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Aorto-carotid bypass for orthostatic mediated hypoperfusion transient ischaemic attacks: A case report

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ABSTRACT

INTRODUCTION AND IMPORTANCE: Aorto-carotid bypass is a rare procedure. It is reported to be performed for management of cerebral malperfusion in the setting of supra-aortic branch vessel disease. Malperfusion requiring a bypass is largely secondary to dissection or vasculitis. Atherosclerotic disease of the supra-aortic branch vessels is commonly managed via an endovascular approach. We report a rare and atypical presentation of cerebral malperfusion in the setting of atherosclerotic disease of the innominate and carotid arteries managed with an aorto-carotid bypass graft.

CASE PRESENTATION: A case report of an 80-year-old female presenting with orthostatic mediated hypoperfusion transient ischaemic attacks with episodes of limb shaking and unilateral weakness with postural changes. The malperfusion was in the setting of severe atherosclerotic disease of the innominate and carotid arteries.

CLINICAL DISCUSSION AND CONCLUSION: Our patient was not amendable to endovascular intervention or a less invasive open approach. The patient underwent an aorto-carotid bypass graft with complete resolution of symptoms. This case highlights a rare manifestation of orthostatic mediated cerebral malperfusion and a successful novel treatment method.

1. Introduction

Orthostatic mediated hypoperfusion transient ischaemic attacks (TIA) is a rare phenomenon. This occurs when critical arterial stenosis results in cerebral malperfusion with symptoms described with blood pressure variation when the patient stands [1]. Aorto-carotid bypass is a rare but well described procedure. The indication for intervention is typically malperfusion in the setting of either a dissection or vasculitic process [2]. Here, we present the case of severe orthostatic mediated TIAs secondary to atherosclerotic disease of the innominate and right common carotid artery (CCA) and internal carotid artery (ICA) requiring an aorto-carotid bypass graft. The procedure was performed in collaboration, with the cardiothoracic and vascular surgeons.

2. Presentation of case

An 80-year-old female presented with recurrent episodes of left sided facial, upper and lower limb weakness with associated dystonic activity which occurred only with postural change. The patient was initially admitted under the neurology team for investigation and differentiation as to whether these episodes represented hypoperfusion TIAs or focal seizure activity. The patients' medical history was significant for peripheral vascular disease, carotid artery stenosis, hypertension and asthma.

Initial computed tomography (CT) imaging demonstrated severe occlusive atherosclerotic disease affecting the origin of the innominate artery (Fig. 1), as well as significant disease at the carotid bifurcation bilaterally (Fig. 2). Magnetic resonance imaging (MRI) of her brain identified no evidence of any intracranial abnormality.

In order to elucidate whether her symptoms were stemming from her occlusive arterial disease a single photon emission computed tomography (SPECT) study with and without acetazolamide was performed. This identified impaired cerebral blood flow in the right anterior cerebral artery territory. The patient demonstrated paradoxical reduction in blood flow following administration of acetazolamide. This suggests that her occlusive arterial disease was a contributing factor to her symptomatology and thus that she would benefit from revascularisation.

Abbreviations: TIA, transient ischaemic attack; CCA, common carotid artery; ICA, internal carotid artery; CT, computed tomography; MRI, magnetic resonance imaging; SPECT, single photon emission computed tomography; CPB, cardiopulmonary bypass.

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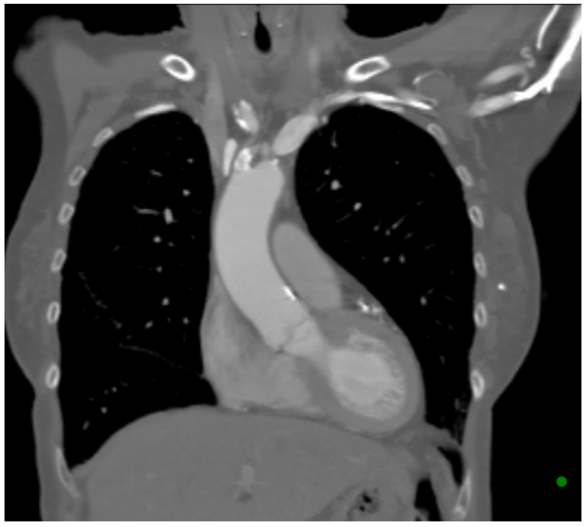

Fig. 1. Coronal section from computed tomography demonstrating severe occlusive atherosclerotic disease at the origin of the innominate artery.

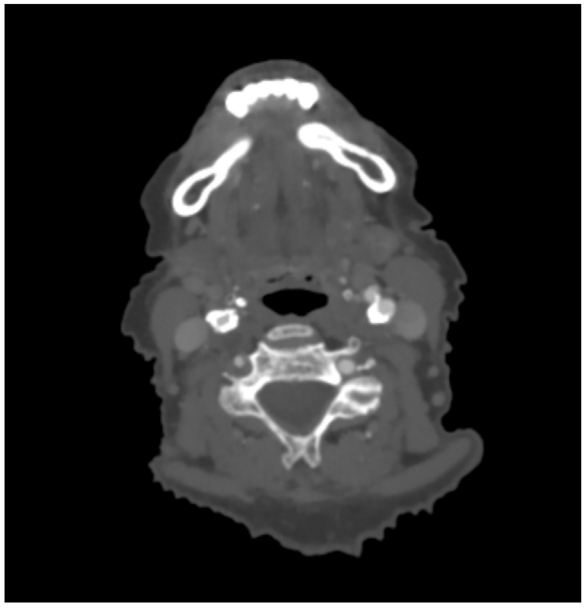

Fig. 2. Axial section from computed tomography demonstrating atherosclerotic disease at the distal common carotid artery bilaterally.

Given the patients age and risk factors she was investigated with a computed tomography coronary calcium study and myocardial perfusion study to stratify her coronary artery risk prior to intervention.

The patient underwent a combined procedure with cardiothoracic and vascular surgeons. A neck incision was made along the anterior border of the sternocleidomastoid as is routine with exposure of the carotid artery at its' bifurcation. The incision was lengthened inferiorly to facilitate a median sternotomy. The patient was placed on cardiopulmonary bypass (CPB) and a 6 mm ring reinforced propyltetrafluoroethylene graft was anastomosed first to the ascending aorta. An endarterectomy of the right CCA extending into the ICA was performed. The graft was then tunnelled deep to the innominate vein and anastomosed on to the carotid artery. The patients' recovery was uncomplicated. Upon 12-month follow up she remained symptom free and was continued on aspirin monotherapy. Her post-operative CT demonstrated widely patent aorto-carotid bypass graft (Fig. 3).

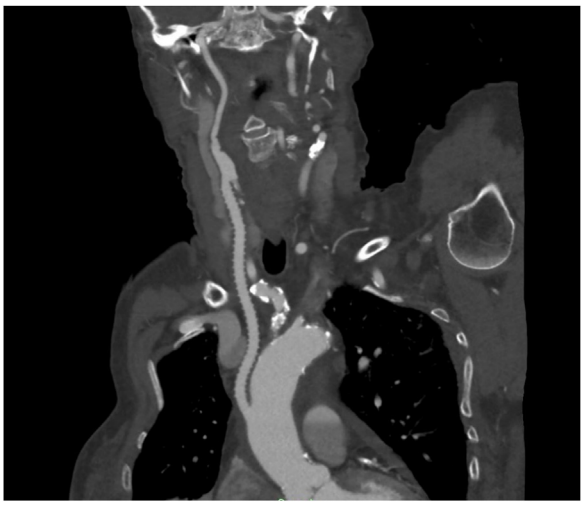

Fig. 3. Reconstruction from computed tomography demonstrating patent aorto-carotid bypass graft.

3. Discussion

Orthostatic mediated hypoperfusion TIA is a rare phenomenon. TIA usually implies embolic phenomena however in this situation it is caused by cerebral malperfusion in the setting of occlusive atherosclerotic arterial disease. The symptoms manifest during standing due to the associated blood pressure change which subsequently decreases cerebral perfusion of the restricted area [1]. Symptoms depend upon the area of the brain affected, dystonic activity has been reported in a prior case report [3].

In this case, where the symptoms were atypical, SPECT study with acetazolamide (DIAMOX) challenge assisted in confirming the presence of restricted cerebral blood flow in the area supplied by the diseased vessel. There are a number of techniques which have been validated at assessing cerebral perfusion, including SPECT, perfusion-weighted and diffusion-weighted MRI and positron emission tomography [4,5].

Endovascular repair of the innominate artery is possible and carries low morbidity and mortality [6]. However, angioplasty and stenting is associated with restenosis and fracturing of the stent as well as a high initial failure rate [6–8]. Given this and also owing to the risk of rupture with angioplasty of a calcified vessel, an endovascular approach was not deemed suitable in this case. Carotid to carotid bypass was also considered, however owing to the severe bilateral nature of the disease and significant stroke risk involved in bilateral carotid endarterectomies was deemed not suitable in this case.

An aorto-carotid bypass was performed as described in collaboration with the vascular and cardiothoracic surgeons. This procedure is well documented in the literature with and without the support of CPB [2,9,10]. There is minor variations in surgical technique. The indication for this procedure is typically malperfusion in the setting of a type A dissection with branch vessel involvement or a vasculitic process (usually Takayasu arteritis) with proximal occlusion of the branch vessels [2,9]. There were no previous reports of aorto-carotid bypass graft performed for orthostatic mediated cerebral hypoperfusion in the setting of atherosclerotic disease.

The principal concern post operatively with aorto-carotid bypass graft is cerebral hyper perfusion with resultant oedema and/or haemorrhage [2]. This was navigated with stringent haemodynamic monitoring in intensive care and strict control of blood pressure.

4. Conclusion

Cerebral malperfusion may present as a diagnostic dilemma. SPECT imaging can be used to assess cerebral perfusion and thus decipher the clinical significance of the patient's arterial disease. This case highlights that in the absence of an alternate endovascular solution, an aorto-carotid bypass can be performed safely in a multidisciplinary setting for patients with malperfusion secondary to atherosclerotic disease.

Declaration of Competing Interest

Joshua Tesar – No conflict of interest to declare.
Danella Favot – No conflict of interest to declare.
Peter Tesar – No conflict of interest to declare.
Livia Williams – No conflict of interest to declare.

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Ethical approval

This study is exempt from ethical approval at our institution.

Consent

Written informed consent was obtained from the patient's next of kin for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Joshua Tesar: Primary author. Drafted manuscript.
Danella Favot: Supervision. Drafting of the manuscript.
Peter Tesar: Supervision. Designed procedure. Drafting of the manuscript.
Livia Williams: Supervision.

Registration of research studies

Not applicable.

Guarantor

Joshua Tesar.

Provenance and peer review

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