Vascular Injuries Caused by Orthopaedic Screws

A Case Report

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Key Words

Iatrogenic ischaemia · Limb ischaemia · Orthopedic screws · Pseudoaneurysm

Abstract

Objective: To describe 3 cases of vascular injuries due to orthopaedic procedures. **Clinical Presentation and Intervention:** Of 242 vascular injuries, 3 were due to orthopaedic screws. The 1st patient presented with a late complication (after 3 years) of an orthopaedic screw placed in close proximity to the axillary artery that with time got eroded and leaked to form a false aneurysm which later caused embolisation to the arm and limb ischaemia. The 2nd and 3rd cases were due acute ischaemia following the orthopaedic procedures. Both were injuries to the popliteal artery, one after a long screw and the other after drilling the tibia. The aneurysm of the 1st case was resected, the screw was removed and a reversed segment of the right long saphenous vein was used to repair the axillary artery. In the 2nd patient, a bypass of the left popliteal artery to the tibio-peroneal trunk was performed using a reversed 12-cm-long saphenous vein graft retrieved from the right thigh. In the 3rd patient, the right popliteal vein was ligated, and a reversed 25-cm-long saphenous vein graft retrieved from the left thigh

was used for a femoro-popliteal bypass. For the 3 patients, postoperative recovery was unremarkable. Pulses were present within 6–10 months of follow-up. **Conclusions:** Whenever limb vascularity is compromised after an orthopaedic procedure, a high index of suspicion for an arterial injury should be exercised and prompt referral to the vascular service is mandatory. Repair of injured vessels with a saphenous vein graft provides excellent long-term results.

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Introduction

Inadvertent injuries to blood vessels during an orthopaedic procedure have been reported to occur in the axillary, subclavian, profunda femoris and popliteal arteries [1–10]. These injuries may present early in the form of excessive bleeding during the procedure or acute ischaemia, noticed during or after the end of the procedure. Late presentation of such injuries is in the form of chronic ischaemia exemplified by claudication or the formation of a pseudoaneurysm. We describe in this report 3 vascular mishaps caused by such inadvertently placed orthopaedic screws.

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Fig. 1. Case 1. **a** Preoperative X-ray of the left shoulder showing humerus nail (A) and the long screw (B). **b** Preoperative duplex of the left axillary artery showing the axillary artery (A), the pseudoaneurysm (B) and the tip of the screw (C). **c** Preoperative angiogram of the left upper limb showing the screw (A) and the axillary artery (B).

Case Reports

Case 1

A 35-year-old man presented with a 5-day history of left-arm pain and numbness. He was involved in a motor vehicle accident in 1998 that resulted in fracture of the left humerus. The fracture was fixed with nailing and screwing. On physical examination, the left upper limb was pale and cold, with reduced sensation and power. The left axillary pulse was present, other pulses were not palpable but there was good Doppler flow in the radial and ulnar arteries. Blood pressure was 130/70 and 50/30 mm Hg on the right and left arms, respectively. The heart rate was regular at 80 b.p.m. Physical findings were within normal ranges in the right upper and lower limbs. Plain X-ray of the left shoulder showed a long screw passing beyond the medial border of the bone into the axillary fossa (fig. 1a). The patient was put on intravenous heparin, the next day his clinical symptoms improved dramatically and the radial and ulnar pulses were palpable. Duplex scanning revealed a 3-cm pseudoaneurysm of the axillary artery, with the tip of the screw in the wall of the aneurysm (fig. 1b). Angiography showed a pseudoaneurysm of the axillary artery with good run-off (fig. 1c).

Surgical exploration of the axilla through an infra-clavicular approach was done with a skin incision along the delto-pectoral groove. Mobilization of the pectoralis major muscle revealed an intact brachial plexus. A pseudoaneurysm of the axillary artery with a screw inside was identified. The aneurysm was resected and the screw was removed. A reversed segment of the right long saphenous vein was used to repair the axillary artery. The patient's postoperative course was unremarkable. He remained asymptomatic, and all pulses were present in the left arm at the 6-month follow up.

Case 2

A 25-year-old man sustained a comminuted fracture of both left tibia and fibula after a road traffic accident. After admission to an orthopaedic hospital, an external fixation of the tibia was performed (fig. 2a). On the 2nd postoperative day, the patient developed pain and bluish discoloration of the left foot. Examination revealed absent pedal pulses with paresis of the left leg. Urgent angiography showed absent popliteal and distal vessels of the left lower limb (fig. 2b). Exploration of the popliteal fossa through a medial incision revealed that one of the screws had damaged the popliteal and anterior tibial arteries, and the posterior tibial nerve. A bypass of the left popliteal

Fig. 2. Case 2. **a** Preoperative angiogram of the left lower limb showing the popliteal artery (A), the external fixator and its screws (B) and the fracture sites (C). **b** Preoperative angiogram of the left lower limb showing the popliteal artery (A) and the distal run-off (B).

artery to the tibio-peroneal trunk was performed using a reversed long saphenous vein graft (12 cm long), retrieved from the right thigh. The postoperative period was uneventful except for left foot drop. At the 10-month follow-up he had good pedal pulses.

Case 3

A 36-year-old man had an arthroscopic repair of the anterior cruciate ligament of the right knee. In the recovery room, the patient developed acute swelling of the popliteal fossa with loss of movement and sensation in the lower limb. A vascular injury was suspected, the popliteal fossa was explored through a medial approach, and an intra-operative angiogram revealed extravasations of contrast from the popliteal artery (fig. 3). There was a penetrating injury of the popliteal artery, the popliteal vein was cut and there was a partial injury to the tibial nerve. These injuries were caused by the drilling of the tibial tunnel during the procedure. The right popliteal vein was ligated and a reversed long saphenous vein graft retrieved from the left thigh was used for a femoro-popliteal bypass. The graft was about 25 cm long, and an end-end anastomosis was used at both ends. At the 6-month follow-up he has good pedal pulses, but left with a foot drop due to the nerve injury.

Discussion

In the last 10 years we managed 242 vascular injuries and only 3 (1.2%) were due to orthopaedic screws. Generally, these injuries could present early as bleeding or acute ischaemia or late as pseudoaneurysm or signs of chronic ischaemia. Studies have shown that the most common

Fig. 3. Case 3. Intraoperative angiogram of the right lower limb showing the popliteal artery (A), extravasations of contrast (B), the end button and interference screw (C), and the distal run-off (D).

orthopaedic operation causing an arterial injury was due to a modified Bristow procedure for shoulder joint stabilization. Many years later, these injuries presented as pseudoaneurysm of the axillary artery with limb ischaemia due to distal embolisation [1–6], as observed in the 1st patient. Cases of acute ischaemia caused by orthopaedic screws to the subclavian [7], profunda femoris [8, 9] and the popliteal arteries [10–12] have also been reported.

The popliteal artery is in close proximity to the posterior capsule of the knee joint. The 2nd and 3rd cases are examples of acute presentation with ischaemia. Both were injuries to the popliteal artery, one after a long screw and the other after drilling the tibia. Arterial injury should be suspected if a swelling developed in the popliteal fossa and calf muscle following surgery.

In both cases, the medial approach was preferentially used to get access to the popliteal artery. This approach provided an excellent vascular access to the popliteal

artery and its branches and allowed retrieval of the long saphenous vein from either leg. The posterior approach was not used because it is limited to few operations on the popliteal artery such as the popliteal entrapment syndrome. In addition, by the time a vascular surgeon arrives at the emergency operating theatre, the patient is already lying supine under general anaesthesia, and it would be therefore very inconvenient to turn such a patient around to lie prone.

Knee flexion position during surgery was thought to keep the popliteal artery out of harm's way. However, measurement of the distance of the popliteal neuro-vascular bundle from the posterior part of the proximal tibia by magnetic resonance imaging in volunteers showed that knee flexion position would not necessarily provide protection to the central part of the popliteal fossa during surgery of the knee [11, 13].

Iatrogenic vascular arterial injuries associated with orthopaedic surgery are rare. Meticulous orthopaedic

techniques are required to avoid such complications especially when using screws. Pre-operative and operative angiograms are essential to delineate the site and type of injury.

Conclusion

This report shows that repair with a saphenous vein graft provided an excellent long-term patency. We suggest that when a high index of suspicion for arterial injury due to compromised limb vascularity occurs, the patient should immediately be referred to a vascular surgeon.

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