Occlusive ascending aorta and arch atheroma treated with deep hypothermic circulatory arrest and thromboendarterectomy

Katie E. O’ Sullivan¹*, Sarah A. Early, Leo Lawler and John Hurley

¹ Department of Cardiothoracic Surgery, Mater Misericordiae University Hospital, Dublin, Ireland
² Department of Radiology, Mater Hospital, Dublin, Ireland

* Corresponding author. Mater Misericordiae University Hospital, Eccles St., Dublin 7, Ireland. Tel: +353-86-8377625; fax: +353-1-8034134; email: kaosulli@tcd.ie (K.E. O’ Sullivan).

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Abstract

We describe an uncommon presentation of severely advanced aortic atherosclerosis in a 48-year old man with a history of hypertension and heavy smoking. Initial presentation with upper limb ischaemia led to the diagnosis of an aortic arch atheroma occluding 90% of the aortic lumen, managed with deep hypothermic circulatory arrest and aortic thromboendarterectomy. To our knowledge, this is the first reported case of atherosclerotic plaque resulting in aortic occlusion and requiring emergent operative intervention.

Keywords: Aorta • Atherosclerosis • Ischaemia • Thromboendarterectomy • Circulatory arrest

CASE REPORT

A 48-year old man with a background history of hypertension, heavy smoking and alcohol excess presented to a peripheral hospital with a 3-day history of pain and numbness in his right wrist. Examination revealed pallor and reduced capillary repletion above the sinus of Valsalva distally (Fig. 1). An emergency fasciotomy and embolectomy of the right arm was performed, restoring pulsatile flow to the right radial and ulnar arteries. Unfractionated heparin was commenced. Transoesophageal echocardiography (TOE) was found to be consistent with the CT findings and he was transferred to a tertiary referral vascular surgery centre for emergency embolectomy.

Computed tomography (CT) aortogram demonstrated a bovine aortic arch and large atherosclerotic plaque extending from 1 cm above the sinus of Valsalva distally (Fig. 1). An emergency fasciotomy and embolectomy of the right arm was performed, restoring pulsatile flow to the right radial and ulnar arteries. Unfractionated heparin was commenced. Transoesophageal echocardiography (TOE) was found to be consistent with the CT findings and he was transferred to our institution for urgent surgery.

The patient was placed on cardiopulmonary bypass through the innominate artery and via bicaval venous cannulation and cooled to an arterial circuit temperature of 18°C. Retrograde cerebral perfusion was maintained throughout. A longitudinal aortotomy revealed a pale yellow organized mass with overlying thrombus, occluding 90% of the aortic lumen. The appearance was consistent with fresh thrombus overlying chronic atheroma, which was carefully extracted from the vessel wall. Circulatory arrest time was 29 min, and cardiopulmonary bypass time was 147 min. The aorta was closed and the patient was taken off cardiopulmonary bypass without event.

Extubation was possible on Day 1 and there was no gross neurological deficit. Histological examination of the extracted mass confirmed atherosclerotic plaque. Haematology consultation was obtained which ruled out the presence of a coagulopathic disorder. The patient was maintained on intravenous heparin until fasciotomy wound closure was performed and warfarin commenced with a target international normalized ratio of 2.0–3.0. Residual paraesthesia in the right hand persisted until discharge. Postoperative CT aortogram confirmed complete excision of the aortic atheroma (Fig. 2) and the patient was discharged on postoperative Day 13. A 6-week review confirmed resolution of the paraesthesia. He remains well 3 months post-procedure and has returned to normal activities.

DISCUSSION

Our case is best described as one of peripheral arterial embolization secondary to a 90% occlusive atheromatous lesion situated in the aortic arch. Atherosclerosis of the aorta occurs commonly in the general population with an incidence of 6.4, 31.0 and 44.9% in the aortic arch, ascending aorta and descending aorta, respectively, and is a well-recognized source of systemic emboli, which frequently develop on an area of underlying disease [1]. While the overall development of atheroma is slow and progressive, individual lesion morphology is dynamic, with formation and resolution of mobile components occurring frequently and resulting in embolic events, particularly ischaemic stroke [2]. Unsurprisingly, the risk of developing aortic atherosomas is the same as traditional risk factors for developing atherosclerosis and our patient had a history of hypertension and heavy smoking. However, Montgomery et al. [2] report longitudinal follow-up of 191 patients with identified aortic atherosclerosis on TOE with a mean age of 68 ± 1.5 for those with grade V atherosclerosis, indicating how young our patient was to develop such severe disease.
Thoracic aortic occlusion is infrequently observed, but has been reported to occur secondary to embolism and thrombosis, aortic dissection, blunt trauma and more rarely due to Takayasu's arteritis, radiation, primary aortic sarcoma, metastatic emboli, fungal infections, hypercoagulable disorders and heparin-induced thrombocytopenia. In-hospital mortality associated with complete aortic occlusion is 35% [3]. This patient presented with acute upper limb ischaemia and a relatively short history of claudication. This case illustrates the importance of investigating for a central source of thrombi following management of the acute peripheral ischaemia.

TOE is the modality of choice for imaging thoracic aortic atheromas [4]. Interobserver and intraobserver concordance is 92.5 and 95%, respectively [2]. However, in our case, computed tomographic angiography was the modality of choice due to the presentation of upper limb ischaemia. Magnetic resonance imaging (MRI) has also been used to detect aortic arch thrombi and differentiate between thrombus and intravascular tumour and both CT and MRI have the advantage of being able to image the small area masked by the tracheal air column on TOE [4].

Definitive management of aortic arch atherosclerosis is yet to be established. The technique of hypothermic circulatory arrest is typically reserved for the management of acute aortic dissection, during aortic arch repair, pulmonary thromboarterectomy and occasionally during aortic valve replacement in patients with a porcelain aorta. However, in this case, given the extent of aortic occlusion and the presentation of significant limb ischaemia, urgent operative management and circulatory arrest was considered the best option. Given the unique nature of this presentation, however, there was no precedence set in the literature to guide us. There are limited reports of high-grade aortic atheromata requiring surgical treatment to date; however, Vogt et al. [5] describe performing aortic thromboendarterectomy for patients with grade IV and V aortic plaques at the time of aortic valve replacement and coronary artery bypass grafting with an acceptable risk and a low recurrence rate.

**CONCLUSION**

To our knowledge, this is the first reported case of aortic arch atherosclerosis resulting in 90% aortic occlusion requiring urgent surgery, and is particularly unusual given the young age of our patient. TOE is the modality of choice for the diagnosis or aortic arch atheromata and thrombi. The presentation of this case with upper limb ischaemia reinforces the importance of out ruling a central source of thromboembolism. Operative management with deep hypothermic circulatory arrest was instituted in this case to...
facilitate aortic arch thromboendarterectomy and a successful outcome.

**Conflict of interest:** none declared.

**REFERENCES**


