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Multidimensional management of a vascular injury following total knee arthroplasty: A rare case report

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ABSTRACT

Acute vascular injury during total knee arthroplasty (TKA) is an extremely rare complication, but one which can have devastating consequences threatening the limb and/or life of the patient if not diagnosed and managed at the earliest. The clinical presentation can vary from acute haemorrhage or ischemia in the peri operative period; to a delayed presentation of recurrent swelling and pain secondary to a geniculate or popliteal artery pseudoaneurysm. This is the first reported case of an acute inferolateral genicular artery haemorrhage following TKA and the associated medical complications. It was successfully managed with emergency percutaneous endovascular coiling and appropriate medical management. This case highlights that clinical suspicion, prompt diagnosis and urgent intervention with a multidisciplinary approach can help successfully manage a vascular insult.

1. Introduction

Acute vascular injury during total knee arthroplasty (TKA) is an extremely rare complication, but one which can threaten the limb and/or life of the patient if not diagnosed and managed at the earliest[1–3]. The clinical presentation can vary from acute haemorrhage or ischemia in the peri operative period; to a delayed presentation of recurrent swelling and pain secondary to a geniculate or popliteal artery pseudoaneurysm[1,4,5]. This is the first reported case of an acute inferior lateral geniculate artery haemorrhage following TKA.

2. Case report

65 year old female underwent an uneventful left TKA (Legion posterior stabilized, Smith and Nephew Inc., Memphis, TN, USA) for tricompartmental osteoarthrosis after spinal anesthesia with adductor canal block (Figs. 1 and 2). The procedure was done under tourniquet and the drain clamped for 4 h following closure as per protocol. Significant surgical site bleeding was noted in the recovery room managed with compression dressing. Distal pulses were palpable and SpO2 of the limb was 100%. Surgical site soakage persisted with a drain output of 1500 ml over the next 4 h on opening the drain, resulting in hypotension. Patient was transfused 2 units of packed red blood cells (PRBC's) and underwent Digital subtraction angiography (DSA). DSA showed an inferior lateral geniculate artery bleeding which was addressed immediately with percutaneous endovascular coiling (Hilal Microcoils 2 mm/2 mm, Cook Medical, Bjaeverskov, Denmark). (Figs. 3–7) Popliteal vessels were found to be intact. Vital parameters improved, however drain output was 100 ml/h. Investigations revealed a deranged platelet count (18000/cu mm) and coagulation profile (Prothrombin Time-17.7 s, Partial ThromboplastinTime-86 s, INR-1.61, Fibrinogen-135 mg/dL, Fibrin degradation products-normal) suggestive of consumptive coagulopathy. She was subsequently transfused 3 units of cryoprecipitate, 4 units of fresh frozen plasma, 6 units of platelets and 2 units of PRBC's. Drain was kept clamped throughout this period. Patients blood pressure, platelet count and coagulation profile normalized with no surgical site soakage. Hemoglobin (Hb) improved from 5.1 gm% to 8.5 gm%. However, there was another drop in Hb to 5.2 gm% 12 h later. Blood lactate dehydrogenase was raised (3436 IU/L) suggestive of hemolysis; however, Direct Coomb's test, Indirect Antiglobulin test, Reticulocyte count and urine analysis were normal. Cefuroxime induced hemolysis was

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Fig. 1. Antero posterior radiograph showing osteoarthrosis of left knee joint.

Fig. 2. Lateral radiograph showing osteoarthrosis of left knee joint.

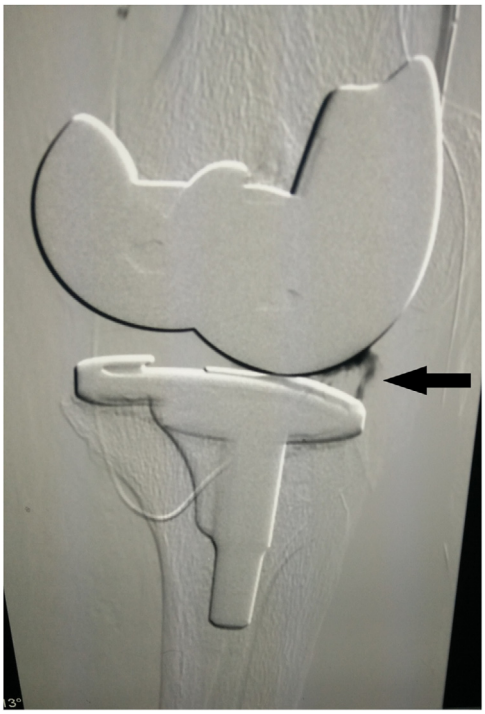

Fig. 3. Digital subtraction angiography showing extravasation of dye from inferolateral genicular artery.

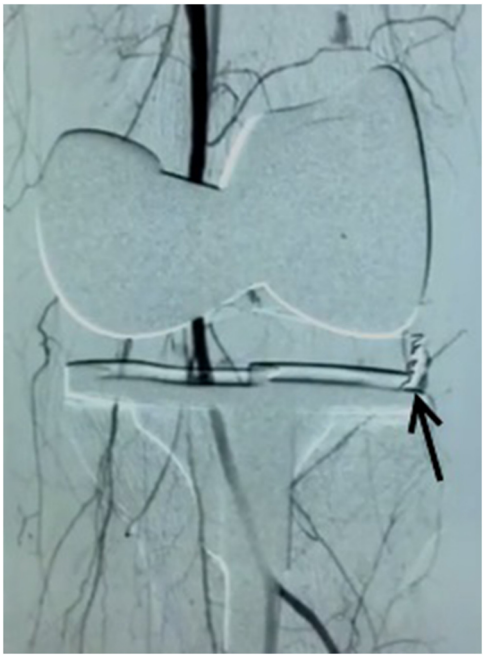

Fig. 4. Digital subtraction angiography with no extravasation of dye from inferior lateral geniculate artery following endovascular coiling.

postulated as a possible cause of raised blood lactate dehydrogenase levels. Computed Tomogram of the abdomen and chest ruled out other sources of bleeding. Bilateral pleural effusion and basal crepts were suggestive of fluid overload with resultant hemodilution. Fluids and Cefuroxime were stopped and patient started on intravenous Hydrocortisone, Furosemide and transfused 2 PRBC's. Patient improved clinically over the next two days and laboratory parameters returned to normal. She was mobilized full weight bearing walking on 3rd postoperative day. She had no recurrence of bleeding, swelling or pain in the left knee at 3 months follow up.

Fig. 5. Fluoroscopy image showing endovascular coil with left knee prosthesis.

Fig. 6. Post operative antero posterior radiograph showing endovascular coil with left knee prosthesis.

Fig. 7. Post operative lateral radiograph showing endovascular coil with left knee prosthesis.

3. Discussion

Incidence of vascular injuries following TKA vary from 0.03 to 1 %[2–4,6,7]. These injuries can be a result of direct trauma, but are more commonly due to an indirect injury causing compression or stretching of the vessels[6]. Various mechanisms postulated are a preexisting vascular pathology, tourniquet induced thrombosis, release of severe flexion contractures and direct injury to the perigeniculate vasculature[1,8].

Haemorrhage following TKA can be immediate or delayed depending on the etiology. The most common cause of delayed recurrent hemorrhage is trauma to hypertrophic vascular synovium; pseudoaneurysm of popliteal or geniculate vessel, geniculate artery injury and arteriovenous fistulas being the less common causes[2]. Acute hemorrhage secondary to a popliteal or geniculate artery injury manifests as an intra operative bleed or with a significant post operative hematoma; as was seen in our case[1]. Releasing the tourniquet before closure to achieve haemostasis is one way to ensure haemostasis; although studies have shown that this does not limit the overall blood loss[9]. Yildiz et al have described an equally effective alternative where the tourniquet is released after wound closure and compressive dressing, with post operative clamping of the drain for 6 h[10].

In a recent meta- analysis, Zhang et al. have concluded that although early tourniquet release and haemostasis is associated with lesser complications, the blood loss and operative time could be higher; and advise against doing so especially in anemic patients[11].

We have not experienced any major complications at our institute with the protocol of late tourniquet release with post operative clamping of the drain for 4 h.

Disseminated intravascular coagulation (DIC) is an extremely rare but lethal complication following surgery[12]. Unless the primary cause of DIC like a direct vascular injury causing consumptive coagulopathy is addressed urgently, it can have grave consequences. Similarly, Cefuroxime induced hemolysis is an extremely rare occurrence; but one which must be suspected if tests are suggestive as second and third generation cephalosporins are the commonest cause of drug induced hemolysis[13].

In 2003,Calligaro et al have reported 100% limb salvage in all their cases with vascular injuries between 1989 and 2002; and have stressed on the importance of identifying and addressing these complications on the same day of the arthroplasty[14]. In their subsequent review of vascular injuries between 1989 and 2012, they have highlighted the advantages of endovascular management over open repair due to substantially shorter time to vascular restoration, less morbidity, and equivalent satisfactory outcomes[15].

4. Conclusion

Vascular injury following TKA, although an extremely rare complication requires immediate intervention as a delay in managing a small geniculate artery injury can also result in devastating complications endangering limb or life. This case highlights that clinical suspicion, prompt diagnosis and urgent intervention with a multidisciplinary approach can help successfully manage a vascular insult and its complications.

Conflict of interest

The authors declare that there is no conflict of interest.

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