Central venous catheterization in humans was first described by Werner Frossman, a surgical intern, in 1929, who canalized his own right atrium via the cephalic vein. In 1953, Sven-Ivar Seldinger introduced a technique that facilitated a safe and easily accessible method for the placement of central venous catheters. Central line or Dialysis line placement by the Seldinger technique is a vital and one of the most common procedures done in the critical care setting. Complications arising from this procedure have decreased in rate after the introduction of ultrasound-guided insertion and standardizations in insertion techniques. However mechanical complications of CVC like vascular injury are a significant cause of morbidity and mortality. Arterial catheterization, although a rare complication, is potentially life-threatening. It is important for intensivists and anesthetists to identify and manage complications arising from arterial catheterisation.

IJV catheterisation has a high success rate but it is not without its complications which include infections , embolism, hematomas, pneumothorax, thrombosis, fistula formation, pseudoaneurysm.

Case Summery:

A 56 year old male presented to emergency department with complains of multiple episodes hematemesis, progressive dyspnoea, fever and decreased urine output for 3 days. His history includes CKD STAGE 5 on MHD, T2 DM and HTN. Patient was shifted to ICU for management,

- O/E, T-99.5, HR-110/min, BP-105/60 mm/hg, SPO2-90% in 4lO2.
- CHEST- B/l crepts.
- ABG – pH-7.45, pCO2 – 23, pO2 – 54, K-5.1, HCO3- 16
- LAB- tc – 12, hb- 6.45, s,cr- 2.95, BUN – 20
- CXR- features of volume overload

Patient was put on a conservative management. Dialysis and Endoscopy was planned for the patient.

A large bore triple lumen dialysis catheter insertion was attempted on the left internal jugular vein under ultrasound guidance . However iatrogenic carotid puncture took place and arterial catheterisation was done. The error was detected by a hematoma formation on the left side of the neck. The dialysis line was removed and compression applied to the hematoma. Compression was continued for 6 hours. The hematoma did not subside and a CT scan with 3D reconstruction was done. CT scan showed the formation of left sided pseudoaneurysm arising from proximal common carotid artery. Doppler study of neck

arteries showed a cystic structure in the left sided neck region showing communication with proximal common carotid artery through a vascular fistulous track. The opinion of intervention radiologist was sought. Endovascular stenting for left CCA was planned for the patient.

Procedure report : A 9 mm * 60 mm covered fluency stent was deployed in the left CCa through B/L femoral arterial routes. Post procedure DSA revealed complete exclusion of pseudoaneurysm and good flow through the stent into intracranial arteries. Patient was advised dual antiplatelet therapy post procedure.

Discussion:

Identification and management of complications of central catheterisation is quite essential in a critical care setting. A brief discussion on confirmation of placement and management of arterial catheterisation follows.

The traditional method for confirming venous placement is to observe colour and pulsatility of blood coming from the needle before guidewire insertion. However this method is not always reliable specially in critically ill patients. Incorrect results may be obtained depending on the patients oxygenation status , fluid volume status and blood pressure.

ABG is an alternate to colour but is deemed impractical by many due to delay in measurement and cost factors.

Insertion of guidewire under ultrasound guidance have been suggested as practical alternatives to both colour and ABG. Troianos et al first reported the use of ultrasound-guided central vascular access in the anesthesia literature in 1991. Although ultrasound guidance has reduced the rate of arterial puncture and catheterisation , inadvertently this might occur due to various factors. The needle tip may not be seen in the ultrasound beam. The shaft of the needle may be imaged in the vein while the tip of the needle is located in the adjacent artery. The needle may be in the vein and properly imaged with ultrasound, but the needle may move into the artery during placement of the guidewire. Although imaging the guidewire in the vein is a potentially useful maneuver to confirm proper placement , the guidewire can pass through the vein (due to a through-and-through puncture with the needle) and into the adjacent artery , which may not be appreciated with ultrasound.

Measurement of pressure in the needle is a highly reliable method for distinguishing artery from vein and can be used alone or in combination with ultrasound guidance to prevent inadvertent arterial cannulation. Traditional methods for pressure measurement include

column manometry or the use of a pressure transducer, connected to the hub of the needle by a length of sterile pressure tubing with the results displayed on a monitor.

Fluoroscopy and echocardiography can be used to identify the anatomic location of guidewires. . Fluoroscopy has the advantage of imaging the entire course of a guidewire, not just at the vascular entry point. Fluoroscopy also offers the possibility of observing the course of dilators and catheters as they are advanced into the venous system, in real time. This can help to prevent injuries to veins . Transesophageal echocardiography can be utilized to identify a wire in the vena cava or right atrium . If the transesophageal echocardiography probe has been inserted before CVC placement, the guidewire may be identified in the superior vena cava or right atrium as final confirmation of guidewire placement.

Management of arterial canulation:

Although the use of ultrasound guidance and pressure monitoring has reduced the incidence of arterial injury still arterial canulisation takes place. So management of such a situation is warranted. There are 3 management possibilities.

- Simply remove the catheter and apply pressure (‘‘pull and pressure’’),
- direct surgical repair, and
- endovascular repair.

The ‘‘pull-and-pressure’’ approach often done when the femoral artery has been cannulated deliberately for coronary angiography, placement of an intraaortic balloon pump, or other purposes.

The ‘‘pull-and-pressure’’ approach is difficult to apply to the carotid or subclavian arteries, because it is difficult or impossible to effectively compress these vessels. In 2008,Guilbert et al found that morbidity and mortality from the‘‘pull- and-pressure’’ approach was unacceptably high , while a direct operative or endovascular repair yields clearly superior results. They identified cases of carotid or subclavian injury associated with central venous catheterization from 3 large centers in Montreal , and, in addition , gathered cases from the literature published between 1980 and 2006. They also found that false aneurysms and fistulas can occur late in this technique and hence a close follow up is needed.

Historically treatment of pseudoaneyrysm has been primarily surgical. However surgery of pseudoaneurysms located near skull base or neck is highly challenging and has been associated with high morbidity and mortality risks. Endovascular techniques have become

more appealing as it is a minimal invasive technique which gives rise to fewer complications than open surgery. Intraprocedural or post procedural complications from carotid stent placements are attributable to thromboembolism. Occlusion of the stent can occur even after adequate anticoagulation/ antiplatelet regimen.

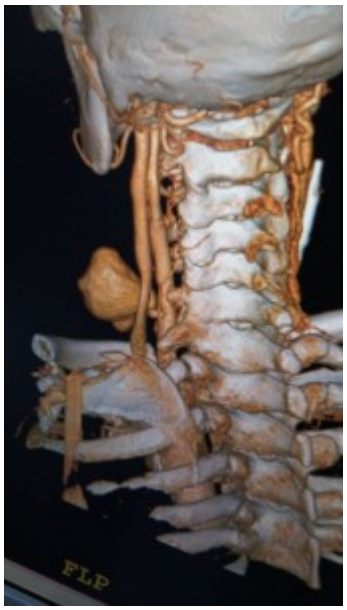
There are primarily two types of stent deployment systems – balloon expandable or self expanding. Self expanding stents are preferred in the carotid artery because of the potential for permanenet collapse of the stent from intrinsic pressure. Post placement patient should be put on an adequate anticoagulation/ antiplatelet regimen.

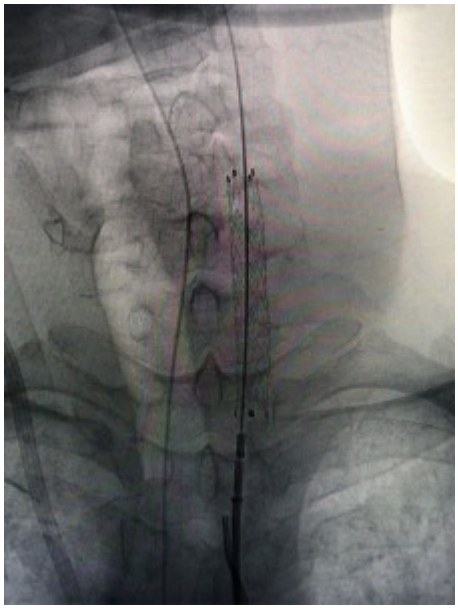
Conclusion:

Inadvertant arterial puncture or catheterisation may take place even after all precautions are taken.

Pull and pressure technique should be avoided for carotid or subclavian catheterisation.

Endovascular techniques are gaining widespread acceptance for the treatment of pseudoaneurysm in carotid artery.



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Author

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