Popliteal Artery Occlusion After Total Knee Replacement: A Vascular Team Approach for Limb Salvage

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ABSTRACT: Popliteal artery occlusion is a rare complication of total knee arthroplasty with direct injury being the most common cause. We describe an interesting case that presented to us 6 weeks after total knee arthroplasty with critical leg ischemia. The possible cause of the arterial occlusion was thought to be the knee implant compressing the popliteal artery. Timely communication between the wound care specialist, endovascular operator, and vascular surgeon led to limb salvage. Appropriate use of skin perfusion pressure as well as pedal access approach will also be discussed.

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Key words: total knee arthroplasty, critical limb ischemia, popliteal artery occlusion

A rterial vascular injury after total knee arthroplasty (TKA) is rare; its rate of occurrence is 0.03% to 0.17%. Post-TKA arterial occlusion can be caused by thrombosis, fascial obstruction, plaque embolization, or direct trauma to the vessel. Optimal treatment options for popliteal artery occlusion are primary repair of the vessel and saphenous vein bypass. There have been reports of repairing popliteal artery occlusion after TKA using endovascular modalities including balloon angioplasty or stenting. In this case report, we will discuss a patient who had a successful balloon angioplasty of the popliteal artery which ultimately required venous bypass surgery for reasons described below.

Figure 1. Abnormal skin perfusion pressure of 13 mmHg was consistent with critical limb ischemia.

CASE REPORT

A 58-year-old female presented with past medical history of hypertension, COPD, and osteoarthritis with
**Figure 2.** Abnormal pulse volume recording in the right lower extremity.

**Figure 3.** Right anterior leg wound.

**Figure 4.** Right posterior leg and heel wound.
left total knee replacement in 2010 that was complicated by postoperative deep venous thrombosis (DVT) and pulmonary embolism. The patient underwent successful right total knee arthroplasty (TKA) in June 2014. She developed DVT in the right lower extremity despite being on warfarin. She also developed acute numbness in the right lower extremity despite documented normal pedal pulses, as well as blisters in the right anterior and posterior leg.

The patient was subsequently discharged on rivaroxaban (Xarelto), however her pain progressively got worse. The patient was seen at an orthopedic clinic for postoperative follow-up without any suspicion for arterial insufficiency. She was referred to a wound care clinic for wound management where the SensiLase System (Vasamed) was used to identify severe arterial insufficiency in the right lower extremity documented by abnormal segmental skin perfusion (Figures 1 and 2). The distal right lower leg had areas of dark intact eschar. There

![Figure 5. Right popliteal artery occlusion (right lateral view on angiogram).](image)

![Figure 6. Balloon angioplasty of the right popliteal artery.](image)
was no drainage from the areas. There was no purulence or odor. The areas of eschar were firmly adherent (Figures 3 and 4). The patient was referred urgently to our clinic for further evaluation.

The patient was taken to the cardiac catheterization lab and initial diagnostic angiogram through the right radial approach showed right popliteal artery and right anterior tibial occlusion (Figure 5). The patient was scheduled the next day for endovascular intervention of the right popliteal artery.

Initial access was obtained in the right common femoral artery in an antegrade fashion using 6 French 30 cm long Ansel sheath. Heparin was used for anticoagulation. Initial attempts were made to cross the lesion using a 0.014” Command ES wire (Abbott Vascular) and Rubicon 0.018” crossing catheter (Boston Scientific). However, it was difficult to clearly define the proximal cap and course of the popliteal artery due to extensive collaterals as well as poor visualization due to the knee implant.

**Figure 7.** Final angiogram after successful balloon angioplasty of the right popliteal artery showed improved flow in the proximal anterior tibial artery.

**Figure 8.** Skin perfusion pressure 2 weeks after venous bypass of the popliteal artery.
Distal posterior tibial arterial access was secured with a micropuncture needle, and a 4 Fr micropuncture sheath was placed. A cocktail of heparin, nitroglycerin, and verapamil was administered to reduce vasospasm. Using a 0.014” Choice PT wire (Boston Scientific) and 0.014” Rubicon crossing catheter, the popliteal artery was easily crossed into the distal superficial femoral artery and the guidewire was pulled out from the right CFA sheath. Balloon angioplasty of the right popliteal artery was performed from the groin access using a Charger 5.0 mm x 60 mm balloon followed by a Charger 6.0 mm x 60 mm balloon (Boston Scientific) with excellent results. However in the right lateral view while balloon was inflated, there was a hint of suspicion that the implant might be pushing on the popliteal artery (Figure 6). It was decided at that time not to deploy a Supera stent (Abbott Vascular), which is FDA approved for this location.

With flow restored in the popliteal artery, the proximal anterior tibial artery that was previously occluded seemed to have some flow as well, which we thought would improve with time (Figure 7). The patient was transferred to the recovery area. Because of the suspicion for knee implant compression on the popliteal artery, ultrasound of the right lower extremity performed, which showed occlusion of the popliteal artery again. At that time, the decision was made not to further pursue endovascular management. The vascular surgery team was consulted and the patient underwent successful saphenous vein bypass of the right popliteal artery. The patient tolerated the procedure well with gradual improvement in her lower extremity sensation as well skin perfusion pressure, documented by the SensiLase test repeated 2 weeks after the procedure (Figure 8).

**DISCUSSION**

Popliteal vascular injury is a very rare complication of TKA. The presentation is often acute with devastating consequences, including limb loss, if it is not repaired.

To the best of our knowledge, this is the first report of popliteal artery occlusion presenting 6 weeks after surgery with a knee implant being the cause of compression of the artery. Although the Supera stent is FDA approved for deployment in the popliteal artery because of its very low risk of fracture, we used clinical judgment in not deploying the stent as this would have led to stent crush from the implant and disastrous consequences.

We also appreciate the importance of teamwork in managing wounds and vascular issues. The wound care team used SensiLase, an excellent modality for the assessment of arterial flow. This skin perfusion pressure test measures skin perfusion using a laser Doppler sensor and a pressure cuff to evaluate reactive hyperaemia. With prompt referral and management, we were able to save her limb.

**CONCLUSION**

In this rare case of popliteal artery occlusion after knee joint replacement, prompt communication and teamwork led to diagnosis and management of this serious, debilitating complication. This case also emphasizes the importance of using a newer diagnostic modality for arterial insufficiency that measures skin perfusion pressure. The most important takeaway message from this case is to avoid stenting every lesion, as many endovascular interventionists are tempted to do. Stenting in this case most likely would have led to further complications and compromising the surgical bypass option, which still is the preferred modality in
this case. We also used a pedal approach to cross the lesion, which reinforces the importance of having skills with different access sites for the successful completion of complicated cases. ■

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