Case Report

Unusual Clot Formation Following Insertion of Central Double Lumen Catheter for Hemodialysis

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We report a case of a patient with chronic renal failure (CRF) due to fibrillary glomerulonephritis, who was admitted to our Hospital for fever accompanied by chills of two days' duration. Due to aggravation of his CRF, accompanied by severe metabolic acidosis, an internal jugular double lumen central vein catheter was inserted, through which he was hemodialyzed. Transthoracic and transesophageal echocardiography revealed a clot in the right atrium with an abnormal circumference, connected to the tip of the catheter. The case is presented in order to illustrate the significant contribution of transesophageal echocardiography to the non-invasive detection of a clot in the right atrium and to the choice of appropriate therapeutic management in saving the patient's life. The transesophageal echocardiogram provides invaluable information concerning the evolution, development and regression of right atrium clots formed at the tip of jugular catheters.

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Double lumen central vein catheters are of major importance as a means of vascular access for urgent hemodialysis. The insertion of these catheters in the superior vena cava, through the subclavian or the internal jugular vein, is relatively easy with the use of Seldinger's technique. Complications associated with the catheter insertion (arterial needling, pneumothorax or hemothorax), as well as complications associated with the presence of the catheter (infection, thrombosis or vascular stenosis), have recently been reduced, but they are still observed in 2% of patients[1-3].

The case presented here illustrates the significant contribution of transesophageal echocardiography to the detection of clots in the right atrium in patients who have dialysis catheters.

Case report

A male patient, 60 years old, with a medical history of renal impairment due to fibrillary glomerulonephritis, progressed suddenly to end stage renal disease, with lung infection and severe metabolic and respiratory acidosis. A double lumen central catheter was inserted via his internal jugular vein and hemodialysis was started. Chest X-rays showed left lower lobe pneumonia. Triple antibiotic treatment, Clarithromycin, Cefoxitin and Netilmicin, was administered for his lung infection. Seven days later, he was discharged from the hospital in a satisfactory condition, and continued hemodialysis as an outpatient.

The patient was readmitted to the hospital three days later, because of reappearance of fever and malaise. His laboratory data are summarized in table 1. His new chest X-rays were negative for lung infection and the only finding was a small fluid collection at the base of his left lung and old pleural fibrosis. Due to persisting fever and the increased WBC count, the central catheter for hemodia-

Table 1. Laboratory data.

- Hct: 33%, Hb: 10.4. WBC: 18.5 x 1000/cu mm, (Gran 72%, Lymph 14%, Mono 10%), Platelets: 407 x 1000/cu mm, pH: 7.08, HCO_3: 3.8 mmol/L, PO_2: 83, PCO_2: 35.
- ESR: 90 mm/hour, CRP: 88 mg%, Fibrinogen: 452 mg%
- Glucose: 70 mg%, urea: 116 mg%, creatinine: 5.5 mg%, potassium: 5.8 mEq/L, sodium: 139 mEq/L, calcium: 8 mg%, phosphorus: 4.5 mg%, total protein: 6.1 gr%
- Widal (-), Wright (-), RB (-), Mono test (-), HbsAg (-), ANCA (-)
- Mantoux (-), direct saliva preparation for b-Koch testing (-), saliva cells (-)
- Urine cultures (-), blood cultures from a peripheral vein and from the catheter for aerobic and anaerobic bacteria (-)
- Bacteriology assay of the old jugular catheter tip showed: *Staphylococcus haemolyticus*.

lysis was removed and its tip was sent for culture, while the patient was started on Vancomycin intravenously. The catheter's tip culture revealed colonization with hemolytic staphylococcus sensitive to Vancomycin and Netilmicin, so intravenous Netilmicin was added to his antibiotic regimen. A new trans-jugular central catheter was inserted 24 hours later, for future hemodialysis sessions.

A subsequent transthoracic ultrasound examination was performed to rule out endocarditis and revealed a mass in the right atrium with an irregular circumference, close to the junction with the inferior vena cava, with dimensions of 2.7 by 1.9 cm. This finding was confirmed by transesophageal ultrasound studies (Figure 1).

Further detailed investigation with a chest CAT scan and cardiac MRI confirmed the diagnosis of an organized clot attached to the wall of the right atrium. Additionally, negative lung radioisotope studies ruled out the possibility of sub-clinical pulmonary embolism. The patient was started on anticoagulants, initially with calcium nadroparin and converted 7 days later to acenocoumarol.

On the 5th post admission day, the patient became afebrile and his WBC levels returned to normal. On the 20th hospitalization day, an arteriovenous graft was implanted as vascular access for hemodialysis and the patient was discharged from the hospital on the 28th post admission day. One month later the transthoracic echocardiogram showed significant reduction of the clot dimension.

Four months later, heart ultrasound studies revealed reduction of the organized clot to half the original size (Figure 2). The patient remained symptom free for one year. Anticoagulation therapy has recently been stopped and the patient is on 100 mg salicylic acid daily. Recent transthoracic and transesophageal heart ultrasound studies revealed further reduction of the clot size to 0.9 by 0.7 cm (Figure 3).

Discussion

Dual lumen central venous catheters are an important tool used in urgent vascular access for hemodialysis, and these catheters have been employed worldwide for such purposes[3]. Their placement is not free of complications, which may occur during their insertion or later on. The literature to date shows that the placement of a catheter via the internal jugular vein is superior to placement via the subclavian vein, since it entails a lower risk for pneu-

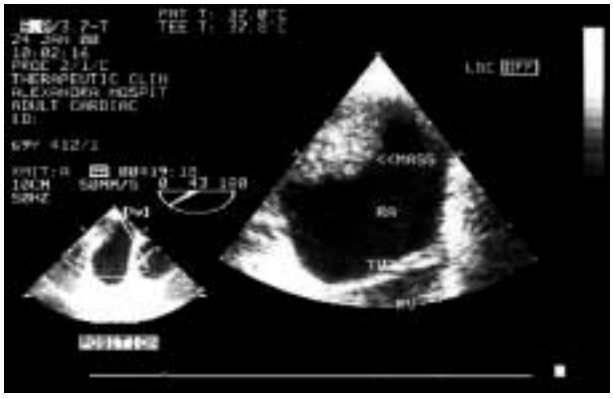

Figure 1. Transesophageal echocardiogram, showing a clot in the right atrium that has an abnormal circumference and appears to be related to the tip of the catheter. RA=right atrium, RV=right ventricle, TV=tricuspid valve.

Figure 2. Transesophageal echocardiogram four months later, showing a significant reduction in the size of the atrial clot.

Figure 3. Transesophageal echocardiogram from the last ultrasound examination, showing a further decrease in the size of the clot.

mothorax and contributes to easier compression of the vessel in case of hemorrhage[5-7]. The insertion of catheters in the superior vena cava is facilitated by the catheterization of the right internal jugular vein. The jugular vein is also preferred over the subclavian vein, since it does not usually exhibit stenosis or thrombosis, which would otherwise render the creation of a vascular access route (A-V fistula or A-V graft) for hemodialysis on the same side problematic or even impractical. The ideal positioning of the double lumen central catheter tip for hemodialysis should be between the end of the upper superior vena cava and the upper third of the right atrium.

Despite this, the possibility of complications still remains. Cardiac tamponade is a serious complication of the placement of a central double lumen venous catheter, due to the perforation of the cardiac wall[8-10]. Two cases of cardiac wall perforation leading to cardiac tamponade have been reported, in which the cardiac wall was perforated during guide wire deployment. One of these two cases was fatal[11-13].

Uldal et al[14] used a novel flexible catheter with a 2% frequency of thrombosis of the internal jugular vein. Grote et al[15] reported a 30% frequency of thrombosis in the superior vena cava, due to the long-term placement of silicon catheters in the internal subclavian vein. A frequent transesophageal cardiac ultrasound follow-up is mandatory.

Two cases have been reported in which clot formations in the right atrium were detected and were related to the use of long-term catheters via the internal jugular vein. In these patients, the catheter tip was located in the right atrium and thus may have contributed to the clot formation[16]. A recent report, involving 193 patients, showed that the risk of septicemia is relatively low (1.7-10.4%) when temporary jugular catheters are placed initially and have remained less than 4 weeks. Also, there was no right atrial clot detected in these patients[17].

A large intraatrial clot is a rare complication from the application of hemodialysis catheters. If there is a fault at the tip of the catheter, massive pulmonary embolism may occur, or a mass within the right atrium may be depicted using triplex ultrasonography or fluoroscopy[16]. An atrial clot may represent a further development of an initial cardiac wall clot. As the clot expands, it may be mobile within the atrium, and thus appear in the ultrasound. These clots may be significant enlarged, with potentially fatal effects. The risk of pulmonary embolism is high and the associated mortality is 30-40% in this patient population[18,19]. Therapy consists of removal of the catheter and anticoagulant therapy (initially intravenously and subsequently orally), which should be continued until the clot has dissolved or has become stabilized (not less than one month in duration). The progress of the clot must be monitored weekly. In cases where large clots exist, leading to ventricular malfunction, surgical excision is required.

In our case, the patient underwent urgent hemodialysis, because of worsening of his renal function and severe metabolic acidosis, and the temporary catheter used must have passed into the right atrium and contributed to the formation of the septic clot. Throughout the four months, and while the patient was under consistent cardiac ultrasound monitoring, the clot's size decreased significantly, most probably due to the removal of the catheter and the continuous anticoagulation therapy (acenocumarol). The patient's recent cardiac ultrasound revealed further reduction of the intraatrial clot, and the patient is undergoing chronic hemodialysis.

Since similar complications cannot be avoided in the future, the insertion of catheters in central veins must be performed with great caution. It is recommended that a small section of the guiding wire (7-9 cm) is inserted, along with frequent radiographic[20] and cardiac ultrasound monitoring[21]. In the case that there is fever of unknown origin, the existence of the catheter as a source of infection should be investigated, along with the rare possibility of septic clot formation in the right atrium. Thus, frequent and complete cardiac ultrasound monitoring of these patients is imperative.

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