Case Report

DOI: 10.7860/JCDR/2016/19399.7860

Malposition of Subclavian Venous Catheter Leading to Chest Complications

Surgery Section

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ABSTRACT

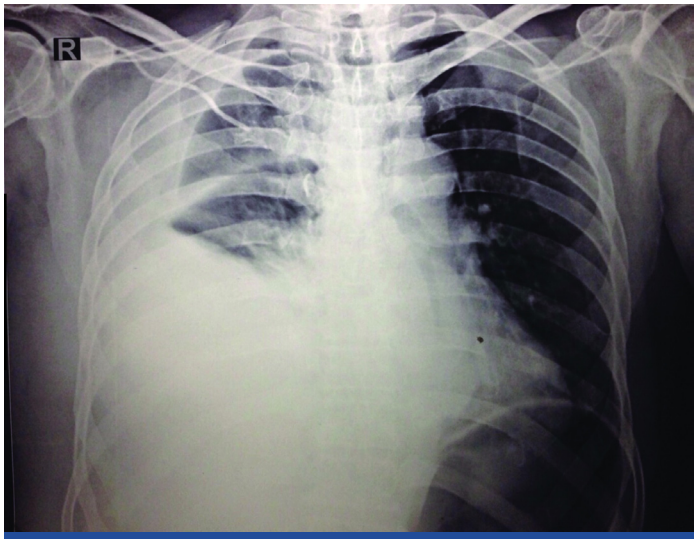
Although Central Venous Catheter (CVC) placement is a relatively simple procedure but its insertion and maintenance are associated with significant risks. Malposition (defined as any CVC tip position outside the superior vena cava) may be associated with catheter insertion and may require immediate intervention. It may result in complications like haemothorax, pleural effusions, pneumothorax, sepsis, thrombosis and cardiac tamponade. This case report presents timely detection of the complication after placement of CVC. Everyone should be aware of the complications and monitor consistently appropriate position of catheter tips.

Keywords: Cannulation, Hydrothorax, Pneumothorax

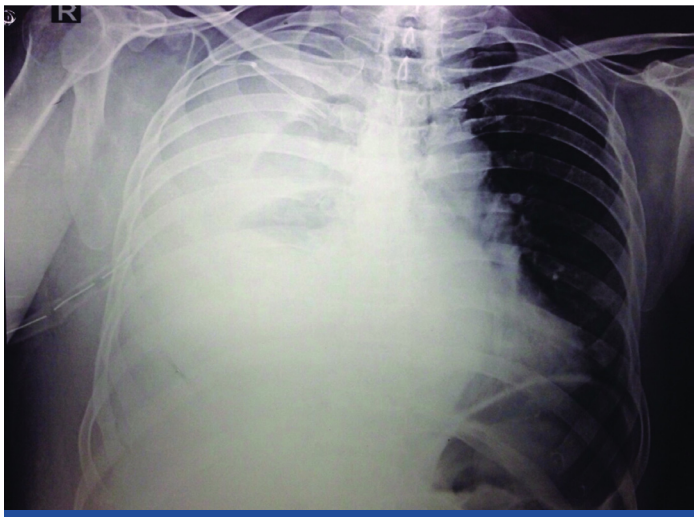
CASE REPORT

A 55-year-old male patient with multiple injuries was referred for the evaluation of blunt trauma chest. The patient was having respiratory distress. His blood pressure was 90/60 mmHg, pulse 90 beats/min and respiratory rate 28/min. Immediately patient was put on oxygen. On examination, there was massive contusion and abrasion injury on the posterior aspect of chest on right side with mild subcutaneous emphysema and crepitus. There were decreased breath sounds over the right lower anterior and posterior chest on auscultation. Central venous access through right subclavian vein had been already gained. His haemoglobin (Hb) was 8g%, TLC 6400cumm, platelet count 1.5lac/cumm, serum bilirubin 0.64g%, blood urea 38mg/dl and serum creatinine 0.91mg/dl. Chest X-ray (PA view) suggested right sided haemothorax and abnormally placed catheter [Table/Fig-1]. CVC was not removed because of the unstable condition of the patient. Immediately, thoracostomy was performed with 28 Fr chest tube in 6th intercostal space and the patient was admitted to intensive care unit. Approximately 300 ml of blood was drained immediately. Over a period of 24 hours, chest tube drained 2.5 litres of blood stained fluid. The patient's condition improved with SpO_2 99% on oxygen inhalation. A portable chest X-ray revealed an aberrant course of the central line catheter and entire right side was opaque except in the apical part of right upper lobe [Table/Fig-2]. CECT thorax showed mediastinal shift towards left side, right sided pleural effusion, misplaced central line through which contrast was seen extravasating into the right pleural cavity making a collection of 80mm x 60mm [Table/Fig-3]. There was no contrast seen filling the cardiac chambers and great vessels. Chest tube was seen in 6th intercostal space with partial collapse of right lung. On 3rd day, patient was found to be anemic, jaundiced and dyspneic. Thoracostomy tube was not working and urobag drained dark straw colored urine his Hb was 3.5g%, TLC 12000/cumm, platelet count 1.2lac/cumm, blood urea 40mg/dl, serum creatinine 1.0mg/dl, serum bilirubin 6.8mg% and normal coagulation profile.

CVC was removed and left internal jugular vein was cannulated without any complications. Chest tube was replaced with Malecot catheter 36Fr and drained 1 litre of fluid mixed with blood. Further supportive treatment in the form of blood transfusion, intravenous fluids and chest physiotherapy was continued. The patient's condition improved drastically. He maintained SpO_2 99% on room air with respiratory rate 18-20/min. The patient was kept under observation. A repeat chest X-ray after 24 hours showed bilateral fully expanded lungs with no collection [Table/Fig-4].



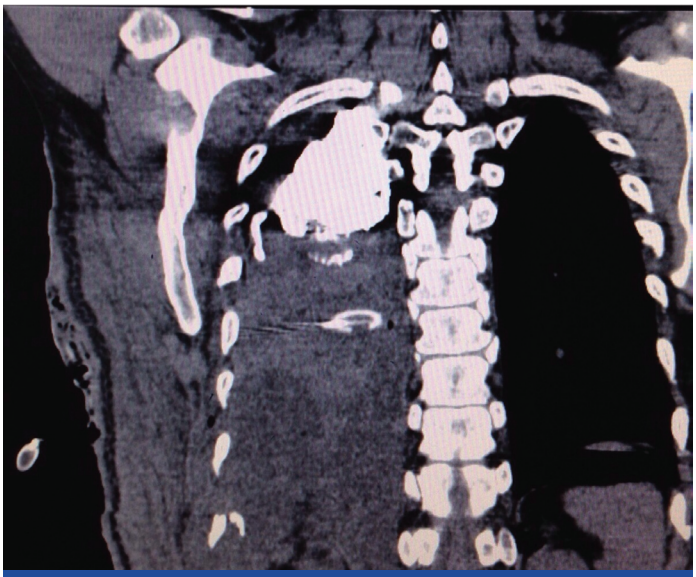
[Table/Fig-1]: Chest X- ray showing right sided haemothorax and abnormally placed catheter.



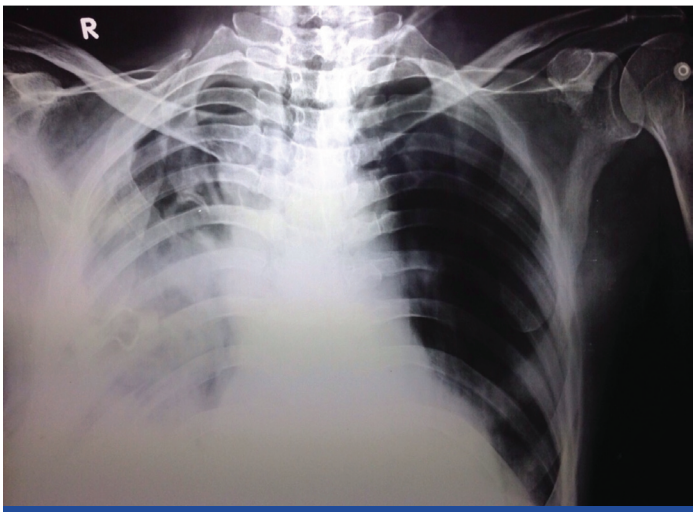
[Table/Fig-2]: Chest X-ray showing opaque right lung along with chest tube and abnormal position of the central line catheter.

DISCUSSION

Central Venous Catheterization (CVC) is a time honored, safe and commonly performed invasive procedure in intensive care units and also in all specialties ranging from oncology, anesthesia, to emergency medicine [1-4]. It plays an indispensable role in the



[Table/Fig-3]: CECT thorax showing contrast extravasating into the right pleural cavity making a collection of 80mm x 60mm.



[Table/Fig-4]: Chest X-ray showing expanded right lung with malecot catheter in situ.

management of trauma and haemodynamically unstable paediatric and adult patients for delivering fluids, nutrients, drugs, monitoring central venous pressure, pulmonary artery catheterization and placement of transvenous cardiac pacemakers [1,3,5]. It is dependent on the skill of the clinician and the use of the standard technique [1,3]. CVCs have device or procedure related complication rates of approximately 20% and are associated with significant morbidity and mortality [1,6].

Immediate procedure-related complications include inadvertent arterial puncture or cannulation, pneumothorax, hematoma, failed attempts to cannulate target vessel, inability to pass the guidewire, and cardiac tamponade [1,3,7-11]. Catheter-related bloodstream and skin infections as well as venous thrombosis are frequently observed late complications [1,7,10]. Massive pleural effusion due to intrapleural collection of administered fluid has been rarely reported and often results in significant morbidity and mortality. This report highlighted a case of a malpositioned central venous catheter leading to massive pleural effusion.

Placement of a central vein catheter requires substantial training and supervision to become facile with it. Subclavian vein cannulation is more tolerated by patients because of large caliber with estimated diameter of 2cm and running a fixed course. The risk of pneumothorax is because at some point, the subclavian vein is only 5mm above the apical pleura of the lung. If catheter perforates the vein and infusion of fluid is continued, hydrothorax can develop [8,11]. Damage to vein can possibly occur either due to chemical damage from infused fluids or mechanical trauma from the catheter tip [11]. This damage may further erode the wall leading to perforation of the vein and then, solutions can be directly infused into the pleural cavity [11,12]. Catheter tip migration can occur in approximately 17% of all cases [8]. Change of patient's position, a very important management strategy in intensive care, may cause vascular erosion. Pleural dome puncture in a patient with severe coagulopathy can cause haemothorax. Ghafoor et al., has reported transpleural placement of CVC in a child with scoliosis [13].

Chang et al., have emphasized that all clinicians should have a very high degree of suspicion and should be able to diagnose misplacement of catheter and its complications on a radiograph [14]. Early recognition of complications avoid consequences. However, placement of central venous catheters under ultrasound guidance or use of pressure transducers immediately to confirm the pressure tracings minimizes the risk of any complications by early diagnosis [14,15]. Even chest X-ray can miss delayed pneumothorax in about 0.5% (2 of 424 cases) of patients with right internal jugular lines [15]. The introduction of ultrasound during the past few years as a common tool for venous catheter placement has shown marked improvement in complication rates as compared to traditional landmark techniques [15]. However, use of ultrasonography for CVC line insertion is not routine in all hospitals especially in resource poor settings.

The current report aims to increase awareness of this complication and clinicians should have low threshold for suspecting any complications. 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. Thus, chest radiography should be performed after insertion of central venous catheters and a high index of suspicion should be maintained in order to detect and effectively treat the rare and delayed complications of central venous catheterization.

CONCLUSION

Although central venous cannulation forms one of the mainstays of management of trauma and haemodynamically unstable patients, it carries a significant risk of procedural and operator-related complications. All inexperienced trainees with less previous catheter insertions should be trained and supervised at all times. If pressure transducers are not available immediately to confirm the pressure tracings, chest X-ray should be performed to rule out malposition of CVC so that complications like hydrothorax or pneumothorax could be tackled immediately. The internal jugular vein should be the preferred vessel, whenever possible, as it carries less complication compared to a subclavian vein approach.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Feb 09, 2016**
Date of Peer Review: **Mar 07, 2016**
Date of Acceptance: **Mar 26, 2016**
Date of Publishing: **May 01, 2016**