



Case Report

Anterior prosthetic knee dislocation with acute vascular injury: A case report

David Constantinescu^a, William Pavlis^{b,*}, Dennis Vanden Berge^a, Spencer Barnhill^a, Joseph Geller^a, Fernando E. Vilella^a^a Department of Orthopaedics, University of Miami, Miami, FL, 33136, USA^b University of Miami Miller School of Medicine, Miami, FL, 33136, USA

ARTICLE INFO

Keywords:

TKA
Knee arthroplasty
Knee dislocation
Vascular injury
Case report

ABSTRACT

Introduction: and Importance: Anterior dislocation of a prosthetic knee is rarely encountered. Acute vascular injury following anterior prosthetic dislocation has only been reported once in the literature with extremely poor outcomes.

Case presentation: The authors report the case of a 70-year-old woman who presented with anterior prosthetic knee dislocation after a fall from slipping. After closed reduction, CT angiography found transection and active extravasation of the left popliteal artery. An emergent fasciotomy and popliteal bypass were performed with concurrent external fixation of the joint. Recovery was complicated by bacteremia requiring eventual explant of total knee arthroplasty (TKA).

Clinical discussion: We report the only case of successful vascular repair after acute vascular injury from traumatic anterior prosthetic dislocation. External fixation of the knee allowed for better stabilization of the joint and preservation of the repaired vascular injury; however, it carries a risk for infection, as seen in this case.

Conclusions: While there are no clear guidelines for management, we highlight the importance of rapid diagnosis with CT angiography and shared decision making with the vascular surgery team to repair the injury and stabilize the joint.

1. Introduction

Total knee arthroplasty (TKA) is a highly successful surgery that continues to grow in popularity [1,2]. Anterior prosthetic knee dislocation is a rare complication with several etiologies and potential complications [3]. Acute vascular injury is seldom encountered and requires emergent management to avoid loss of limb or function [4]. We present the case of a 70-year-old female with acute popliteal artery injury after traumatic anterior prosthetic knee dislocation. The importance of careful evaluation with CT angiography and emergent exploration with vascular repair and stabilization of the joint is discussed. This case report has been reported in line with the SCARE Criteria [5].

2. Presentation of case

A 70-year-old female with a past medical history of schizophrenia, diabetes, and hypertension who had a previous patella sparing left TKA

at an outside institution 5 years prior presented to the emergency department for acute left knee pain after a fall from standing. Patient originally obtained a right TKA 22 years prior, followed by left TKA 5 years ago. She had experienced 2 previous dislocations of her left prosthetic knee that were treated with closed reduction at the same facility. With both prior dislocations, no vascular injuries occurred. The patient's medications included temazepam, haloperidol, benzotropine, and metformin. Patient reported no known drug allergies and denied smoking, alcohol, or recreational drug use.

Focused exam of the left lower extremity demonstrated moderate swelling around the knee with full leg compartments. Patient denied sensation in the deep peroneal, superficial peroneal, saphenous, sural, and tibial nerve distributions. Patient was unable to fire tibialis anterior, extensor hallucis longus, flexor hallucis longus, and gastrocnemius-soleus motor complexes. Left dorsalis pedis and posterior tibial pulses were not palpable nor identifiable with doppler ultrasound. Standard radiograph views showed anterior dislocation of the knee joint with

* Corresponding author. 1600 NW 10th Ave #1140, Miami, FL, 33136, USA.

E-mail address: wwp7@med.miami.edu (W. Pavlis).

<https://doi.org/10.1016/j.amsu.2022.103425>

Received 30 January 2022; Received in revised form 21 February 2022; Accepted 27 February 2022

Available online 1 March 2022

2049-0801/© 2022 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

hardware well seated without signs of fracture or loosening, a large knee joint effusion, and anterior displacement of the patella (Fig. 1a and b).

A closed reduction was performed by an orthopedic resident at bedside using gentle traction on the foot and a posteriorly directed force on the proximal tibia. There was a palpable clunk consistent with reduction. Repeat radiograph found interval partial reduction of dislocation with remaining subluxation of the tibia at the knee joint (Fig. 1c and d). There was no return of palpable pulses and no signal in deep peroneal or posterior tibial arteries on doppler.

The patient was placed in a knee immobilizer and taken for CT angiography with contrast of bilateral lower extremities to assess vascular flow. Evaluation of CT found traumatic transection and active extravasation of the left popliteal artery with enlarging hematoma of the popliteal fossa tracking inferiorly to the level of the proximal tibial diaphysis (Fig. 2). No contrast opacification of the left lower extremity arteries was noted beyond the popliteal segment.

The patient subsequently developed compartment syndrome and was brought emergently to the operating room. Vascular surgery performed a 4 compartment fasciotomy and above knee popliteal-below knee popliteal bypass using the contralateral great saphenous vein tunneled subcutaneously posterior medially in the distal leg. The procedure was complicated by left femoral vein injury, causing significant venous bleeding. Orthopedics was consulted for external fixation placement and the coordinated decision was made with the vascular surgery team for the external fixator to be placed concurrently with the ending portion of their procedure to minimize the patient's operative time and prevent subsequent dislocation. A standard knee-spanning external fixator was placed without complication by senior author and orthopedic trauma surgeon VH.

Postoperatively, the patient was transferred to the ICU for postoperative management. On postoperative day 6, vascular surgery performed a fasciotomy, incision & drainage, and closure. The patient was subsequently downgraded out of the ICU. The patient adhered to weight bearing precautions as well as routine follow ups across multidisciplinary team with the help of a home health nurse and her daughter. Follow up was complicated by methicillin-sensitive *staph aureus* bacteremia treated with antibiotics. Four months after initial presentation, the orthopedic team performed removal of the left knee external fixator, explant of TKA, and insertion of an antibiotic spacer that presently remains in place. The patient is non-weight-bearing due to the presence of the spacer, but sensation to light touch is intact distally and the patient can fire the tibialis anterior, gastrocnemius and extensor hallucis longus. The patient's recovery has been further complicated by the development of chronic periprosthetic infection on the contralateral knee, requiring arthroplasty explantation and placement of an additional antibiotic spacer. The patient's daughter, her healthcare proxy, has described the process as "exhausting and frustrating to have so many setbacks."

3. Discussion

Dislocation of functioning total knee arthroplasty is an event rarely reported in the literature. Anterior dislocation of prosthetic knees was first reported in 1997 by Wang et al., who reported three cases of anterior dislocation of a cruciate-retaining implant [6]. A 2019 systematic review identified only 9 cases of anterior prosthetic dislocations reported in the literature [3]. Many etiological factors have been reported, including both traumatic and instability factors. Reported risk

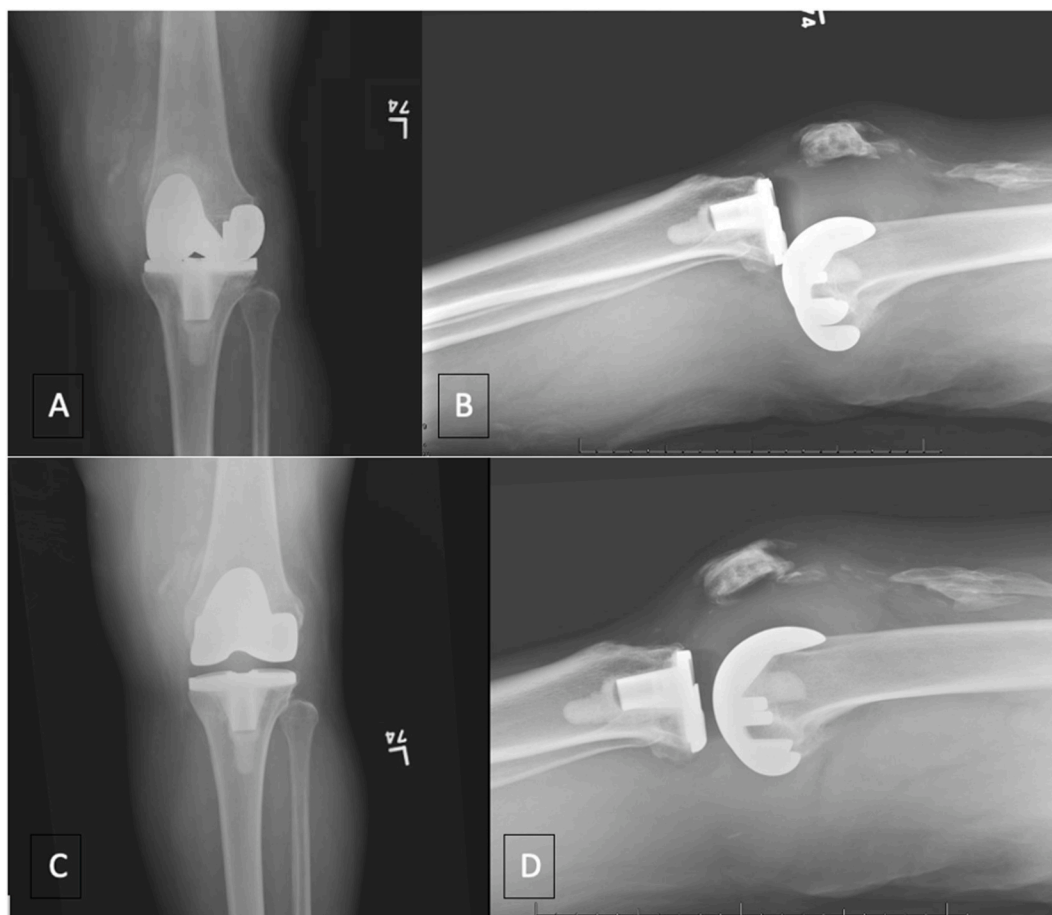


Fig. 1. Anteroposterior (A) and lateral (B) radiographs of the left knee on presentation and anteroposterior (C) and lateral (D) radiographs of the left knee after closed reduction.



Fig. 2. CT angiography of the lower extremity (A) demonstrating traumatic transection of the left popliteal artery active arterial extravasation measuring 1.6×1.4 cm (B) and enlarged hematoma measuring 6.3×4.1 cm on delayed imaging (C).

factors include polyethylene wear, valgus deformity of the knee, malposition of components, greater laxity in flexion than in extension, extension tear, posterior capsule tear, and comorbidities [7–12]. In cases of trauma, anterior dislocation can also occur in a previously well-functioning implant without clear risk factors [13].

Neurovascular injury is a common complication associated with dislocation of both prosthetic and nonprosthetic knees. A 2014 systematic review determined 18% of knee dislocations resulted in vascular injury and 25% resulted in nerve injuries [14]. However, neurovascular injury in the setting of TKA dislocation is a rare occurrence. Our case is only the 5th case of popliteal injury from prosthetic knee dislocation reported in the literature and the first in the United States. In 2003, Pao et al. described a case of a 56-year-old female with end-stage renal disease experiencing anterior prosthetic dislocation causing transection of the popliteal artery and resulting in above-knee amputation 2 days after presentation [10]. In the case presented by Aderinto et al., non-traumatic dislocation led to complete thrombosis of the popliteal artery on the third day of admission. The vascular compromise was treated with femoropopliteal bypass and external fixation; however, at 6 months postoperatively the prognosis of return of function was poor, and below-knee amputation had been discussed with the patient [15]. In 2018, Addevico et al. presented a case of delayed popliteal thrombosis requiring vascularization 80 hours after dislocation [11]. At 5 months after the operation, the patient had not recovered any nerve function distal to the knee. Most recently, Novotny et al. presented a case of acute popliteal artery tear where anastomosis failed to provide effective reperfusion of the lower extremity. This required an above-knee

amputation as a lifesaving procedure; however, multi-organ failure followed, and the patient expired.

Our case is only the second to report acute onset of neurovascular injury after anterior prosthetic dislocation of the knee. Timely closed reduction of the dislocation and performance of CT angiography allowed us to rapidly identify the transection of the popliteal artery. The transection and resulting compartment syndrome were rapidly managed with bypass grafting and fasciotomy. In only one other previously reported case was an external fixator used; however, it is common practice in the management of nonprosthetic knee dislocations with vascular injury [16]. In a coordinated decision with the vascular surgeon team, we opted for the external fixation of the knee for better stabilization of the joint and preservation of the repaired vascular injury. While this method did offer these advantages, it also introduces the risk of complications such as infection, as witnessed in this case.

In the four previous reported cases, outcomes for patients were extremely poor and included loss of function, amputation, and death. In our case, the patient has sensation and motor function distal to the injury, representing the first reported successful vascular repair after acute vascular injury secondary to anterior prosthetic knee dislocation. However, the case has been complicated by infection requiring explantation and placement of an antibiotic spacer, and contralateral chronic periprosthetic infection. These outcomes highlight the benefits and potential risks of external fixation in this clinical scenario. Due to the rarity of this condition, there remain no clear guidelines for care. Pillars of care include rapid diagnosis with CT angiography as well as rapid consultation and shared decision making with the vascular surgery

team.

4. Conclusions

Anterior prosthetic knee dislocation is a rare occurrence and vascular injury is a potentially very serious complication. We report the only case of acute vascular injury after traumatic anterior prosthetic dislocation with a successful vascular repair. Due to the rarity of the condition, strong evidence-based guidelines for management cannot be made. We discuss the importance of closed reduction followed by emergent CT angiography and vascular surgery consultation. In the perioperative setting, the orthopedic and vascular team should use shared decision making to guide choices regarding type of vascular repair and need for external fixation and understand the postoperative morbidities and complications that may occur.

Provenance and peer review

Not commissioned, externally peer reviewed.

Ethical approval

N/A.

Sources of funding

None.

Author contributions

David Constantinescu: study concept, data collection, data analysis, writing the paper, William Pavlis: data collection, data analysis, writing the paper, David Vanden Berge: study concept, data collection, writing the paper, Spencer Barnhill: study concept, data collection, Joe Geller: study concept, data collection, Fernando Vilella: study concept, data analysis, supervision.

Consent of patient

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Research registration

Not applicable.

Guarantors

David Constantinescu, William Pavlis.

Declaration of competing interest

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.103425>.

References

- [1] F. Canovas, L. Dagneaux, Quality of life after total knee arthroplasty, *Orthop Traumatol Surg Res* 104 (1) (2018 Feb) S41–S46.
- [2] M. Sloan, A. Premkumar, N.P. Sheth, Projected volume of primary total joint arthroplasty in the U.S., 2014 to 2030, *J Bone Jt Surg* 100 (17) (2018 Sep 5) 1455–1460.
- [3] L. Rouquette, R. Erivan, B. Pereira, S. Boisgard, S. Descamps, G. Villatte, Tibiofemoral dislocation after primary total knee arthroplasty: a systematic review, *Int. Orthop.* 43 (7) (2019 Jul 23) 1599–1609.
- [4] T. Novotny, E. Vanaskova, J. Soukup, Rare case of traumatic anterior knee dislocation of total knee arthroplasty with a serious neurovascular injury, *Arthroplast Today* 10 (2021 Aug) 171–174.
- [5] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, et al., The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020 Dec) 226–230.
- [6] C.-J. Wang, H.E. Wang, Dislocation of total knee arthroplasty: a report of 6 cases with 2 patterns of instability, *Acta Orthop. Scand.* 68 (3) (1997 Jan 8) 282–285.
- [7] Y. Sato, M. Saito, R. Akagi, M. Suzuki, T. Kobayashi, T. Sasho, Complete anterior knee dislocation 16 Years after cruciate-retaining total knee arthroplasty, *Orthopedics* 35 (4) (2012 Apr).
- [8] S.C. Lee, K.A. Jung, C.H. Nam, S.H. Hwang, W.J. Lee, I.S. Park, Anterior dislocation after a posterior stabilized total knee arthroplasty, *J. Arthroplasty* 27 (2) (2012 Feb) 324, e17-324.e20.
- [9] T. Mine, H. Tanaka, T. Taguchi, K. Ihara, T. Moriwaki, S. Kawai, Patellar tendon rupture and marked joint instability after total knee arthroplasty, *Arch. Orthop. Trauma. Surg.* 124 (4) (2004 May 1) 267–271.
- [10] J.-L. Pao, C.-C. Jiang, Above-knee amputation after recurrent dislocations of total knee arthroplasty, *J. Arthroplasty* 18 (1) (2003 Jan) 105–109.
- [11] F. Addevico, A.M. Nucci, M. Rosati, A. Poggetti, M. Scaglione, Traumatic anterior dislocation of a prosthetic knee, from trauma to delayed onset of vascular injury, *Arthroplast Today* 4 (4) (2018 Dec) 407–410.
- [12] M. Villanueva, A. Ríos-Luna, J. Pereiro, H. Fahandez-Saddi, A. Pérez-Caballer, Dislocation following total knee arthroplasty: a report of six cases, *Indian J. Orthop.* 44 (4) (2010) 438.
- [13] R.S. Ahn, M.J. Brown, M.D. Santilli, Traumatic anterior knee dislocation after total knee arthroplasty, *Arthroplast Today* 2 (3) (2016 Sep) 97–99.
- [14] O. Medina, G.A. Arom, M.G. Yeranossian, F.A. Petrigliano, D.R. McAllister, Vascular and nerve injury after knee dislocation: a systematic review, *Clin. Orthop. Relat. Res.* 472 (9) (2014 Sep) 2621–2629.
- [15] J. Aderinto, A.E. Gross, B. Rittenhouse, Non-traumatic anterior dislocation of a total knee replacement associated with neurovascular injury, *Ann. R. Coll. Surg. Engl.* 91 (8) (2009 Nov) 658–659.
- [16] E. Ramírez-Bermejo, P.E. Gelber, N. Pujol, Management of acute knee dislocation with vascular injury: the use of the external fixator. A systematic review, *Arch. Orthop. Trauma. Surg.* 142 (2) (2020 Nov 22) 255–261.