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Popliteal artery rupture with closed degloving injury: A case report

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Ethical approval
This case report was approved by the Health Research Ethics Committee of Sultan Agung Islamic Hospital on June 16, 2025 (No. 99/KEPK-RSISA/VI/2025). All patient-related procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Informed Consent
Verbal and written informed consent was obtained from the patient for publication of this case report and all accompanying images without personal identifiers.

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No conflict of interest was declared by the authors.

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Abstract

Popliteal artery rupture is a rare but limb-threatening vascular injury, particularly when it occurs with a Morel-Lavallée lesion (closed degloving injury). The concurrent presence of complete arterial disruption and extensive soft-tissue damage substantially increases the risk of irreversible distal ischemia and amputation, especially when definitive intervention is delayed beyond the critical six-hour ischemic threshold. We report the case of a 29-year-old man who presented after a high-energy traffic accident with hemodynamic instability, absent distal arterial pulsation, and extensive subcutaneous fluctuation extending from the right thigh to the medial knee. Initial radiologic assessment revealed no fracture. Arteriography of the right femoral artery confirmed complete rupture of the right popliteal artery with nonvisualization of the posterior tibial, peroneal, and distal anterior tibial arteries beyond the injury site. Arteriographic delineation of the vascular occlusion level was used to determine the optimal amputation level. The patient underwent fluid resuscitation, transfusion of three units of whole blood, intravenous heparin therapy, surgical drainage of the closed degloving cavity, and primary amputation of the right lower extremity. Amputation was required because delayed presentation beyond the golden period had resulted in irreversible ischemia. He was discharged in stable condition after five days of hospitalization. This case underscores the need for early recognition and timely intervention in popliteal artery injuries. Delay beyond the ischemic threshold substantially increases the risk of amputation. A multidisciplinary approach and awareness of the narrow window for limb salvage are essential in complex lower extremity trauma.

Keywords: closed degloving injury, popliteal artery rupture, morel-lavallée lesion, arteriography, irreversible ischemia, amputation

Introduction

The popliteal artery is a continuation of the femoral artery that traverses the popliteal fossa and branches into the anterior tibial, posterior tibial, and peroneal arteries [1]. This artery plays a crucial role in supplying blood to the lower extremity below the knee, including the gastrocnemius, soleus, and plantaris muscles and the muscles of the foot [2]. Although the popliteal artery is protected by surrounding osseous and muscular structures, sufficiently high-energy trauma can cause serious injury. Popliteal artery injuries typically occur after blunt trauma, such as traffic accidents. Blunt trauma may damage the vessel wall, resulting in thrombus formation, contusion, or complete vascular rupture [3]. This condition is often accompanied by severe soft-tissue injury, including closed degloving injuries caused by substantial shear forces acting on the skin and subcutaneous tissue [4, 5]. Popliteal artery rupture is a severe vascular injury associated with a high lower-limb amputation rate because of tissue damage, circulatory compromise, and progressive tissue necrosis [5]. Complete rupture of the popliteal artery carries a high risk of irreversible distal ischemia when revascularization is not performed within six hours of injury [6, 7].

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Closed degloving injury, also known as internal degloving injury or a Morel-Lavallée lesion (MLL), is a rare soft-tissue injury. It is usually caused by significant shear forces applied to the skin surface, which separate the skin and subcutaneous tissue from the underlying fascia. This process creates a potential space filled with blood, lymphatic fluid, and necrotic fat, resulting in a subcutaneous hematoma with varying degrees of tissue damage [8, 9]. MLLs may occur in the thigh, pelvis, knee, or lumbar region and are often not recognized at the initial trauma assessment, making diagnosis challenging in resource-limited settings. Despite their low incidence, serious complications such as infection, skin necrosis, and extremity dysfunction may occur if these lesions are not identified and managed in a timely manner. Diagnosis may be suggested by physical examination, while adjunctive imaging modalities such as ultrasonography and magnetic resonance imaging can support early detection and guide optimal management [9-11].

When ischemia is already irreversible on patient arrival, amputation becomes necessary to prevent life-threatening systemic complications of reperfusion injury, including hyperkalemia, myoglobinemia, and multiple organ failure [12, 13]. In such cases, arteriography has a dual role: it confirms the diagnosis and accurately defines the extent of vascular occlusion to guide the optimal amputation level, thereby reducing the risk of revision surgery at a more proximal level [13, 14]. This report describes the case and discusses the diagnostic approach, the role of arteriography in surgical planning, and relevant lessons for clinicians managing high-energy lower extremity trauma in resource-limited settings.

Case presentation

A 29-year-old man presented to the Emergency Department with right-leg pain after a traffic accident. The patient appeared clinically weak but had no altered consciousness on arrival. Primary survey examination showed a patent airway. Breathing assessment revealed dyspnea with a respiratory rate of 25 breaths per minute, without tracheal deviation or jugular venous distension. During circulatory evaluation, his blood pressure was 71/45 mmHg and his pulse rate was 140 beats per minute. Immediate resuscitation was initiated with 1000 mL of Ringer lactate, after which the patient showed a transient favorable response.

Examination of the right lower limb revealed erythema, edema, and extensive hematoma without visible deformity or open wound. On palpation, the limb was tender and markedly cool distally, with hypesthesia throughout the foot and complete absence of the right dorsalis pedis pulse. Extensive subcutaneous fluctuation was detected from the mid-thigh to the medial aspect of the knee, consistent with a large subfascial fluid collection. Active range of motion of the right lower extremity was markedly restricted, and passive ankle dorsiflexion was met with rigidity, suggesting advanced muscular ischemia (Figure 1).

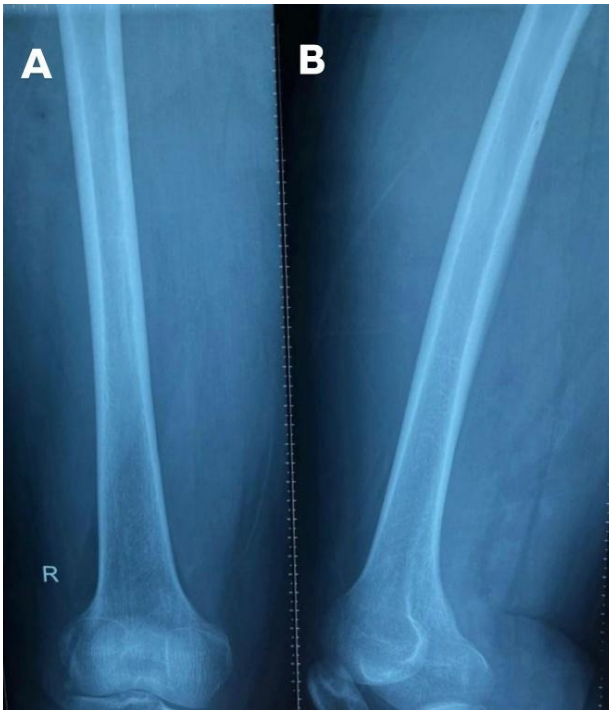
Radiographic evaluation of the lumbosacral spine revealed lumbar scoliosis without fracture or dislocation. Anteroposterior pelvic radiography demonstrated no osseous abnormality, and plain radiographs of the right femur in anteroposterior and lateral projections similarly showed no fracture or dislocation (Figures 2-4).

Figure 1. Closed degloving injury involving the medial aspect of the right thigh and knee, demonstrating characteristic ecchymosis and subcutaneous fluctuation overlying a large Morel-Lavallée fluid collection. The absence of an open wound is consistent with the closed degloving mechanism.

Figure 2. Lumbosacral spine X-ray. (A) Anteroposterior and (B) lateral views showing no dislocation but the presence of lumbar scoliosis. The absence of spinal injury directed clinical focus toward a vascular etiology for the patient's hemodynamic compromise.

Figure 3. Pelvic X-ray, anteroposterior view, showing no fracture, dislocation, or bony abnormality. This finding, together with the femoral radiographs, confirmed the absence of skeletal injury and reinforced the suspicion of isolated vascular injury as the cause of distal ischemia.

Figure 4. Right femur X-rays. (A) Anteroposterior and (B) lateral views confirming the absence of fracture, dislocation, or other osseous injury. The lack of skeletal injury, together with clinical signs of distal ischemia, confirmed an isolated vascular injury mechanism.



Arteriography of the right femoral artery was performed using the Seldinger technique with insertion of a 7-French vascular sheath, followed by catheter-guided contrast injection under fluoroscopic guidance. The study demonstrated complete transection of the right popliteal artery, with abrupt cessation of contrast opacification at the level of injury. The posterior tibial, peroneal, and distal anterior tibial arteries were entirely nonvisualized beyond the lesion, confirming total vascular occlusion without demonstrable collateral reconstitution. Considering the patient's hemodynamic instability and the unavailability of computed tomography angiography, conventional arteriography was selected as the most appropriate imaging method. The arteriographic finding of absent distal vessels was used to determine the appropriate level for primary amputation (Figure 5).

Figure 5. Arteriography of the right femoral artery demonstrating complete rupture of the right popliteal artery, accompanied by absence of blood flow in the posterior tibial, peroneal, and anterior tibial arteries distal to the injury site.

Following arteriography, the patient was admitted for inpatient care. Complete blood laboratory testing revealed low hemoglobin levels with hemodynamic instability. Resuscitation was therefore performed with three units of whole blood and colloids, and the patient was transferred to the Intensive Care Unit for further stabilization. Pharmacologic therapy included heparin at 250 IU per hour for two days, ketorolac 30 mg every eight hours, and ranitidine 50 mg every eight hours. Surgical management was performed after hemodynamic parameters had been adequately stabilized through resuscitation. The operation included primary above-knee (transfemoral) amputation of the right lower extremity at the level determined by arteriographic findings and confirmed intraoperatively based on the proximal extent of non-viable tissue. The patient was closely monitored in the Intensive Care Unit after surgery. He gradually improved clinically and was discharged in stable condition after a total hospital stay of five days.

Discussion

This case illustrates the diagnostic and therapeutic complexity encountered when complete popliteal artery rupture occurs in combination with an MLL in the absence of associated fracture. The interval between injury and arrival, combined with the time required for resuscitation and imaging, resulted in ischemia that exceeded the six-hour threshold described for extremity vascular injury [6, 7, 15]. Clinical findings, including an absent dorsalis pedis pulse, poikilothermia, hypesthesia, ankle rigidity, and severe restriction of active movement, precluded an attempt at limb salvage. Revascularization of a nonviable limb may cause fatal reperfusion injury due to systemic release of potassium, myoglobin, and reactive oxygen species [12, 16].

Conventional arteriography is useful for assessing distal blood vessels before amputation. The degree of occlusion and the patency of distal flow correlate with the likelihood of wound healing and can therefore help predict the appropriate amputation level [13, 16]. In this patient, the complete absence of all three infrapopliteal arteries indicated the absence of a viable vascular territory below the popliteal injury, supporting amputation above the zone of occlusion. This approach is consistent with guidance recommending preoperative vascular imaging before major lower extremity amputation to reduce the risk of subsequent revision at a more proximal level [17]. In resource-limited settings where computed tomography angiography is unavailable, conventional arteriography can fulfill this role effectively by providing high-resolution anatomic mapping and potential interventional access in a single session [18].

The concurrent MLL added further complexity to the surgical management. The most common causes of MLL are high-energy trauma, compressive injuries, and blunt trauma, including traffic accidents [4, 9]. MLLs predominantly occur in areas where mobile overlying skin overlies rigid fascia, such as the quadriceps fascia above the knee and the iliotibial fascia of the proximal lateral thigh [9]. In the present case, the lesion extended from the mid-thigh to the medial knee, consistent with commonly affected periarticular regions. Degloving injuries can be assessed clinically by skin examination, which may reveal ecchymosis, edema, fluctuation, skin hypermobility, and decreased skin sensation. As the injury evolves, the overlying skin may become hardened and painful, indicating encapsulation of fluid collections [19].

When an MLL accompanies irreversible limb ischemia requiring amputation, management of the degloving component remains critical. If left untreated, fluid accumulation can lead to wound infection, delayed stump healing, and increased risk of revision amputation [20, 21]. Surgical drainage performed concurrently with amputation may reduce this risk. This approach is consistent with evidence supporting surgical management for extensive MLLs [9, 22].

Overall, this case highlights three principles that distinguish its management from the standard algorithm for popliteal artery injuries. First, the absence of fracture should not reduce clinical suspicion of vascular injury after high-energy lower extremity trauma. Second, when a patient presents beyond the golden period and arteriography confirms irreversible ischemia without distal blood flow, primary amputation is an appropriate life-saving intervention, and arteriographic findings can guide the optimal amputation level. Third, concomitant MLL must be actively identified and surgically treated during the same operative session to prevent infectious complications and support healing in patients undergoing amputation.

Conclusion

Popliteal artery rupture with concurrent MLL after blunt trauma is an exceptionally rare and clinically challenging combination. These conditions carry a high risk of irreversible limb loss, particularly when presentation is delayed beyond the six-hour ischemic threshold. Arteriography serves two purposes: confirming the diagnosis and defining the extent of vascular occlusion to establish the optimal level of amputation, thereby reducing the risk of revision surgery. Concomitant surgical drainage of MLLs is crucial for preventing infectious complications and promoting healing. A multidisciplinary approach is essential to optimize outcomes in these complex cases and underscores the life-saving value of systematic clinical protocols and early vascular assessment in all patients with high-energy lower extremity trauma.

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