



Case Report

Bilateral knee dislocation with associated bilateral popliteal arterial injury[☆]



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ABSTRACT

Tibiofemoral unilateral knee dislocations are uncommon, making bilateral dislocations even rarer injuries. Knee dislocation is considered one of the most serious injuries that can affect this joint. Associated complications such as popliteal artery injury are responsible for the important morbidity in these patients. The authors report the case of a 52-year-old man with a traumatic bilateral knee dislocation with associated bilateral popliteal arterial injury. His clinical presentation along with radiographic and angiographic findings are described. Surgical and non-surgical treatment and functional outcomes are also reported.

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Luxação bilateral dos joelhos com lesão bilateral da artéria poplítea

RESUMO

As luxações unilaterais tibiofemorais do joelho são incomuns, o que torna as luxações bilaterais ainda mais raras. A luxação do joelho é considerada um dos ferimentos mais graves nesta articulação. As complicações associadas, tais como a lesão da artéria poplítea, são responsáveis pela importante morbidade observada nesses pacientes. Os autores relatam o caso de um homem de 52 anos com luxação traumática bilateral do joelho associada a lesão bilateral da artéria poplítea. O estudo descreve a apresentação clínica e os achados radiográficos e angiográficos. O tratamento cirúrgico e não-cirúrgico e os resultados funcionais também são relatados.

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Introduction

Tibiofemoral knee traumatic dislocation is a relatively uncommon injury, with a reported incidence of less than 0.02% of all orthopaedic injuries. Bilateral knee dislocations are even rarer injuries, and have only been reported in a few case reports.¹⁻³ As far as we know this is the first published case of a bilateral popliteal artery injury after bilateral knee dislocation. Knee dislocation is one of the most serious and complex knee injuries. They are often associated with multiple complications such as ligamentar instability, popliteal artery injury, common fibular nerve injury, acute compartment syndrome, deep venous thrombosis, range-of-motion loss, need for amputation and intra-articular pathology.^{1,4,5}

Clinical case

A 52 year-old male with type two Diabetes got his lower limbs stuck under a farm tractor. It overrode both his legs until it was finally stopped. He was taken to the nearest hospital where he was diagnosed with bilateral knee dislocation: an open anterior dislocation on the left and a closed posterior dislocation on the right knee (Fig. 1). He had also deep lacerations with significant loss of substance in the left popliteal region as well as in the lateral parts of the thigh and leg. Both dislocations were reduced approximately 2 h after the trauma and immobilized. Intravenous antibiotherapy was immediately started. Absence of distal pulse and decreased temperature in the left inferior limb raised the possibility of vascular injury and prompted immediate transfer to a tertiary centre. On arrival ecodoppler revealed bilateral absence of blood flow distally to the popliteal triangle. An angiography revealed bilateral occlusion of popliteal arteries with distal recanalization observed only on the right inferior limb (Fig. 2).

The patient was taken to the operating room where knee dislocations were stabilized with anterior uniplanar external fixators to allow for vascular intervention (Fig. 3). Femoropopliteal bypass with ipsilateral saphenous vein allowed revascularization of both popliteal arteries, which was performed approximately 6 h after the initial trauma. Surgical debridement and closure of skin lacerations was performed afterwards. A skin graft harvested from the thigh was applied on the left leg skin injury. Despite successful bilateral revascularization, the left leg skin laceration evolved to necrosis and became infected. Appropriate antibiotherapy and several surgical debridement procedures were fruitless and above the knee amputation came to be necessary at the left lower limb.

Post-operatively, a period of four weeks with external right knee fixators was followed by two weeks with an intermittent use of knee orthotics and appropriate physiotherapy. One year after injury he is able to walk with a left leg knee prosthetics. He complains of mild mechanical right knee pain, with no signs of instability. Right knee range-of-motion is 0-130° and MRI revealed complete anterior cruciate ligament rupture, with no other relevant injuries (intact posterior cruciate ligament - PCL).



Fig. 1 – Initial radiographs of the right and left knees showing bilateral tibiofemoral dislocations: anterior dislocation at the left knee and posterior dislocation at the right knee.

Discussion

Tibiofemoral knee dislocations are classified based on the direction of the tibial displacement relative to the femur: anterior, posterior, medial, lateral, and rotary.^{1,2,5} The most common injury mechanism for an anterior dislocation is forced hyperextension while for a posterior knee dislocation it is a direct force on the tibia while the knee is flexed, forcing the tibia posteriorly on the femur.⁵

Initial evaluation in emergency setting must rule out associated injuries that may compromise limb integrity and function. Following high-energy trauma care must be taken to identify fractures and dislocations and the latter must be reduced as soon as possible. Close reductions must be favoured whenever possible. The reported incidence of popliteal artery injuries in knee dislocations varies between 20 and 40%.^{3,4,6,7} It is the most frequently injured vessel in such lesions, probably due to its firm anchorage and reduced mobility above and below the knee (at the adductor magnus and soleus hiatus, respectively).⁷

Posterior dislocations are the most commonly sub-type associated with popliteal artery injuries. The shear forces

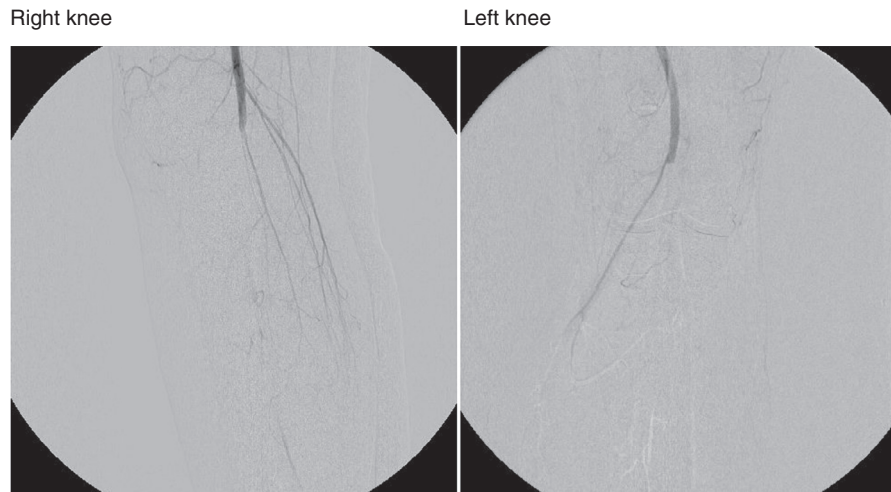


Fig. 2 – Angiography showing bilateral popliteal artery occlusion (right and left knees, respectively).

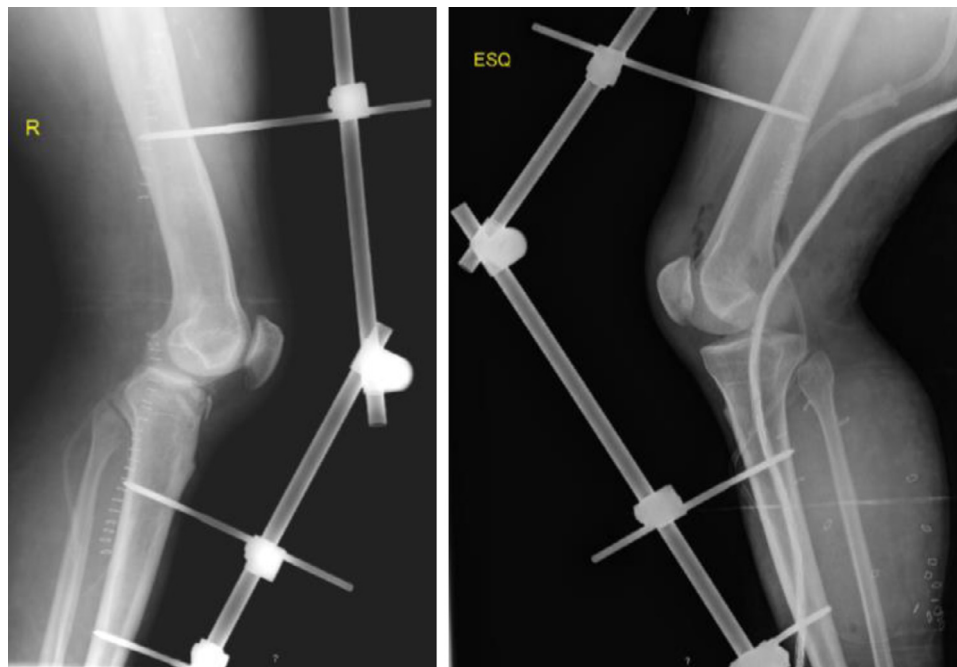


Fig. 3 – External fixators systems in anterior position.

associated with such injuries often lead to intima rupture and arterial transection. On the other hand, in anterior dislocations stretching is the most common injury mechanism to the popliteal artery.⁴

Neurovascular exam must be performed before and after reduction. Popliteal artery injury is a serious injury that compromises limb survival. Patterson et al. reported that one in five patients with knee dislocation and associated arterial injury end up requiring limb amputation.⁷ The poor collateral circulation around the knee is responsible for the amputation rate as high as 86% after eight hours of ischaemia.^{8,9} Therefore early diagnosis and treatment is an absolute priority.¹ As knee dislocations may occur and reduce spontaneously, neurovascular injuries may arise with the knee partially

dislocated or even reduced. Knee dislocations are also often complicated by acute compartment syndrome, which necessitates an emergent fasciotomy. Ischaemia and compartment syndrome may not be present at the beginning, accordingly, the clinician must maintain a high index of suspicion and perform serial neurovascular examinations in the days that follow the injury.⁵

Considering the frequent association between knee dislocations and popliteal artery injuries and the lack of sensitivity of physical examination (presence of warm foot and palpable distal pulses despite popliteal artery injury; lack of significant swelling and effusion in knee dislocations because of capsular damage and fluid extravasation) some authors advise angiography in all knee dislocations. Others only recommend

this exam when findings such as pulse weakness, abnormal ankle-arm index or doppler imaging are present.^{1,3,4}

Cruciate and collateral ligament injuries are very common in tibiofemoral knee dislocations. Nonetheless in some sub-dislocations and even in some complete dislocations the PCL may be found intact. MRI is the imaging modality of choice for evaluation of intra-articular knee injuries. Biomechanical studies recommend ligament reconstruction in the setting of instability following a knee dislocation, in an attempt to restore knee kinematics.^{1,2,5-7} In patients without knee instability a conservative approach encompassing a period of immobilization followed by rehabilitation may be advised after reduction. To avoid stiffness, immobilization time should not surpass six weeks.¹⁰ In this specific case intrinsic knee stability provided by the intact PCL and absence of relevant symptoms justified our option not to perform knee ligament reconstruction. The intact PCL and the strong patient's compliance to physiotherapy may explain the excellent functional outcome for the right knee. Amputation and subsequent changes in gait biomechanics (even with the prosthetic) will probably favour the development of early right knee osteoarthritis.

Tibiofemoral knee dislocations are devastating orthopaedic injuries that may compromise limb perfusion and affect all major static knee constraints. Popliteal artery integrity must be evaluated before and after reduction and, if arterial injury is confirmed, revascularization is mandatory and should be performed as soon as possible, after knee reduction and stabilization. In this paper we describe an extremely rare case of traumatic bilateral knee dislocation with associated bilateral popliteal arterial injury, his clinical presentation, diagnosis methods, treatments performed and obtained outcomes, in order to share our experience and hope clinicians can learn from our case on dealing with similar injuries.

Conflict of interest

The authors declare no conflicts of interest.

REFERENCES

1. Rihn JA, Cha PS, Groff YJ, Harner CD. The acutely dislocated knee: evaluation and management. *J Am Acad Orthop Surg.* 2004;12(5):334-46.
2. Sisto DJ, Warren RF. Complete knee dislocation. A follow-up study of operative treatment. *Clin Orthop Relat Res.* 1985;(198):94-101.
3. Natsuhara KM, Yerosian MG, Cohen JR, Wang JC, McAllister DR, Petrigliano FA. What is the frequency of vascular injury after knee dislocation? *Clin Orthop Rel Res.* 2014;472(9):2615-20.
4. Medina O, Arom GA, Yerosian MG, Petrigliano FA, McAllister DR. Vascular and nerve injury after knee dislocation: a systematic review. *Clin Orthop Relat Res.* 2014;472(9):2621-9.
5. Henrichs A. A review of knee dislocations. *J Athl Train.* 2004;39(4):365-9.
6. Wascher DC, Dvirnak PC, DeCoster TA. Knee dislocation: initial assessment and implications for treatment. *J Orthop Trauma.* 1997;11(7):525-9.
7. Patterson BM, Agel J, Swiontkowski MF, Mackenzie EJ, Bosse MJ. Knee dislocations with vascular injury: outcomes in the Lower Extremity Assessment Project (LEAP) Study. *J Trauma.* 2007;63(4):855-8.
8. Green NE, Allen BL. Vascular injuries associated with dislocation of the knee. *J Bone Joint Surg Am.* 1977;59(2):236-9.
9. Halvorson JJ, Anz A, Langfitt M, Deonanan JK, Scott A, Teasdall RD, et al. Vascular injury associated with extremity trauma: initial diagnosis and management. *J Am Acad Orthop Surg.* 2011;19(8):495-504.
10. Holmes CA, Bach BR. Knee dislocations: immediate and definitive care. *Phys Sportsmed.* 1995;23(11):69-83.