Endovascular treatment of iatrogenic aortic graft injury after sternal puncture

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Abstract

We report the case of a 71-year-old woman who had previously undergone supra-aortic trunk transposition via a median sternotomy, along with endovascular thoracic aortic stent-graft repair. During the diagnostic sternal puncture for a recently discovered acute lymphoblastic leukaemia, an accidental graft injury occurred. For this patient, who was not a surgical candidate, endovascular treatment with a covered stent (endograft) was performed, with uneventful postoperative follow-up. This case report illustrates the limitations of sternal puncture in patients with a previous sternotomy, and discusses the possibility of endovascular treatment in the event of aortic graft injury, given easy accessibility and favourable aortic neck anatomy.

Keywords: Aortic arch • Endovascular procedure • Penetrating trauma

INTRODUCTION

Traumatic thoracic aortic injuries are associated with high mortality and morbidity [1] but iatrogenic accidents due to sternal puncture are rather uncommon, occurring mostly in patients with a concomitant disease for which the sternal puncture is indicated. We present an uncommon case of a patient who presented with aortic graft injury after sternal puncture with endovascular treatment.

CASE REPORT

A 71-year-old woman with a history of pancytopenia was admitted to our hospital for further investigation, with a medical suspicion of acute lymphoblastic leukaemia. Several years prior, the patient had undergone aortobi-iliac grafting for a sub-renal aortic aneurysm, as well as endovascular repair of a thoracic aortic aneurysm, with endoprosthesis implantation, left sub-clavian carotid transposition and adjunctive supra-aortic trunk (SAT) transposition via median sternotomy. The SAT transposition consisted of a prosthetic graft from the ascending aorta to the brachiocephalic artery trunk [10 mm polytetrafluoroethylene (PTFE)], along with a prosthetic graft from the former to left common carotid artery (8 mm PTFE). Because acute lymphoblastic leukaemia was suspected, a myelogram was performed via sternal puncture using an 8-gauge 10-cm trocar to assess the pancytopenia aetiology. During the puncture procedure, the trocar suddenly passed through the sternum, resulting in a significant, pulsatile blood reflux, along with thoracic pain, which led to suspicions of an underlying, accidental arterial injury. The trocar was promptly repositioned in the puncture needle holder that had been left in place (Fig. 1A). Following arterial pressure stabilization and vascular filling, a computer tomography (CT) scan was performed. This CT scan clearly revealed the trocar’s penetration 1 cm from the left limb (towards the left common carotid artery) of the supra-aortic rerouting graft (Fig. 1B and C), with minimal contrast agent leakage around the ascending aorta. An emergency echocardiography did not detect any signs of pericardial tamponade and the haemoglobin levels were stable. Given the patient’s prior sternotomy and her severe pancytopenia, conventional cardiac surgery with redo sternotomy and cardiopulmonary bypass (CPB) was considered too challenging. Due to the vascular injury’s location and because of a sufficiently long vascular neck (1 cm), covered endograft treatment of the vascular injury was proposed. A cervicotmy facilitated access into the left common carotid artery with a 7-F catheter and catheterization of the debranching graft’s left limb. An angiography catheter was advanced to the aortic root via the right femoral artery. An aortogram in the left anterior oblique view revealed the trocar’s entry point in the graft (Fig. 2A). A 7-gauge 45 cm catheter guide was advanced via the left common carotid and successfully engaged the ascending aorta, and an 8 × 38 mm PTFE-covered balloon-expandable stent (Advanta V12, Atrium Medical, Inc., Hudson, NH, USA) was then introduced. After positioning the stent across the vascular injury (Fig. 2A) and removing the guide, the trocar was withdrawn, and the stent inflated. A control angiogram confirmed the stent’s good positioning, the supra-aortic rerouting system’s full permeability, and the absence of leakage. The patient received amoxicillin prophylactically. An uneventful postoperative confirmed
haemodynamic and biological stability. At Day 8, a control CT scan showed satisfactory results (Fig. 2B and C) and the patient was transferred to the haematology department for management of the acute leukaemia. She had no vascular complications during all the follow-up and died 8 months later of the leukaemia.

DISCUSSION

Thoracic aortic penetrating trauma is infrequent, and only a few cases have been reported in the scientific literature. Associated mortality is particularly high, exceeding 90% [1]. The prevalence of such injuries is low, and most are traumatic in origin. The largest reported series was from North America, involving 27 cases [2]. Penetrating trauma was responsible in 82% of cases, with 69% caused by firearms and 18% by white arms [3]. Iatrogenic injuries are rather exceptional, occurring mostly during angiography procedures, spinal osteosynthesis [4], jugular vein approaches or sternal punctures. To our knowledge, a traumatic injury to the supra-aortic rerouting graft has not yet been reported in the literature.

Cardiovascular collapse is observed in 82.5% of aortic injury cases [3]. Whenever possible, a CT scan or echocardiography...
should be performed to exclude a haemopericardium and to precisely localize the aortic injury. In the event of major haemodynamic instability, an emergency haemodynamic intervention is required to ensure prompt haemostasis. In such a scenario, a median sternotomy is usually indicated, although a left anterolateral rescue thoracotomy may facilitate evacuation of a haemopericardium and repair of vascular wound by simple suture or prosthetic patch [5]. In our patient, surgical intervention would have entailed a new sternotomy, a delicate procedure for the presence of retrosternal vascular graft. Prior to such a redo sternotomy, CPB by peripheral cannulation and elective cardiac arrest under hypothermia would have been required. This procedure would have carried a great risk, especially considering the patient’s severe leukaemia-induced pancytopenia.

We believe our case to be interesting for the following reasons: (i) it reports an infrequent traumatic aortic graft injury; (ii) a sternal puncture was the causal agent; (iii) the endovascular approach was considered a therapeutic option. The endovascular approach was selected due to favourable anatomical conditions, notably the 1-cm neck between the graft’s left limb and the trocar entry. Given the patient’s comorbidities, especially acute leukaemia with severe pancytopenia, we were reluctant to carry out a major redo surgical intervention. Moreover, our case clearly illustrates the risk associated with sternal punctures, especially when conducted in potentially osteoporotic or elderly patients, and particularly in the event of a prior sternotomy, rendered easily recognizable by a median scar. Should this be the case, another puncture site should be selected.

Sternal punctures should be contraindicated in elderly, often osteoporotic patients, and in those with median scarring that testifies to a prior sternotomy, and an iliac puncture should be carried out instead. In the event of a vascular injury in haemodynamically stable patients, rigorous preoperative CT scan evaluation may facilitate the selection of an endovascular approach instead of conventional surgery, given the easy accessibility and a favourable aortic neck anatomy.

**Conflict of interest:** none declared.

**REFERENCES**


