DEPARTMENT OF RADIOLOGY

TEXAS TECH UNIVERSITY HEALTH SCIENCES CENTER Paul L. Foster School of Medicine

Thrombotic Septicemia: An important Complication of Central Venous Catheterization

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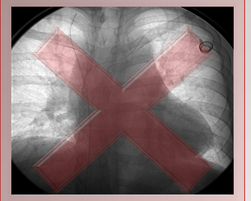
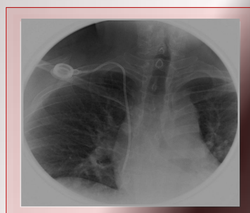


Fluoroscopic image at the time of the initial angiogram showing the culprit device in the left subclavian vein. This position is associated with a higher thrombotic risk than the right internal jugular position.



Fluoroscopic image of a chest port in the preferred insertion site: right internal jugular vein.

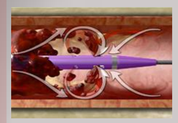
INTRODUCTION

Central venous catheters are commonly used for intravenous access in a myriad of clinical situations. Patients requiring long-term therapy, typically chemotherapy, often receive subcutaneous chest ports attached to such a catheter. Hemodialysis patients often require intravenous infusion catheters, either nontunneled ("temporary") or tunneled ("permanent"), as bridges to the preferred access routes of arteriovenous fistulas or grafts. These patients with long-term central venous devices are at particular risk for the infectious and thrombotic complications of invasive devices. These complications may be effectively treated given prompt diagnosis and appropriate management. This presentation reviews the potential complications of central venous access devices, discusses the management of catheter-related thrombotic septicemia, and offers recommendations to minimize the risk of such complications, e.g. avoidance of the subclavian approach.

CASE REPORT

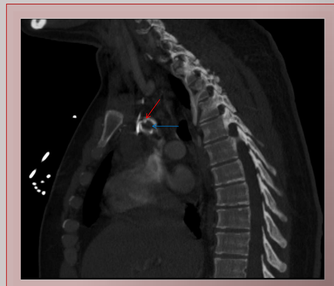
A 23-year-old male with mediastinal non-Hodgkin's lymphoma presented to the emergency department with neutropenic fever two weeks after chemotherapy. The patient had a left subclavian chest port for intravenous access. Blood cultures revealed methicillin-sensitive *Staphylococcus aureus* septicemia at the time of presentation. Chest CT showed multiple bilateral subpleural cavitary nodules consistent with septic emboli. The source was a catheter-related thrombus involving the left brachiocephalic vein and SVC. Management consisted of chest port removal and temporary SVC filter placement with concomitant intravenous antibiotics and heparin anticoagulation. Five days after the initial intervention, the patient underwent percutaneous thrombectomy with subsequent filter retrieval. This treatment led to venous recanalization and symptomatic improvement while the patient's white count normalized.

Examples of various chest ports and hemodialysis catheters used for central vein catheterization.

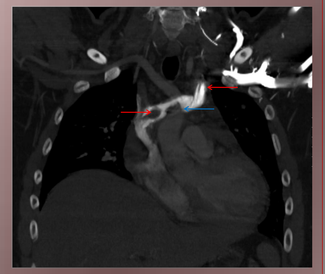


AngioJet technology creates a vacuum for fast and effective removal of a thrombus.

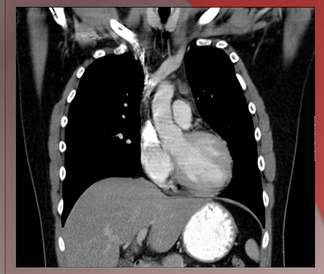
AngioJet Ultra™ thrombectomy device used 5 days after initiation of therapy.



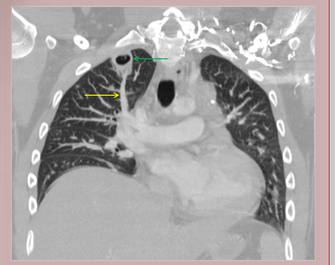
Sagittal image from the patient's initial chest CT angiogram showing the chest port catheter (red arrow) in the left brachiocephalic vein with a surrounding thrombus (blue arrow).



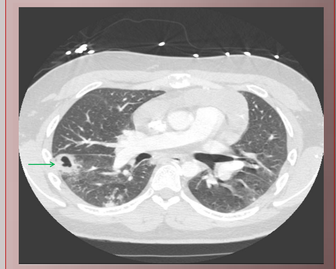
Coronal image from the patient's initial chest CT angiogram showing the chest port catheter (red arrow) in the left brachiocephalic vein with a surrounding thrombus (blue arrow).



IV contrast-enhanced chest CT performed 6 weeks after thrombectomy documents patency of the left brachiocephalic vein.



Coronal image (lung windows) from the patient's initial chest CT angiogram showing a cavitary subpleural lesion (green arrow) with a proximal feeding pulmonary artery (yellow arrow), findings consistent with an embolic septic pulmonary infarction. The patient had multiple similar lesions in both lungs.



Axial image (lung windows) from the patient's initial chest CT angiogram showing a different cavitary subpleural lesion (green arrow). This is an embolic septic pulmonary infarction. The patient had multiple similar lesions in both lungs.

Fluoroscopic image obtained at the time of placement of a superior vena cava (SVC) filter. This was placed to reduce the patient's risk of additional septic emboli while antibiotic therapy and heparin anticoagulation were relieving the septicemia and thrombotic nidus respectively.

Fluoroscopic images 5 days later showing filter retrieval. At this time the patient had negative 48 hour blood cultures. Percutaneous thrombectomy with the AngioJet Ultra device was performed prior to removal of the filter. The patient had an excellent outcome.

Complications of Central Venous Catheters

ACUTE	Bleeding (insertion site hematoma, mediastinal hematoma, hemothorax), pneumothorax, air embolism, catheter malposition.
DELAYED	Catheter dysfunction (fibrin sheath, catheter thrombosis, mechanical impingement), catheter leakage/fracture, catheter-related thrombosis, infection, thrombotic septicemia +/- septic emboli.

Complication Prevention Strategies

- •Image-guidance (e.g. ultrasound, fluoroscopy) for placement of central lines.
- •Insertion site: right side of the body should be used rather than left; jugular insertion is preferable to subclavian.
- •Proper education of healthcare personnel involved in the insertion and maintenance of these devices.
- •Use of maximal sterile barrier precautions during central line insertion.
- •Use of a 2% chlorhexidine preparation for skin antisepsis during insertion.
- •Avoidance of routine replacement of central lines as a strategy to prevent infection.
- •Limit catheter duration to less than 90 days.

Thrombotic Septicemia Management Principles

- •Prompt Diagnosis:
  Imaging (ultrasound, IV contrast-enhanced chest CT, angiography) and clinical (arm, face, or neck edema, pain, vital signs, laboratory workup, blood cultures).
- •Removal of the offending catheter.
- •Antibiotics.
- •Imaging assessment of clot burden→ may prompt embolism prophylaxis (e.g. anticoagulation, filter placement).
- •Consideration of thrombectomy if clot burden is large.

CONCLUSION

Increased awareness of the causes and treatment of central venous catheter-related complications in general, and thrombotic septicemia in particular, should help reduce the morbidity and mortality associated with central venous devices.

REFERENCES

1) Macdonald S, Watt AJ, McNally D, Edwards RD, Moss JG. Comparison of technical success and outcome of tunneled catheters inserted via the jugular and subclavian approaches. *J Vasc Interv Radiol* 2000;11:225–231.

2) Trerotola SO, Kuhn-Fulton J, Johnson MS, Shah H, Ambrosius WT, Kneebone PH. Tunneled infusion catheters: increased incidence of symptomatic venous thrombosis after subclavian versus internal jugular venous access. *Radiology* 2000;217:89–93.