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Three cases of vomiting-associated cervical artery dissection

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Abstract

Extracranial Cervical Arterial Dissection (CAD) affects 10-25% of young onset Acute Ischaemic Stroke (AIS) patients. We report three cases of CAD in young AIS patients (ages 14, 18 and 49) associated with prior vomiting. All three cases presented within five weeks of each other at a single centre, lived in a specific region in North-east Scotland suffering an outbreak of winter vomiting and were treated with IV thrombolysis. These cases are noteworthy for several reasons; reports of stroke in children treated with thrombolysis are rare, and new UK guidelines for stroke thrombolysis in children have been published; secondly we speculate that infective gastroenteritis triggered CAD, and thirdly the two younger cases developed vertebral artery pseudoaneurysms which are rare in CAD. In one case the presence of an anomalous vertebral artery course between the first and second cervical vertebrae may have predisposed to dissection.

Keywords: Cervical artery dissection; Paediatric stroke; Thrombolysis; Pseudoaneurysm

Introduction

Extracranial Cervical Arterial Dissection (CAD) is a rare cause of Acute Ischaemic Stroke (AIS) affecting 1-2% of cases, but may account for 10-25% of young onset AIS [1-3]. It can present with ipsilateral cervical pain or headache, ipsilateral Horner's syndrome, transient ischaemic attack and stroke. CAD can be traumatic or sporadic. Many potential triggers have been reported including major neck trauma, or relatively minimal trauma such as coughing, sneezing, vomiting and neck manipulation [2-4]. We describe three cases of AIS in younger patients following arterial dissection associated with vomiting. They presented within five weeks of each other and came from the same area in north-east Scotland. All three cases were treated with IV thrombolysis, and the two younger cases had vertebral artery dissection associated with pseudoanuerysm. Each person or their caregiver consented for their anonymised case to be reported.

Case 1

A 14 and a half year old female developed left sided weakness, slurred speech, difficulty walking and confusion in the afternoon associated with mild occipital headache. She had been intermittently vomiting for the prior 18 hours; her mother and sister also reported vomiting symptoms in recent days. On advice of the attending general practitioner, the patient was transferred urgently from their village 35 miles away to Aberdeen Royal Infirmary (ARI) by ambulance.

On examination, she was apyrexial and normotensive. Weight was 62 kg. She had a right internuclear ophthalmople-

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gia, left sided ataxia and mild weakness (MRC grade 3, National institute of health Stroke scale [NIHSS]=5). Past medical history included asthma, eczema and iron deficiency anaemia. There was no family history of connective tissue disease or young onset stroke. An urgent CT brain scan showed a hyperdense focus in the distal basilar artery suspicious of an occlusion; a CT angiogram confirmed a 4mm filling defect in the tip of the basilar artery, suggestive of thrombus (Figure 1a). In addition a 4mm wide-necked anteriorly facing pseudoaneurysm in the V3 segment of the dominant left vertebral artery was seen (Figure 1b). The left vertebral artery was of varying calibre between its intradural segment and loop around C1 in keeping with dissection. The left vertebral artery was found to run in an anatomically anomalous course between C1 and C2, indicating a dominant first intersegemental artery replacing this section of vertebral artery [5,6]. Blood tests showed an elevated CRP of 37 mg/L (normal range 0-4), but otherwise normal full blood count, liver and renal function tests.

A diagnosis of brainstem ischaemic stroke was made, and after discussion with the patient and her parents about risks and potential benefits, intravenous alteplase (0.9 mg/kg, 4.5 hours post symptom onset) was initiated and she was later transferred to a paediatric Neurology centre in Edinburgh. NIHSS at 24 hours was 3 and a CT brain scan after 36 hours revealed a persistent distal hyperdense basilar artery and no infarction. Aspirin 75mg/day was started. MRI on day 4 showed patchy brainstem ischaemia, and MR angiography demonstrated persistent distal basilar artery occlusion. She developed repeated episodes of left facial numbness and headache 3-4 weeks post stroke. Repeat CT angiography on day 28 showed that the basilar artery remained narrow but had recanalised, and the pseudoaneurysm had closed. MRI on day 30 showed no definite new ischaemia, but as a precaution Clopidogrel 75mg/day was started in addition to Aspirin. There were no findings of note from echocardiography or a thrombophilia or vasculitis screen. The patient was discharged at 5 weeks with a mild residual left hemiataxia; she was independently ambulant and was referred for community physiotherapy and occupational therapy.

Case 2

6 days after the first case presented, an 18 year old woman from the same village as case 1 sought medical attention after developing sudden onset headache, dizziness and visual disturbance at 3pm. She had been well that morning. She had vomited twice in the preceding 24 hours. The attending general practitioner identified unilateral right sided weakness and incoordination, suspected a stroke and admitted the patient to ARI. There was no past medical history of note. She was taking the combined oral contraceptive pill. On admission, temperature was 36.9, blood pressure was 149/92 mmHg, and she was in sinus rhythm. She had a mild right arm and leg weakness (MRC grade 4+), with a right pronator drift and past pointing. There was reduced right face, arm and leg sensation (NIHSS=3). She was initially very difficult to assess due to emotionalism and anxiety. Functional weakness was considered in the differential diagnosis. CRP was elevated at 6 mg/L, with a neutrophillia of 12.2 $x10^9$/l.

A non-contrast CT head showed a focal 24mm hyperdensity in the left Posterior Cerebral Artery (PCA, Figure 2a). A CT angiogram confirmed a filling defect in the left PCA (Figure 2b) and a short focal dissection of the left vertebral artery (V3 segment), with a pseudoaneurysm measuring 7 x 5 mm (Figure 2c). The patient was treated with IV thrombolysis 4.5 hours post symptom onset with consent. NIHSS was unchanged at 2 hours, but was 7 at 24 hours, with new findings of right homonymous hemianopia, right sensory neglect and mild aphasia. Limb weakness was unchanged.

A CT scan 24 hours later showed development of a left posterior cerebral artery territory infarct (Figure 2c). The patient was commenced on a 4 week course of Aspirin 75mg and Clopidogrel 75mg per day in light of her deterioration despite thrombolysis, and also Ramipril 5mg/day and a 3 month course of Atorvastatin 80mg/day. Bubble transoesophageal echocardiography was normal. However, a thrombophilia screen yielded significant titre for lupus anticoagulant. This was negative on repeat testing 3 months later. Over the course of her week-long admission, the patient's neurological symptoms largely resolved. At the time of discharge, the patient only had slight right upper limb weakness and paraesthesia. Outpatient visual field testing one month after discharge, showed complete resolution of the right homonymous hemianopia. The patient remains on Aspirin 75mg daily and is receiving community physio and occupational therapy. A repeat CT angiogram 2 months later showed persistence of the pseudoaneurysm.

Case 3

Five weeks after case 2 presented, a 49 year old male crane controller was transferred to ARI from his home town (8 miles from the town of cases 1 and 2) after suddenly developing word finding difficulties and right sided weakness at work at 18.45. He had become unable to understand how to operate the machinery and developed word finding difficulties. He had a preceding 10 day history of headaches and vomiting severe enough to prevent him from attending work. He had been unable to keep any food down due to retching and vomiting. There was no past medical or family history of note.

On admission, temperature was 36.7, blood pressure was 163/89 mmHg with a sinus tachycardia of 112 bpm. At hospital 2.5 hours after symptom onset, the right sided weakness had resolved, but right face arm and leg sensation was reduced, with right sensory inattention, and moderate nominal dysphasia (NIHSS=4).

A non-contrast CT scan showed a hyperdense focus in a segmental branch of the left middle cerebral artery (Figure 3a). A CT angiogram showed an occluded left internal carotid secondary to apparent dissection in the cervical segment (Figure 3b). The patient was treated with IV thrombolysis 2 hours and 39 minutes post symptom onset. At 24 hours NIHSS was 1 and a CT scan showed a left parietal infarct and reduction of the vascular hyperdensity. Initial blood tests revealed a CRP of 94 mg/L, but normal full blood count and liver and renal function. He was commenced on Aspirin 300mg/day for two weeks, followed by long term Clopidogrel 75mg per day. The patient was transferred to a local Stroke Rehabilitation Unit after 5 days for ongoing speech therapy.

Discussion

CT and CTA angiography with their high availability, speed and detail formed the mainstay of imaging diagnosis as illustrated by these three cases. CAD can also be identified using MRI and MR angiography, ultrasound and catheter based angiography [7]. Our three cases are notable as all three developed dissection in association with vomiting, suggesting that this was a causative trigger. Secondly, it is unusual to see two cases of CAD with pseudo aneurysm presenting in two very young onset

stroke patients six days apart. At our hospital we have treated over 1000 patients with IV thrombolysis since 2003, but only one prior case was under 20 years old. There are estimated to be about 400 paediatric strokes in the UK per year, and an audit of a tertiary referral centre estimated that a small minority might have been eligible for thrombolysis [8].

Although our first case was out with the license for alteplase for AIS because of age, the fact that she had a proven arterial occlusion (a recognised risk factor for clinical deterioration in AIS-9) and was of adult weight, we considered it necessary to offer treatment with IV thrombolysis with parental consent. It is unclear whether the benefits and risks of stroke thrombolysis that are well recognised for adults are similar in the breadth of the paediatric population.

There are isolated case reports of thrombolysis in children with AIS; an attempted RCT of thrombolysis in children with AIS was terminated after 9 months as only one patient was enrolled [9,10]. Recent guidelines allowing the use of thrombolysis in children aged between 2 and 16 years have been published, which include a lower age-stratified blood pressure exclusion criteria compared to adults [11]. The retained alteplase treatment dose remains 0.9 mg/kg [11]. In view of these new guidelines, paediatricians and adult Stroke teams need to consider developing thrombolysis pathways for children with AIS.

The link between trauma and CAD is widely reported including major neck trauma [2,3], and minimal trauma e.g. coughing, sneezing, vomiting and chiropractic manipulation [12]. Some studies report the majority of cases of CAD to be sporadic [12], and there can be a risk of recall bias in considering precipitants. Additional risk factors for CAD include connective tissue disorders rarely [13] and infection [14]. One study found CAD was more frequently associated with infection per se, but not significantly with sneezing, coughing or vomiting [14]. This study may have been underpowered for these assessments; gastrointestinal infection was only present in 1 of 48 CAD patents. Vascular risk factors (excluding hypertension) are less common in CAD patients than age matched AIS patients, and there is an association of higher rates of migraine without aura in CAD [15,16]. Bilateral carotid dissection secondary to vomiting has been reported in a single case [17]. In our cases 1 and 2 there was a close association with symptoms of vomiting, likely due to infective gastroenteritis with raised inflammatory markers, prior to developing symptoms of CAD. Since cases 1 and 2 were from the same village and there had been a local outbreak of vomiting, we postulate that the trauma relating to vomiting triggered the dissection. Both cases had dissection in the V3 portion of the vertebral artery with associated pseudoaneurysm. The V3 portion of the vertebral artery is it's most mobile portion, in the vicinity of C1 and C2 vertebrae, where CAD most commonly occurs [2,3,7]. In Case 3, episodic vomiting had been more prolonged, and so the link to CAD was not as acute, but some cases of CAD can be linked to trauma several weeks prior [18].

The risks and benefits of thrombolysis for dissection have not been specifically examined in an RCT. One observational study from an IV thrombolysis national registry, found that 5.2% of just over 1000 IVT AIS patients had stroke due to CAD [19]. CAD treated patients had lower rates of good outcome at 3 months (38 vs. 44%), but had similar rates of secondary haemorrhage, and non-significant lower rates of recurrent stroke (1.8 vs. 3.7%). A study of 180 patients with CAD receiving IV or intra-arterial thrombolysis found no difference in rates of secondary haemorrhage, mortality or good prognosis compared to other causes of AIS [20]. In selected cases clot retrieval may be a treatment option in CAD related AIS. Optimal secondary prevention following CAD has been examined in observational studies [21,22] and in a small feasibility RCT (n=250 patients, 22); these studies found no clear difference whether patients were treated with antiplatelet or anticoagulant medication for secondary prevention, although this study was underpowered and time to initiation of secondary prevention was more than 72 hours post stroke symptom onset.

Figures

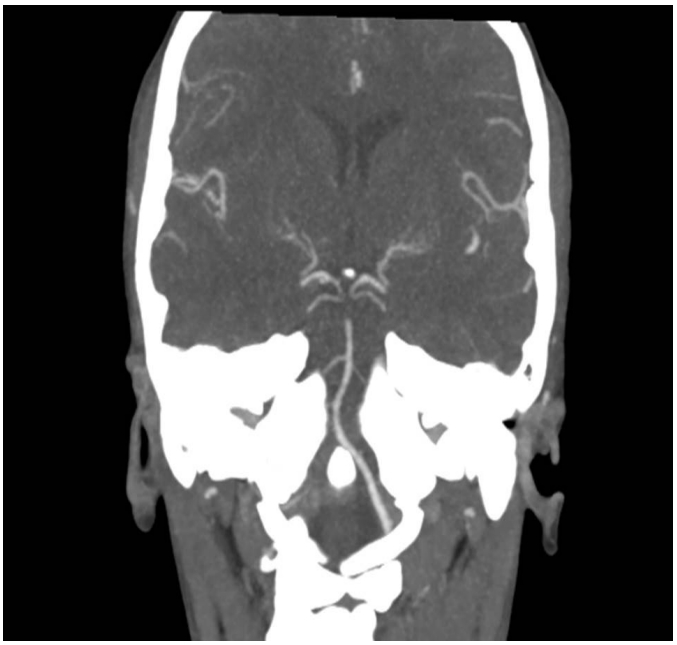

Figure 1a: Coronal CT angiogram showing non opacification of the terminal basilar, with preserved posterior cerebral and superior cerebellar arteries.

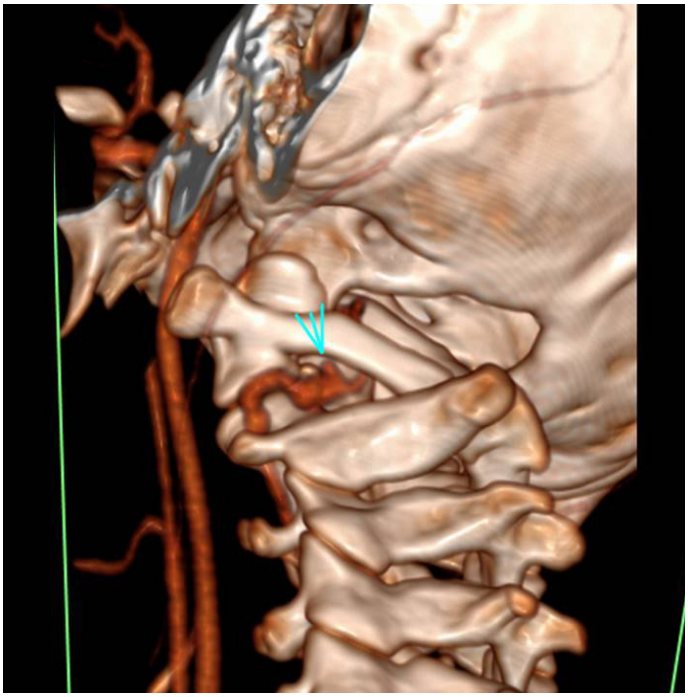

Figure 1b: 3D reconstruction of CT angiogram viewed from the left with cropping of skull base structures. The left vertebral artery does not pass normally between the skull base and C1. Instead, it is replaced by a persistent dominant first intersegmental artery. This is of an irregular calibre and has a pseudoaneurysm (arrow), which suggests trauma to the vessel presumably from being trapped between the left posterior arches of C1 and C2.

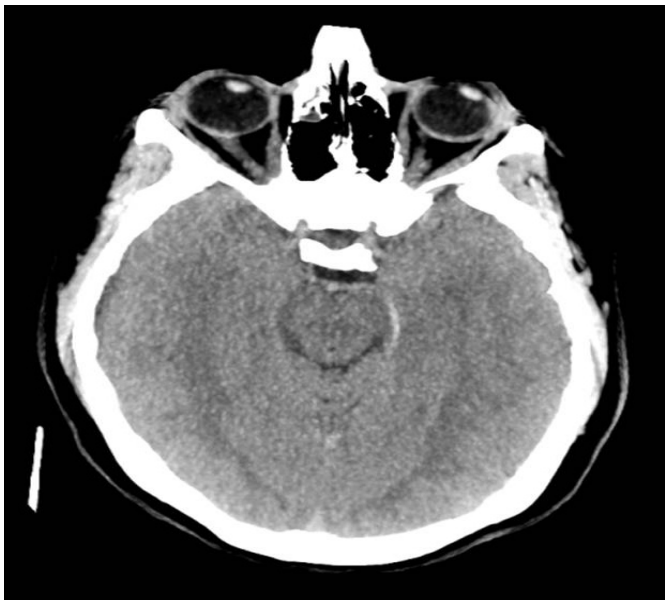

Figure 2a: Unenhanced CT Maximum Intensity Projection (MIP) image showing a 23 mm hyperdense thrombus within the left posterior cerebral artery and patient gaze towards the side of the thrombus.

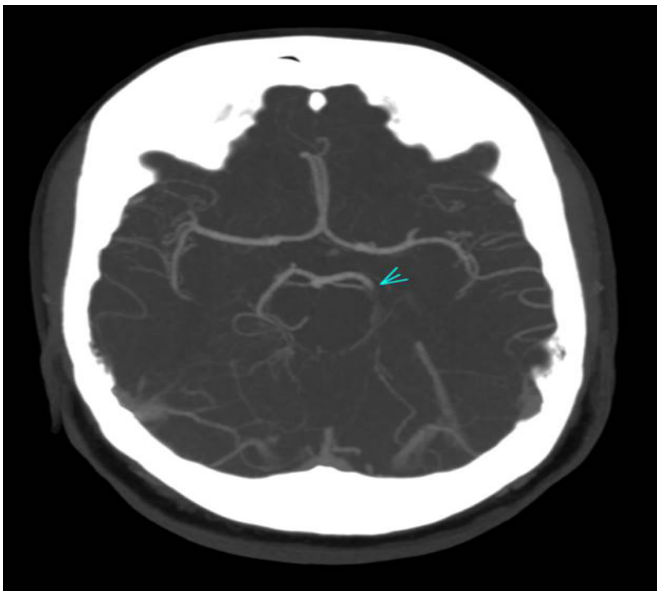

Figure 2b: Transverse CT angiogram MIP showing abrupt termination of perfusion in the left posterior cerebral artery marked with an arrowhead.

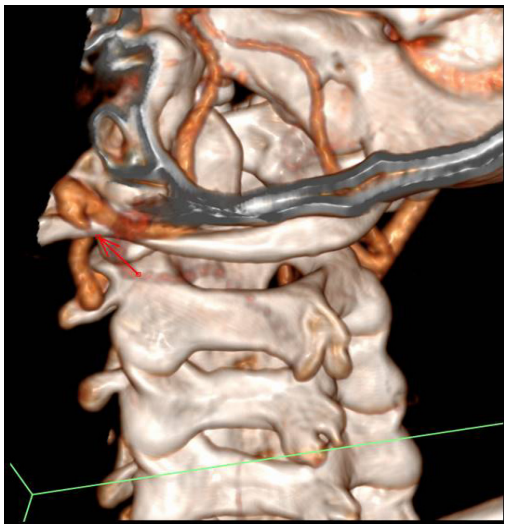

Figure 2c: Cropped posterolateral 3D reconstructions showing the location of a small posteriorly-pointing aneurysm arising from the V3 segment of the left vertebral artery as it loops around C1 and the skull base. The aneurysm is marked with an arrow.

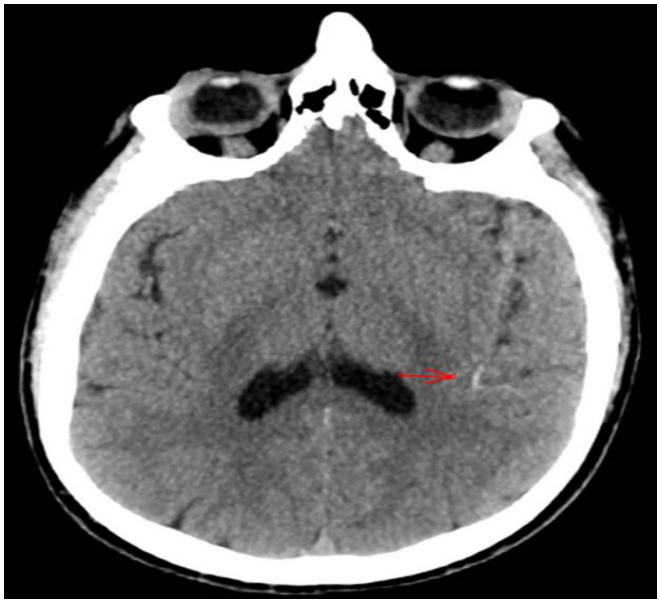

Figure 3a: Transverse angled MIP CT showing a small hyperdensity in a left MCA branch (labelled with an arrow).

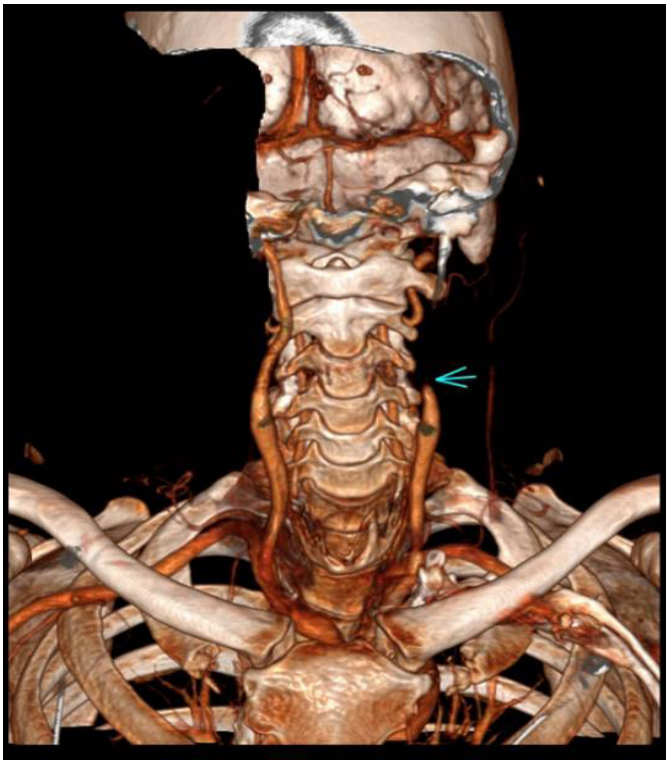

Figure 3b: 3D reconstruction showing abrupt tapering occlusion of the left internal carotid artery marked with an arrow.

Conclusion

CAD needs to be considered as a cause of stroke in young patients. These three cases highlight a possible causative role of vomiting in CAD and demonstrate the need for prompt diagnosis and treatment, including with thrombolysis where indicated.

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