



Malpositioned Central Venous Catheters: A Diagnostic Dilemma

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Abstract

Central venous cannulation is routinely done to infuse inotropes, for measuring central venous pressure, for total parenteral infusion, for large-bore venous access, and for infusing chemotherapeutic drugs. Various complications like pneumothorax, hemothorax, chylothorax, malposition, and fracture of catheters are described after central venous cannulation. Malpositioning of a central venous catheter into an anomalously draining left-sided pulmonary vein is a rare complication. We report a case of a patient presenting for carotid body tumor excision in whom the central venous catheter was malpositioned who was found to have a partial anomalous pulmonary venous drainage of the left lung.

Keywords: central venous cannulation, malpositioned central venous catheter, partial anomalous pulmonary venous connection

Introduction

Central venous cannulation is routinely done to infuse inotropes, for measuring central venous pressure, for total parenteral infusion, and for infusing chemotherapeutic drugs. Various complications like pneumothorax, hemothorax, chylothorax, malposition, and fracture of the catheter are described after central venous cannulation.¹ The ideal position of the catheter tip is at the superior vena cava (SVC)-right atrial junction or lower third of the SVC.² Although incorrect positioning of the catheter tip in the ipsilateral internal jugular vein (IJV) is most common (5.4%), catheter tip placements in the contralateral IJV through left innominate vein, left internal mammary vein, azygous vein, hemiazygos vein, lateral thoracic vein, inferior thyroid vein, left superior intercostal vein, thymic vein, ipsilateral arm vein, and the jugular foramen have been reported.²⁻⁶ We report a case of malposition of a central venous catheter (CVC) in a partial anomalous left-sided pulmonary vein draining into a left

innominate vein. Normally, pulmonary veins drain into the left atrium. Anomalously they may drain into the innominate vein, SVC, coronary sinus, inferior vena cava, or into the hepatic veins. Partial anomalous pulmonary venous drainage is a rare condition wherein a few pulmonary veins drain into a major systemic vein and the rest normally drain into the left atrium. There are various methods, like echocardiography, ultrasound, fluoroscopy, EKG-guided CVC insertion, induction of atrial arrhythmias, postinsertion chest radiograph, recording pressure waveform, and measuring central venous pressure (CVP) to confirm the position of the CVC tip. One of these methods should be used to prevent malposition of a CVC and its consequences. This case report was approved for publication by our institutional ethics committee. The patient and her family reviewed the case report and gave written consent for publication.

Case Report

A 25-year-old woman presented with swelling in the right side of the neck associated with pain that had lasted 2 months. It was gradually increasing in size and tenderness. No comorbidities were present. She was evaluated and determined to have a carotid body tumor and was scheduled to undergo excision under general anesthesia. No past history of any cardiac illness was reported. Because the patient had thin peripheral

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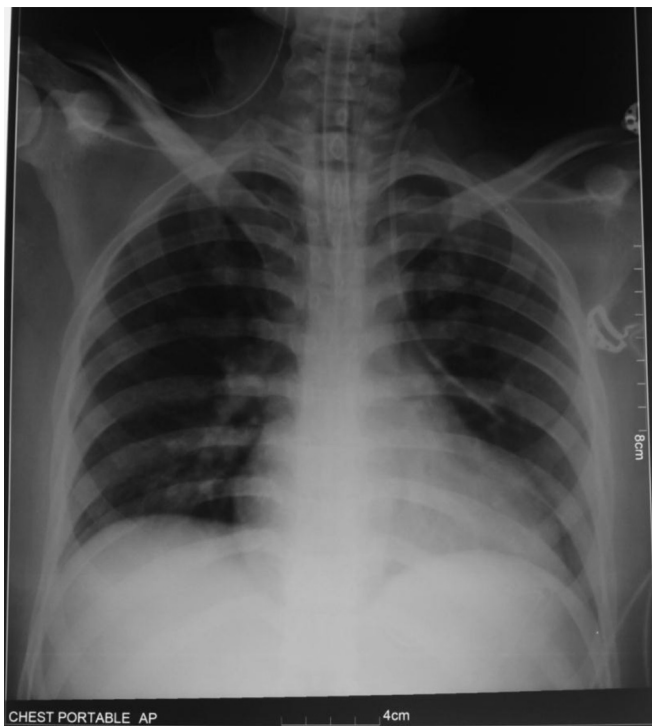


Figure 1. Chest radiograph posterior-anterior view showing malpositioned central venous catheter pointing toward the left pleural cavity and outside pericardial cavity without pleural effusion.

veins, it was major surgery with the risk of injuring the internal carotid artery that could result in massive hemorrhage. There was also risk that the patient could develop severe bradycardia during manipulations of the tumor, so a central line was inserted into the left IJV using the landmark technique after the induction of general anesthesia. Although ultrasound-guided central venous cannulation is the standard of care, at our institution we practice both the landmark technique and ultrasound-guided central venous cannulation as per institute policy. Aspirate was slightly brighter, but when transduced the waveform was similar to venous and 16 cms of water pressure was recorded (normal CVP is 8-12 cm water). We routinely confirm the position of the tip of a catheter using transesophageal echocardiography intraoperatively, but it was not used in this patient, so we confirmed the position by recording the pressure waveform and CVP, which may not be always accurate. EKG-guided CVC positioning is not practiced in our hospital because it is expensive and time-consuming.

The intraoperative period was uneventful. A routine chest radiograph (Figure 1) was done in the postoperative intensive care unit showing the malpositioned CVC. The CVC tip was pointing toward the left plural cavity and it was outside the left pericardial margin. No pleural effusion was detected. From all the 3 lumens blood was aspirated, and it appeared to be bright. An arterial blood gas was done that resembled the arterial sample. But the pressure was 16 cms of water

and the waveform resembled a venous trace. Ultrasound of the neck showed that the CVC was in the left IJV. Transthoracic echocardiography showed right atrial and ventricular volume overload, 6 mm ostium secundum atrial septal defect with mild pulmonary hypertension, left-sided pulmonary veins draining anomalously to left innominate vein, right-sided veins were draining into the left atrium, good biventricular function, and no pericardial effusion. We concluded that the CVC was probably malpositioned in an abnormal systemic-pulmonary collateral and we removed the CVC. The patient underwent an angiogram before discharge that showed that her left-sided pulmonary veins joined to form a vertical vein that was draining into the left innominate vein (Figures 2 and 3 and the Video; Video available at www.avajournal.com). The patient was referred to a cardiologist for further evaluation.

Discussion

Central venous cannulation is routinely done to infuse inotropes, for measuring central venous pressure, for total parenteral infusion, for large-bore central venous access, and for infusing chemotherapeutic drugs. Various complications like pneumothorax, hemothorax, chylothorax, malposition, and fracture of the catheter are described after central venous cannulation.¹ The ideal position of the catheter tip is at the SVC-right atrial junction or lower third of the SVC.² Although incorrect positioning of the catheter tip in ipsilateral IJV is most common (5.4%), catheter tip placements in the contralateral IJV through the left innominate vein, left internal mammary vein, azygous vein, hemiazygos vein, lateral thoracic vein, inferior thyroid vein, left superior intercostal vein, thymic vein, ipsilateral arm vein, and the jugular foramen have been reported.²⁻⁶ If it perforates the vein it may enter the pleural



Figure 2. Angiogram showing left pulmonary veins joining to form a vertical vein and then draining anomalously into the left innominate vein. LUPV = Left upper pulmonary vein; LLPV = Left lower pulmonary vein; CVC = Central venous catheter; VV = Vertical vein; IV = Innominate vein.

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