

Endovascular Management following Unintentional Subclavian Artery Injury during Central Venous Catheter Placement

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Background: Traumatic injury to the subclavian artery during central venous catheter (CVC) placement is rare but can be catastrophic. Standard open surgical treatment is challenging and associated with significant complications. Presented is a case of endovascular treatment of these injuries and associated complications.

Methods and Results: This is a description of the endovascular repair of a subclavian artery injury during CVC placement at Örebro University Hospital.

Conclusions: This case report suggests that endovascular repair of subclavian artery injuries a less invasive and may decrease the morbidity and mortality associated with open surgical repair.

Keywords: *Subclavian Artery; Endovascular; Stent; Hemorrhage; Central Venous Catheter*

Received: 4 February 2019; Accepted: 5 February 2019

INTRODUCTION

Central venous catheter (CVCs) are commonly placed in critically ill patients [1]. The procedure is performed bedside using anatomical landmarks or by ultrasound guidance [2]. Severe mechanical complications involving hemorrhage are rare but can be life threatening [3]. Traditional open surgical repair is challenging because of the difficult exposure and the close relationship to vital structures [4]. This case report describes the late detection, endovascular treatment and complication of a right subclavian artery injury after central venous catheter insertion.

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Conflict of interest: None.

Funding: None.

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PATIENTS AND METHODS

This is a description of a clinical case where hemorrhage from the right subclavian artery was treated using endovascular repair at Örebro University Hospital, Sweden, by the on-call vascular surgeon in the hybrid operating room.

RESULTS

A previously healthy 38-year-old male was monitored and managed on the intensive care unit for bilateral pneumonia of unknown etiology. When the patients condition worsened, he was put under general anesthesia, intubated and, on day 6 a triple lumen CVC was inserted by an experienced intensive care physician into the right internal jugular vein using an ultrasound-guided supraclavicular approach. Subsequently, because of suspected pulmonary embolism, a computer tomography (CT) was performed which showed a 5 cm supraclavicular hematoma with ongoing extravasation from the right subclavian artery. The patient was hemodynamically stable and was taken to the hybrid operating room where the on-call vascular surgeon placed a 4 Fr introducer retrograde in the right brachial artery. The angiography showed continued extravasation (Figure 1). The introducer was upgraded to a 6 Fr and a 6 × 50 mm² Viabahn

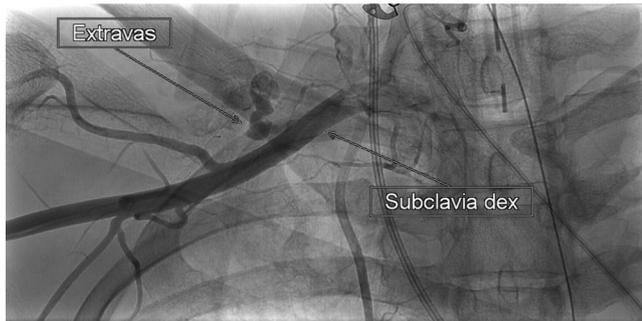


Figure 1 Angiography showing extravasation from the right subclavian artery after CVC placement.



Figure 2 Undersized stent graft with continued extravasation from the right subclavian artery.

stent graft (W.L. Gore & Associates, Flagstaff, Arizona) was placed in the right subclavian artery, distally to the right vertebral artery, covering the vessel injury. The stent graft was, however, undersized resulting in continued extravasation (Figure 2). Additionally, the undersized stent graft migrated distally in the subclavian artery and after unsuccessful attempts were made to reposition the migrated stent graft the decision was made to puncture the right common femoral artery and a 6 Fr introducer was placed retrograde (Figure 3). An 8 × 50 mm² Viabahn stent graft was successfully positioned in the right subclavian artery, distally to the right vertebral artery, covering the vessel injury and discontinuing the extravasation (Figure 4). After the procedure, both radial and ulnar pulsations could be heard using doppler.

DISCUSSION

Misplacement or injury to the subclavian artery during CVC placement is reported in the literature and is almost always right-sided, thought to be because of the specific anatomy [5]. Most are detected immediately because of the bright red, pulsatile backflow from the puncture needle or cannula [6]. If not, it may be hard to identify as a hematoma since extravasation from the subclavian artery is generally only visible at a late stage and the outcome



Figure 3 Angiography via right femoral access showing distal migration of undersized stent graft in the right subclavian artery.



Figure 4 Completion angiography after placement of a correctly sized stent graft in the right subclavian artery showing no extravasation.

may then be catastrophic. A CT scan can be very useful for confirmation of the suspected diagnosis as well as determining its relation to other vessels. Once detected, surgical treatment is often required since alternative treatment is generally inadequate. Manual compression of the subclavian artery is often not possible because of subcutaneous tissue, bony structures, and as lack of structural support around the artery. Open surgical management of subclavian artery injuries is extensive requiring sternotomy or clavicular transection, associated with high morbidity and mortality in these often already critical patients [4]. Using an endovascular approach with stent grafts avoids the increased risk of open surgery but is, however, not risk free. The proximity of the subclavian artery to the origin of the vertebral artery risks thromboembolic events or covering the vertebral artery completely, and migration of the stent graft risks distal extremity ischemia [7]. The correct choice of stent graft is therefore paramount. Balloon-expandable stent grafts allow for higher precision when deployed, but self-expandable stent grafts have better long-term patency.

CONCLUSIONS

Endovascular management following traumatic subclavian artery injury during CVC placement is possible, effective and avoids the need for extensive open surgery. However, this carries its own risk of complications, which are important to be aware of.

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