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MIGRATION OF CENTRAL VENOUS CATHETER LEADING TO MASSIVE PLEURAL EFFUSION: A CASE REPORT AND TIPS TO REMEMBER

Anaesthesiology

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KEYWORDS

INTRODUCTION

Central venous cannulation is a common procedure done in hospitals both in operating room (OR) and Intensive care unit (ICU) settings to provide fluid, blood and blood component infusions, and to monitor central venous pressure, and administration of intravenous drugs to the patients. Various non-invasive modalities are used for the successful positioning and confirmation of correct placement of needles, guidewires, and venous catheters, including intra atrial electrocardiography (ECG) guidance, ultrasound guidance, X-ray imaging, with contrast enhanced computed tomography remaining the gold standard for confirmation of catheter placement (1).

CASE REPORT

A 43 year old man with a history of fall from the height of 30 feet, underwent thoracotomy with D9 anterior corpectomy with D8 to D10 posterior fixation in our institution. When he arrived in the emergency department, he was extremely anxious, with loss of function of both legs. His initial systolic/diastolic blood pressure was 58/36 mm hg and his heart rate was 110 beats per minute. Norepinephrine infusion was started at 0.8 µg/kg/min along with fluid resuscitation. No significant past medical history. His preoperative laboratory findings were haemoglobin (Hb) 7.1 g/dL, prothrombin time 19.6 seconds, international normalized ratio 1.81, and others appeared to be within normal range. ECG showed sinus tachycardia with heart rate of 111.

In the OT, it was decided to insert a central vein catheter (CVC) in the right internal jugular vein (IJV). After placing the patient in the Trendelenburg position, right IJV was punctured using an 18 gauge needle. The guidewire was inserted through the needle without any appreciable resistance until arrhythmic beats started to show up on the 5 lead ecg monitor. After dilatation, a 7 French, triple lumen catheter was rail-roaded over the guide wire, and the guidewire removed. The catheter was fixed at 12 cms, following which all three ports were aspirated for free flow of venous blood. After successful aspiration of each port, it was flushed with normal saline and catheter was fixed with 2-0 silk sutures and sterile dressing done. No noticeable resistance, arrhythmia, or changes in vital signs were observed during the insertion of intravenous catheter. Intravenous fluids were uneventfully infused through this catheter. At the end of surgery, the patient was shifted to the intensive care unit intubated and sedated. 2 units of packed PRBCS were transfused over night through this catheter as well.

Postoperative chest x-ray revealed massive pleural effusion in right lung fields and the catheter tip at the 4rth intercostal space before the atrium. Due to the limited 2D image in a chest x ray, confirmation of catheter in SVC could not be made, and all intra venous fluids were stopped through this catheter.

An Ultrasonography (USG) chest was done and a diagnosis of pleural effusion with massive haemothorax was made, it was decided to do a therapeutic pleural tap. Pleural fluid was grossly red in colour and analysis showed red blood cells (56500/cu.mm), and white blood cells (500/cu.mm) with no evidence of necrosis, caseation, malignant cells or parasites. Subsequently, a decision to do CECT chest was made but due to the lack of peripheral IV access, a High Resolution Non-contrast Computed Tomography (HRCT) chest was done and confirmation was made that the Central venous catheter tip was lodged in the right pleural cavity. Afterwards, a right sided Intercostal drainage tube was inserted.

HRCT chest showed the course of the catheter just lateral to right brachio-cephalic vein abutting its lateral margin further coursing into the right pleural cavity with the tip of catheter seen within the pleural cavity at the level of D4 vertebra.

DISCUSSION

Numerous modalities are used for confirming accurate placement of central venous catheters with each modality having its own limits and impediments. X ray imaging is limited to only a two dimensional projection of the image. Ultrasonography is helpful in imaging initial vessel puncture but has restricted value for confirmation of tip position. Transoesophageal echocardiography, even though confirmatory, requires expertise and often is not readily available. CT scan with contrast remains the gold standard in confirmation of correct CVC placement and hence diagnosing misplaced CVC, but is expensive. Many factors may lead to change in catheter tip position such as respiration, intra vessel blood flow dynamics, rotation with posture and neck movements. This might lead to friction which can manifest in vessel erosion and perforation, commonly with left sided vascular structures because catheters are more likely to abut the right wall of superior vena cava at an acute angle. Female gender might be another risk factor for vascular erosion because of their smaller vessel diameters compared to male gender. (2) There can also be extravasation of fluid of hyperosmolar parenteral infusate is infused leading to endothelial damage and subsequent increase in vascular permeability causing effusion. Phlebitis because of infection can also wear out vessel wall which can lead to vessel perforation. (3) There has been a reported case of migration of the tip of CVC into pulmonary venous system with subsequent pleural effusion secondary to increased hydrostatic pressure. (4)

Also, the right border of superior vena cava, azygous, hemiazygos, and internal thoracic veins are immediately adjacent to the pleura. Damage to these or nearby arteries by guidewire or catheter erosion can cause significant bleeding into the low-pressure pleural space. If the catheter tip lies in the pleural cavity, then infusion of blood, blood products, Intra venous fluids, intra venous medication administration can lead to haemothorax or pleural effusion without any major bleeding as well. One important point of note is that if the catheter tip is misplaced into the pleural space and bleeding has occurred or if there has been a transfusion of citrated blood products through the catheter, then this blood might not clot and low-pressure blood may be aspirated freely back from the line. In our case, there could have been an injury to the vessel wall due to guide wire or dilator through which the catheter tip eroded into the pleural space over the next few hours as patient was shifted from operating room to the intensive care unit.

To prevent complications like these, following points should be kept in mind every time a CVC is introduced:

1. Aspiration of blood through all ports should be done.
2. Color of aspirated fluid should be noted.
3. If transducer is available, waveform consistent with intravenous placement should be confirmed.
4. X ray chest should be obtained prior to first time use and whenever there is suspicion of migration or misplacement.

Pulling out such misplaced catheters require careful consideration as this may lead to torrential haemorrhage if a vessel has been traversed. It is generally prudent to leave such catheters in place and consult with a vascular surgeon or interventional radiologists for assessment of further plan of action rather than hastily removing them and applying pressure at the access site. (5)

CONCLUSION

Although various modalities are available for correct placement of CVC, misplacement and migration are real possibilities to consider with potentially disastrous consequences. Every healthcare proceduralist providing central venous access should be aware of such complications and exercise precaution during use. During instances where CVC is suspected to have crossed through vessel wall or migrated, it is wise to consult vascular surgery or interventional radiology before removing the line.

Image 1. Chest scout image showing large right sided pleural effusion with shift of trachea and mediastinum along with catheter seen in right para vertebral location

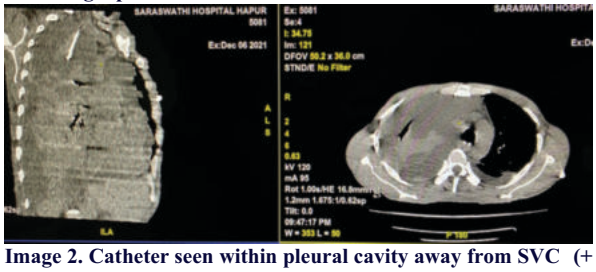

Image 2. Catheter seen within pleural cavity away from SVC (+ sign is marked on SVC)

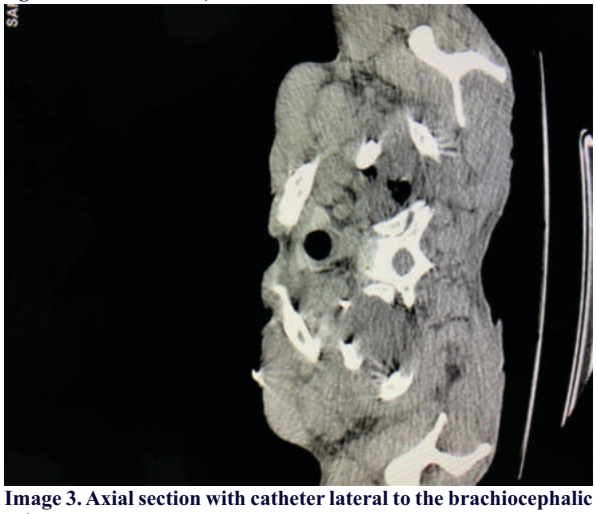

Image 3. Axial section with catheter lateral to the brachiocephalic vein

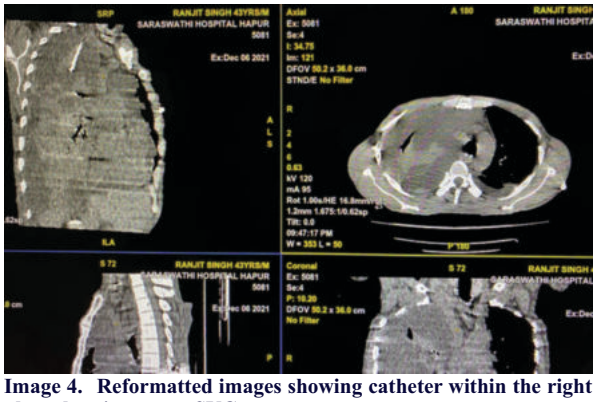

Image 4. Reformatted images showing catheter within the right pleural cavity star on SVC

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