



## Vascular Interventions Case Report

# Subclavian vein injury during placement of the right internal jugular dialysis catheter

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### ABSTRACT

We present a case of a serious complication during placement of a tunneled central venous line due to rupture of the right subclavian vein and subsequent right hemothorax and hemomediastinum that warranted surgical intervention. The surgery was successful, however, the patient died of multiple comorbidities and multiorgan failure 4 days later.

**Keywords:** Central venous line, Subclavian vein, Tunneled dialysis catheter

### INTRODUCTION

Central venous lines are widely used in medicine for various indications, including fluid replenishment, medication and antibiotic administration, central pressure measurements, nutritional support, and renal dialysis. Central venous line placement comes with a risk, however. Although infection and thrombosis are the most common complications, other less common mechanical complications may occur.<sup>[1,2]</sup> These include venous injury, inadvertent arterial placement, and pleural or extrapleural line placement. Some of these complications can be life threatening due to the developments of events such as tension pneumothorax, hemothorax, hemopericardium with cardiac tamponade, hemomediastinum, or hypovolemic shock. The physician performing the procedure should be aware of these less common complications and prepared to manage them. Venous injury or rupture of the brachiocephalic or subclavian veins may be associated with injury to the pleural space and accumulating hemothorax, making it a potentially life-threatening complication. Herein, we report right subclavian vein injury during placement of a tunneled dialysis catheter through right internal jugular access complicated by hemomediastinum and right hemothorax.

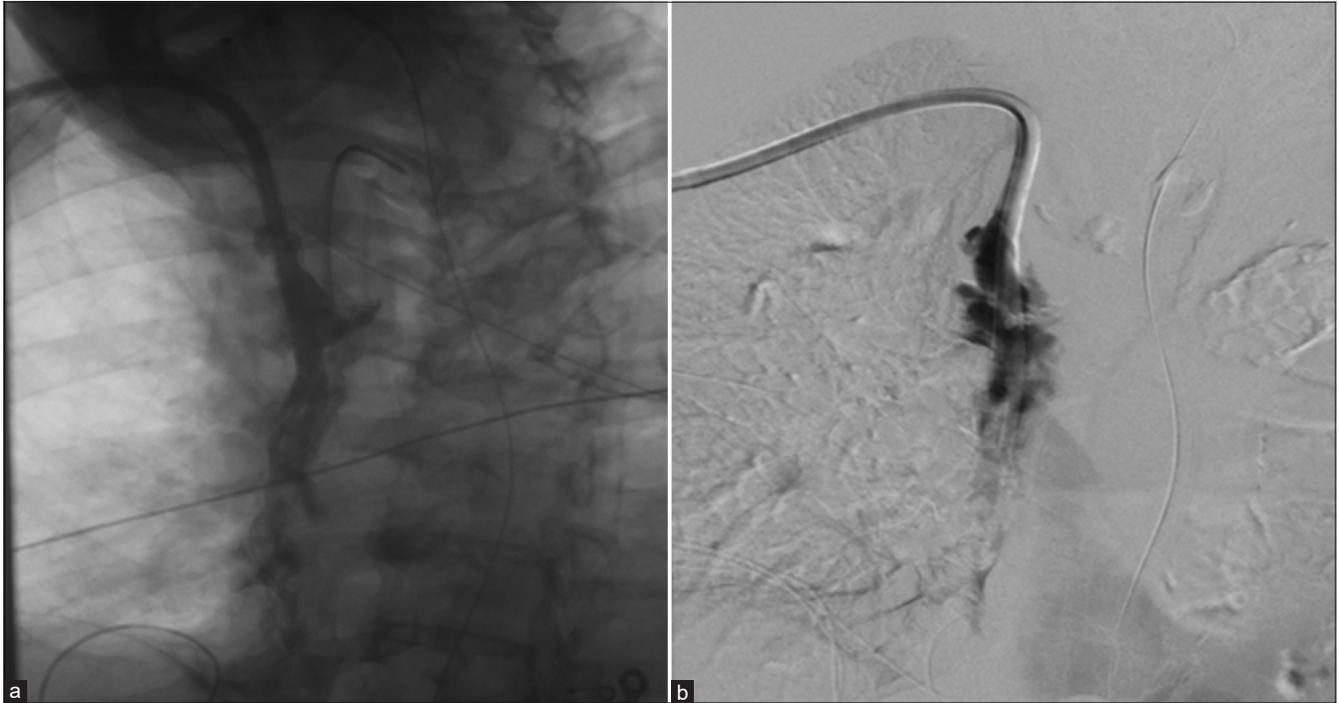
A few cases of venous rupture during placement of a central venous line using internal jugular access have been reported.<sup>[3-6]</sup> However, this is a rare case demonstrating injury to the right subclavian vein using internal jugular access.

### CASE REPORT

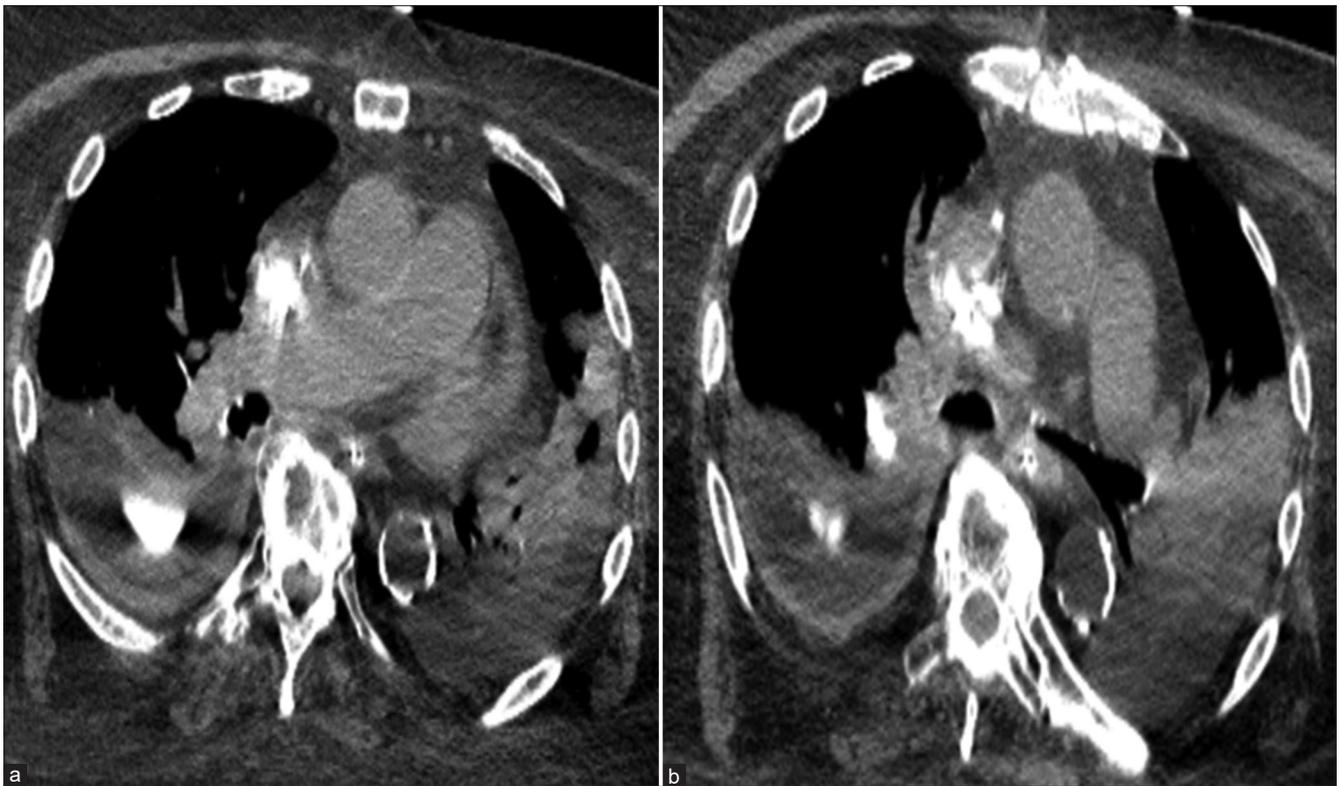
A 75-year-old man with renal cell carcinoma of the left kidney was admitted to the intensive care unit (ICU) of a comprehensive cancer center. The patient had a history of multiple comorbidities:

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**Figure 1:** A 65-year-old man with a history of the left renal cell carcinoma and chronic renal failure who was referred for tunneled dialysis catheter placement. (a) Non-subtraction image after injection of contrast through the catheter port showing extravasation of the contrast into the mediastinum. (b) A digital subtraction image confirming contrast extravasation within the mediastinum and right pleural space.



**Figure 2:** (a and b) CT scan images of the same patient (a 65-year-old man with a history of the left renal cell carcinoma and chronic renal failure who was referred for tunneled dialysis catheter placement) performed in the hybrid interventional radiology suite showing extravasation of the contrast agent with hemomediastinum and right hemothorax. The left basal lung consolidation with mild pleural effusion is also noted.

Systemic hypertension, diabetes mellitus, obstructive sleep apnea, chronic renal disease, and morbid obesity (body mass index of 44.26 kg/m<sup>2</sup>). Due to progressively worsening kidney function, he was referred to the interventional radiology department for placement of a tunneled dialysis catheter for long-term dialysis. The procedure was scheduled with general anesthesia support.

Under real-time ultrasound guidance, a 21-gauge needle was used to gain access into the right internal jugular vein. Using the Seldinger technique, the venotomy access was dilated and a 0.035" stiff wire was advanced down to the superior vena cava under fluoroscopic guidance. This was followed by dilation of the tract to accept a 16 French Peel-Away sheath.

Blunt dissection was used to create a tunnel for the dialysis catheter. The catheter was tunneled through the subcutaneous soft tissues to the lower left neck venotomy site. A 9 French Peel-Away sheath was advanced over the 0.035" guidewire. The catheter was advanced under fluoroscopic guidance with the tip positioned in the mid/upper right atrium. This was followed by an unsuccessful attempt to advance the dialysis catheter through the Peel-Away sheath, which was found to be kinked. Multiple attempts to straighten the sheath were not successful, given the patient's marked obesity, short neck, and fresh tracheostomy.

A guidewire was advanced coaxially through the dialysis catheter to keep the internal jugular access and retract the catheter. The 16 French sheath was replaced with an 18 French Peel-Away sheath through which the dialysis catheter was successfully advanced to the superior vena cava. However, an attempt to aspirate blood from the catheter was unsuccessful. Injection of contrast agent through the catheter demonstrated extravasation of contrast into the mediastinum and right pleural space [Figure 1]. At that time, we thought that the injury was at the superior vena cava level. A non-contrast computed tomography (CT) scan was performed in the interventional radiology suite for better assessment of the catheter position. The CT revealed penetration of the wall of the right subclavian vein at the confluence level, contrast extravasation into the mediastinum and right pleural space, and right hemothorax [Figure 2]. The anesthesia team confirmed the hemodynamic stability of the patient.

The thoracic surgical team was notified, and on the basis of their recommendation, a right femoral central line was placed before transferring the patient to the operating room for emergency surgery. The patient underwent median sternotomy, mediastinal exploration, and cardiopulmonary bypass. The patient received 12 units of blood during the surgery. A laceration was identified in the inferior aspect of the right subclavian vein just beyond its confluence with the right internal jugular vein. The laceration was sutured and the bleeding was controlled. Two 32 French surgical chest tubes were placed within the right pleural space to drain the accumulated blood. After surgery, the patient returned to the

ICU, where he spent 4 more days before dying of multiorgan failure.

## DISCUSSION

Venous line placement is a common procedure frequently performed by interventional radiologists and sometimes performed by ICU physicians, anesthesiologists, or emergency room teams.<sup>[7-9]</sup> Over the past two decades, the complication rate following central line placement has significantly decreased secondary to the use of ultrasound guidance for venous access.<sup>[8]</sup> Complications related to the procedure are classified according to the time of onset as acute complications (e.g., pneumothorax) and long-term complications (e.g., vein stenosis). Venous rupture and arterial puncture are acute complications with an incidence of <1%.<sup>[7-10]</sup>

In our case, the patient was morbidly obese, had a short neck, and had recently undergone tracheostomy surgery; all of these conditions are known to make venous line placement more difficult by causing kinking of the Peel-Away sheath and subsequent difficult advancing of the dialysis catheter. This necessitated further manipulation that led to injury of the inferior wall of the right subclavian vein and the development of hemomediastinum and right hemothorax.

Fortunately, the procedure was performed in a hybrid interventional radiology suite with general anesthesia team support. This setting allowed for an immediate CT scan to confirm the diagnosis and plan for surgery without losing any time. The support of the anesthesia team also ensured the hemodynamic stability of the patient before and during the patient's transfer to the operating room. Although the patient died 4 days later of multiorgan failure, the emergency surgery went very well and the patient was hemodynamically stable in the ICU.

## CONCLUSION

A few lessons were learned from this case. Although venous injury during central line placement is considered a rare complication nowadays, the performing physician should be aware of it as it is life threatening. Reviewing the images before the procedure for abnormal anatomical findings is crucial and helps the performing physician to foresee any technical challenges during the case. Second, assessment of the body habitus for characteristics such as obesity and a short neck, as well as awareness of recent neck surgery, recent neck radiation, or bulky neck tumors, is important in each case to predict difficulty during the procedure. Third, placement of a central line should be smooth, without any significant resistance, and the interventional radiologist should avoid using excessive force to overcome resistance while advancing wires, sheaths, or catheters, as this may lead to life-threatening injuries.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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