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Case Report

Brachiocephalic artery aneurysm plaque rupture, stroke & repair ☆,☆☆

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ABSTRACT

A 70 year old left-handed man presented to his general practitioner with abnormal left arm movements, left hemianopia and loss of balance. He was found to have an isolated brachiocephalic artery aneurysm, measuring 3.5 cm, with associated plaque rupture, contributing to recurrent episodes of transient ischemic attack. He was discussed extensively by a multidisciplinary team. e concurrently had complete occlusion of the right internal carotid artery with distal reconstitution in its supraclinoid segment from collaterals. Stenting of the region would necessitate inappropriately covering the right vertebral artery which would further compromise intracerebral blood. Surgical intervention was deemed the only safe option and he was thus accepted for cardiothoracic surgery. Standard workup revealed left anterior descending artery stenosis. He underwent coronary artery bypass grafting, left atrial appendectomy and brachiocephalic artery resection with replacement with a interposition graft with 10 mm polytetrafluoroethylene graft. He recovered well. This case demonstrates the multi-disciplinary decision making in a rare cause of embolic stroke.

Case report

A 70 year old left-handed man presented to his general practitioner with abnormal left arm movements, left hemianopia and loss of balance. His history was felt to be concerning for stroke and he was referred to the emergency department. Two months prior to this he had an episode of sudden onset left arm numbness and weakness which resolved within six to seven hours. On that occasion his GP diagnosed a transient ischaemic attack (TIA) and the patient was commenced on aspirin, an anti-hypertensive and a cholesterol lowering tablet

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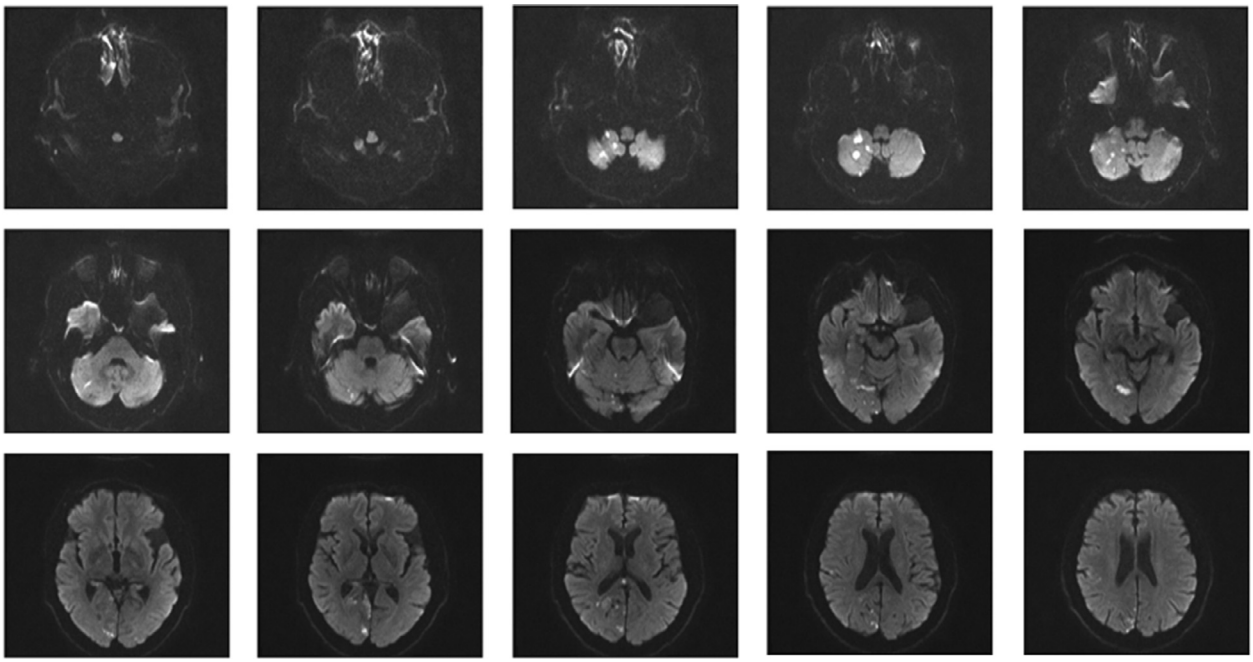

Fig. 1 – MRI Brain demonstrating multifocal acute infarcts on diffusion weighted sequences in the right cerebellar hemisphere, right occipital cortex, right parietal cortex and corpus callosum.

in the community, however the patient self-ceased this after one month. Neurological examination following admission revealed mild left restricted visual field loss and distal left upper limb chorea. Cardiovascular exam was unremarkable. He was not hypertensive on arrival. He was commenced on aspirin 300mg daily and as part of his work-up he underwent magnetic resonance imaging (MRI) of his brain which demonstrated multiple right sided infarcts which were scattered throughout vascular territories, implying a probable embolic source (Fig. 1).

CT angiography revealed an isolated aneurysmal dilatation of the origin of the brachiocephalic trunk with a large volume ulcerated soft plaque and occlusion of his right internal carotid artery (Fig. 2). He was commenced on therapeutic low molecular weight heparin. Following multi-disciplinary team discussion it was felt that this was the most likely root cause of emboli. He concurrently had complete occlusion of the right internal carotid artery with distal reconstitution in its supraclinoid segment from collaterals making his right vertebral artery the dominant blood supply to his brain. Carotid dopplers demonstrated mild vertebral artery stenosis. Stenting of the region would necessitate inappropriately covering the vertebral artery, thus further compromising his intracerebral blood supply. The occlusion of his right internal carotid artery ruled out the possibility of stenting the diseased area as it would undoubtedly result in stroke. He was referred for cardiothoracic surgery intervention.

Standard cardiothoracic surgery work-up, revealed a significant 70% stenosis of the left anterior descending artery during routine coronary angiography. American Heart Association Guidelines mandated coronary artery bypass grafting in this setting. Non-obstructive disease was demonstrated in the circumflex and right coronary arteries. Echocardiography confirmed normal valve function and preserved left ventricular function.

Operative approach was via median sternotomy. The pericardium was opened in an inverted “T”. The left internal mammary artery was harvested in pedicled fashion. This was of good calibre and flow. Heparin was administered. Cardiopulmonary bypass was established using 2-stage right atrial venous drainage and ascending aortic return. No calcified plaque was palpated on the aorta. The ascending aorta was cross-clamped. Cardioplegia was delivered in an antegrade fashion to the aortic root. Subsequent antegrade doses were given at 30 minute intervals. Coronary artery bypass grafting was performed with the left internal mammary artery anastomosed to his left anterior descending artery. Left atrial appendectomy was performed with a 60G Vascular Ethicon stapler. The brachiocephalic artery was found to be 3.5 cm, calcified and thrombus was found inside the lumen (Fig. 3). Aortic cross clamp was removed and the brachiocephalic artery was clamped on either side, and divided distal to the aneurysm. An end-to-side graft was performed between the brachiocephalic artery and a 10 mm Polytetrafluoroethylene Advanta graft using continuous 5-0 prolene with pledgets, thus isolating the aneurysm. The graft was unclamped and a side clamp on the aorta was used to exclude the brachiocephalic aneurysm. The aneurysm was resected and repaired with interrupted 4-0 prolene with pledget sutures (Fig. 4). The patient was rewarmed. Two ventricular epicardial pacing wires were inserted. The patient was separated from cardiopulmonary bypass without difficulty. Protamine was administered and haemostasis achieved. Three 32 French drains were inserted: to the inferior pericardium, the mediastinum and the left pleural space.

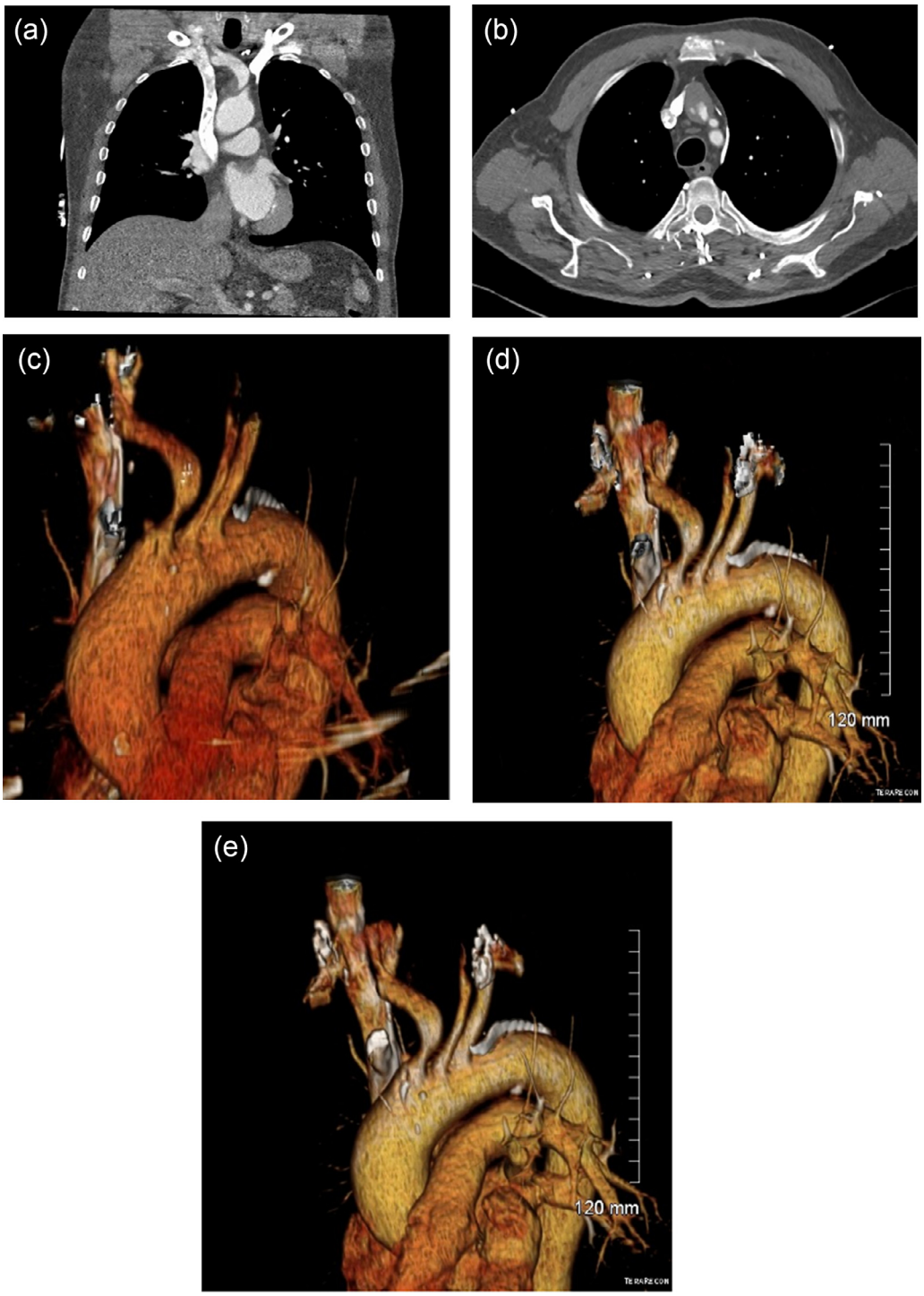

Fig. 2 – Computed Tomography Angiography showing aneurysmal dilatation of the origin of the brachiocephalic trunk (measuring 3.5 cm) with a large volume ulcerated soft plaque. Complete occlusion of the right internal carotid artery through its course, with distal reconstitution, distal reconstitution in its supraclinoid segment, likely from collaterals.

The sternum was closed with steel wires, and the soft tissue in layers.

Recovery from surgery was uneventful, save for an episode of atrial fibrillation with fast ventricular response which resolved with amiodarone. He was discharged from the cardiothoracic clinic 6 weeks after his surgery, with increasing exercise tolerance.

Discussion

Stroke presentation

Acute hyperkinetic movement disorders are an uncommon presenting feature of acute stroke. Within this,

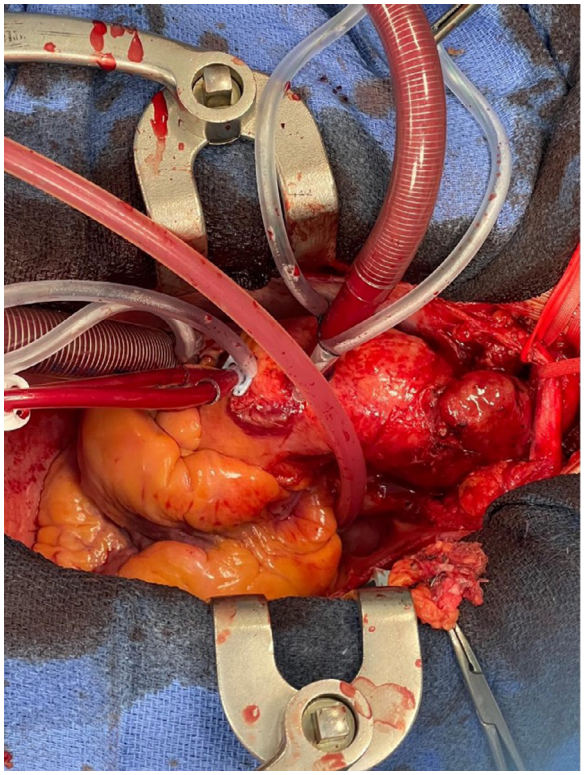

Fig. 3 – Innominate artery aneurysm measuring 3.5 cm.

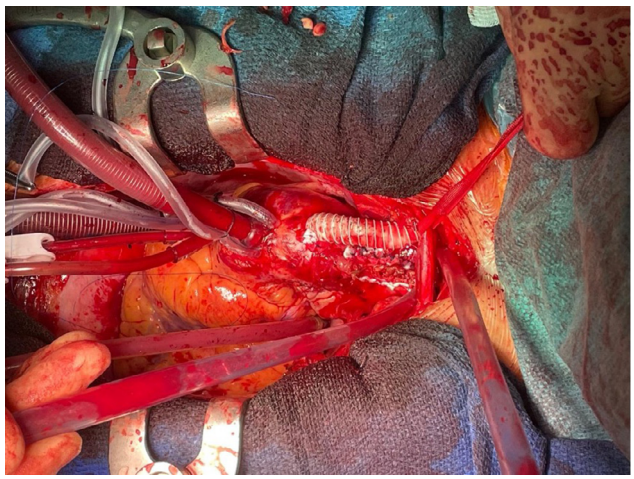

Fig. 4 – Polytetrafluoroethylene Interposition graft repair of Brachiocephalic Aneurysm.

hemiballismus-hemichorea is the most common cause [1]. The most frequent neuroanatomical localisation of this is to the contralateral basal ganglia, and in particular the subthalamic nucleus [2]. An important differential to consider is a limb shaking transient ischemic attack, which is a rare hypoperfusion syndrome secondary to high grade contralateral internal carotid artery stenosis [3]. Detailed history can help with distinguishing these two entities.

Brachiocephalic artery aneurysms and this man's anatomy

Brachiocephalic artery aneurysms are rare, representing approximately 3% of all arterial aneurysms. They are predom-

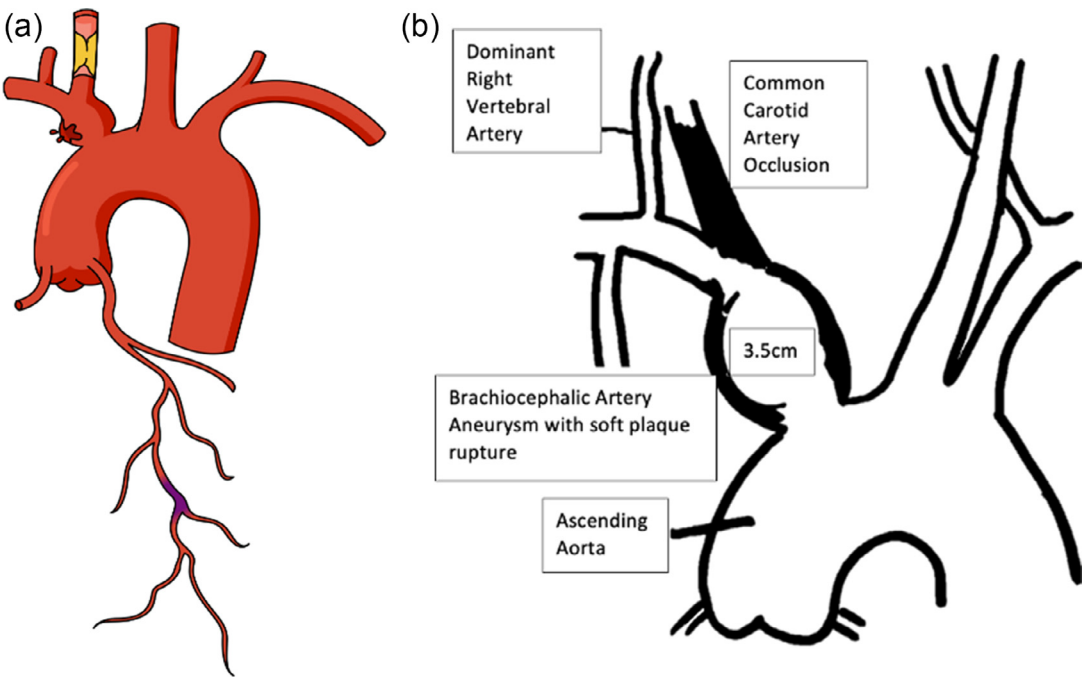

Fig. 5 – Surgical planning diagram demonstrating occlusion of common carotid artery and 3.5 cm brachiocephalic artery aneurysm with soft plaque rupture.

inantly atherosclerotic in aetiology however alternate causes include syphilis, tuberculosis, Kawasaki's disease, Takayasu's arteritis, Behçets disease, connective tissue disorders and angiosarcoma [4,5]. Presentation may be with symptoms due to local compression, or alternatively due to thrombosis or, as in our case, due to distal embolisation [4].

Diagnosis and delineation of aneurysms may be performed with CT angiography of the vessel. Involving the carotids in imaging may allow one to determine brain blood supply. Non-contrast phase allows for evaluation of vascular calcification and plaque, particularly of the aorta where side biter and cross-clamp may cause plaque rupture. Careful placement of vascular clamps is warranted and should be correlated with imaging, to mitigate against plaque rupture and thromboembolic phenomena intra-operatively.

Interventional or surgical management

The principle of aneurysmal disease or stenosis, is isolating and resecting the area of vasculature that is diseased and replacing it with an appropriate alternative. First described in 1818, by Mott, advances have been made in the surgical repair of innominate artery aneurysms [4]. Interventional stent placement in this situation was inappropriate, as there was lack of a proximal and distal landing zone. Placement of stent over the distal zone would have occluded the vertebral artery, which may have caused significant stroke (Fig. 5).

This relatively uncommon aneurysm with its unique presentation and management warrants reporting of this case for educational benefit.

Authors' contributions

MO'D & ZT collected clinical data, analyzed and summarized the medical records, and wrote most of the manuscript; M R, AM G-G, K O'C and M T contributed to the analysis and interpretation of medical records, as well as to the writing of the manuscript; ST L reconstructed CT images. MO'D and ZT edited and corrected the manuscript. All authors have read and approved the final manuscript.

Patient consent

Written informed consent was obtained from the patient for publication of this report and any accompanying images. A copy of the written consent is available for review from the Editor-in-Chief of this journal.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Ethics approval

Not required in our institution.

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