

## Full length article

# Acute thrombotic occlusion after total knee arthroplasty: Role of endovascular management



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## ABSTRACT

**Aim:** Acute arterial occlusions after total knee arthroplasty (TKA) are rare but very serious complication. We present a series of 9 patients who underwent endovascular recanalisation for acute thrombotic occlusion following TKA in our institution. The present series determine the importance of early diagnosis and role of early intervention for good clinical outcome in these cases.

**Methods:** From 2013 to 2016, a total of 9 patients (3 male and 6 female) presented with acute popliteal thrombosis following TKA. All the patients underwent endovascular procedure. Clinical presentation, procedural details and clinical outcome was discussed.

**Results:** Technical success is achieved in all the cases. A combination of clot lysis, thromboaspiration and balloon angioplasty was used. 8 patients had successful clinical outcome. One patient underwent amputation despite good recanalisation.

**Conclusion:** High degree suspicion with careful monitoring in the postoperative period is needed to identify the problem at the earliest, and early diagnosis with recanalisation within 6 h is the key to limb salvage in these patients.

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## 1. Introduction

Vascular injury following TKA is extremely rare with a reported incidence of 0.03 to 0.17%.<sup>1,2</sup> There are less than 100 cases reported in the literature.<sup>1–4</sup>

The risk of thrombosis is higher in patients with pre existent vascular insufficiency. It is important to detect the complication at the earliest with close monitoring in the recovery room. Doppler screening is important in suspicious cases, followed by definitive diagnostic method like CT angiogram or catheter angiogram. We report the outcome of acute popliteal thrombotic occlusion in 9 patients following TKA successfully treated by endovascular method.

## 2. Materials and methods

During the period February 2013 to august 2016, 7693 arthroplasty surgeries were performed in our hospital. Vascular injury in the form of acute arterial occlusion due to thrombosis

occurred in 9 patients (3 males and 6 females) with a mean age of 69 years (59–78). Apart from routine preoperative medical examination, vascular assessment involved palpation of all the lower limb pulses. 3 patients underwent bilateral TKR and 6 patients underwent unilateral TKR. Co morbid conditions include Diabetes mellitus in 4 patients and 2 patients are diabetic and hypertensive. None of our patients had any prior cardiac events.

Among these 9 patients who presented with acute limb, 8 were identified in the immediate postoperative recovery room with lack of pulse, with occlusion confirmed by bed side duplex imaging. One other patient, 64 year male who underwent unilateral TKR, presented on 3rd post operative day (late onset) with pulselessness, paresthesias and changes of early ischemia in the toes. All the patients underwent CT angiogram and shifted immediately to cath suite. The patient who presented with late onset changes underwent endovascular procedure on the 4th postoperative day.

## 3. Procedure

Femoral access was used in all the cases. Cross over balkin sheath is placed in the thrombotic limb from the contra lateral side. Intravenous heparin is given to maintain the activated clotting time >250. The thrombus is reached with 4F glide catheter and

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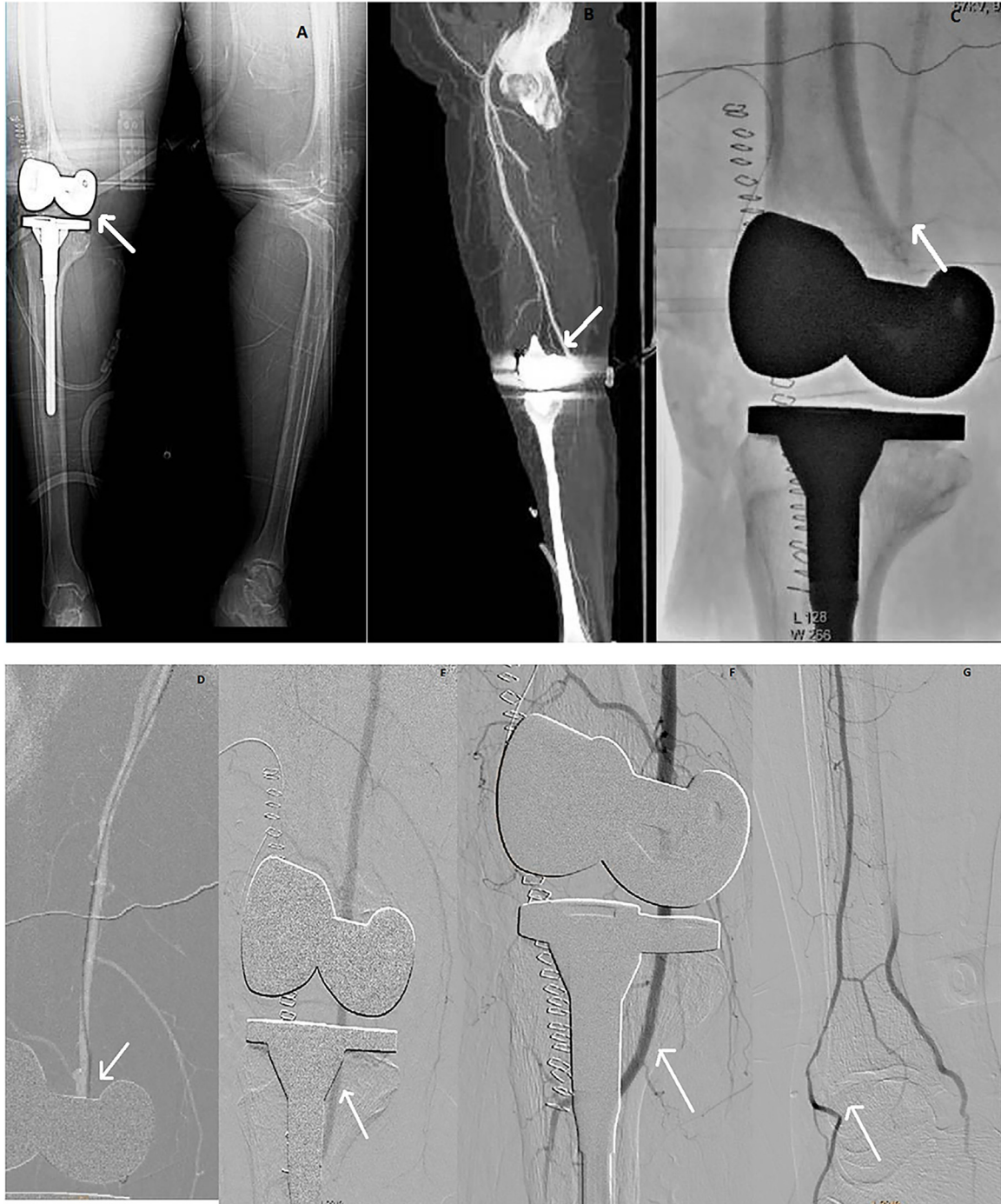
0.025 terumo combination and 2–5 mg tissue plasminogen activator (tpa) was given. Thromboaspiration is done with export catheter (Medtronic). Balloon angioplasty is then done with  $2.5 \times 80$  and  $5 \times 100$  mm peripheral balloons (Cook). Ante grade flow is established and documented till the ankle.

#### 4. Results

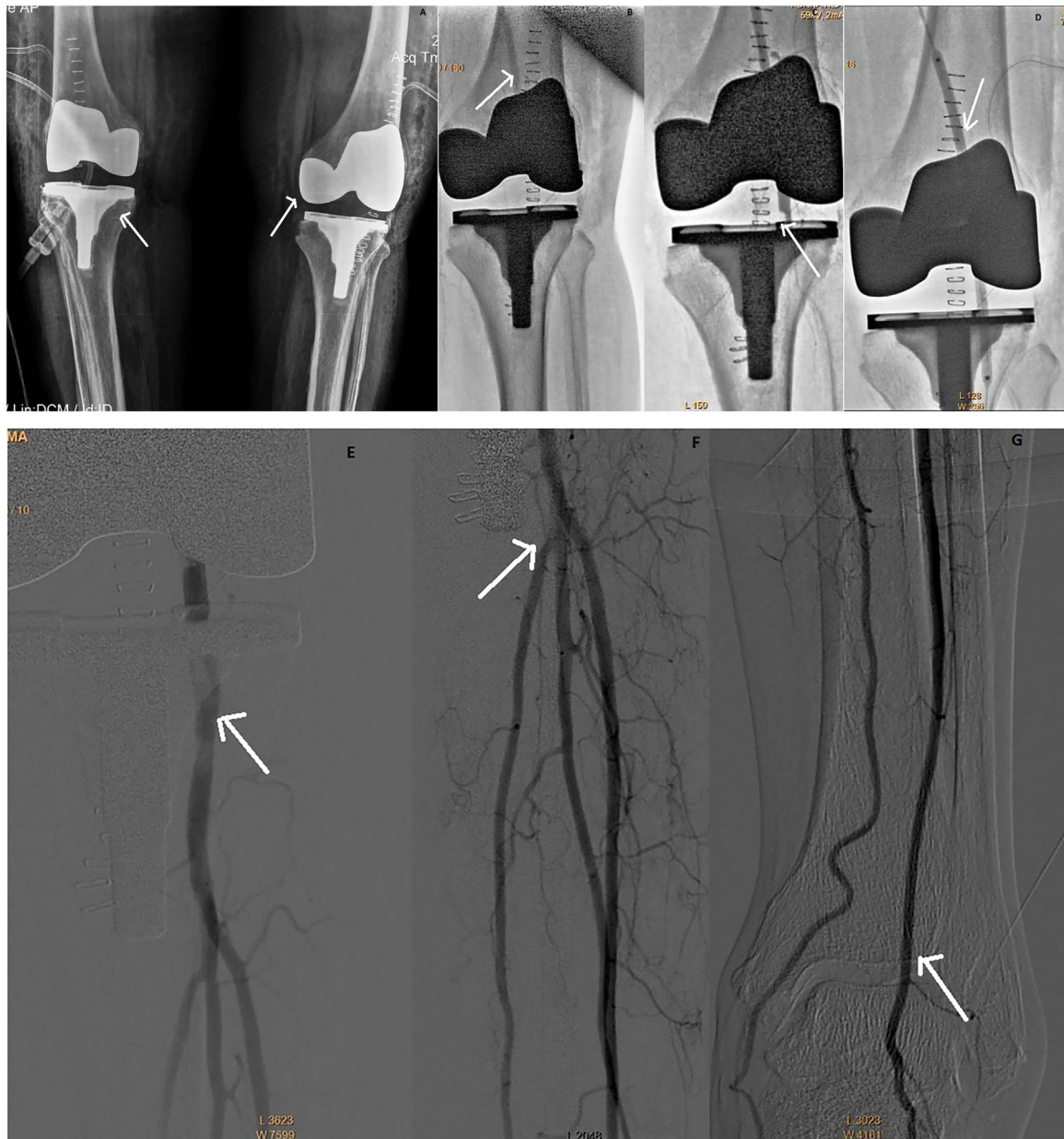
Successful recanalisation with good distal ante grade flow is established in all the cases. 8 out of 9 patients (90%) had full

restoration of the limb function at the time of discharge. One patient who presented with late onset despite good recanalisation underwent amputation. None of the patients required any adjuvant vascular surgical procedure for the thrombotic occlusion and endovascular technique achieved good outcomes in all the cases.

Prompt detection with early intervention is the reason for successful clinical outcome in 90% of the patients. We did not have any mortality because of this complication in our series (Figs. 1 and 2).



**Fig. 1.** 69 year old female presented with acute limb ischemia following TKA. Scout film showing the implant on the right side (arrows in A). CT angiogram on sagittal plane showing the occlusion of right popliteal artery (arrow in B). Catheter angiogram showing no filling from the distal superficial femoral artery (arrow in C). Under road map guidance catheter reached the thrombus (arrow in D). Post procedure angiogram showing the recanalised artery at the level of the implant (arrow in E) and at the bifurcation (arrow in F). Good ante grade flow is seen till the ankle joint (arrow in G).



**Fig. 2.** 72 year old female presented with acute limb and plain x ray showing the bilateral implants of the knee (arrow in A). Catheter angiogram showing the occlusion of the left distal SFA with no distal flow (arrow in B). Glide catheter is placed in the clot (arrow in C) and lysis given followed by angioplasty with  $5 \times 100$  (arrow in D) balloon. Post procedure digital subtraction angiogram images showing the recanalised popliteal artery (arrow in E) with good trifurcation (arrow in F) and antegrade flow till the ankle (arrow in G).

## 5. Discussion

Vascular injury is a rare complication with a reported incidence of 0.03–0.17%.<sup>1,2</sup> This is a devastating complication with a mortality of 7% and morbidity of 42%.<sup>5,6</sup> Popliteal artery thrombosis is the most frequent occurrence of all vascular injuries accounting for 67%.<sup>7,8</sup> Early diagnosis in the time from the end of surgery to first symptom and confirmation by Doppler plays pivotal role in early intervention. Green and Allen.<sup>9</sup> Reported 86% amputation rates in their patients because of this complication, in whom surgery was performed greater than 8 h. 70% limb loss is reported by Calligaro et al.<sup>10</sup> in their study.

Time for recanalisation of the artery with restoration of the blood supply to the limb was less than 6 h in 8 of our patients who had good clinical recovery at time of discharge. In the patient who underwent procedure at a later date, despite the technical success,

irreversible damage already occurred to the distal limb and amputation became inevitable. In these patients with major vessel occlusion, failure to recanalise within the golden hours costs the patients to lose the limb. Failure to diagnose at early stage is the reason for delay in this case.

Mechanical pressure of tourniquet may traumatize vessel causing intimal tear and plaque embolisation. Indirect trauma is the common cause of popliteal artery thrombosis.<sup>11, 12</sup> Tourniquet was used in all our patients. By nature, arthroplasty involves unavoidable use of mechanical forces, thus eliminating the occurrence of vascular injuries is not feasible.

A routine thromboprophylaxis with low molecular weight heparin is given to all the patients undergoing arthroplasty in our institution. Few authors reported that in presence of preexistent risk factors, arthroplasty should be performed without use of tourniquet.<sup>12</sup>

Endovascular treatment is a minimally invasive procedure with significant advantage as evident in our experience. The success of the procedure mainly depends on the time interval between presentation and intervention. Dedicated endovascular peripheral hardware which is least traumatic was used by the operators. Use of larger guide catheters predisposes spasm and dissection in such cases which was totally avoided. Standard protocol with initial clot lysis followed by suction and angioplasty was used in all our patients. The most important factor is that revascularization should be done in less than 6 h to avoid soft tissue damage which can be irreversible. Endovascular treatment should be the first treatment option in these emergency cases mainly because of its minimal invasive nature and less procedural morbidity.

With increasing number of arthroplasty procedures every year, the incidence of vascular complication may also increase.<sup>13,14</sup> The main emphasis is to have a dedicated core working team with a good post operative protocol to detect the onset at the earliest and inter disciplinary team work is most important to ensure the best outcome.

## 6. Conclusion

Vascular injury is a rare but devastating complication of TKA causing limb loss and mortality. High degree of suspicion is required for early diagnosis and multidisciplinary approach is the key for successful outcome in such cases.

## References

1. Calligaro KD, Dougherty MJ, Ryan S, et al. Acute arterial complications associated with total hip and knee arthroplasty. *J Vasc Surg.* 2003;38:1170e1177.
2. Da Silva MS, Sobel M. Popliteal vascular injury during total knee arthroplasty. *J Surg Res.* 2003;109:170–174.
3. Wilson JS, Miranda A, Johnson BL, Shames ML, Back MR, Bandyk DF. Vascular injuries associated with elective orthopedic procedures. *Ann Vasc Surg.* 2003;17:641–644.
4. Khan S. Popliteal artery occlusion after total knee replacement: a vascular team approach for limb salvage. *Vasc Dis Manage.* 2014;11(9).
5. Matziolis G, Perka C, Labs K. Acute arterial occlusion after total knee arthroplasty. *Arch Orthop Trauma Surg.* 2004;124(2):134–136.
6. Parvizi J, Pulido L, Slenker N, et al. Vascular injuries after total joint arthroplasty. *J Arthroplasty.* 2008;23:1115.
7. Gregory PC, Rogic R, Eddington C. Acute arterial occlusion after total knee arthroplasty. *Am J Phys Med Rehabil.* 2006;85(November (11)):924e6.
8. Matziolis G, Perka C, Labs K. Acute arterial occlusion after total knee arthroplasty. *Arch Orthop Trauma Surg.* 2004;124:134e6.
9. Green NE, Allen BL. Vascular injuries associated with dislocation of the knee. *J Bone Jt Surg Ser A.* 1977;59(2):236–239.
10. Calligaro KD, DeLaurentis DA, Booth RE, et al. Acute arterial thrombosis associated with total knee arthroplasty. *J Vasc Surg.* 1994;20:927e932.
11. Berger C, Anzbock W, Lange A, et al. Arterial occlusion after total knee arthroplasty: successful management of an uncommon complication by percutaneous thrombus aspiration. *J Arthroplasty.* 2002;17:227.
12. Langkamer VG. Local vascular complications after knee replacement: a review with illustrative case reports. *The Knee.* 2001;8:259e644.
13. Barrack RL. Neurovascular injury: avoiding catastrophe. *J Arthroplasty.* 2004;19 (4 Suppl. (1)):104.
14. Rue JP, Inoue N, Mont MA. Current overview of neurovascular structures in hip arthroplasty: anatomy, preoperative evaluation, approaches, and operative techniques to avoid complications. *Orthopedics.* 2004;27:73.