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ENDOVASCULAR AND SURGICAL TECHNIQUES

Endovascular Transcatheter Occlusion for Traumatic Vertebral Artery Pseudoaneurysm

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Introduction

Traumatic injury of the vertebral arteries by penetrating or blunt trauma is exceedingly rare. The largest study in the literature comprises only 43 cases. Both anatomical location of the vessel and rarity of sequelae make the management decisions complicated.[1,2] Besides its rarity, vertebral artery injury may be initially unrecognised. Sequelae of injury include arteriovenous fistulae and pseudoaneurysms that may appear months after injury. The incidence of sequelae is unknown. Exposure of distal segments of vertebral arteries (V3–V4) presents great difficulty, therefore recent literature has focused on transcatheter embolisation techniques for stable patients. Surgical intervention should be reserved only for patients with exsanguinating haemorrhage or where embolisation has failed.[3]

We present a successful transcatheter embolisation for a paediatric patient with a traumatic vertebral artery pseudoaneurysm to demonstrate the effectiveness of this technique.

Technique

A 4-year-old boy was admitted with a left-sided, painful cervical mass. Three weeks before he had sustained a right femoral fracture following a fall that also caused sudden counter-rotation of neck. In physical examination, his general status and neurological conditions were normal. There was a left-sided, posteriorly oriented, 8–10 cm diameter cervical mass. The mass was firm, painful, and non-pulsatile in palpation. A systolic murmur was also auscultated.

Doppler ultrasonographic and angiographic evaluations of the mass revealed a huge arterial pseudoaneurysm originating from the third zone of the dominant left vertebral artery. The location of the pseudoaneurysm made an open operative intervention impossible. The endovascular procedure was performed under general anaesthesia in the digital substraction angiography unit. An 8 F introducer sheath was placed from the left femoral artery and selective angiograms of intracranial, and extracranial segments of bilateral carotid as well as vertebral arteries were obtained. A huge arterial pseudoaneurysm, originating from third zone of a dominant left vertebral artery at the atlanto-axial joint level, with surrounding massive thrombus formation, was confirmed (Fig. 1). The right vertebral artery was patent and completely normal. Since microballoon occlusion was contemplated in a dominant vertebral artery, evoked potentials and EEG were closely observed by a neurophysiologist along the intervention. A detachable silicon microballoon (DSB-Interventional Therapeutics Corporation-385 Oyster Point Boulevard, S6, South San Francisco, California, U.S.A.), 4.5×10 mm in size (diameter and length) was placed in the left vertebral artery immediately below the aneurysm and a test occlusion was performed for 30 min (Fig. 2). The test occlusion was tolerated well, and angiographic collateral circulation was adequate, so the balloon was detached. Postembolisation, selective right and left vertebral artery angiograms showed almost no filling of pseudoaneurysm cavity (Fig. 3). Retrograde blood flow from vertebrobasilar junction and adequate filling of posterior inferior cerebellar artery (PICA) were observed in the selective right vertebral artery angiogram.

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Fig. 1. Left vertebral angiogram, anteroposterior, demonstrating the pseudoaneurysm at V3 segment of left vertebral artery. Arrow indicates the pseudoaneurysm.

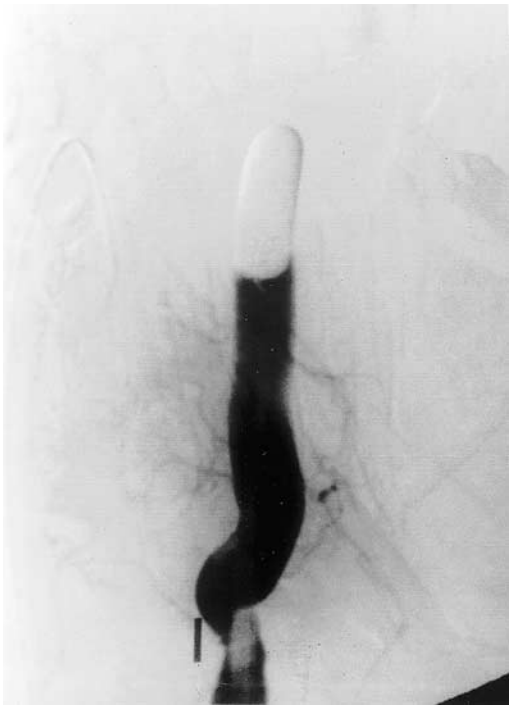

Fig. 2. Left vertebral angiogram, anteroposterior, demonstrating the test occlusion after placement of the microballoon.

Angiography and Doppler examination 6 months later showed total obliteration of aneurysm cavity. The patient remained stable over an 18-month follow-up with completely normal physical and neurological conditions.

Fig. 3. Postembolisation right vertebral angiogram, anteroposterior, showing almost no filling of the pseudoaneurysm.

Discussion

The most common location for rotational injury is the V3 segment where the vertebral artery is subjected to the rotational movement of head. Injury of the intima can lead to dissection, thrombosis, embolisation, pseudoaneurysm formation or an arteriovenous fistula. Since clinical manifestations may be delayed or overlooked after the vertebral artery trauma and non-invasive diagnostic tools have little value, angiography is the gold standard in diagnosis.[2,5] In our case, the only physical sign was slowly evolving cervical mass and the correct diagnosis was established after angiography.

It has been shown that the incidence of brainstem ischaemia with unilateral vertebral artery ligation is 3.1% for the left and 1.8% for the right. The results of relevant studies suggest that most of the vertebral artery injuries, including arteriovenous fistulas and pseudoaneurysms, could be managed by proximal and distal occlusion.[2] The early literature emphasised the value of surgical management. Meier *et al.*, in a series of 13 cases with vertebral artery trauma, claimed that surgical ligation of vertebral artery could be employed

in the treatment of any patient with a normal contralateral vertebral artery.[6] Reid and Weigelt recommended the surgical ligation in their series of 43 patients.[2] In 1990, de los Reyes reported a successful surgical repair of vertebral artery pseudoaneurysm.[7] Conversely, recent studies recommend that arterial repair should be reserved for patients whose angiography demonstrates inadequate collateral circulation, and for unstable patients with life threatening haemorrhage. Stable patients with pseudoaneurysm and arteriovenous fistulas should be managed with endovascular techniques.[1,3] In 1979, Buscaglia reported successful permanent occlusion of vertebral artery by a balloon catheter.[8] Coil embolisation proximal and distal to the injury site has provided satisfactory control of arteriovenous fistulas and pseudoaneurysms. Halbach *et al*. have shown successful management of vertebral artery dissections and pseudoaneurysms.[9] Demetriades *et al*., in a series of 22 patients with vertebral artery injury, found that only four patients required an operation and suggested that most vertebral artery injuries could be managed safely by angiographic embolisation.[10] In our case, endovascular occlusion provided permanent elimination of a difficult vertebral artery pseudoaneurysm.

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