1. Introduction

The popliteal artery, running an exposed course in the popliteal fossa, is anchored superiority by the adductor canal and the fibrous arch of the soleus muscle inferiorly. With this tethering and its relative lack of soft tissue protection in the popliteal fossa, the popliteal artery is highly susceptible to trauma as a result of posterior dislocation of the knee.4,5,8,12,13 There is a growing realization that other types of injury, such as trampoline related accidents, resulting in hyper-extension of the knee can also result in trauma to the popliteal artery.2,6

One issue with such injuries, is that vascular injury may not be clinically apparent on examination (i.e. intimal flap), culminating in limb threatening ischaemia later. We report a case of trampoline injury resulting in blunt trauma to the popliteal artery accompanied by tibial plateau fracture in which computerised tomography (CT) was used to image the vascular and bony injury.

2. Case report

A 19-year-old, white female, university student presented to the accident and emergency department immediately following an injury sustained to the left knee when she landed awkwardly on her left leg during a university trampoline competition. Subsequently she was unable to weight bear and developed paraesthesia in her left foot which she stated then turned cold. This neurovascular deficit had resolved by the time she presented to the hospital. On examination by the accident and emergency physicians, she was noted to have a swollen left knee, absent dorsalis pedis and posterior tibial pulses on the left, despite a warm and well-perfused foot. There was no neurological deficit, no open injury and no obvious bony deformity. Antero-posterior and lateral X-rays of her knee confirmed a tibial plateau fracture (Schatzker IV, fracture medial plateau). In light of these findings a CT scan of the left knee (Fig. 1) to assess the nature of the tibial plateau fracture and CT angiogram of the popliteal artery were performed (Fig. 2). The CT angiogram revealed a 55-mm occlusion in her popliteal artery. On exploration, the popliteal artery was severely contused and primary repair was not possible. An above knee to below knee (distal) popliteal bypass was performed, using contralateral reversed long saphenous vein as conduit. The popliteal artery was ligated just proximal and distal to the injured segment. Once perfusion was re-established, open reduction and internal fixation of the tibial plateau fracture was carried out by the orthopaedic team.

The patient made an uneventful postoperative recovery with no neurological compromise. Day 7 postoperative duplex revealed that the graft was patent with triphasic flow and three-vessel run off to the ankle.

3. Discussion

Boyer et al. reviewed the nature of injuries sustained as a result of trampoline-related accidents and reported that the most severe injuries resulted from the combined recoil force when two people are on the trampoline at the same time.2 This combined force has been shown to cause linear transverse fractures of the proximal tibia. Hyperextension of the knee joint resulting in this degree of bony injury can be associated with significant trauma to the neurovascular structures.2

Fractures with arterial injuries requiring vascular repair are severe, with up to 18% requiring amputation.11 In cases of severe blunt trauma to the lower limb, selective angiography based on clinical examination only is supported. Several studies have reported a strong correlation between physical findings and abnormalities observed on catheter angiography.1,7,14 Furthermore, another study has concluded that the selective use of lower limb angiography, based on physical findings, is sufficient in patients with severe blunt lower limb injury.10 However, presence of an intimal flap in the popliteal artery may be associated with no...
vascular deficit and few, if any signs or symptoms of ischaemia. Such an intimal lesion can progress and result in limb threatening ischaemia.9,15 Hence, selective use of lower limb angiography in severe blunt lower limb trauma may result in the delayed diagnosis of such arterial injuries.3

Non-invasive imaging modalities such as arterial duplex examination and CT angiography allow accurate assessment of arterial trauma without the need for invasive catheter angiography and its inherent complications. When arterial injury is suspected in patients with tibial plateau fractures, a CT scan with intra-venous contrast can accurately illustrate the severity of the arterial injury as well a depict the fracture in a 3D format, allowing for both vascular and orthopaedic surgical planning. This can be performed rapidly and with minimal extra discomfort to the patient.

4. Conclusion

This case illustrates the importance of early suspicion and appropriate imaging of these injuries with timely repair, leading to the salvage of a functional, neurologically intact limb.

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References


Fig. 1. Digitally reconstructed image (volume rendered 3D image) of the CT angiogram of the left popliteal fossa revealing the tibial plateau fracture (black arrow) and the occluded popliteal artery (white arrow).

Fig. 2. Digitally reconstructed images (volume rendered 3D image) of the CT angiogram revealing occlusion of the left popliteal artery (white arrow) behind the knee with reconstitution of the tibioperoneal trunk (black arrow).