POPLITEAL ARTERY INJURY FOLLOWING PRIMARY TOTAL KNEE REPLACEMENT: A CASE REPORT

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ABSTRACT

Injury to the popliteal artery following primary Total Knee Replacement (TKR) is rare but has far reaching consequences to both the patient and the surgeon. It is a limb threatening event and can lead to amputation if prompt and adequate intervention is not undertaken. It is a traumatizing event to both the patient and the surgeon. We present a case of popliteal artery injury following primary total knee replacement. The diagnosis was made in the immediate post-operative period following increasing calf pain which was not responsive to analgesia and absent dorsalis pedis pulsation. This was confirmed with a Computerized Tomography (CT) angiography of the lower limb. The patient had immediate vascular exploration and a perforation was noted on the anterior wall of the popliteal artery. There was direct repair of the perforation and the intra-luminal arteriotomy repaired with a venous patch. There was spontaneous return of distal pulsation and the limb was salvaged. On follow up at 3 months, there were no ischaemic changes on the limb. Injury to the popliteal artery may result from direct arterial injury. Preventive measures which include good and safe surgical techniques must be employed during TKR. Early diagnosis and prompt intervention are necessary to prevent complications.

Key words: Total knee replacement, Popliteal artery injury

INTRODUCTION

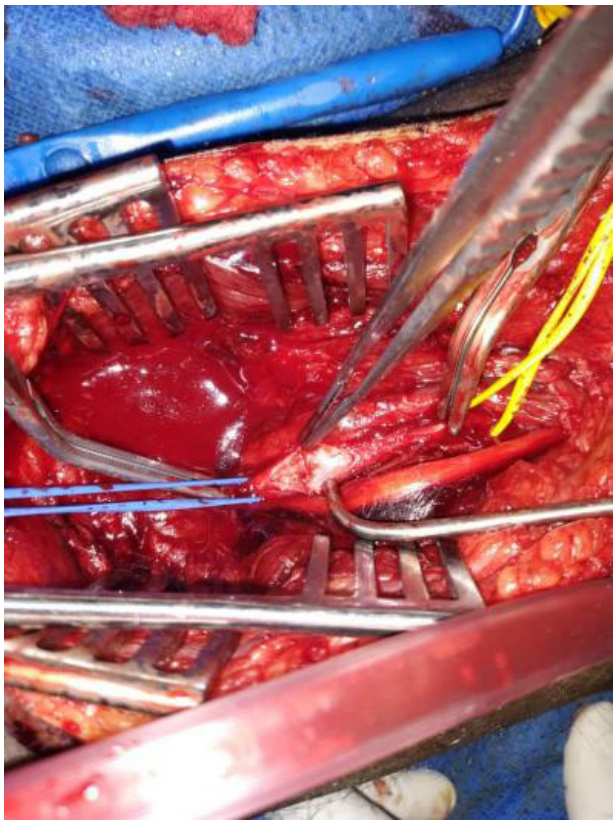
Popliteal artery injury is a very rare complication following Total Knee Replacement (TKR) (1-3). Incidence of vascular injuries after TKR from several studies vary from 0.05 to 0.23% (2,4–7). These injuries could result from direct trauma during surgery, but are more commonly due to an indirect injury (6). Thermal injury from bone cement, mechanical stretching, compression from tourniquet, and retractor penetration have been described as possible mechanisms of injury (2,4,6). This case report describes popliteal artery injury following primary knee replacement and its outcome.

CASE REPORT

A 48 year old man who had reconstruction of the anterior cruciate ligament 20 years ago was diagnosed with secondary osteoarthritis of the right knee. He underwent primary right TKR. Surgery was with pneumatic tourniquet and let down before closure of the wound. It was a tight and varus knee. The tourniquet time was two and half hours. There was no significant bleeding afterwards. About 3 hours post- operatively, he complained of increasing right calf pain which was unresponsive to analgesia. The right foot was cold, sensation absent, the dorsalis pedis and posterior tibial artery pulsations were not palpable. The calf was swollen but not tensed. Hand held doppler scan did not demonstrate flow on the vessels. CT angiography of the lower limb did not demonstrate complete filling from the level of the popliteal fossa.

The popliteal artery was explored immediately. Longitudinal arteriotomy revealed a perforation on the anterior wall of the popliteal artery (Figure 1).

Figure 1
Perforated interior wall of the popliteal artery

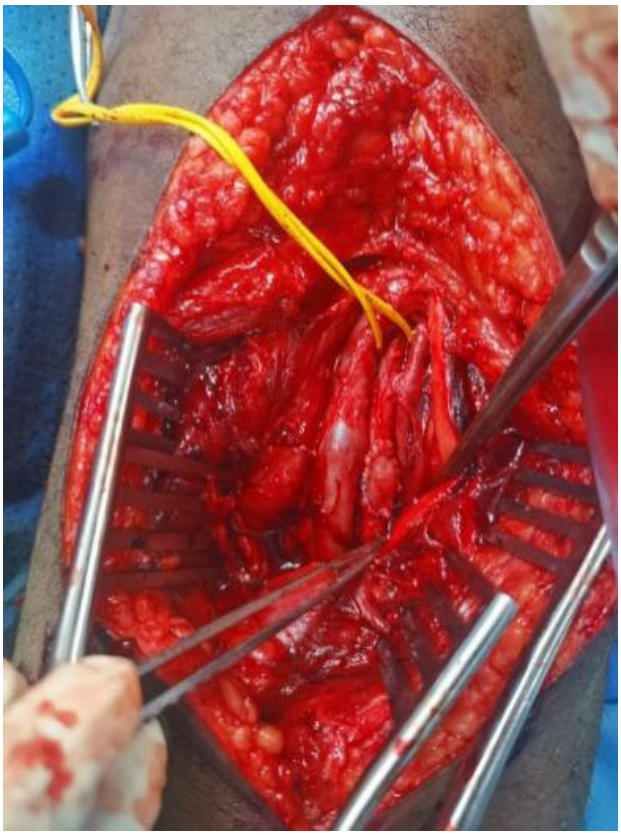


Intra-luminal thrombosis was retrieved with a forgarty catheter from the distal segment of the artery (Figure 2).

Figure 2
Intra-luminal thrombus

The punctured wound was repaired with prolene 5/0. The arteriotomy was repaired with a venous patch harvested from the short saphenous vein (Figure 3).

Figure 3
Popliteal anterior repaired with venous patch



There was return of the dorsalis pedis pulsation and the limb was subsequently well perfused. He did not demonstrate ischaemic changes on the leg on follow up at three months.The vascular repair was done by our vascular surgeon.

DISCUSSION

The risk of vascular complication is reported to be higher in patients with preexisting vascular insufficiency who may have leg claudication, atherosclerosis, prior coronary bypass surgery, and decreased distal pulses (2,5,6,8). Black race and female gender have been reported as possible risk factors for vascular complication following TKR (4).

The rare occurrence of this complication might pose a challenge to the surgeon who may not be familiar with its management which could eventually lead to limb loss. Patients may suffer

devastating consequences especially with delayed recognition and inadequate treatment of this complication (1,9). Multi-disciplinary approach to emergent care involving the vascular surgeon is vital to achieve a good outcome (2,9).

Popliteal artery injuries can occur due to vascular occlusion which can be caused by either thrombosis from vascular wall damage or embolization of calcified plaque from another site usually from the area of tourniquet application. Sharp transection of the artery during bone cuts, arteriovenous (A-V) fistula formation and pseudoaneurysm formation are other ways the injury can also occur (10).

There are four critical points during TKR when popliteal artery has been noted to be at great risk of injury and they include; (i) during the tibial cut, (ii) during the posterior cut of the femoral condyles, (iii) during the application of retractor for anterior dislocation of the tibia, and (iv) during placement of the knee in hyperextension after the cuts and before the application of the hardware (10,11). Most injuries have been found to occur during tibia preparation (12). Our patient had perforation on the anterior wall of the popliteal artery probably from injudicious use of the Hohamm retractor. This might have occurred during the anterior dislocation of the tibia.

Popliteal arterial injuries following total knee replacement could be recognized as direct excessive or pulsatile bleeding from the injured vessel intraoperatively, while decreased or absent pulse, decreased capillary refill, swelling, limb ischemic pain, or neurological deficit may be the findings seen after surgery (6). Popliteal artery pseudoaneurysm should be suspected with complains of unusual and persistent posterior knee pain, swelling, and paresthesia (13). Limb ischemic ulcers and gangrene may also occur if the injury is not detected early or inadequately treated (1,2).

Clinical and radiological assessment are important in the recognition and diagnosis of this injury. Bedside doppler ultrasonography can be used to confirm distal arterial pulsation and can be done immediately in the recovery unit. (4,5,13). CT angiography is recommended for a more detailed radiological assessment of vascular injury and perfusion in these patients (2,6,13). Our patient had limb ischaemic pain and absent pulse few hours after surgery. This was confirmed with a doppler scan in the recovery room and a CT angiography of the lower limb.

Emergent revascularization procedures are required to restore adequate limb perfusion distal to the site of vascular injury. A posterior approach to the popliteal fossa, with the patient in the prone position, is recommended for these procedures which include; interposition graft, ligation with bypass using autologous vein graft or prosthetic graft, popliteal).l stent, primary repair and venous patch angioplasty, end-to-end anastomosis for complete transection and thrombectomy (2,5,10). Fasciotomy is additionally done if compartment syndrome is present (5,6). Above knee amputation is considered a salvage procedure in the treatment of these injuries (7,10). Our patient had primary repair, venous patch angioplasty and thrombectomy.

Preoperative screening for pre-existing vascular disease on history and physical examination may help to identify high-risk patients (2,8,9,14). Preoperative arterial studies have been recommended for patients with non-palpable distal pulses or ankle brachial index less than 0.40. Vascular surgery consultation is important in these patients who may require revascularization procedures before TKR (2,7,10). Patients with risk factors such as diabetes, hypertension, smoking, peripheral vascular disease may also be considered for preoperative vascular surgery consultation (7). Intraoperative measures, such as surgery without a tourniquet, (15,16) gentle manipulation of the knee and careful retraction have been described as techniques to decrease the risk of this complication during TKR (7). Immediate post-operative vascular assessment protocol is important to identify possible vascular compromise early before patient is released from the post-anaesthesia recovery unit (6). The consequences of vascular injury after TKA may be neurologic injury, compartment syndrome, Periprosthetic Joint Infection (PJI), amputation, or even mortality (4–6,16,17).

CONCLUSION

Popliteal artery injury following TKR though very rare, have grave consequences. A significant proportion of affected patients are likely to launch legal suit against the operating surgeon. Careful perioperative evaluation is vital for early recognition. Prompt adequate vascular surgical intervention improves outcome and recovery in these patients.

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