Case Report

Bleeding from Penetrating Vertebral Artery Injury: A Difficult Injury to Control

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Abstract

This is a case of a male who suffered a penetrating injury to the neck with difficult to control bleeding. He was transferred from an outside hospital and was hypotensive on admission. He was on multiple vasopressors and attempts were made to control bleeding in the emergency room. He showed minimal signs of neurologic function. He was taken to the angiography suite where a left vertebral artery injury was identified with significant extravasation. Angiographic embolization was attempted with mitigation of the bleeding but without complete resolution of bleeding extravasation. The patient was delivered to the surgical intensive care unit where he was noted to be unchanged neurologically. The patient expired shortly thereafter.

ABBREVIATIONS

CTA: Computed Tomographic Arteriography; prbc: packed red blood cells; PICA: Posterior Inferior Cerebellar Artery

INTRODUCTION

Penetrating injury to the vertebral artery is an uncommon but often difficult injury to treat that may lead to life-threatening hemorrhage. The artery is located deep in the neck, which contributes to both the rarity of injury, as well as difficulty in treating it [1]. Most vertebral artery injuries in adults are from penetrating injuries. These injuries account for 2.4-6.1% of all arterial injuries, and 7.1-19.4% of all cervico-cranial injuries [1]. An increasingly common method for diagnosing vertebral artery injury is Computed Tomographic Arteriography (CTA). A review of the literature fails to reveal a consensus as to the appropriate first-line treatment approach for patients with life-threatening vertebral artery hemorrhage. Several cases of endovascular embolization and ligation of vertebral artery injuries have been reported [2]. In this paper we report our experience with the endovascular management of a traumatic, life-threatening vertebral artery transection.

CASE REPORT

A 19 year-old male with unknown past medical history was transferred from an outside hospital to our Level I trauma center after suffering a penetrating injury to the neck. He was struck in the left posterior superior thorax and brought to an outside hospital where he was intubated and right chest tubeinserted for apparent right sided hemothorax. While at the outside hospital, he required initiation of norepinephrine and epinephrine for low blood pressure and was given multiple transfusions of packed red blood cells (prbc). By the time the patient arrived to our emergency room he had received 9 unit’s of prbcs, 1 unit of platelets, and 1 unit of fresh frozen plasma. Our institution’s Mass Transfusion Protocol was initiated on the patient’s arrival. He required norepinephrine and epinephrine to maintain his blood pressure. On primary and secondary survey, he was noted to have fixed and dilated pupils, active hemorrhage from his oropharynx, and active hemorrhage from the entrance wound. The oropharynx was packed with QuikClot (Z-Medica, Wallingford CT) and a Foley catheter was inserted into bullet wound and inflated to tamponade bleeding. He was brought to the CT scanner for a CTA of his head, neck, and chest, which demonstrated that the bullet had traveled through the left Transverse Foramina of the C2 and C3 vertebrae, fracturing them and causing vertebral artery laceration with active extravasation. The patient remained hemodynamically unstable throughout, with continued norepinephrine and epinephrine requirements to maintain blood pressure. Given the difficult location of the injury, we decided to attempt endovascular management of the bleeding vertebral artery. Neurovascular services were consulted. The patient was brought to the endovascular suite and an angiogram was performed using the right femoral artery for access. Bilateral angiographic images of the extracranial and intracranial segments of both carotid and vertebrobasilar systems were obtained. Injection of the left vertebral artery demonstrated an injury to the distal left vertebral artery with massive contrast extravasation (Figure 1).

The decision was made to proceed with therapeutic occlusion of the left vertebral artery. The diagnostic catheter was exchanged over the Glidewire for a 6 Fr Envoy DA guide catheter, the tip of

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which was kept in the left vertebral artery, at the mid-distal V2 segment. This was at the interface point between what appeared to be a normal vessel and the proximal end of the injured vascular segment. A 6 x 7 mm Amplatzer Vascular Plug was introduced coaxially, and successfully deployed at the most proximal end of what seemed to be the injured vascular wall. At this time, contrast injection showed slowing of the flow but continued but continued bleeding from the vascular injury with contrast extravasation (Figure 2).

At this point a Prowler Select Plus microcatheter was introduced coaxially and advanced to the proximal end of the Amplatzer Plug, and 4 coils were deployed and attached. Attempts at introducing additional coils were unsuccessful. However, by this time, the patient’s hemodynamic status had improved, with systolic blood pressures consistently above 100-110 mm Hg, and reduced dosing of vasopressor drugs. Additional angiographic images documented reduction of contrast extravasation by approximately 60-70%, with significant slowing of the flow through the injured vascular segment. At that point the procedure was terminated, and the residual flow through the artery was felt to be secondary to patient coagulopathy. The patient was brought to the Surgical ICU where his resuscitation was continued. Although the patient initially had improved hemodynamics in the ICU following the procedure, he eventually required a third vasopressor, and had no clinical improvement in mental status. His pupils remained fixed and dilated. Discussion was held with family regarding the patient’s poor prognosis and he was made do not resuscitate status with no further escalation of care or administration of blood products. He expired shortly afterwards in the ICU.

DISCUSSION

Vertebral artery injuries due to trauma are rare, ranging from 2.4%-6.1% of all arterial injuries and 7.1%-19.4% of all cervico-cranial arterial injuries [1]. The deep location in the neck and path within the vertebral foramina makes traumatic injury to the vertebral artery difficult to diagnose and treat. Surgical access to the vertebral artery is also difficult and time consuming, leading to the emergence of the endovascular approach for treatment, utilizing both coil embolization and various other embolic materials [3]. While there does not appear to be consensus within the literature regarding the first-line treatment approach to patients with life-threatening vertebral artery injuries, there have been several case reports in the literature of successful endovascular management [2]. Prior to attempting treatment of a vertebral artery injury, however, a diagnosis must be made. If vertebral artery injury is suspected, CTA is a quick and effective diagnostic test that can be performed early in patient management [1]. If extravasation due to a vertebral artery injury is identified by CTA, the next step in treatment is either surgical repair or an endovascular approach in the angiography suite. As stated above, surgical control of high vertebral artery segments are often challenging and time consuming, and may involve multiple specialists [4], whereas the endovascular route can be quicker, with easier access to the injured segment [4]. When attempting endovascular management, the contralateral artery should also be assessed to ensure that the posterior cranial circulation could be used as a route for treating the injured vertebral artery from the distal end via the vertebrobasilar junction [1]. This should be assessed because proximal control of the vertebral artery may not be adequate to control bleeding. If occlusion of the distal segment is needed, it should be performed as close to the injury site as possible and proximal to the origin of the Posterior Inferior Cerebellar Artery (PICA), so that the PICA can fill via retrograde flow [2]. Occlusion of the PICA may result in posterior circulation ischemia with adverse neurological outcome [3]. Methods of endovascular occlusion include coil embolization, detachable balloons, or several other embolic materials [2]. While these methods result in sacrifice of the injured vertebral artery, stent-grafts offer the potential for repair.
of the injured vessel [2]. Repair with a stent graft is only possible if the injured segment of the vessel can be traversed with an endovascular wire [2]. Surgical repair is indicated in situations where the vertebrobasilar circulation is not patent [3]. Surgical repair of a vertebral artery transection involves dissecting down to the injury where the artery can be either ligated or repaired [2]. Several options for surgical revascularization include bypass to the distal vertebral artery via the external carotid artery, or via saphenous vein bypass graft from the subclavian artery to the distal vertebral artery [2]. However, the above stated surgical options are time-consuming and technically difficult, and may not be the most suitable options for patients that have vertebral artery injury causing hemodynamic instability. Given the difficulty and time consuming nature of the surgical approach, the endovascular approach offers the advantage of time and is relatively easier to perform [2].

CONCLUSION

Vertebral artery injuries can lead to life-threatening hemorrhage that may be both difficult to diagnose and treat. Given the complexities and time-consuming nature of open vertebral artery repair, the endovascular approach offers a comparatively faster and easier option for control of a vertebral artery injury, which can be performed on both hemodynamically stable and unstable patients.

REFERENCES