clinically instability of knee, and he continued playing football for many years after with no complaint.

Conclusion

Early diagnostic of isolated fibular head fracture enables adequate treatment, and anatomic reduction of avulsed fragment is achieved easily. Absence of additional injuries of the knee leads to faster and full functional recovery of these patients with no residual ligament instability.

R E F E R E N C E S

1. Coobs BR, LaPrade RF, Griffith CJ, Nelson BJ. Biomechanical analysis of an isolated fibular (lateral) collateral ligament reconstruction using an autogenous semitendinosus graft. *Am J Sports Med* 2007; 35(9): 1521–7.
2. Grood ES, Stowers SF, Noyes FR. Limits of movement in the human knee: effect of sectioning the posterior cruciate ligament and posterolateral structures. *J Bone Joint Surg Am* 1988; 70(1): 88–97.
3. Bushnell BD, Bitting SS, Crain JM, Boubliek M, Schlegel TF. Treatment of magnetic resonance imaging-documented isolated grade III lateral collateral ligament injuries in National Football League athletes. *Am J Sports Med* 2010; 38(1): 86–91.
4. Shindell R, Walsh WM, Connolly JF. Avulsion fracture of the fibula: the “arcuate sign” of posterolateral knee instability. *Nebra Med J* 1984; 69: 369–71.
5. Fanelli GC. Surgical Treatment of Lateral Posterolateral Instability of the Knee Using Biceps Tendon Procedures. *Sports Med Arthrosc Rev* 2006; 14(1): 37–43.
6. Sisto DJ, Warren RF. Complete knee dislocation: a follow-up study of operative treatment. *Clin Orthop* 1985; (198): 94–101.
7. Levy BA, Dajani KA, Morgan JA, Shah JP, Dahm DL, Stuart MJ. Repair Versus Reconstruction of the Fibular Collateral Ligament and Posterolateral Corner in the Multiligament-Injured Knee. *Am J Sports Med* 2010; 38(4): 804–9.
8. Ranawat A, Baker CL III, Henry S, Harner CD. Posterolateral corner injury of the knee: Evaluation and management. *J Am Acad Orthop Surg* 2008; 16(9): 506–51.
9. Stannard JP, Brown SL, Farris RC, McGwin G Jr, Volgas DA. The posterolateral corner of the knee: repair versus reconstruction. *Am J Sports Med* 2005; 33(6): 881–8.
10. LaPrade RF, Terry GC. Injuries to the posterolateral aspect of the knee: association of anatomic injury patterns with clinical instability. *Am J Sports Med* 1997; 25(4): 433–8.
11. Oh HK, Kim JH, Lee CS, Singh PK, Wang KH, Nba KW. Isolated Avulsion Fracture of the Fibular Head: A New Fixation Technique Using a Suture Anchor. *Orthopedics* 2011; 34(2): 100–4.
12. Zhang H, Hong L, Wang XS, Zhang J, Liu X, Feng H. All-Arthroscopic Repair of Arcuate Avulsion Fracture with Suture Anchor. *Arthroscopy* 2011; 27(5): 728–34.
13. Kim JM, Park BM, Lee SH, Jeon SJ, Shin JB, Song KS. Surgical Management of Comminuted Avulsion Fracture of the Proximal Fibula with Lateral Collateral Ligament Injury-Technical Note. *J Korean Fract Soc* 2013; 26(1): 77–80.
14. Chytas A, Spyridakis A, Gigis J, Beslikas T, Panos N, Christoforidis J. A rarecase of traumatic bilateral fibular head fractures. *Case Rep Med*. 2010; 2010: pii:920568.
15. Huang GS, Yu JS, Munshi M, Chan WP, Lee CH, Chen CY, et al. Avulsion fracture of the head of the fibula (the “arcuate sign”): MR imaging findings predictive of injuries to the posterolateral ligaments and posterior cruciate ligament. *AJR Am J Roentgenol* 2003; 180(2): 381–7.
16. Phadnis A, Johnston P, Glasgow M. Avulsion of the fibular head post-total knee replacement. *Knee Surg Sports Traumatol Arthrosc* 2007; 15(11): 1340–2. Phadnis A, Johnston P, Glasgow M. Avulsion of the fibular head post-total knee replacement. *Knee Surg Sports Traumatol Arthrosc* 2007; 15: 1340–2.

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