Management of Lower Extremity Ischaemia During Type A Dissection Repair

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INTRODUCTION

Type A dissection can be complicated by malperfusion syndrome, including lower extremity ischaemia in 15–40% of cases. Repair of Type A aortic dissection (ascending aorta with or without arch replacement) aims to restore flow to the true lumen. However, there are few management options to address acute lower limb ischaemia before completion of repair. Timely correction of lower limb malperfusion may improve outcomes in patients presenting with signs and symptoms of significant lower limb ischaemia. A case of Type A aortic dissection with such a presentation is described.

CASE REPORT

A 67 year old man presented to the Emergency Department via ambulance after experiencing sudden onset of retrosternal tearing chest pain. A widened mediastinum was demonstrated on chest radiography. Shortly thereafter the patient experienced right leg pain that progressively worsened to motor-sensory deficit. A computed tomography (CT) angiogram showed a Type A aortic dissection extending from the aortic root to the common femoral arteries (Fig. 1). Pertinent details of this case include the extension of the dissection flap into the brachiocephalic artery and common carotid arteries bilaterally, which remained patent. The visceral vessels were perfused by the true lumen, with a patent false lumen supplying the left renal artery. The common iliac arteries (CIAs) were supplied by the false lumen bilaterally. On the right, the CIA, external iliac artery (EIA), and common femoral artery (CFA) appeared occluded with superficial femoral artery (SFA) reconstitution by colaterals. A proximal SFA thrombus was noted with complete occlusion of the profunda femoris. On the left, the distal EIA and CFA were occluded with reconstitution at the distal CFA.

The lower extremities had been ischaemic for 3.5 hours by the start of the procedure. To address the leg ischaemia in a timely fashion, the cardiac and vascular surgeons constructed a joint operative plan to perfuse the femoral arteries during the central aortic repair, to be followed by re-evaluation and definitive management of the lower extremities by vascular surgeon. Bilateral groin exposure was performed with the CFA, SFA, and profunda arteries controlled individually within 10 minutes. With the patient heparinised, an 8 mm Dacron graft was anastomosed to the right axillary artery (to facilitate antegrade cerebral perfusion during arch repair) and connected to the arterial limb of the cardiopulmonary bypass (CPB) circuit. A side arm was taken off the circuit and attached to two 6 mm balloon...
tipped cardioplegia cannulae (Polystan, Ballerup, Denmark), which were cannulated into the SFAs bilaterally in a downward direction. Passive perfusion was allowed from the axillary to femoral arteries before sternotomy. Following central venous cannulation and commencement of CPB, perfusion continued with the additional cannulae acting as arterial limbs (Fig. 2). The maximum flow achieved by this manoeuvre was estimated at ~200 mL/min. Revascularisation was anticipated (e.g., angioplasty with or without femoro-femoral crossover), pending reassessment at completion of the ascending aorta and hemiarch repair (cross clamp 64 minutes, circulatory arrest 23 minutes at 22°C with cerebral perfusion, and CBP 135 + 45 minutes).

After repair and weaning from CPB, the patient had palpable femoral pulses, suggesting leg ischaemia was secondary to a dynamic obstruction flap that resolved with true lumen reperfusion at the completion of arch repair. The left foot appeared warm and well perfused with an excellent Doppler signal. On the right, there was an obstructive pulse by Doppler, poor foot perfusion, and a noticeably weaker popliteal signal. A transverse CFA arteriotomy was therefore performed with a no. 4 Fogarty catheter balloon passed down the SFA and profunda arteries, achieving thrombus retrieval, good back bleeding, and a low resistance Doppler signal into the CFA. Post-operatively, the patient developed renal dysfunction as a consequence of the right renal artery occlusion, which improved and did not require dialysis. Notably, he had complete motor-sensory recovery of his lower extremities without fasciotomies.

DISCUSSION AND CONCLUSIONS

Thoracic aortic dissection has a reported incidence of 2.9 per 100,000 per year, and if untreated 50% die within 48 hours. Few options exist for management of concurrent limb ischaemia during Type A dissection. While repair of the entry tear is the primary treatment and may ultimately restore flow, it requires significant time that can jeopardise the limb creating haemodynamic and biochemical instability because of ischaemic metabolites. Case series highlight outcomes in this clinical scenario with one study (221 patients) determining iliofemoral malperfusion in 12.7% of cases, with a need for distal revascularisation in 42.9% of those. Limb loss was significant, with an amputation rate of...
10.7%. A slightly larger case series by Charlton-Ouw et al. (335 patients) determined iliofemoral malperfusion in 15.2% with less need for revascularisation (21.6%), and a single patient with limb loss secondary to delayed recognition of persistent ischaemia. Persistent malperfusion after aortic repair can be treated by open or endovascular revascularisation techniques. Some have advocated, however, lower extremity revascularisation prior to definitive proximal aortic repair because the reported higher postoperative mortality of end organ ischaemia. Alternatively, simultaneous ascending aortic repair with femoro-femoral crossover bypass has been recommended for patients with suspected static occlusion. Interestingly, Hussain et al. have recently described temporary axillofemoral bypass for reperfusion of an ischaemic limb complicating Type A dissection. More recently, some centres have employed near infrared spectroscopy (NIRS) to evaluate limb perfusion. In centres where NIRS is not routinely available or in cases where anticipated repair may be prolonged and Type A dissection is complicated by bilateral limb ischaemia, it may be reasonable to attempt SFA cannulation and reperfusion as described here when the CFA is dissected.

While the majority of lower extremity ischaemia resolves with repair of Type A dissection, long duration of repair and/or persistent ischaemia leaves tissue at risk with potentially substantial morbidity. Here, bilateral cannulation of the SFA is described with passive perfusion initially via the right axillary artery, then via the CPB circuit as a means to limit limb ischaemia and potentially improve outcomes in the setting of Type A dissection with lower extremity malperfusion. In the case of anticipated prolonged ischaemia or lack of reperfusion due to occluded external iliac arteries, simultaneous perfusion of the femoral arteries should be considered. Early involvement of vascular surgeons is therefore recommended when managing these patients.

CONFLICT OF INTEREST
None.

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