Bail-out technique utilising covered stents at the brachiocephalic trunk bifurcation in the case of a misplaced central venous catheter.

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Introduction

Central venous catheters (CVC) are crucial in the management of the critically ill patient. The procedure is relatively safe with ultrasound guidance and associated with fewer complications when inserted using anatomical landmarks (1). Despite training and education, the insertion of these catheters is not risk-free. Acute mechanical complications are usually associated with injury to contiguous structures such as the pleura, nerves, oesophagus, or nearby arteries. Inadvertent arterial puncture is serious occurring in 5% of cases (0% to 11%) (1). Malposition of the CVC into the brachiocephalic trunk is extremely rare and can be quite challenging to rectify.

This report describes a novel approach in utilising the Viabahn balloon-expandable endoprothesis (VBX) (GORE, Flagstaff, AZ, USA) in the brachiocephalic trunk (BCT) and right common carotid artery (CCA) for the safe removal of a CVC malposition.

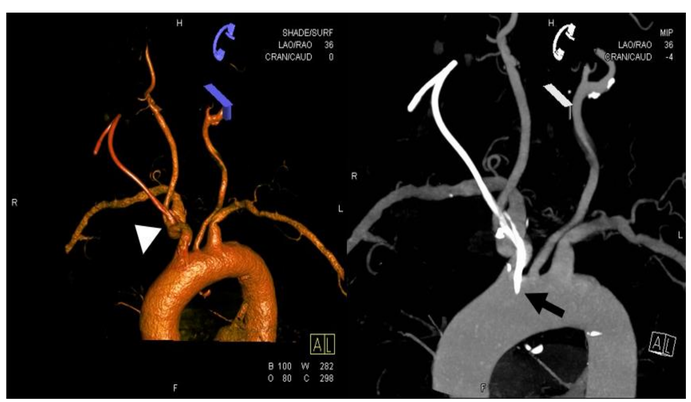
Clinical Presentation

A 74-year-old male presented to our institution in cardiogenic shock secondary to atrial flutter.

On admission to the CCU, a 7-Fr right internal jugular CVC was inadvertently inserted using the Seldinger technique) into the BCT at the ostium of the right CCA. This was confirmed on a CT angiogram (figure 1)..

Procedure details

1. Access obtained via a 10-fr short sheath was inserted into right common femoral artery.
2. Pigtail catheter was introduced up to the aortic arch for a dedicated angiogram. The tip of the CVC was identified within the BCT.
3. Using a Hinck-1 guiding catheter (Terumo®, Somerset, NJ, USA) the BCT was successfully cannulated and the glidewire positioned in to the right external carotid artery for a standard exchange to a Rosen wire (COOK medical , Bloomington, IN, USA).
4. A 9-Fr x 70cm flexor sheath (COOK medical , Bloomington, IN, USA) was then introduced into the right CCA.
5. Two Viabahn VBX covered stents (GORE, Flagstaff, AZ, USA) were deployed.
6. CVC was removed,. Pulsatile bleeding had ceased, however extravasation was still noticed at the arterial CVC entry site secondary to collateral backflow from the SCA (figure 2).
7. A 16mm AMPLATZER™ vascular plug (AVP) (St. Jude Medical , Plymouth, MN, USA) was positioned and deployed at the origin of the right SCA via right brachial artery access.
8. The completion angiogram showed no contrast extravasation with widely patent stents and opacification of the carotid tree



Method

A review of the literature pertaining to CVC malposition within the brachiocephalic trunk was performed.

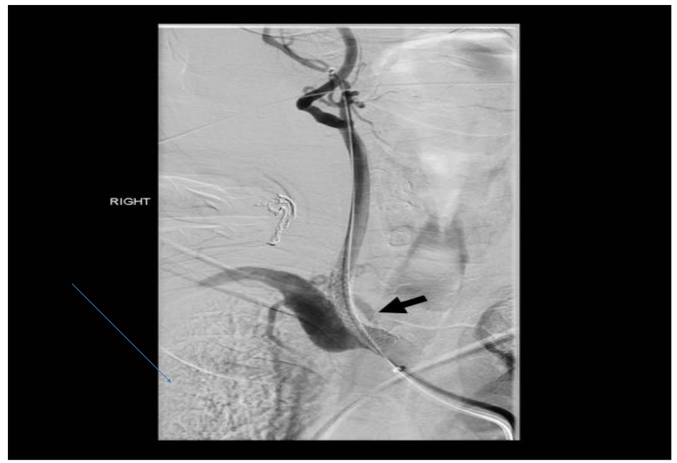


Figure 3. Digital subtraction angiography demonstrating patency of VBX stent extending from the brachiocephalic trunk into the right common carotid artery with extravasation (arrow).

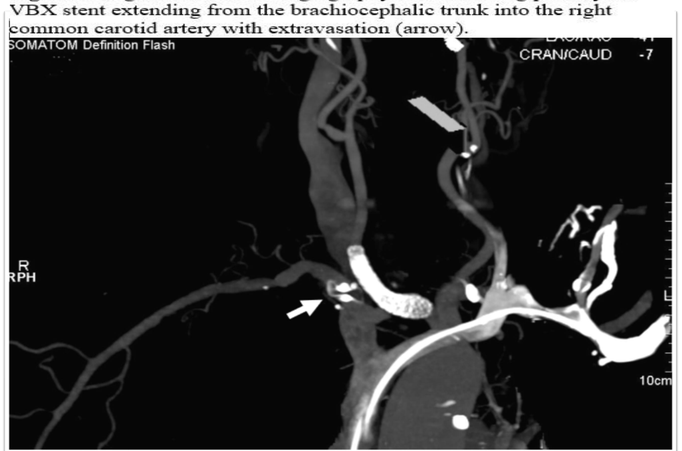


Figure 4. Coronal reformat CT angiogram. Performed 72-hr post-procedure demonstrating patency of the Viabahn VBX stent and the AMPLATZER plug (arrow) within the right SCA. A left subclavian central venous catheter can also be visualised.

Results

There were zero cases involving the brachiocephalic trunk. Two cases involving the aortic arch, one closed using percutaneous closure device and the other repair via open surgical approach. The majority of cases

Discussion

- All removal approaches were considered
  - Surgical
  - Percutaneous closure device
  - Endovascular
- Patient was not deemed fit for surgical approach, although the current evidence reports it to be the safest option
- Percutaneous closure device was also ruled out for many reasons
  - Unknown distance from skin to puncture site
  - They require anterior vessel wall punctures. This was unknown in our case
  - Most closure devices have a rigid component that could result in sheer injury to nearby structures
  - Catastrophic outcome in the event of device failure
- Viabahn VBX stent-graft was used for its flexibility and ability to be overinflated to ensure good vessel wall apposition.

Conclusion

We provide a novel use of the Viabahn VBX stent-graft as a safe bail-out option for iatrogenic arterial injuries that involve the innominate vessels.

Future Considerations

- Flow diagram / protocol for critical care physicians

Government of Western Australia
South Metropolitan Health Service
Fiona Stanley Hospital