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Acute Subclavian Artery Occlusion by Blunt Trauma: A Case Report

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ABSTRACT

We report a case of acute left subclavian artery occlusion after blunt trauma, presenting with symptoms of acute left upper arm ischemia. Angiography was performed to confirm the injury. The injured left subclavian artery was approached via left thoracotomy, and an interposition graft was placed. The patient recovered without any complications.

INTRODUCTION

Although most blunt traumatic aortic tears occur at the base of the left subclavian artery [Mattox 2000], an isolated left subclavian artery injury is uncommon [Pretre 1997]. Subclavian artery injuries are often associated with fracture and/or dislocation of the thoracic outlet. Here we present a case of acute subclavian artery occlusion caused by blunt chest trauma.

CASE PRESENTATION

A 30-year-old woman, who was a belted driver, was evacuated from a car involved in a high-speed head-on collision. The patient was transported to a level 1 trauma center by ambulance. Upon arrival to the trauma bay, she was fully awake, alert, without any respiratory distress, but complaining of left shoulder pain and numbness of the left fingers. Her heart rate was 100 and blood pressure was 180/90 mm Hg on the right arm. There was no palpable pulse or blood pressure obtainable from the left arm, which was cold and showed poor capillary refill. Motor function of the left upper extremities was normal. Ecchymosis and abrasion of the skin was observed from the left upper chest to the shoulder, correlating with the position of the seatbelt. She denied any previous medical history, and findings on other examinations were within normal limits. Trauma x-ray series identified a left clavicle fracture, left first- and second-rib fractures, mediastinal widening, tracheal shift, and left pleural effusion (Figure 1); no fractures or dislocations were observed in the cervical spine or pelvis. A chest tube, placed on the left chest, drained 300 cc of serosanguinous fluid. A left subclavian artery injury was suspected and the patient underwent angiogram, which confirmed total occlusion of the left subclavian artery just distal to the left vertebral artery (Figure 2). There was no evidence of injury in the aorta or other neck vessels. No extravasations of dye were observed on angiography.

The patient was quickly transferred to the operating room with a diagnosis of acute traumatic left subclavian artery occlusion. After intubation with a double-lumen endotracheal tube, an anterior left thoracotomy was performed at the third intercostal space. Clots within the left hemithorax were evacuated. The phrenic nerve and vagus nerve were identified and protected throughout surgery. The left subclavian artery was identified at its origin, and the aorta and the base of the left subclavian artery appeared intact. A 3-cm pseudoaneurysm was identified in the distal portion of the intrathoracic left subclavian artery. To optimize the exposure of the pseudoaneurysm, an upper median sternotomy with an extension of the incision to the supraclavicular space was performed to create a "trap door." The left subclavian artery was carefully dissected from the surrounding tissue. The left internal mammary artery and vertebral artery were ligated, and the innominate vein was dissected and protected with vessel loops. Heparin was given by the anesthesiologist, then the left subclavian artery was clamped at its origin and distally to the pseudoaneurysm. A portion of the left subclavian artery was replaced with a 10-mm Dacron graft. As soon as the left subclavian artery was declamped, the saturation monitor placed on the left finger showed a good arterial pulse wave form. Two chest tubes were placed and the chest was closed in the usual fashion. Normal pulses along the left upper extremities were restored and the left-hand numbness was resolved.

The postoperative recovery was steady and she was discharged from hospital on postoperative day 5. At the 3-month follow-up, no ischemia or neurological deficit of the upper extremities was observed.

COMMENTS

The mechanism of injury in this patient could have been significant direct impact to the upper chest, which is consis-

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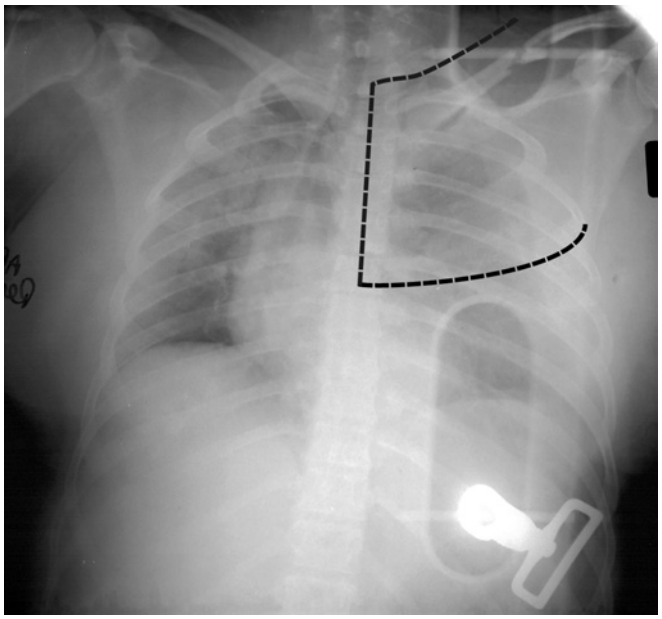

Figure 1. Chest x-ray of the patient demonstrates clavicle fracture and fractures of the first and second ribs. Dashed line indicates surgical incision.

Figure 2. Angiogram of the patient demonstrates acute occlusion of the left subclavian artery.

tent with the fractures of the upper ribs and clavicle. Rapid deceleration during motor vehicle accident will cause rapid forward motion of the body of the passenger. This forward motion might have been suddenly interrupted by a seatbelt, which might cause significant impact on the left thoracic outlet structures, including the upper ribs and clavicle [Strum 1983]. This impact to the left upper chest could have been transmitted to the subclavian artery, which would have produced the intimal tear and pseudoaneurysm formation, and, subsequently, an occlusion with a thrombus causing left upper extremity ischemia.

Acute occlusion of the subclavian artery can be diagnosed relatively easily by simple pulse exams. However, diagnosis may be difficult if the artery is not completely occluded, or difficult to assess in the presence of coexisting injuries. Pulse exams may remain normal because of the abundant collaterals in the upper extremity, even if the subclavian artery has been injured [Kartras 2001]. If a subclavian artery injury is suspected, prompt angiography should be performed to confirm the location and extent of the injury. Spiral CT can provide nearly 100% sensitivity for diagnosis of great vessel injury [Feliciano 1999] and recently has been used for screening for great vessel injury. It provides direct information of the vessel injury, including the size of the pseudoaneurysm. Absence of mediastinal hematoma by spiral CT can rule out the diagnosis of injury of these vessels. Arteriography is highly specific (specificity 96%-99%) and sensitive (sensitivity 92%-99%) modality to detect the injury of the great vessels, and it is still a "gold standard" diagnostic technique [Feliciano 1999]. The major advantage of the arteriography is the ability to detect the specific location of the injury, but it may not collate with the size of the extraluminal hematoma. We performed arteriography without a CT scan for this patient, because the clinical presentation was typical for the left subclavian artery injury and because the most important information we needed was the location of the injury for the selection of the surgical incision. Delay in the diagnosis of the acute occlusion of the subclavian artery may result in loss of the affected limb due to ischemia [Pretre 1994]. Expanding hematoma from the subclavian artery injury may compress the brachial plexus, resulting in loss of function in the affected limb [McCready 1986].

We performed left thoracotomy to access the proximal subclavian artery, where we found a large pseudoaneurysm. This left thoracotomy did not provide enough operative field to place distal control to the injured subclavian artery. Additional median sternotomy and creation of a "trap door" optimized the exposure of the entire length of the intrathoracic left subclavian artery. Because of the isolated pseudoaneurysm of the proximal left subclavian artery without any distal lesions, an interposition graft could be placed to form the "trap door." Combined supra- and infraclavicular approaches to the subclavian artery provide excellent exposure of the mid and distal portions of the subclavian artery; however, exposure proximal to the vertebral artery can be difficult [Kartras 2001, Myers 1991]. Carotid-subclavian bypass via a supraclavicular approach could be performed if the injury is limited to the distal subclavian artery; however, it was not indicated for this case due to the presence of a pseudoaneurysm in the proximal subclavian artery. Endovascular stenting could be another treatment option for a patient with subclavian artery stenosis or occlusion [Bates 2004, Babatasi 1999]. However, it could be technically challenging to place a stent across a totally occluded vessel with a pseudoaneurysm in an emergency setting.

Acute occlusion of the subclavian artery by blunt trauma is not common. Prompt diagnosis and surgical repair is essential to save the function of the limb.

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