



Sepsis and Thrombosis with the Use of Central Venous Catheters during Hemodialysis

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Abstract

Infection and thrombosis are the two most common complications associated with the use of Central Venous Catheters (CVC). Improvements in the design and maintenance of CVCs have reduced the amount of cases of bacteremia and thrombosis. Current improvements include the use of antibiotics and tPA catheter locking solutions. Even when the rates of infection and thrombosis have decreased and patency has improved, Arterial-Venous (AV) fistulas and grafts are still the preferred methods of venous access for long-term hemodialysis. We present a case of sepsis and thrombosis, co-occurring in a patient with End-Stage Renal Disease (ESRD) associated with the use of central venous catheters.

Keywords: Sepsis; Thrombosis; Hemodialysis; Central venous catheters; AV fistulas; AV grafts

Introduction

In patients with renal disease, central venous catheters are indicated for acute dialysis or as a bridge to the maturation of AV fistulas or grafts [1]. However, the use of central lines is not without complications. The two most common complications associated with the use of central venous catheters are infection and thrombosis [1-4]. Improvements in the design and maintenance of CVCs have reduced their occurrence. Current improvements include the use of antibiotics and tissue plasminogen activator (tPA) catheter locking solutions [2,3]. Even when the rates of infection and thrombosis have decreased and patency has improved, AV fistulas and grafts are still the preferred method of venous access for long-term hemodialysis. Not every patient is suitable for an AV fistula; including the elderly and diabetic populations are not good candidates. An AV graft is often more suitable for this particular type of patients, and is considered a better option over a CVC [5]. We present a case of sepsis and thrombosis, co-occurring in a patient with End-Stage Renal Disease (ESRD), associated with the use of central venous catheters.

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Case Presentation

A 54-year-old patient with ESRD on hemodialysis with a past medical history of seizure disorder, hypertension, heart failure, and a cerebral vascular accident with residual right hemiparesis, was transferred to the emergency department from a nursing home due to syncope, falls and altered mental status. Last fall prior to admission was unwitnessed.

On initial assessment, the patient was unable to recall what had occurred prior to the fall. The patient denied palpitations, headache, blurry vision, excessive sweating or weakness. The only complaint was pain in the left arm and hip. Vital signs were within normal limits, except for a temperature of 39.6°C. No signs of fracture were noted on X-rays of the cervical spine, left arm, shoulder or hip. No acute injury noted on cephalic non-contrast CT nor any abnormalities on the electrocardiogram or encephalogram. A portable chest X-ray demonstrated a moderate effusion of the right lung field, as well as cavitory lesions at the left lateral base. Lab findings demonstrated a leukocytosis of 30.62×10^3 with an ANC of 27.18×10^3 . The Blood chemistry panel revealed a BUN of 84 mg/dl and a creatinine level of 9.81 mg/dl. Lactate level was 1.1 meq/L. The patient was started on antibiotic therapy with vancomycin and piperacillin/tazobactam.

On subsequent investigation, a CT scan of the chest showed bilateral pleural effusions and cavitory lesions scattered throughout the left lung field with a possible consideration for septic emboli. A right internal jugular central venous line extending into the superior vena cava was also visualized. An abdominal CT showed a questionable wedge-shaped hypodensity along the inferior and lateral aspect of the spleen, suspicious for a possible splenic infarct. A pelvic CT demonstrated a small amount of fluid and gas at the entry of a left femoral venous line. A transthoracic

echocardiogram demonstrated the presence of a fluffy echogenic mass which appeared attached to the catheter, likely thrombotic in origin. The mass traveled across the tricuspid valve to the level of the tricuspid leaflet. The possibility of the mass being colonized with bacteria was possible. Anticoagulation with heparin and warfarin was initiated. A ventilation perfusion scan and Doppler studies of upper and lower extremities showed no abnormalities.

Blood cultures, grew *Enterococcus faecalis* and *Staphylococcus hominis*. The tip of the internal jugular dialysis catheter grew *Staphylococcus aureus*. Sputum cultures grew *Candida albicans* and normal flora. Antibiotic therapy was switched to gentamicin and ampicillin.

Removal of the femoral venous catheter followed. The right internal jugular venous catheter was removed and replaced by a new catheter in the left internal jugular vein. The patient resumed dialysis during the hospital course and continued dialysis upon discharge.

Prior to discharge a transesophageal echocardiogram still demonstrated a small thrombus at the junction of the superior vena cava and right atrium; no vegetations were visualized. The patient continued anticoagulation therapy upon discharge with Warfarin 5 mg PO daily and heparin 8000 units subcutaneously every 12 hr. A new chest CT scan demonstrated stable to slightly decreased lung nodules, interval resolution of the right pleural effusion and a grossly stable 4 cm splenic lesion. Further investigation of the splenic lesion via biopsy or laparoscopy was not recommended due to a high surgical risk. Due to the high suspicion of a splenic abscess, the patient was discharged on 500mg of vancomycin and 70 mg of gentamicin. A follow-up with infectious disease as an outpatient was arranged. The patient's leukocytosis was resolved and blood cultures were negative prior to discharge.

Discussion

Infection and thrombosis are the two most common complications of CVC use [1-4]. Reduction in the incidence of complications

are observed with the use of tPA and antibiotic catheter locking solutions, as well as with the use of mupirocin or polysporin as topical agents at the catheter exit site [2,3]. The presence of catheter-related thrombosis predisposes to bacterial colonization and catheter related sepsis [3]. Localized injury of the vein at the access site can occur during insertion of the catheter; as a result deposition of fibrin occurs at the site of the injury, followed by the formation of a thrombus [1,3]. The biofilm layer found around the lumen of the catheter offers a perfect nidus for bacterial growth [1,3]. Obtaining the right long-term vascular access is a critical factor affecting the morbidity and mortality of patients on hemodialysis [2,4]. In this particular case, the patient's initial catheters were removed, and a new catheter in the left internal jugular vein was placed. A preferred option in these particular types of cases, in which patients require long-term hemodialysis, is that of an autogenous fistula. AV fistulas provide a better outcome in terms of mortality, infections, hospitalization rates, and avoids repeated access interventions [2,4]. Even when the incidence of thrombosis and infection with the use of CVCs has decreased, AV fistulas are still the preferred method for long-term hemodialysis [2,4].

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