

Left Internal Jugular Vein Dissection with Anterior Mediastinal Placement Following Hemodialysis Catheter Insertion

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ABSTRACT

We report a case of a 68-year-old woman with end stage renal disease in whom the placement of ultrasound-guided left internal jugular vein hemodialysis catheter was extraluminal. Slight flow restriction was noted through the arterial side of the catheter towards the end of the hemodialysis session and subsequent CT scan and venography revealed extraluminal placement of the line with probable clotting of the distal tip. The line was removed carefully and was replaced with a longer catheter bypassing the rent in

the lumen of the left brachiocephalic vein. Although dissection of the internal jugular vein during hemodialysis cannulation is a rare complication, physicians who place these catheters should be careful. Higher incidence of complications has been reported with left internal jugular vein and it should not be the first preference. The placement of the catheter and location of its tip should always be confirmed with a radiograph or by fluoroscopy.

Keywords: Hemodialysis; Internal Jugular Vein; Venography

INTRODUCTION

Placement of an ultrasound-guided internal jugular vein temporary hemodialysis catheter for end stage renal disease is a fairly common procedure. Usually the right internal jugular vein is cannulated owing to the ease of cannulation and reduced rate of complications [1]. However the right-sided internal jugular cannulation is sometimes not feasible due to various factors, such as intraluminal thrombus; in such cases, cannulation of left-sided internal jugular vein is an obvious choice. We report a case where an ultrasound-guided left-sided hemodialysis catheter placement, confirmed by chest X-rays, was subsequently found to be extraluminal. Interestingly, as there was no flow restriction through both catheter ports with free flow of blood on flushing and aspiration, hemodialysis was commenced. Close to the end of the hemodialysis session, a slight flow restriction was noted through the arterial port of the dialysis catheter. Subsequent CT scan and venography revealed extraluminal placement of the line with probable clotting of the terminal (distal opening) tip. The line was removed carefully in the arterial

catheterization laboratory and was replaced with a longer catheter bypassing the rent in the lumen of the left brachiocephalic vein. A literature review of venous catheter misplacements with emphasis on the left-sided jugular vein cannulation follows the case report.

CASE HISTORY

A 68-year-old ambulatory female was referred for placement of internal jugular hemodialysis catheter. On ultrasound, a partially obstructive thrombus was noted in the right internal jugular vein and hence the left internal jugular vein was chosen for catheter placement. Two attempts by a resident to insert a left-sided 12 French Surgimedik™ flexicath straight dual lumen dialysis catheter failed owing to resistance beyond approximately 5 cm of guide wire insertion. An experienced intensivist inserted the catheter under ultrasound guidance using a high approach. Very minimal resistance was encountered during the procedure. Review of chest X-ray (Figure 1) showed proper line placement. Moreover, blood flow from both ports was optimal and hemodialysis was commenced.

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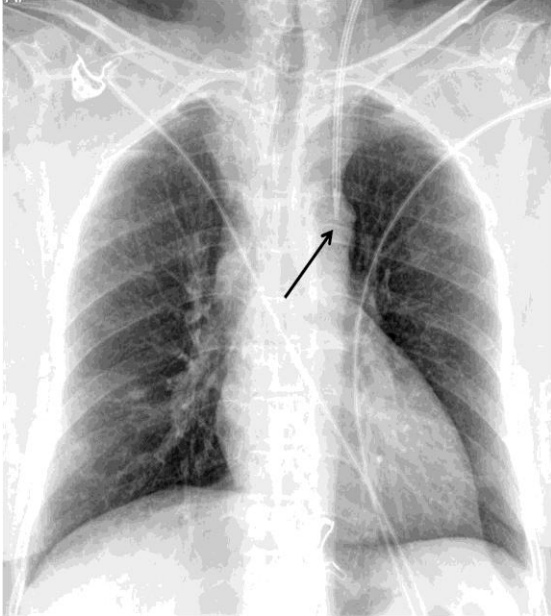
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Figure 1: Chest radiograph with left-sided catheter not crossing the midline



However, towards the end of the first 4-hour hemodialysis session, the flow through the arterial side of the catheter seemed to deteriorate. A CT scan (Figure 2) to investigate the cause found an extraluminal placement of the catheter and a venography in the angiocath lab revealed no flow through the distal lumen but reasonable flow

Figure 2: CT scan of the extraluminal position of the catheter



Figure 3: Extraluminal track visualized on angiography



through the laser cut side lumens when flushed (Figure 3). The tip of the catheter was withdrawn and venogram found a linear streak of contrast outside the lumen of left brachiocephalic vein. The venogram was repeated twice at the interval of 15 minutes. There was no change in the appearance of extraluminal leak. A dissection flap was appreciated on venogram. Subsequently, the existing catheter was removed in a staged manner with 14mm balloon catheter for tamponade as standby (in case of torrential bleed) and a fresh left-sided dialysis internal jugular vein catheter of 12 French and 23 cm length was placed under fluoroscopic guidance without complications. Post procedure CT scan did not reveal any evidence of hematoma in the mediastinum. Patient made an uneventful recovery after the procedure.

DISCUSSION

Pneumothorax, hydrothorax, carotid artery puncture, hematoma, mediastinal extrusion and air embolism are immediate complications with placement of venous catheter in the internal jugular vein. The frequency of complications generally depends on the operator experience. Dialysis catheters are of wider diameters and often firmer than usual central venous catheters and hence may have higher incidences of

complications.

Misplaced central venous catheters have a reported incidence of 1.4-30% and this rate is higher in the catheters placed in the left internal jugular vein [2] [3]. Several factors make the left internal jugular vein a less optimal site for central venous catheterization as compared to the right vein. The higher cupola of the left lung pleura increases the risk of pneumothorax with left-sided cannulation. The left internal jugular vein is smaller in diameter in 34% adults and more closely overlaps the carotid artery as compared to the right side [4]. The left internal jugular venous cannulation is associated with a higher proportion of malposition as compared to the right side as a result of near transverse course of the left brachiocephalic vein. Hence, catheters inserted from the left side of the patient must traverse the brachiocephalic vein and enter the superior vena cava perpendicularly. That means the “firm” dialysis catheter needs to negotiate two nearly 90 degree bends for correct placement [5]. The distal tip may impinge on the right lateral wall of the superior vena cava, thereby increasing the risk of vascular injury [6]. Cannulation of the left superior intercostal vein has been reported in literature [7]. The thoracic duct enters at the junction of the left internal jugular and the subclavian veins. Reports of thoracic duct injury after attempted left internal jugular cannulation have also been reported [8] [9]. Others have reported a case of cardiac tamponade after left internal jugular cannulation [10]. Moreover, a larger proportion of intensivists and anesthetists routinely cannulate the right internal jugular vein and hence may be less comfortable with the left side.

Using the anatomical landmark-based blind cannulation approach, the reported incidence of failure to place a catheter or incorrectly placed catheter is 19% with left internal jugular vein as compared to 3% with the right vein [11]. In a prospective randomized study of 120 patients, left internal jugular vein cannulation not only took longer than right vein cannulation but was also associated with higher incidence of complications [12]. In the same study, use of ultrasound improved success rate and decreased the number of complications during internal jugular vein cannulation. Several other studies have confirmed the superiority of ultrasound-guided catheter placement approach over the landmark-based approach [13] [14] [15] [16]. The success of ultrasound-guided approach has prompted intensive care societies to strongly recommend the use of ultrasound for jugular vein

cannulation [17]. Left internal jugular catheters increase the incidence of central vein occlusions and left innominate vein occlusions leading to unilateral arm swelling and at times access ligation [18] [19].

In our case, the hemodialysis catheter had penetrated the wall of the brachiocephalic vein and entered the anterior mediastinum. There was dissection of the anterior wall of left internal jugular vein and this continued for a length of about 3cm before becoming extraluminal. However, the rent in the wall was similar to width of dialysis catheter with 1.5 cm extraluminal catheter as seen on CT scan. To our knowledge, such a dissection has not been reported in literature. We hypothesized that the occluded distal lumen prevented leak through the distal opening while the presence of side holes allowed dialysis to progress until the flow through the side holes became suboptimal due to clotting.

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