

Transpleural central venous catheter discovered during thoracotomy

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Abstract

We report an uncommon complication of subclavian central venous catheterization, discovered at thoracotomy. The central venous catheter (CVC) was placed by left infraclavicular route after induction of general anesthesia. CVC was secured after aspiration of blood and satisfactory central venous tracing. On thoracotomy, CVC was noticed to traverse the pleural cavity while the tracing was normal. CVC was thus removed consequent to which bleeding from each puncture site was noticed, that were secured surgically.

Keywords: Central venous catheter, infraclavicular, thoracotomy, transpleural

Access this article online

Website: www.ijccm.org

DOI: 10.4103/0972-5229.125435

Quick Response Code:



Introduction

Though, the advantages of central venous catheter (CVC) placement outweigh the disadvantages significant risks are associated with the insertion and maintenance of a CVC. We report an unusual complication of CVC, discovered during thoracotomy, which possibly goes unnoticed in an unknown number of patients.

Case Report

A 37-year-old male with cystic bronchiectasis in the left lower lobe was scheduled for left lower lobectomy. His preoperative checkup was unremarkable. Computerized tomography scan of the chest revealed cystic bronchiectasis in the left lower lobe with consolidation. Imaging cannot show "infection" and mild bronchiectasis in the right middle lobe. Following placement of routine monitors, thoracic epidural catheter was inserted in the T₆-T₇ interspace. Patient refused CVC insertion under local anesthesia. After induction of general anesthesia, the

patient was intubated with right sided 41 FG double lumen tube. Left infraclavicular access for CVC was selected as the patient had to undergo left thoracotomy. Venipuncture was performed 1 cm lateral to the curvature of the middle third of the clavicle with the needle pointing horizontally directed at the sternal notch until free aspiration of blood was obtained. Positive pressure ventilation was withheld during the CVC insertion until free flow of blood was obtained. 16G catheter through needle CVC was introduced in the first attempt. The blood aspirated during the insertion was uninterrupted and no air or fluid was noticed. CVC was confirmed with easy aspiration of blood and appropriate waveform. The catheter was fixed at the mark of 12 cm from the tip of the catheter. Bedside chest xray to confirm CVC position was not immediately available and thus, the CVC was only used for monitoring the waveform. No fluids were infused through the CVC. During the surgical exploration, it was noticed that CVC was traversing the superior aspect of the pleural cavity [Figure 1]. Position of the CVC tip was reconfirmed and was found to be satisfactory as per the waveform and aspiration of blood.

Suspecting the puncture site as a potential site for bleeding, it was decided to remove the catheter before thoracic cavity was closed. While it was being removed under vision, bleeding was noticed from both puncture sites at the pleural surface. Manual pressure was

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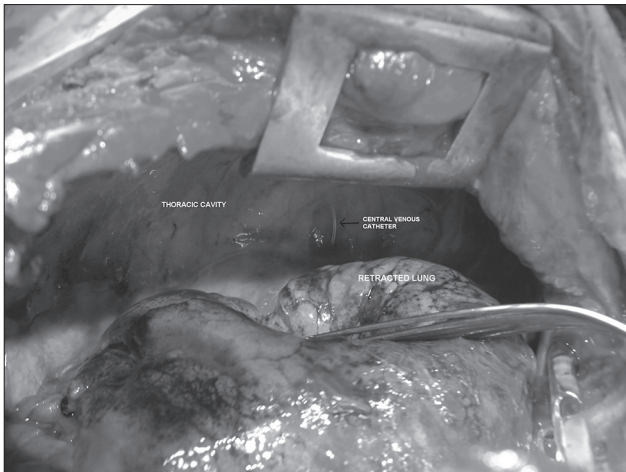


Figure 1: Central venous catheter traversing the superior aspect of the pleural cavity

insufficient to stop the bleeding. Therefore, two sutures one at each puncture site were placed. Post-operative course was uneventful.

Discussion

CVCs are routinely inserted in a variety of patients for assessment of intravascular depletion, hemodynamic monitoring, delivery of vasoactive drugs, long-term intravenous access for antibiotic treatment or parenteral nutrition, pulmonary artery catheterization and placement of transvenous cardiac pacemakers. The success of CVC cannulation follows a precise protocol of execution, including methods to verify correct insertion, advancement and final location as well as detecting mechanical and positioning complications.

Complications of variable magnitude with incidence of (5-19%) can accompany the placement of CVC.^[1] These complications in decreasing order of frequency include inadvertent arterial puncture or catheterization, puncture of lung apex with or without clinically manifest pneumothorax, thoracic duct injury, venous air embolism, tracheal puncture, hemoptysis, seizures and acute severe asthma.^[2]

Isolated pleural dome puncture in a patient with severe coagulopathy has resulted in life-threatening hemothorax due to continuous bleeding from the puncture site in the pleura. Transpleural placement of CVC has been described before in a patient with scoliosis.^[3] However, this is the first report of transpleural placement of CVC discovered accidentally during thoracotomy in a patient with normal thoracic anatomy. In our patient, it resulted in bleeding from the puncture site when CVC was removed under vision with the chest open.

Complications unique to the infraclavicular route are direct brachial plexus injury and injury to the clavicle and the periosteum of the first rib. Isolated pleural dome puncture is generally detected only if there is pre-existing fluid, blood or air in the pleural dome, none of which was present in our patient. Puncture of normal lung apex is unusual by this approach as it lies caudad to the first rib. However, It can occur if positive pressure ventilation and/or large tidal volumes are used or in a patient with grossly disturbed anatomy.^[2] Lung apex was intact despite pleural injury in our patient possibly because intermittent positive pressure ventilation was withheld during the venous puncture.

Hemothorax appearing after removal of CVC is well-mentioned in the literature, but suggested possible mechanism is mostly vessel erosion, trauma to the adjacent tissue, displaced catheter tip and coagulopathy.^[4] Continuous bleeding from the puncture site is generally expected in patients with coagulopathy, but in our patient fibrosis of the adjoining tissue due to lung pathology probably prevented this complication. (bleeding in your case occurred only when CVC was removed at thoracotomy).^[2] Viewing the above case, bleeding from the punctured pleura despite correct placement of the catheter tip should be considered as a possible cause in unexplained cases of delayed hemothorax. Thoracotomy provided us the opportunity to view transpleural CVC placement, which might have occurred in many cases without being noticed. Therefore, it should always be remembered that transpleural CVC can occur in patients even with normal thoracic anatomy and aspiration of blood and correct CVC tracing may not always exclude transpleural placement of CVC.

Literature describes various methods to aid the successful and uncomplicated insertion of CVC. Ultrasonography, fluoroscopy and ECG being the most commonly recommended. Although, all these devices improve the safety of CVC placement, none of them have been proved to identify such minor details like a small pleural dome puncture before entering the vascular lumen. Careful review of the literature does not reveal any clinical signs or diagnostic methods to identify or prevent the isolated pleural dome injury in a closed chest.

Some Anesthesiologists^[1] may prefer to continue with the same CVC post-operatively also if the catheter tip is well-positioned. We preferred to remove the catheter under the vision and noticed significant bleeding as well. We therefore, suggest (based on a single case absolute certainty for this cannot be established) that catheter should be removed and the requirement for local hemostasis checked.

A few learning points from the above study are:

- Aspiration of blood and normal CVC waveform do not exclude the transpleural placement of CVC
- Intravascular placement of the catheter tip does not mean that the catheter has taken the correct path and has not traversed through the pleura
- A transpleurally placed CVC should be considered among the causes of a delayed hemo or pneumothorax or pleural effusion through intrapleural infusions
- Transpleural CVC if noticed during thoracotomy, should be removed under direct vision and hemostasis secured even if the coagulation profile is normal.

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How to cite this article: Malhotra A, Sharma P, Kumar A, Malhotra N. Transpleural central venous catheter discovered during thoracotomy. *Indian J Crit Care Med* 2014;18:37-9.

Source of Support: Nil, **Conflict of Interest:** None declared.