

Unexpected Pleural Effusion due to Vascular Erosion 48 Hours after Left Internal Jugular Venous Catheterisation. A Case Report

Kartik Munta¹, Rahul Amte¹, S Manimala Rao², Chetan G Shirodkar³

¹Consultant Intensivist, Department of Critical Care Medicine, Yashoda Multi-Speciality Hospital, Somajiguda, Hyderabad, Telangana, India,

²Director, Chief Intensivist, Department of Critical Care Medicine, Yashoda Multi-Speciality Hospital, Somajiguda, Hyderabad, Telangana, India,

³Director, Chief Intensivist, Department of Critical Care Medicine, Yashoda Multi-Speciality Hospital, Somajiguda, Hyderabad, Telangana, India

ABSTRACT

Ultrasound (USG) guided cannulation has been shown to decrease the rate of complications associated with insertion. Misplaced catheter tips causing vascular erosions have been seen though rarely, in spite of USG guided central venous catheter insertion. We present a case report of a misplaced catheter tip 24 h post left jugular vein catheterization caused due to the vascular erosion of superior vena cava. Acute onset of pleural effusion and color of pleural fluid created a dilemma regarding the cause of the effusion. The factors which can cause delayed vascular erosions of successful inserted catheter and differentiating between total parenteral nutrition extravasation and chyle have been elaborated in the case report.

Keywords: Central venous catheters, Catheter tip, Parenteral nutrition, Pleural effusion, Ultrasound, Vascular erosion

Corresponding Author: Dr. Kartik Munta, Department of Critical Care Medicine, Yashoda Multi-Speciality Hospital, Somajiguda, Telangana, Hyderabad, India, Phone: +91-9885263990. E-mail: kartikmunta@yahoo.com

INTRODUCTION

Central venous cannulation with ultrasound (USG) guidance has become a norm of safe practice in critical care units across the world.¹ Ease of administration of drugs, providing parenteral nutrition support, and helping in measuring central venous pressure makes insertion of central venous catheters widely practiced procedure across the intensive care units (ICU). With the increasing use of USG as a diagnostic and therapeutic aid in the practice of critical care, its role is rapidly growing every day. The rate of adverse events occurring during line insertions has decreased after the use of USG, henceforth making the use of USG a dictum of good clinical practice.²⁻⁵ There have been many reported cases in literature about catheter tip misplacement even after USG guided cannulation.⁵ Left internal jugular vein (IJV) cannulation is not a routinely preferred site of insertion for central venous catheters, but are performed in ICUs due to need for alternate sites for catheter changes in critically ill ICU patients to overcome catheters induced nosocomial bloodstream infections.

The incidence rates of misplaced tips are more when left sided catheterization is performed when compared to

the right-sided cannulations.^{6,7} Many reasons have been proposed to explain the reason for such occurrences in literature. Few of them include the increased angulation of approach of left IJV catheters with respect to the wall of superior vena cava increasing the chances of vascular erosion. The presence of thoracic duct on the left side causes chylothorax on its disruption and the smaller size of left IJV when compared to the right is also a causative factor.^{8,9} In the event of occurrence of acute onset of pleural effusions after central vein cannulation, the literature evidence suggests to consider the chance of vascular erosion as one of the causative factor.¹⁰ In the case report presented, post central vein cannulation in the patient developed acute onset pleural effusion within 48 h of insertion. The condition was diagnosed and treated promptly after undertaking an uneventful procedure. The chances of vascular erosion occurring are rare, never the less there is an impending need to considered such a diagnosis especially when left sided cannulations are performed even with USG guided technique. The case report explains about the reason of increased chances of vascular erosion especially seen in left sided cannulations, the precautions we need to consider and also sensitizes the fraternity to think of the diagnosis which would thereby help in avoiding

life threatening situations and aid in improved clinical outcomes.

CASE REPORT

A 66-year-old male patient on treatment for infective endocarditis diagnosed 20 days back and congestive heart failure with on-going treatment with antibiotics and diuretic and beta-blocker medications was admitted to our tertiary care ICU with complaints of abdominal pain and vomiting since 7 days. On evaluation, the patient was in sepsis with tachycardia, raised total leukocyte count of 16,000/cumm, heart rate 110/min, blood pressure 110/60 mm of hg, and raised body temperature. The patient was diagnosed with small bowel ischemia after contrast computed tomography (CT) scan abdomen. The patient was kept nil by mouth and was posted for emergency laparotomy. The patient underwent resuscitation for sepsis and decision was taken to insert a central venous catheter in view of fluid management and presence of congestive heart failure.

Left IJV cannulation under USG guidance was performed, and the position was checked on chest X-ray (Figure 1). Aspiration was confirmed from all the ports. The patient underwent exploratory laparotomy the same day and treated post-operatively in the surgical ICU. He received antibiotics, fluids, vasopressors, and total parenteral nutrition (TPN) through the central line post-operatively. Right jugular vein could not be cannulated in this particular patient due to improper visualization on USG also due to anatomical variation.

On day 2, the patient was extubated with stable vital signs without any signs of effusion. On day 3, the patient developed dyspnea and X-ray chest performed showed bilateral pleural effusion with right more than the left (Figure 2). USG thorax revealed massive pleural effusion on the right and mild effusion on the left side (Figure 3). The pleural tap showed white fluid which appeared like chyle at the very outset (Figure 4). Intercostal drain was placed on the right side showed drain of 1.8 L in first 12 h. The biochemical analysis of pleural fluid showed increased triglycerides, cholesterol, and glucose levels.

Saline flush test with two-dimensional echo performed revealed resistance in the lumen of distal port raising suspicion of misplaced tip. There was no backflow either, so CT chest plain was performed, which revealed the tip to be just protruding out of superior vena cava (Figure 5). The finding explained the cause to be extravasation of TPN due to the vascular erosion of catheter tip. The catheter was withdrawn and adjusted. The patient recovered and remained uneventful till the day of discharge on day 10 of ICU (Figure 6).

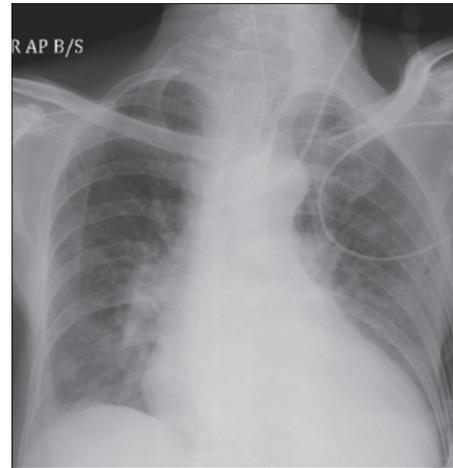


Figure 1: X-ray post central line insertion



Figure 2: X-ray showing bilateral pleural effusion



Figure 3: Ultrasound thorax showing pleural effusion

DISCUSSION

A central line is used for administering drugs, parenteral nutrition, and central venous pressure monitoring. Central venous catheterizations are performed nowadays



Figure 4: Pleural fluid collection



Figure 5: Computed tomography scan showing vascular erosion

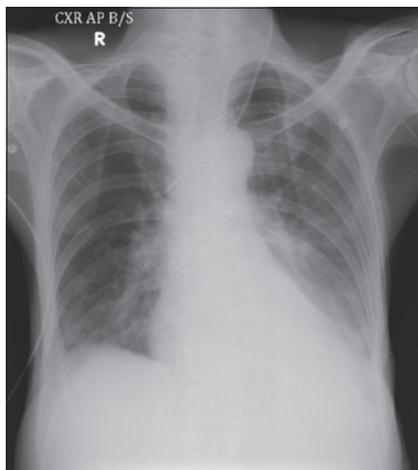


Figure 6: X-ray at time of discharge from intensive care units

with fewer rates of complications with increasing use of USG. Migration of catheter tips has been seen in the past due to anatomical variation, procedure related problems and patient-related factors. Rarely, catheter tips cause

vascular erosion and further complications. Literature search showed case reports reporting pleural effusion after few hours to few days after catheter insertion.¹¹

Duntley *et al.* observed the incidence of pleural effusion occurring the post insertion to be around 0.5%. Symptoms occurred 2.9 ± 0.8 days after catheter insertion. Maximum incidence was seen in left brachiocephalic vein catheters as they abutted right lateral wall of superior vena cava at an angle of approximately 45° .¹² Delay of 3 ± 1.5 days was noticed in identifying the diagnosis due to incorrect diagnosis made like pneumonia, fluid overload or pulmonary embolism.¹²

The median time of occurrence of vascular perforation was seen to be around 2 days.¹² 74% of them had left sided catheters, amongst the left side cannulations, left internal jugular were to the tune of 20% which was the second highest after left subclavian cannulation.¹² The most common complications due to vascular erosion were pleural effusion (79%) with bilateral effusions seen in 31%. The most common clinical symptom was dyspnea (82%) followed by chest pain (46%).¹² In the case report also, it took 2 days for erosion to occur, and the patient complained of dyspnea as presenting symptom.

Perforation chances increased with increasing degrees of perpendicular orientation of catheter with respect to superior vena cava wall.¹³ Progressive widening of superior mediastinum adjacent to catheter tip with obscuration of mediastinal structures is a characteristic roentgenographic feature of this complication and rarely do patients manifest with pleural effusion without this finding.¹⁴ Entrapment of catheter tips within ostium of azygous vein when entering superior vena cava and mechanical forces exerted by respiration along with flexion of neck against venous wall may cause vascular erosion.^{15,16} The angulation in our case was more than 45° and ventilatory driven forces could be the reasons for explaining vascular erosion.

Chyle is known to have high triglyceride, low cholesterol, and lower chylomicrons with glucose content not greater than blood glucose. The pleural fluid analysis showed high triglyceride concentration (310 mg/dl), high cholesterol levels (>325 mg/dl), and high glucose content (310 mg/dl) when the serum glucose was 180 mg/dl. The lab findings and acute onset of effusion within 24 h of starting TPN with CT chest proving vascular perforation concluded the origin of pleural fluid to be extravasation of TPN.

CONCLUSION

The left sided catheters are fraught with complications such as vascular erosion and misplacements due to

reasons explained above. They should be avoided as far as possible. The routine practice of aspiration of ports must be practiced before starting any infusions. Inability to do so should raise a suspicion of misplaced catheter tip which could avoid further complications. In case of placement of left sided catheters, care must be taken to determine the angulation of the tip and length of insertion should be adjusted to position the catheter end lies parallel to the superior vena cava.

ACKNOWLEDGMENTS

We gratefully acknowledge the management of the hospital for their valuable support.

REFERENCES

1. American Society of Anesthesiologists Task Force on Central Venous Access, Rupp SM, Apfelbaum JL, Blitt C, Caplan RA, Connis RT, *et al.* Practice guidelines for central venous access: A report by the American Society of Anesthesiologists Task Force on Central Venous Access. *Anesthesiology* 2012;116:539-73.
2. Lamperti M, Bodenham AR, Pittiruti M, Blaivas M, Augoustides JG, Elbarbary M, *et al.* International evidence-based recommendations on ultrasound-guided vascular access. *Intensive Care Med* 2012;38:1105-17.
3. Troianos CA, Hartman GS, Glas KE, Skubas NJ, Eberhardt RT, Walker JD, *et al.* Guidelines for performing ultrasound guided vascular cannulation: Recommendations of the American society of echocardiography and the society of cardiovascular anesthesiologists. *J Am Soc Echocardiogr* 2011;24:1291-318.
4. Troianos CA, Hartman GS, Glas KE, Skubas NJ, Eberhardt RT, Walker JD, *et al.* Special articles: Guidelines for performing ultrasound guided vascular cannulation: Recommendations of the American society of echocardiography and the society of cardiovascular anesthesiologists. *Anesth Analg* 2012;114:46-72.
5. Blaivas M. Video analysis of accidental arterial cannulation with dynamic ultrasound guidance for central venous access. *J Ultrasound Med* 2009;28:1239-44.
6. Malatinský J, Kadlic T, Májek M, Sámel M. Misplacement and loop formation of central venous catheters. *Acta Anaesthesiol Scand* 1976;20:237-47.
7. Deitel M, McIntyre JA. Radiographic confirmation of site of central venous pressure catheters. *Can J Surg* 1971;14:42-52.
8. McGee WT, Mallory DL. Cannulation of the internal and external jugular veins. *Prob Crit Care* 1988;2:217-41.
9. Lobato EB, Sulek CA, Moody RL, Morey TE. Cross-sectional area of the right and left internal jugular veins. *J Cardiothorac Vasc Anesth* 1999;13:136-8.
10. Bach A. Complications of central venous catheterization. *Chest* 1993;104:654-5.
11. Westermann SA, Pahlplatz PV, Brouwers MA. Timeline of cellulitis and late development of hydrothorax induced by a right-sided central venous catheter: Report of a case. *JPEN J Parenter Enteral Nutr* 2010;34:341-3.
12. Duntley P, Siever J, Korwes ML, Harpel K, Heffner JE. Vascular erosion by central venous catheters. Clinical features and outcome. *Chest* 1992;101:1633-8.
13. Okada A, Takehara H, Murakami H, Kita Y, Komi N. Pleural effusion with intimal injury of superior vena cava caused by central venous catheter: Report of a case. *Tokushima J Exp Med* 1987;34:113-8.
14. Usselman JA, Seat SG. Superior caval catheter displacement causing bilateral pleural effusions. *AJR Am J Roentgenol* 1979;133:738-9.
15. Kapadia CB, Heard SO, Yeston NS. Delayed recognition of vascular complications caused by central venous catheters. *J Clin Monit* 1988;4:267-71.
16. Wechsler RJ, Byrne KJ, Steiner RM. The misplaced thoracic venous catheter: Detailed anatomical consideration. *Crit Rev Diagn Imaging* 1984;21:289-305.

How to cite this article: Munta K, Amte R, Rao SM, Shirodkar CG. Unexpected Pleural Effusion due to Vascular Erosion 48 Hours after Left Internal Jugular Venous Catheterisation. A Case Report. *Int J Adv Health Sci* 2015;2(3):15-18.

Source of Support: Nil, **Conflict of Interest:** None declared.