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RIGHT BRACHEOCEPHALIC VEIN LACERATION DURING SUBCLAVIAN VEIN CANNULATION: A CASE REPORT.

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Abstract:
Central venous catheter (CVC) insertion is commonly used in critically ill patients and those undergoing major surgery for invasive monitoring and aggressive haemodynamic resuscitation. Mechanical complications most often occur during insertion of the catheter. We report a rare complication of right brachiocephalic vein laceration despite an uneventful procedure of subclavian CVC insertion on same side. The stiff dilator sheath introduced over the guidewire then perforated the wall of the brachiocephalic vein. This was diagnosed on thoracotomy, which was the first phase of the planned surgery. Subsequently central line was removed and the laceration was successfully repaired without significant blood loss.
Keywords: Bracheocephalic vein laceration, central venous catheter insertion, subclavian vein, superior vena cava.

I. Introduction:

The use of a central venous catheter was first described by Aubaniac in an injured soldier in 1952.[1] In modern day anaesthesia, central venous catheter (CVC) insertion is a mandatory for various purposes like volume resuscitation, central venous pressure (CVP) monitoring, trans venous cardiac pacing, hemodialysis access, in cancer patients with difficult venous access and for chemotherapy.[2] It is most commonly inserted via the subclavian vein (SCV) or the internal jugular vein. The choice between the two veins is more or less empirical, depending on the custom of the center.

Although a routine procedure, central venous cannulation is associated with a wide range of complications either mechanical or infective. Mechanical complications usually occur during insertion and removal of catheter, some of which may even be life-threatening. Here, we report right Bracheocephalic vein (BCV) laceration during uneventful procedure of CVC insertion, which was managed successfully.

II. Case report:

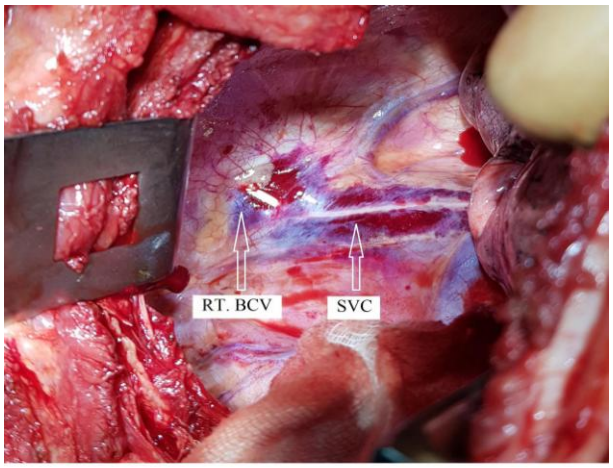
A 50 year old female with Body mass index (BMI) of 18 presented with difficulty in swallowing for solid food and weight loss since four months. She was investigated and diagnosed as squamous cell carcinoma of lower one third of esophagus. Therefore, the patient was scheduled for elective total three field esophagectomy with feeding jejunostomy. She had no co-morbidity and all preoperative investigations were normal.

Informed written consent was taken. Pulse oximetry, Electrocardiogram and noninvasive blood pressure (BP) monitoring were started. Lower thoracic epidural catheter was inserted under local Anaesthesia. After Anaesthesia induction, right radial arterial catheter was inserted uneventfully for invasive BP monitoring. We planned right SCV CVC insertion through infraclavicular approach. The patient was placed in the Trendelenburg position and the procedure was carried out under all aseptic precautions with 7F 16cm triple lumen catheter. Introducer needle was entered one cm below the clavicle at the junction of middle and medial third of the clavicle and directing the needle towards the suprasternal notch.

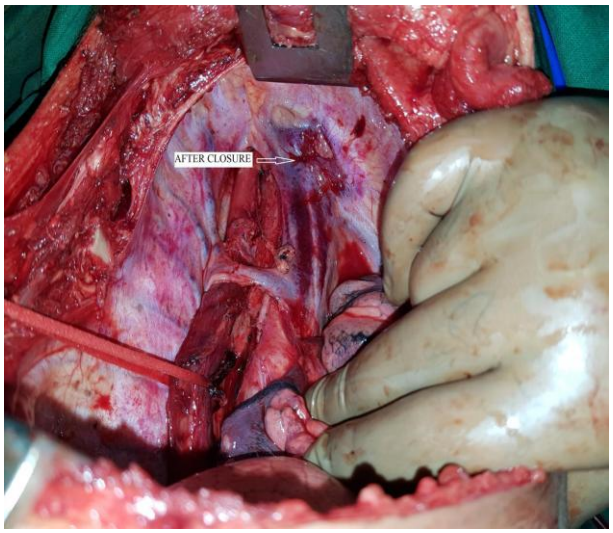
In the first attempt, dark blood was freely aspirated at around three cm depth. A guidewire was inserted smoothly. The track was dilated with 8F dilator. After that the dilator was pulled out and catheter was introduced with Seldinger technique. The length of the catheter inside was 12cm which was determined by overlaying the catheter from the puncture site to second intercostal space. The entire procedure was uneventful with good back

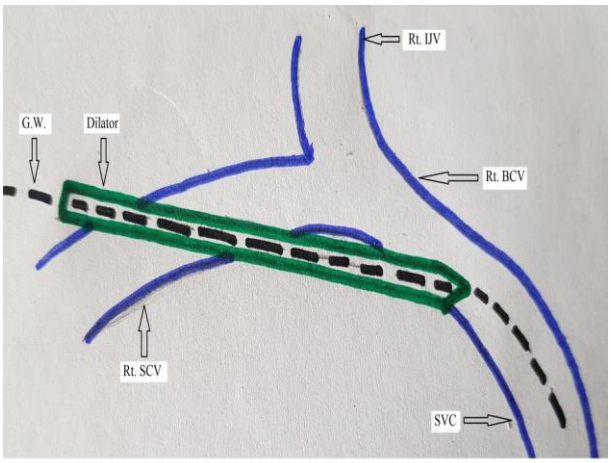
flow in all three lumens and CVP tracing on the monitor.

During right thoracotomy which was the first phase of the surgery, surgical team noticed a part of central line catheter outside the right BCV inferiorly where it meets superior vena cava (SVC). There was around 1.5 cm linear lacerations on the inferior wall of the right BCV. Tip of the catheter was in SVC and there was small hematoma with no active bleeding from the laceration. In view of linear laceration, it was decided to remove the central line catheter under vision. We secured 16G peripheral intravenous line and catheter was removed under vision. Adequate pressure was applied by surgeon on the right BCV defect. Bleeding was not stopped by this maneure so the laceration was repaired with fine sutures. Blood loss during this event was at around 80-100cc. Rest of the procedure was uneventful. Post operative chest X-Ray was normal.



Rt. BCV - Right Bracheocephalic vein, SVC - Superior vena cava.





Rt. IJV - Right Internal jugular vein, Rt. BCV - Right Bracheocephalic vein, Rt. SCV - Right Subclavian vein, SCV - Superior vena cava, G.W. - Guidewire.

III. Discussion:

The SCV is the preferred site for CVC insertion because of its large size, lower risk of infection and its ability to provide patient comfort in long term use.[3,4] Though it may be associated with fewer infectious complications than the IJV, overall, internal jugular catheterization and subclavian venous catheterization carry similar risks of mechanical complications. Arterial puncture, hematoma and pneumothorax are the most common mechanical complications.[5] Although the greatest emphasis in preventing vascular injury during CVC placement concerns avoiding inadvertent cannulation of arteries, injuries to intrathoracic veins also are potentially life threatening complications. Probably the most common injury is a through-and-through injury to an intrathoracic vein.[6] Injury to the right BCV.[7,8,9] and SVC have been reported. BCV laceration can lead to communication between the vein and pleural space, resulting in life threatening hemothorax. The danger of vessel injury makes an understanding of the underlying vein trajectory critical. Vascular injury is more common on right SCV as it takes a near right angle turn into the SCV. [10]

There are different mechanisms of vascular injury during CVC placement. The most likely mechanism is that a guidewire becomes trapped against the wall of a vein by a stiff dilator, sheath or catheter that is being advanced over the guidewire, and the vein is perforated or torn.[6] We presume the same mechanism in our case which might have been caused by excessive advancement of dilator.

Apparently, the dilator pierced the proximal wall and with further advancement, it came out from the distal wall pushing the guidewire sideways along with it. This resulted into the linear laceration. Subsequently, the catheter followed the route of guidewire and temporarily it sealed the laceration. The local hematoma with its tamponade effect too contributed in sealing the defect. During the removal of the catheter the defect was opened up and bleeding was not controlled with only "pull and pressure" approach as it was not simple circular defect. Absence of circular defect ruled out the direct injury of the vein by introducer needle. Surgical repair is the gold standard method for such defect especially when the involved vein is non compressible. In our case, CVC insertion was done on the same side of thoracotomy so venous laceration was detected early. This way, we could avoid the catastrophy of profused bleeding as it was repaired under vision. If it would not have been thoracotomy on same side of CVC placement, it's removal would have invited hemothorax considering big laceration and BCV being non compressile vein.

Risk factors for failures and complications should be identified before the procedure. Patients with BMI higher than 30 or lower than 20 is one of the risk factor.[11] This risk factor was there in our patient. Introducer needle depth was not noted down so the possibility of excessive advancement of the dilator was high. The number of unsuccessful attempts of CVC placement significantly increases the frequency of complications. The complications are more common in multi-lumen CVCs compared to mono-lumen ones. Hematoma and pneumothorax are more common in multi-lumen CVCs in more than two attempts of catheter applications.[12]

Early diagnosis and interventions are of paramount important. The number of complications can be reduced if the central vein puncture is performed under ultrasound control, which is becoming a standard.[13] Use of ultrasound to estimate the depth of penetration of the needle, the position of the tip of the needle and the position of the guide wire could help to avoid this type of complication. The dilator should not be inserted beyond the approximate depth that has been traversed bt the introducer needle.

IV. Conclusion:

Uneventful procedure of CVC placement cannot rule out the underlying complications. If permitted, CVC insertion should be done on the same side of thoracotomy for the early diagnosis of the complications, if any.

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