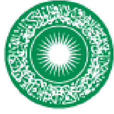

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ECTOPIC PLACEMENT OF CENTRAL VENOUS CATHETER, IMPORTANCE OF X-RAY CHEST

Nadeem A Zaidi and Fazal H Khan

ABSTRACT: A case of malpositioning of central venous catheter which was judged to be correctly placed on clinical criteria is being presented. Abberant positioning was picked up on X-ray chest.

KEY WORDS: Catheterization, Central Venous X-ray chest Placement

INTRODUCTION

Most of the critically ill patients and some surgical procedures require invasive monitoring of cardiovascular system. Placement of central venous catheter via the internal jugular vein is a useful and commonly performed procedure which facilitates invasive haemodynamic monitoring. Complications associated with the procedure are related to malpositioning of central venous catheter and injuries to the surrounding structures. There have been incidents of severe and even fatal complications such as air embolism[1], Pneumothorax[2], cervical haematoma[3], thoracic duct injury[4], Homer's syndrome[5], stroke[6] arrhythmias and even complete heart block resulting from guide wire[7] insertion during central venous cannulation.

The tip of the central venous catheter inserted should lie in a large intrathoracic vein. The preferred position is in the upper part of superior vena cava above the pericardial reflection. Irrespective of the route of insertion the catheter tip may settle in an unsatisfactory site. X-ray chest is the only certain method of identifying the position of the tip and should be done as soon as possible after placement of central venous catheter.

We report a case of malpositioning of central venous catheter in an abberant vein which was identified radiologically.

CASE REPORT

A 47 year old male admitted to the intensive care unit for elective postoperative ventilation, a known patient of chronic liver disease underwent laparotomy for bleeding esophageal varices. Gastric devascularization and spleenectomy was done. During the surgery a central venous catheter was placed through the right internal jugular vein and its position confirmed through a chest X-ray in the ICU.

In view of line sepsis, on the 6th day of the patient's ICU stay it was decided to change the site of the central venous catheter. So the left internal jugular vein was cannulated with 16 G (Secalon - Universal - 65cm) central venous catheter about 20 cm in length and the procedure was done without any difficulty. There was free flow of blood through the catheter on aspiration. X-ray chest was done to confirm the position of the catheter which showed a coiling tip on the left side of the mediastinum (Fig 1). Radiopaque dye (urograffin) was injected through it which showed spillage in the mediastinum (Fig. 2) so the catheter was immediately pulled out and re-inserted through the right subclavian vein.

DISCUSSION

Central venous catheter inserted either through the internal jugular, subclavian or more peripheral vein in the upper extremity must be located within the true central venous system i.e. beyond all the venous valves which interfere with direct transmission of right atrial pressure to the catheter. The preferred position is the upper part of the superior vena cava above the pericardial reflection[8]. On a postero-anterior view of X-ray chest it should be medial to the anterior border of the first rib[9], or it should be no more than 2cm (in adults) below a line joining the lower surface of the medial ends of the clavicle[10].

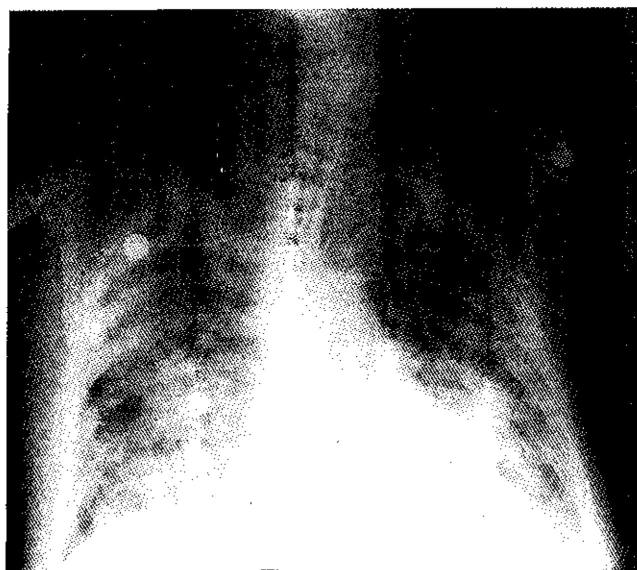

Figure 1 X-ray chest showing the coiling of central venous catheter in an abberant position

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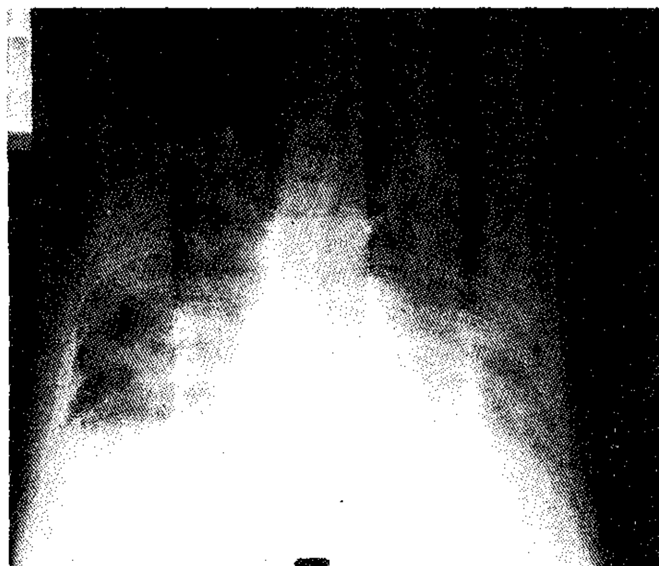

Figure 1 X-ray chest showing the spillage of dye from the catheter into the mediastinum

Irrespective of the route used there are chances that the catheter tip may be incorrectly placed. Veins used for access have their own peculiar anatomy which predispose the catheters inserted to unique aberrant positions. The most common aberrant locations include right internal jugular vein[11], right atria, right ventricle, or various extra-thoracic locations including veins of the upper extremity or the hepatic vein. The catheter may curl on itself and pass retrogradely.

Langston[12] found that when he used arm veins he was accurate 74% of the time in proper placement of the catheter. The internal jugular vein was the commonest aberrant position being catheterized 16% of the time. Deitel and McIntyre[13] found that malpositioning occurred 28% of the time when arm veins were used. They too noted frequent malpositioning in the internal jugular vein. In a series of 73 central venous catheters thought to be correctly placed on clinical criteria only 64% were in an acceptable position radiologically[14]. Arm veins were used for catheter insertion when the external jugular vein was used the incidence of malpositioning was found to be between 30-50%[13-15]. Belani et al[16] using the right external jugular vein found that about 24% of the time they could not pass the catheter beyond the clavicle. Of those that got beyond the clavicle 6.3% were in the ipsilateral internal jugular vein and 12.6% were in the contralateral brachiocephalic vein. The success rate with internal jugular vein was between used 95.99%[15-16].

The fact that several small veins open into the left brachiocephalic vein opposite the left internal jugular vein may result in a higher malpositioning rate when catheters are inserted via the left internal jugular vein. Placement into the left pericardiophrenic, left internal thoracic and left superior intercostal vein has been reported when left internal jugular venous cannulation was attempted[17]. A misplaced catheter may cause signs, symptoms or radiographic findings fairly specific to its location. With aberrant catheter positioning true central pressure will not be monitored and infusion of drugs and fluids through a malpositioned catheter may lead to the occurrence of undesirable effects before the desired systemic effects[18].

An extravascular location of catheter tip may result in inadvertent infusion of fluids into mediastinal or pleural spaces. Mediastinal widening or an increasing pleural effusion should suggest this complication. A central venous catheter is judged to be positioned correctly on clinical criteria by the length of the catheter inserted, by free back flow of blood through the catheter and by fluctuations in the venous pressure with respiration.

Kellner and smart[19] demonstrated that respiratory fluctuations alone were not an indication of correct placement of catheter and x-ray chest is the only certain method of identifying the position of the catheter tip and should be obtained after every central venous catheter placement. If the location of the catheter remains in question contrast injection or C.T. is confirmatory[20].

This case report highlights the importance of confirming the position of central venous catheter tip by x-ray chest before starting infusion through it to avoid life threatening complications.

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