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CASE REPORT

Endovascular treatment of an open cervical fracture with carotid artery tear

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Abstract The dilemma of how to treat penetrating wound injuries to the neck, which involve a combination of a common carotid artery rupture and a cervical spinal fracture, is presented in this case report.

Keywords Carotid artery tear · Penetrating injury · Cervical fracture · Endovascular treatment

Introduction

Penetrating injuries of the carotid artery can pose a significant challenge to the vascular surgeon. This type of vascular trauma accounts for only 3% of patients studied retrospectively in most trauma centers [1, 3, 4, 6, 9, 10, 13]. The severity of injury varies from complete transection to formation of a pseudoaneurysm or initimal flap formation with or without occlusion. Traditionally, the treatment of these lesions has been surgical. However, limitations to obtain satisfactory vascular control led to the search for other alternative treatment options [1, 4, 13]. Recently, the management armamentarium has expanded with the advent of more sophisticated endovascular techniques [3, 9].

Pseudoaneurysm of the common carotid artery after gunshot injury is a relatively infrequent finding. We present a case of a common carotid artery pseudoaneurysm managed by a commercially flexible covered stent.

Case history

A 16-year-old adolescent was transferred to our institution from a different hospital for stabilization of a cervical spinal fracture. Six hours prior to his transfer he had sustained an isolated gunshot wound to his neck. He was quadraplegic and unconscious on his admission to the referring hospital and was therefore intubated and ventilated. CT scan of the cervical spine showed a blow-out fracture of the body of C6 with involvement of the left vertebral foramen (Fig. 1). CT scans of the brain and chest were within normal limits.

Upon admission to our institution his hemodynamic condition was stable with a blood pressure of 115/70 mmHg and pulse of 60 beats/minute. He was ventilated and had a SaO2 of 100% with FiO2 of 0.4. Physical examination of his neck area demonstrated an entry wound in the posterior neck to the left of the midline and an exit wound in the left side of his neck. A large hematoma on the left side of the neck was demonstrated and palpated. A duplex scan of the left carotid artery was performed and was interpreted as a probable false aneurysm of common carotid artery. CT angiogram of the neck demonstrated

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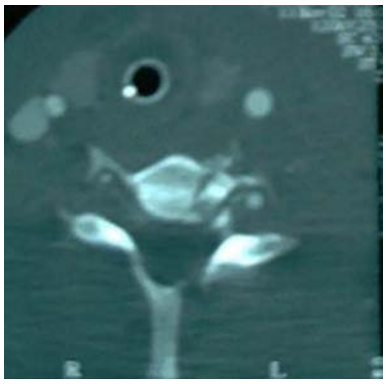

Fig. 1 CT scan at the C6 level demonstrating a vertebral body fracture extending into the left vertebral foramen

anterior and posterior leak of contrast from the common carotid artery, 1 cm proximal to the bifurcation (Fig. 2). The left vertebral artery was shown to be intact. The left internal jugular vein was compressed by the hematoma. The patient was transferred to the angiography suite and the presence of false aneurysms was confirmed. Under local anesthesia, through a transfemoral approach a catheter was inserted into the aneurysmatic area. The aneurysms were treated by the insertion of a covered stent (Jostent 8 ($\times$ 38 mm^2), which also occluded the origin of the external carotid artery (Fig. 2). No change in his neurological status after the insertion of the stent was seen (Fig. 3). No anticoagulation was given. His neck fracture was stabilized by an external fixation device and he was transferred back to the referring hospital.

Fig. 2 Selective left common carotid artery angiography shows traumatic pseudoaneurysm 1 cm below bifurcation

Fig. 3 Selective common carotid artery angiography demonstrates endovascular stent—extending proximal and distal to the borders of pseudoaneurysm with complete exclusion of pseudoaneurysm and external carotid artery

One year later, duplex US follow-up showed good hemodynamics without stenosis. Clinically, no cranial lesions were found.

Discussion

The use of endovascular stent-grafts to address arterial tears was first introduced by Dotter in 1969 [2]. Over the past decade, endovascular grafting has been evaluated as an alternative to conventional surgical repair in the management of aneurysms and other vascular lesions. The application of this form of therapy to the management of vascular trauma offers many potential advantages. Angiography assists with the diagnosis of traumatic lesions such as intimal dissections [12]. In addition, endovascular techniques can be utilized to help with vascular control, as an adjunct to surgery in regions where obtaining proximal or distal control is technically difficult. The use of endovascular stent-grafting for the definitive repair of traumatic lesions has been shown to be associated with a decrease in anesthetic requirement, blood loss and extent of dissection [7]. High-velocity missiles can produce a significant amount of tissue damage, even if not suspected on initial examination [11]. The inherent problems of graft placement in the setting of severe tissue damage, gross contamination and scar tissue formation make the use of a remote insertion site particularly advantageous in the trauma patient [5, 8].

Injury to the carotid artery constitutes only 3% of all arterial injuries [1, 3, 4, 9, 10, 13]. In spite of the rarity of carotid injuries, this trauma presents significant challenges to the vascular surgeon. Gunshot wounds

account for approximately half the injuries [9]. Injury of the carotid artery is frequently associated with other organ injuries [1, 3, 9]. Clinical examination may be unreliable due to confounding factors such as destructive injuries of spine, chest, abdomen, fractures [1, 3, 4, 6, 9, 10, 13]. Therefore, imaging evaluation is essential for the identification and localization of carotid trauma [1, 3, 9].

In contrast to blunt carotid injury, treatment of penetrating injuries of the carotid artery has been primarily surgical [4, 10, 13]. Depending on the described clinical scenario the surgeon is left with several options, which are observation, anticoagulation, ligation of the carotid artery, balloon occlusion of the artery, resection with graft interposition or bypass procedure. However, the best definitive management remains controversial, as no prospective studies regarding the management of penetrating carotid injuries have been reported [1, 3, 4, 6, 9, 10, 13]. Only few case reports on internal carotid artery aneurysm and pseudoaneurysm treated with endovascular stent and coiling procedure have been published [3, 9]. In case of carotid trauma, surgical treatment would be difficult because of problems of exposing the bleeding carotid and to get enough vascular access.

The combined evidences from all cases published in the medical literature support endovascular intervention for pseudoaneurysm of the carotid artery as a good clinical treatment choice. In our patient, we chose to use device graft to ensure complete exclusion of the pseudoaneurysm and external carotid artery without the need for endovascular coil placement. Further studies to investigate the role of endovascular treatment for penetrating carotid artery injury are indicated.

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