

Central Venous Catheter Malposition into the Left Internal Mammary Vein in Patient with Coagulation Disorder and Safe Removal: A Case Report

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Abstract

Case Report

A 61-year-old male patient with underlying diseases of hypertension and alcoholic liver cirrhosis was hospitalized for liver transplantation due to advanced liver cirrhosis. In preparation for liver transplant surgery, a multi-lumen access catheter and Swan-ganz catheter are inserted into the right internal jugular vein. And another central venous catheter is inserted into the subclavian vein for central venous pressure measurement and drug administration. There was no abnormal resistance of the guide wire or catheter that the operator could feel during the insertion process, and there was no abnormality in the function of the catheter. But the postoperative chest image showed that the left subclavian central vein catheter was malpositioned. Through venography at the angiography room, it was confirmed that the central venous catheter was inserted into the left internal mammary vein. Since the patient with coagulation disorder, special attention was required to remove the catheter. In addition, due to the location of the internal mammary vein, it was expected that it would be difficult to compress for hemostasis after removal of the catheter. Therefore, it was necessary to check the patient's coagulation test to determine the appropriate time of the catheter removal and cooperation of the radiologist.

Keywords: Central venous catheter malposition, central venous catheter removal, patients with coagulation disorder.

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INTRODUCTION

Central venous catheter (CVC) is used for high-risk drug administration, renal replacement therapy, parenteral nutrition, massive blood transfusion, and cardiac catheterization (Tan & Gibson, 2006) [1]. Central venous catheterization is an essential technique for the management of high-risk patients (Polderman & Girbes, 2002) [2]. The CVC can be placed in the internal jugular vein(IJV), subclavian vein(SCV), or femoral vein(FV). Complications that may occur during catheterization include pneumothorax, arterial puncture, vascular injury, nerve damage, chylothorax, thrombosis, malposition, air embolism, and arrhythmia (Polderman & Girbes, 2002; Ruesch *et al.*, 2002) [2, 3]. Among them, malposition of CVC is a relatively common complication (5.01%) (Ambesh *et al.*, 2001; Gibson & Bodenham, 2013) [4, 5]. According to a prospective cohort study, the rates of access site choice for central venous catheterization were 63.2% for the right IJV, 17.7% for the right SCV, 6.4% for the left IJV, and

2.3% for the left SCV. Along with that, the rates of malposition for each site were 1.36% for the right IJV, 9.05% for the right SCV, 3.84% for the left IJV, and 2.7% for the left SCV. Between the right and left side approaches, the rate of occurrence of malposition was 3.05% for the right, and 3.54% for the left, which showed a higher probability of abnormal position when inserted to the left (Pikwer *et al.*, 2008) [6].

We report a rare case of a CVC malposition in the left internal mammary vein (IMV) during catheterization through the left SCV in a cadaveric donor liver transplant patient and also discuss how to safely remove the malpositioned CVC in patients with coagulation disorders.

CASE REPORT

A 61-year-old male patient with underlying diseases of hypertension and alcoholic liver cirrhosis was hospitalized for liver transplantation due to

advanced liver cirrhosis. He slipped down while hospitalized and was broken his left femur. He suffered an acute kidney injury after hemiarthroplasty of the hip joint. His model for end-stage liver disease (MELD) score rose, so he underwent an emergency cadaveric liver transplantation. In preparation for liver transplant surgery, a multi-lumen access catheter (MAC), Arrowgard Blue® (Teleflex; North Carolina, USA), and Swan-ganz catheter are inserted into the right IJV for massive transfusion during cadaveric liver transplantation. Another CVC, Arrowgard Blue Plus®, (Teleflex; North Carolina, USA) is inserted into the right SCV for central venous pressure measurement and drug administration. A perm catheter, Arrowgard Blue® hemodialysis catheter (Teleflex; North Carolina, USA) with a large internal diameter is inserted on the left IJV for venous-venous bypass, which may be needed during liver transplantation.

The patient was undergoing continuous renal replacement therapy (CRRT) due to acute kidney injury (AKI) after hip surgery. A triple lumen 7Fr CVC was inserted in the right internal jugular vein, and a perm catheter (Teleflex; North Carolina, USA) was placed in the left internal jugular vein. After induction of anesthesia, a CVC of the right IJV was removed and a MAC was inserted. The insertion of a CVC into the right SCV for the central venous pressure measurement and drug administration was failed. Therefore, a CVC, Arrowgard Blue Plus® (Teleflex; North Carolina, USA) was inserted into the left SCV.

Left SCV was punctured with sonographic guide, there was no abnormal resistance of the guide wire or catheter that the operator could feel during the insertion process. And there were no abnormalities in the function of the catheter, such as blood aspiration, saline infusion and central venous pressure measurement, after insertion.

The postoperative chest image showed that the left SCV catheter was malpositioned (Fig 1). Through venography at the angiography room, it was confirmed that the CVC was inserted into the left IMV (Fig 2). The catheter was safely removed in cooperation with the radiologist (Fig 3).



Fig 1: Postoperative chest x-ray

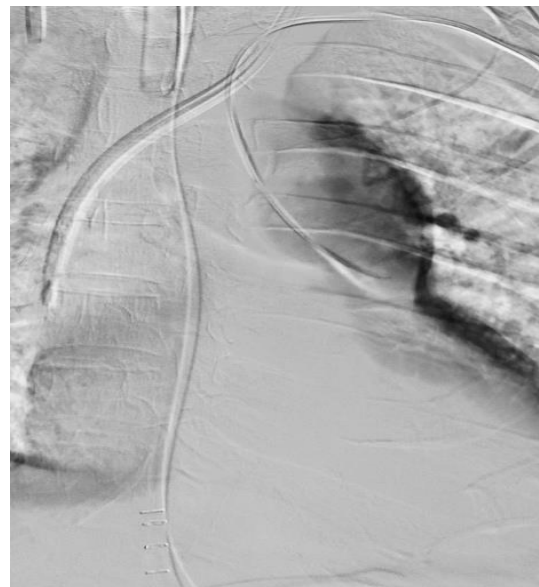


Fig 2: A venogram to confirm the catheter position



Fig 3: Catheter removal using angiography

DISCUSSION

Among the complications that may occur during CVC insertion, malposition of CVC is a relatively common complication (5.01%) (Ambesh *et al.*, 2001; Gibson & Bodenham, 2013) [4, 5]. Among them, it is very rare that the catheter is placed through the IMV, and according to the study, CVC inserted into the thoracic cavity from the left SCV accounted for 0.61% of the total (Pikwer *et al.*, 2008) [6]. The IMV runs medial to the internal mammary artery. In the 3rd and 4th intercostal space, it is divided into an inner branch and an outer branch (Arnez *et al.*, 1995) [7]. The catheter inserted into the patient's left SCV was Arrowgard Blue Plus® with a diameter of 7Fr (2.33mm). In general cases, it is not easy for the catheter to be inserted in IMV because the operator will feel resistance when inserting the guide wire or catheter. The patient in this case had portal hypertension caused by severe liver cirrhosis, and the IMV might be engorged, so the operator could not feel any discomfort during insertion of the guide wire or the catheter.

Complications related to the placement of a CVC in the IMV include laceration of the IMV with massive hemothorax (Eulmesekian *et al.*, 2007) [8]. In order to prevent from occurring such a serious complication, it is recommended to remove the catheter under radiologic monitoring when the catheter was placed in the IMV (Wang *et al.*, 2016) [9]. In cooperation with the radiologist, the catheter was removed safely by venography.

Since this case was the patient with coagulation disorder (PT 48%, INR 1.69, and aPTT 53.2sec), special attention was required to remove the catheter. In addition, due to the location of the internal mammary vein, it was expected that it would be difficult to compress for hemostasis after removal of the catheter (Drewett, 2000) [10]. Therefore, it was necessary to check the patient's coagulation test to determine the appropriate time of the catheter removal. After liver transplantation, the PT level was prolonged until the post operative day (POD) 1, but decreased thereafter and maintained the normal range (11s-13s) from the POD 5. The aPTT was within the normal range (20s-35s) from POD 1 (Stahl *et al.*, 1990) [11]. Fibrin sheath begins to form on the catheter surface and vessel wall 24 hours after catheter placement, attaches the catheter to the vessel wall, making it difficult to remove, and forms a full-length sleeve in 5-7 days (Faintuch & Salazar, 2008) [12]. Therefore, we checked the patient's blood test results on the POD 3, which is considered to be the most appropriate time for PT/PTT values to approach to the normal level before the formation of the full-length sleeve fibrin sheath.

It has been studied that the use of ultrasound assistance to place the CVC can reduce 80% of the occurrence of catheter malposition (Ablordeppey *et al.*,

2017) [13]. In this case, the ultrasound was used for the SCV puncture, but it was not confirmed whether the guide wire was accurately positioned in the brachiocephalic vein. When inserting a CVC on the left side, it is necessary to check whether the guide wire is located in the brachiocephalic vein with bedside ultrasound or other imaging examination to confirm the position of the catheter immediately after insertion.

CONCLUSION

Methods for safely removing malpositioned catheter include: Remove the catheter moderately, Remove the catheter under radiographic monitor, Reposition under radiological guidance, Surgical removal (Wang *et al.*, 2016) [9]. Considering the location of the catheter and the condition of the patient, the most appropriate method for safe removal of CVC must be chosen.

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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