Case Report

An unusual malposition of central venous catheter in critically ill patient. Could it be identified during catheterization? The potential role of point-of-care ultrasonography.

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Abstract

Malpositioning of central venous catheter is not uncommon and can be associated with complications. We report a case where central venous catheter inserted through right internal jugular approach under real time ultrasonographic guidance was malpositioned with its tip in left brachio-cephalic vein. Chest radiograph for detection of catheter malpositioning is associated with time delay and radiation exposure. Point-of-care ultrasonography can be a valuable bedside tool to identify catheter malpositioning during catheter insertion, thus facilitating immediate catheter repositioning and early use of central venous catheter.

Key Words: central venous catheter, malposition, point-of-care ultrasonography

Introduction:

Central venous catheters (CVCs) are inserted in ICU for a variety of indications like administering drugs (vasopressors/inotropes, antibiotics, chemotherapy), monitoring central venous pressure (CVP), measurement of central venous oxygen saturation, renal replacement therapy, total parenteral nutrition, poor peripheral venous access, cardiac catheterization and transvenous cardiac pacing.¹ Successful CVC placement includes positioning of the catheter tip near the right atrium. The optimal CVC tip placement using the subclavian and internal jugular venous approaches is in the distal superior venacava above the preicardial reflection.² Incidence of CVC malposition ranges from 3.6 to 14%.³ Cannulation by the right subclavian vein is associated with the highest risk of malposition.³ Here we report a rare CVC malposition in a critically ill patient with septic shock. The tip of catheter inserted through right internal jugular approach was in left brachioccephalic vein.

American College of Radiology recommends chest radiograph after insertion of CVC to demonstrate proper placement and detect any complications.⁴ However, performance and interpretation of the post-CVC chest radiography is associated with time delay, additional radiation exposure and additional cost.⁵ Early goal-directed therapy provides significant benefit with respect to outcome in patients with severe sepsis and septic shock.⁶ Early confirmation of proper CVC position and use of CVC can facilitate institution of early goal-directed therapy.

Various bedside modalities like point-of-care ultrasonography,⁷ real-time X-ray imaging,⁷ pressure waveform analysis¹ and ECG guidance⁸ can be helpful to detect malposition at the time of catheterization.

Case Description:

A 23 years old lady was admitted to ICU with the diagnosis of septic shock due to severe community acquired pneumonia. She was a known case of Acute Myeloid Leukemia. Central venous access was planned for administration of vasopressors and for monitoring of central venous pressure. She was thrombocytopenic with platelet count of 45,000/cu mm.

Central venous catheter was inserted through right internal jugular approach under real time ultrasonographic guidance. Cannulation was done after confirmation of guidewire in the vein by ultrasound. Catheter was secured at 13 cm after aspiration of blood from all the lumens. Procedure was uneventful and was performed in a single attempt. Central venous pressure, measured manually was 21 cm of H₂O. Portable chest X-ray revealed the catheter tip malpositioned in left brachio-cephalic vein (Fig. 1.). The catheter was withdrawn upto 8 cm and was resinserted over the guidewire. Repeated chest X-ray revealed proper position of catheter in lower superior venacava.

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Fig. 1: Central venous catheter inserted through right internal jugular approach. Catheter tip malpositioned in left brachio-cephalic vein (indicated by arrow).

Discussion:

CVC malposition can be associated with the complications like inaccurate CVP monitoring, potential irritation of the valves by catheter or infused fluids, vessel thrombosis and cardiac tamponade. Though recommended by guidelines, post CVC chest radiography has limitations, due to their 2D projection. Close anatomical proximity with major arteries, veins and pleura in the neck and chest makes it not possible to reliably state whether the distal section of the catheter is in an artery, vein, pleura, or mediastinum from a plain chest X-ray. Subsequent repositioning of catheter is not free of risk. The guidewire repositioning of the malpositioned catheter was performed, as the patient was at risk of mechanical complications if inserted at new site, due to existing thrombocytopenia.

Real-time X-ray imaging using an image intensifier during CVC placement has similar limitations to a plain chest X-ray. Intravascular ECG monitoring is helpful to verify central placement of catheter within the chest at the caval atrial junction, but it is not useful for differentiating between venous and arterial placement of CVC.

Bedside point-of-care ultrasonography using saline flush or contrast enhanced ultrasonography was shown to be the reliable screening test for optimal CVC tip position. Rapid appearance of prominent turbulence in the right atrium on echocardiography after CVC saline flush reliably identified proper CVC tip position. Combination of B-mode ultrasonography and contrast enhanced ultrasonography reliably detected catheter misplacement. Bedside ultrasonography was also valuable in detecting pneumothorax. Time required for sonography was significantly shorter than for chest radiograph.

To conclude, like in our patient, use of point-of-care ultrasonography potentially could have identified catheter malposition during catheterization, thus expediting the catheter repositioning and prompt institution of early goal direct therapy.

References: