

Mediastinal Haematoma: A Rare Complication Following Insertion of Central Venous Catheter

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ABSTRACT

Mediastinal haematoma is a rare complication following insertion of central venous catheter, with few cases reported in the literature. We report a case of mediastinal haematoma in a 33-year-old male patient with end-stage renal disease. In this patient central venous catheter insertion through the right subclavian vein was attempted on the operation table for renal transplantation but the procedure was abandoned as the attempt was unsuccessful. Post-procedure chest radiograph showed a large mediastinal haematoma occupying right hemithorax that developed as a result of injury to the subclavian vein. Patient was managed conservatively and haematoma completely resolved in four weeks time. This case is being reported to signify the importance of routine obtaining a post-procedure chest radiograph and to state that even large mediastinal haematoma can be managed conservatively in asymptomatic patients.

[Indian J Chest Dis Allied Sci 2011;53:225-228]

Key words: Central venous catheter, Complications, Mediastinal haematoma, Conservative management.

INTRODUCTION

Central venous catheters are placed everyday in patients admitted to intensive care units, dialysis units and operation theaters, both for therapeutic and diagnostic indications. As with all other invasive procedures, central venous catheter placement is associated with number of recognised complications and strategies have been developed to minimise them. Complications due to the procedure may occur either during insertion of the catheter (e.g., arterial puncture resulting in bleeding, pneumothorax, cardiovascular side effects); and/or during maintenance of the line (e.g., infection, thrombosis or other mechanical risks). The use of post-procedure chest radiograph to confirm correct position of catheter and to detect other complications, such as, pneumothorax and haemothorax is routine practice.

We report a case of inadvertent mediastinal haematoma following insertion of a central venous catheter in a patient undergoing live-related renal transplantation and outcome of conservative management. *To the best of our knowledge this is an uncommon complication with few reports in the published literature.*¹⁻⁵

CASE REPORT

A 33-year-old male patient with end-stage renal disease, hypertension, on maintenance haemodialysis was taken up for live-related renal transplantation with his mother as the donor. Placement of a triple-lumen central venous catheter through the right subclavian vein was planned, to monitor intra-operative and post-operative central venous pressure and to guide the fluid therapy. The catheter was inserted with Seldinger technique under ultrasound guidance and guided over a guide wire after dilating the tract with a dilator. However, blood could not be aspirated through the catheter, so that procedure was abandoned. Instead, the catheter was inserted through left external jugular vein.

The surgical procedure of renal transplantation was uneventful and patient was haemodynamically stable and comfortable in post-operative period with a heart rate of 84 beats per minute, blood pressure of 138/84 mmHg, respiratory rate of 14 per minute, central venous pressure of 7cm of water, maintaining saturation of 100% on room air and good graft function and urine output.

As per our institutional protocol, the patient underwent a routine chest radiograph in post-operative period. To our surprise, there was a radio-

[Received: January 19, 2011; accepted after revision: June 2, 2011]

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opaque shadow in right hemithorax displacing right lung laterally (Figure 1).

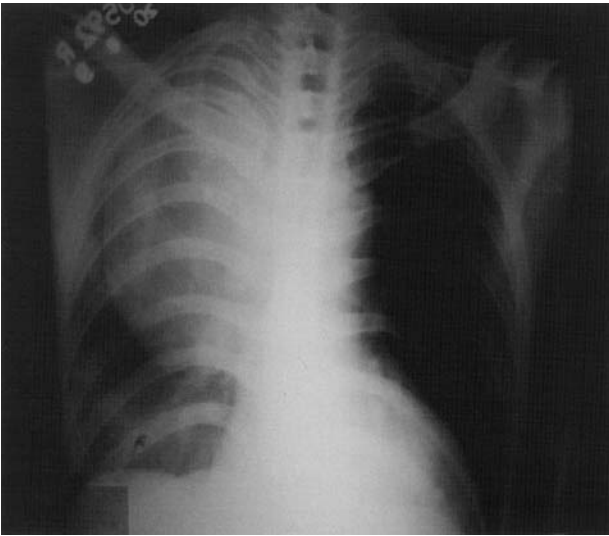


Figure 1. Chest radiograph (postero-anterior view) showing large radio-opaque shadow in the right hemithorax displacing right lung laterally.

Subsequently patient underwent contrast enhanced computed tomography (CECT) chest on which there was non-opacification of right subclavian vein with reflux of contrast into chest wall collaterals with 9cm×9cm×14cm sized well-defined heterogeneous lesion having the CT density ranging from 61 HU in the centre to 72 HU in the periphery in right para-vertebral region with collapse of adjacent lung parenchyma, suggestive of right mediastinal haematoma with injury to right subclavian vein (Figures 2 and 3).



Figure 2. CECT chest showing heterogeneous density measuring 9cm×9cm×14cm in the right para-vertebral region with collapse of adjacent lung parenchyma suggestive of right mediastinal haematoma.

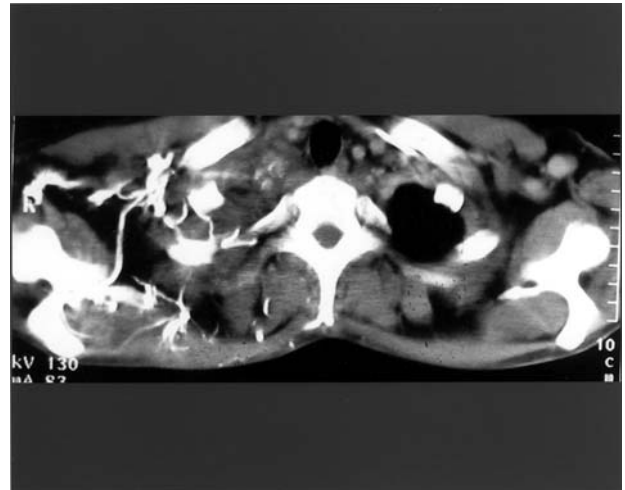


Figure 3. CECT chest showing non-opacification of the right subclavian vein and reflux of contrast into chest wall collaterals, suggesting right subclavian vein injury.

As the patient was immunosuppressed and was receiving triple immunosuppression with tacrolimus, prednisolone, and mycophenolate mofetil, and was asymptomatic, we kept a close vigil and managed the patient conservatively with repeated clinical examinations and chest radiography.

His stay at hospital was uneventful and was discharged as per protocol for discharge of renal transplant patients on 10th post-operative day. The patient was on follow-up and had undergone weekly chest radiographs, in addition to bi-weekly kidney function test and haemogram. Haematoma completely resolved in four weeks (Figure 4). He continues to be on regular follow up with us and is maintaining a serum creatinine level of 1.1mg/dL.



Figure 4. Chest radiograph (postero-anterior view) obtained four weeks later showing resolution of haematoma.

DISCUSSION

Since the introduction of central venous catheterisation to clinical practice in 1945, the technique has been widely used. Central venous catheters allow measurement of haemodynamic variables that cannot be measured accurately by non-invasive means and allow delivery of medications and nutritional support that cannot be given safely through peripheral venous catheters. Unfortunately, the use of central venous catheters is associated with adverse events that are both hazardous to patients and expensive to treat. More than 15% of patients who receive these catheters have complications.⁶ Mechanical complications are reported to occur in 5% to 19% of patients,⁶ infectious complications in 5% to 26%, and thrombotic complications have been observed in 2% to 26%.⁶

Vascular complications are most often related to the injury of the subclavian vein. Perforation of the subclavian artery occurs in less than 1% of cases,⁷ leading to haemothorax (1%) and rarely quadriplegia. Perforation of the aorta and cardiac tamponade can occur if the cannula-site perforation is within the pericardial reflection. This complication is associated with a 90% death rate.⁸ Pseudo-aneurysms, arterio-

venous fistulas and vertebral artery injuries are rare complications (0.2%).⁹ The fact that the right subclavian-jugular venous junction overlies the subclavian artery and the right subclavian vein enters the innominate artery at a sharper angle makes these vessels more vulnerable to perforation if a firm dilator is inserted too deeply.

Vascular complication during insertion of central line can be attributed to the unsafe manipulation of the dilators, some times even causing ventricular perforations. Other possible mechanism of injury include kinking of the guide wire, resulting in misdirection of the dilator and perhaps insertion of the guide wire outside the vessel.¹⁰ All these complications result from inexperience, the number of needle passes made, the use of relatively larger gauge needle, severe dehydration, morbid obesity and coagulopathy.

There are few reports in the literature (Table) documenting the occurrence of mediastinal haematoma following central venous line insertion. Development of hydromediastinum and bilateral hydrothorax after a subclavian line insertion has been described.¹ The patient became tachypnoeic, tachycardiac and hypotensive after central line insertion. The chest radiograph showed widening of

Table. Occurrence of mediastinal haematoma following central venous line insertion

Case No. ^{ref.}	Age (in years) and Gender (M/F)	Site	Clinical Features	Method of Diagnosis	Diagnostic Modality	Management	Outcome
1 ¹	28 M	Left subclavian vein	Tachycardia, hypotension, tachypnoea	Bilateral hydrothorax and hydromediastinum	Chest radiograph, Dye injection through central line	Insertion of bilateral intercostals drains for hydrothorax Hydromediastinum managed conservatively	Recovered
2 ²	51 M	Left subclavian vein	Dyspnoea, hypotension	Hydromediastinum and left hemothorax	Chest radiograph, CT chest	Conservative management	Death
3 ³	78 M	Right subclavian vein	Pain in shoulder, bradycardia	Pleural effusion and hydromediastinum	Fluoroscopy, CT chest, Angiography	Coil embolisation of IMA	Recovered
4 ³	75 M	Right subclavian vein	Tachycardia, hypotension, tachypnoea	Right sided pleural effusion Hydromediastinum	Angiography	Coil embolisation of IMA	Recovered
5 ³	22 M	Left subclavian vein	Asymptomatic	Hydromediastinum	Chest radiography	Coil embolisation of IMA	Recovered
6 ⁴	0.5 F	Left subclavian vein	Tachycardia, hypotension	Bilateral hydrothorax and hydromediastinum	Transoesophageal echocardiography, Chest radiograph	Insertion of bilateral intercostals drains for hydrothorax Hydromediastinum managed conservatively	Recovered
7 ⁵	55 M	Left subclavian vein	Hypotension	Hydromediastinum	CT chest, Angiography, Chest radiograph	Thoracotomy	Recovered
8 (Present case)	33 M	Right subclavian vein	Asymptomatic	Mediastinal haematoma	Chest radiograph, CT chest	Conservative	Recovered

IMA=Internal mammary artery

mediastinum and bilateral hydrothorax. Extravasation of radio-opaque dye inserted through the line into the mediastinum confirmed the diagnosis. The authors believed that injury of vein during cannulation by the dilator was the cause of hydromediastinum, as occurred in our case and shift of fluid from the mediastinum into the pleural cavities caused bilateral hydrothorax. Insertion of intercostal drains relieved the patient. In another report,² occurrence of mediastinal haematoma following insertion of left subclavian vein catheter for haemodialysis in patients with end-stage renal failure was documented.² The patient developed dyspnoea and hypotension, chest radiograph revealed large opacity covering the mediastinum and left hemithorax, as occurred in our case. Computed tomography (CT) of the chest confirmed the diagnosis of mediastinal haematoma and the patient died of hypovolaemic shock. The authors² suggested that guide wire penetrated the vein and caused the haematoma. Three cases of mediastinal haematoma following central venous line insertion through subclavian vein has also been reported.³ Haematoma was caused by iatrogenic injury of the internal mammary artery. Microcoil embolisation of the internal mammary artery was done to treat the patients. In another report,⁴ hydromediastinum in a 6-month-old girl following insertion of left subclavian vein catheter.⁴ The condition was diagnosed by transoesophageal echocardiography and was caused by dislocation of the central line. It was managed conservatively by removing the cannula. Posterior mediastinal haematoma causing tracheal obstruction after internal jugular cannulation has also been reported.⁵ Central venous and pulmonary artery (PA) catheters were inserted via the right internal jugular vein in a patient undergoing coronary artery bypass surgery. The patient began to experience progressive dyspnoea, orthopnoea and stridor on the second post-operative day. Chest CT revealed a posterior mediastinal haematoma behind the oesophagus that compressed the trachea and oesophagus. At thoracotomy there was no significant bleeding in the anterior mediastinum. A haematoma was found in the posterior mediastinum behind the oesophagus which was evacuated and the patient recovered. The authors assumed that haematoma was caused by malpositioning of the internal jugular catheter or guide wire into the azygos venous system.

We believe that hydromediastinum in our case was caused by the dilator, used to dilate the tract. Guide wire must have kinked, so when the dilator was

inserted it perforated the subclavian vein, which is the reason when cannula was inserted blood could not be aspirated, as the tip of the cannula was outside the subclavian vein. The complication was detected on the post-procedure chest radiograph. As patient was asymptomatic and immunocompromised, we decided not to intervene and had kept close vigil; the patient improved with this conservative approach.

In conclusion, meticulous surgical technique, awareness of the complications and close observation of the patient are necessary in the management of a central venous line. Routine post-procedure chest radiographs should be done. Mediastinal haematoma can be managed conservatively in asymptomatic patients.

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