Case Report

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Delayed Acute Ischemia as a Consequence of Multi-Ligament Injury of the Left Knee Following a Motorcycle Accident

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Motorcycle accidents can cause complex orthopedic and vascular injuries, posing diagnostic and treatment challenges. We present a case of a 34-year-old Albanian man with a multi-ligament knee injury and arterial thrombosis in his left leg following a motorcycle accident. The patient initially received conservative care but developed severe leg pain, coldness, and numbness, prompting urgent vascular imaging. Imaging confirmed popliteal artery thrombosis, necessitating surgical intervention. This case highlights the severe complications of motorcycle accidents, emphasizing the need for prompt vascular injury detection and a multidisciplinary approach in trauma management. Early recognition and timely intervention are crucial to prevent long-term morbidity and to optimize recovery. Further research is needed to improve diagnostic and treatment strategies for vascular complications in such injuries.

Keywords: *Arterial Trauma; Imaging Techniques; Limb Ischemia*

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INTRODUCTION

Multiple ligament knee injuries are usually the result of knee dislocations following either high-energy motor vehicle accidents or low-velocity sports injuries [1]. Significant morbidity is associated with knee dislocation including multiple ligament disruption, infections, vascular and neurologic complications following injury and surgery, compartment syndrome, complex regional pain syndrome, deep venous thrombosis, and neurovascular damage. The term multi-ligament knee injury includes all ruptures of two or more major ligaments. Therefore, it has a broad spectrum of clinical presentation, creating a great challenge for orthopedists and surgeons involved in this topic. Motorcycle accidents can result in severe musculoskeletal injuries and vascular complications, presenting significant challenges in diagnosis and management. Vascular injury secondary to an acute knee dislocation is a known complication. However, wide discrepancies exist in the reported rate of vascular injury in this setting [2–5]. Even when a knee dislocation is diagnosed, a neuro-vascular lesion may go unnoticed if the patient is not properly examined and if some simple tests, such as the Ankle-Brachial index that can alert us to a popliteal arterial lesion, are not used. On some occasions when patients arrive unconscious in the emergency department, a peroneal nerve lesion may be neglected, which can have serious consequences [5–8]. Here we present a case report of a 34-year-old Albanian man who sustained a multi-ligament injury to the left lower extremity and developed arterial thrombosis following a motorcycle accident. The patient's clinical presentation, diagnostic workup, and management are discussed, highlighting the importance of prompt recognition and multidisciplinary care in optimizing outcomes for trauma patients.

This case presentation aims to highlight the diagnostic and therapeutic challenges encountered in managing a patient with arterial ischemia following a motorcycle accident, emphasizing the importance of prompt recognition and multidisciplinary intervention in optimizing patient outcomes.

CASE PRESENTATION

A 34-year-old Albanian man was brought to the Regional Hospital following a motorcycle accident. Initial evaluation revealed multi-ligament injury of the

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left knee, including damage to the geniculate arteries, and associated soft tissue trauma. The patient was immobilized, and conservative management was initiated with pain control and elevation of the affected limb. However, on the fourth day of hospitalization in the Regional Hospital, the patient reported severe pain, coldness, and numbness in the left lower extremity. Physical examination revealed absent pedal pulses and sensory deficits in the foot, raising concerns for vascular compromise. Urgent Doppler ultrasound confirmed the presence of thrombosis in the left popliteal artery, necessitating immediate intervention from a vascular surgeon. Despite anticoagulation therapy, antibiotics, immobilization, and analgetics, the patient continued to experience persistent pain, sensory deficits, and motor dysfunction in the affected limb for over a week in the Regional Hospital. Urgently transferred to a University Clinical Center, diagnostic imaging with angio computed tomography (angioCT) of the lower extremities revealed a laceration and extravasation of the left popliteal artery with intramural thrombosis and massive hematoma.

Additionally, magnetic resonance imaging (MRI) demonstrated a fracture of the intercondylar eminence of the left knee, consistent with a multi-ligament knee injury (KD IV), along with associated knee contracture and paralysis of the left peroneal nerve.

On the 13th day post-injury, the patient underwent surgical intervention by a vascular surgeon. An arterial bypass was established from the superficial femoral artery to the second segment of the popliteal artery within Hunter's canal, using a 25 cm autograft from the contralateral vena saphena magna. The procedure was performed through a medial approach. Intraoperatively, while accessing the popliteal artery on the posterior aspect of the knee, considerable damage to knee structures was observed during the evacuation of a large hematoma.

The surgery lasted approximately 5 hours. Medial and lateral fasciotomy of the crural region was performed, revealing that the muscles in that area did not have preserved vitality. Postoperatively, the patient was treated with high-molecular-weight anticoagulants, broad-spectrum antibiotics, blood products, plasma, and albumin. Immediately after the surgery, the patient's foot warmed up; however, the peroneal nerve paresis persisted.

By the third day after surgery, local infection was detected while cleaning the wound, with significant undermining observed (Figure 1).

Therefore, a swab was taken from the wound, isolating *Enterobacter* spp. Local antibiotics were applied, and it was recommended that the patient undergo debridement of necrotic muscles, especially in the area of the anterior tibial artery, under anesthesia (Figure 2).

The patient underwent arterial duplex ultrasound while in bed, revealing triphasic flow in the dorsalis pedis artery and the posterior tibial artery. Due to the infection and radical necrectomy of the tibialis anterior muscle, the anterior tibial artery was completely visualized in the lateral portion, significantly limiting local manipulations. Therefore, a vacuum pump at very low pressure was applied, which noticeably promoted local granulation (Figure 3).

After four weeks of treatment, the patient underwent a final procedure where a plastic surgeon sutured the medial side of the lower leg, leaving the lateral side for secondary healing, with dressings twice daily. The patient remained immobile in bed, without foot sensation or movement. Measures were taken to prevent heel ulcers, although knee pain led to a contracture. Due to persistent infection in the lateral wound, a vacuum pump was reapplied, which was changed every three days. Consultations with a neurosurgeon, physiatrist, and orthopedic surgeon were sought, although no interventions were carried out due to the foot's condition.

After five weeks of hospitalization, the patient was discharged home in an overall improved condition, with mildly elevated inflammatory markers, secondary healing wounds in the lateral aspect of the crural region, and persistent pain and contracture in the left knee, without

Figure 1 Open wound on the lateral aspect of the crural region.

Figure 2 Wound infection after its closure.

Figure 3 Vacuum pump application.

bending the knee, with pulses present in the dorsalis pedis and tibialis posterior arteries. The wound healing process took several months, with phases of exacerbation and improvement, accompanied by continuous monitoring of wound swabs with antibiotics.

Additionally, therapy with antiplatelet agents was prescribed, including an Aspirin 100 mg tablet once daily and a Clopidogrel 75 mg tablet once daily. Meanwhile, the patient, although engaging in physical exercises for other parts of the body, has never rested the leg on the ground.

Seven months after injury, once the wound was fully healed, the patient underwent electromyography of the left leg, an MRI of the left knee, and knee arthroscopy. Orthopedic surgery included anterior cruciate ligament (ACL) reconstruction with a 9.5 mm quadriceps graft, secured by an ACL TightRope and bioabsorbable screw. Posterior cruciate ligament (PCL) reconstruction used a 7.0 mm hamstring graft from the opposite leg, with ACL TightRope and bioabsorbable screws for fixation. PCL reconstruction utilized a 5.0 mm ipsilateral semitendinous graft, fixed by a bioabsorbable screw (modified Larson technique). Post-surgery, the left peroneal nerve was explored and decompressed. The patient was discharged on the second day, instructed to weight-bear as tolerated. After physical therapy, the patient walks without issues, with plantar flexion, and uses an ankle-foot orthosis for dorsiflexion.

Ethical Approval and Informed Consent

Ethics committee approval was not required for this study. Informed consent was obtained from the patient.

DISCUSSION

Motorcycle accidents can result in complex orthopedic injuries and vascular complications, posing significant challenges in diagnosis and management [1–3]. Knee dislocations associated with vascular injuries generally have a poor prognosis. It has been reported that one in five patients who present to a trauma center with an avascular limb associated with a knee dislocation will require amputation [5–8]. The risk of popliteal artery injury with a knee dislocation has varied from 7 to 40%, with more contemporary studies reporting an injury in

the range of 7 to 15%. In addition, if the vascular repair is delayed past 8 hours of ischemia, there is a reported 86% amputation rate [9–12]. In this case, the patient's presentation of severe pain, coldness, and sensory deficits in the left lower extremity raised concerns for vascular compromise, prompting urgent vascular imaging and intervention. In our case, the patient was diagnosed with arterial ischemia 7 days after the injury.

Thrombosis of the popliteal artery is a known complication of lower extremity trauma and can result in limb-threatening ischemia if left untreated [5–10]. Prompt recognition and intervention are essential to prevent complications, such as post-thrombotic syndrome and limb loss. The peroneal nerve is often severely stretched, and no treatment to date has been very encouraging. An ankle-foot orthosis or tendon transfer to achieve dorsiflexion may be needed [7–12].

CONCLUSION

Motorcycle accidents can lead to severe musculoskeletal and vascular injuries, posing challenges in diagnosis and treatment. Popliteal artery injury after knee dislocation often follows a fall, while, with knee fractures, it is rare and usually linked to motor vehicle accidents. This case underscores the need for a multidisciplinary approach for trauma patients with complex orthopedic and vascular issues. Prompt detection of vascular injury is essential to improve outcomes and reduce long-term complications. Delayed treatment in major arterial injuries raises amputation risks, but timely revascularization in stable patients may save limbs. Further research could enhance diagnostics and treatment for these vascular injuries.

Ethics Statement

(1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
(2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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All authors have declared that no financial support was received from any organization for the submitted work. All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Author Contributions

All authors have substantially contributed to the study and manuscript writing.

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