

Successful treatment of fungal right atrial thrombosis complicating central venous catheterization in a critically ill child

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Abstract. A 9-year-old boy was admitted to our pediatric intensive care unit after multiple trauma. On the 17th day post trauma, he developed catheter-related sepsis with candidemia. After removal of the catheter and 6 days of unsuccessful intravenous antifungal therapy, conventional and transesophageal two-dimensional echocardiography was performed revealing a large right atrial thrombus. Surgical thrombectomy under cardiopulmonary bypass was performed and the patient recovered within a few days. Fungal right atrial thrombus is a rare, life-threatening complication of central venous catheterization. Two-dimensional echocardiography is a simple and effective diagnostic technique that should be performed when candidemia is detected. The proper therapeutic response depends on the findings of this examination. For a symptomatic patient with a large, mobile thrombus, we strongly recommend thrombectomy. Surgery not only allows removal of the mass and thus elimination of the mechanical complication but is also a key to management of infection.

Key words: Atrial thrombosis – Candidemia – Central venous catheter – Pediatrics

Right atrial thrombosis is a potentially lethal complication of central venous catheters (CVC) [1] which are now used in nearly 70% of all patients in pediatric intensive care units (PICU). Prompt diagnosis and treatment is needed to prevent pulmonary embolism and death [2]. We report a case of right atrial septic thrombosis due to a catheter related fungal sepsis in a young trauma victim.

Case report

A 9-year-old boy suffered multiple trauma in March 1991. Lesion assessment showed head trauma with a Glasgow coma score of 3, hemorrhagic shock due to spleen rupture, left parietal extradural, left hemothorax and compound fractures of the left lower extremity. After massive fluid resuscitation, transfusion and chest drainage, emergency surgery was undertaken to consolidate the spleen using a polyglactin net, remove the extradural hematoma and reduce the fractures. Antibiotic therapy with cefamandole was administered for 5 days. A subclavian CVC was inserted on the 2nd day post trauma (D2) in order to allow total parenteral nutrition. The patient was completely weaned from the ventilator on D6 and exhibited progressive neurosurgical recovery but with persistent right hemiparesis. On D12 sepsis with high fever and hyperleukocytosis ($>25 \times 10^9 l^{-1}$) appeared and was treated

with empiric antibiotic therapy (vancocin and amikacin). On D13, fever was unabated and the CVC was changed. On D14, cultures of blood specimens as well as of the catheter tip proved positive for *Candida albicans* and antifungal treatment with amphotericin B and 5 fluocytosin was initiated. On D17 neurologic manifestations appeared. CT-scan was nearly normal, fundus examination revealed no candidal endophthalmitis and spinal fluid was normal. An abdominal echography disclosed no intra-abdominal abscess. Two-dimensional echocardiography showed a large right atrial mass, moving through the tricuspid valve. Organic, oliguric renal failure developed and echography revealed enlargement of both kidneys. Transesophageal two-dimensional echocardiography confirmed the presence of a large right atrial mass (Fig. 1). Because antifungal therapy seemed to be inefficient with persistent candidemia, and the hazards of septic thromboembolism, thrombectomy under cardiopulmonary bypass was undertaken. The thrombus (3 cm × 1 cm) (Fig. 2) was implanted on the superior vena cava wall and the tricuspid valve was intact. Histology confirmed the presence of fungal thrombus and culture of the surgical specimen was positive for candida albicans. The post-operative period was uneventful: the patient was weaned from the ventilator within 18 h post-operatively, sepsis resolved and blood cultures became negative within 5 days. Intravenous antifungal therapy was discontinued two weeks after normalization of blood cultures. Diuresis resumed on D20 and renal function normalized on D31. Follow-up two-dimensional echocardiography findings were normal. Neurological status dramatically improved and the patient was discharged from the PICU on D36.

Discussion

The incidence of right atrial thrombus (RAT) in children with CVC has not been accurately determined. A rate of 1.8% was reported in a prospective study including 56 neonates [3]. In a recent review of the pediatric literature, Vitoux-Brot found 28 cases of RAT complicating CVC [4]. In this series, septic RAT accounts for more than 50% of cases. RAT should be suspected in the presence of cardiac or respiratory insufficiency, sepsis, facial edema, ascitis, sudden cardio-respiratory arrest or simple catheter dysfunction [2–4]. Diagnosis can be easily confirmed by two-dimensional echocardiography which is the method of reference [5].

The overall incidence of catheter-related candidemia is approximately 3% [6]. Candidemia is linked to the presence of a CVC in 70% of the cases [6]. Other risk factors associated with candidemia include total parenteral nutrition, broad spectrum antibioticotherapy, immunosuppressive treatment and leucopenia. The natural history of RAT associated with candidemia is poor. Successful man-

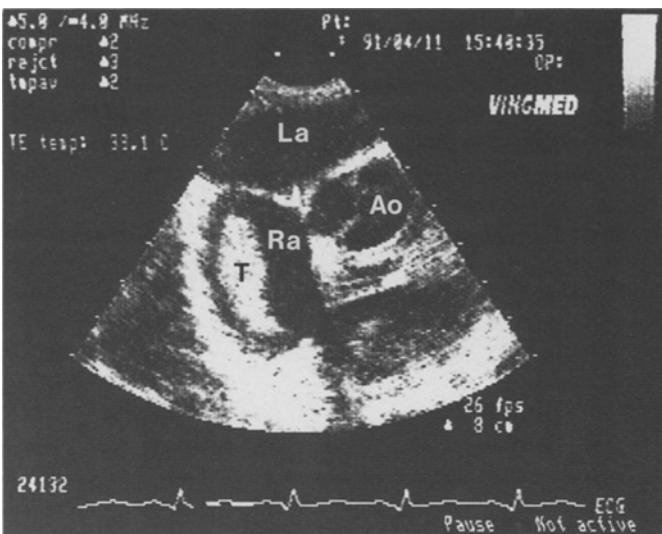


Fig. 1. Two-dimensional transesophageal echocardiography showing a voluminous right atrial thrombus. *LA*, left atrium; *RA*, right atrium; *Ao*, Aorta; *T*, thrombus

agement was first achieved by Foker in 1984 using surgical thrombectomy and antifungal therapy [7].

Complications of RAT include pulmonary embolism, tricuspid valve obstruction, right heart endocarditis or septic metastatic foci. They must be prevented with appropriate management but there is still no consensus with regard to treatment. A wide range of techniques have been proposed including surgical thrombectomy [2, 3, 7, 8], association of heparin and thrombolytic agents [8, 9], catheter removal followed by systemic heparin or simple surveillance [8]. Massive pulmonary embolism and recurrent thrombosis have been associated with thrombolysis, and represent the major limitations of this treatment [4].

In practice, treatment should be based upon clinical and echographic findings: In asymptomatic patients with a small and stationary thrombus, catheter removal and systemic heparin or, alternatively, thrombolysis can be effective [4, 8]. In patients with large, mobile or symptomatic thrombus (i.e. causing cardiac or respiratory failure and/or uncontrolled sepsis), surgical thrombectomy seems to be the only therapeutic alternative [2, 4]. While an appropriate antibiotic therapy is always necessary in patients exhibiting sepsis, thrombectomy is in most cases,



Fig. 2. Macroscopic feature of the fungal right atrial thrombus

the only treatment which allows the sepsis to resolve: in our case like several others, culture of the surgically removed thrombus was positive of bacteria or yeasts despite adapted antibioticotherapy [2, 7]. Prophylaxis and early detection of RAT are fundamental precautions after placement of a CVC. Prevention is best achieved either by low-dose heparin infusion ($1 \text{ U} \cdot \text{ml}^{-1}$) or use of heparin-coated catheters [10]. Early detection can be accomplished by two-dimensional echocardiography, but the timing and frequency of examinations have not been well defined and range from 1–3 weeks [3].

In conclusion the present report demonstrates that surgical thrombectomy is a highly effective treatment for septic RAT. It not only eliminates the atrial mass, but is essential to effective management of sepsis. Indeed antibioticotherapy often fails due to the inability of the antibiotics to penetrate within the thrombus. In the face of a catheter related candidemia, the possibility of right atrial thrombus must be systemically considered. Two-dimensional echocardiography is the assessment method of choice and must be performed to confirm diagnosis in symptomatic patients. This procedure is also recommended to achieve early detection in asymptomatic patients but prospective studies in a large series of patients are needed to determine the timing and frequency of examination.

References

1. Bagwell CE, Marchildon MB (1989) Mural thrombi in children: potentially lethal complication of central venous hyperalimentation. *Crit Care Med* 17:295–296
2. Haddad W, Idowu J, Georgeson K, Bailey L, Doroshow R, Pickham N (1986) Septic atrial thrombosis. A potentially lethal complication of Boviac catheters in infants. *Am J Dis Child* 140:778–780
3. Marsh D, Wilkerson SA, Cook LN, Pietsch JB (1988) Right atrial thrombus formation screening using two-dimensional echocardiograms in neonates with central venous catheters. *Pediatrics* 81:284–286
4. Vitoux-Brot C, Beaufils F, Schlegel N, Mercier JC, Lescoeur-Berg G (1988) Traitement des thromboses auriculaires droites sur cathéter de l'enfant. In: Beaufils F, Schlegel N (ed) *Hémorragies et thromboses en pédiatrie*. Arnette, Paris, pp 243–250
5. Riggs T, Paul MH, Deleon S, Ilbawi M (1981) Two dimensional echocardiography in evaluation of right atrial masses: five cases in pediatric patients. *Am J Cardiol* 48:961–966
6. Dato VM, Dajani AS (1990) Candidemia in children with central venous catheters: role of catheter removal and amphotericin B therapy. *Pediatr Infect Dis J* 9:309–314
7. Foker JE, Bass JL, Thompson T, Tilleli JA, Johnson DE, Anderson RW (1984) Management of intracardiac fungal masses in premature infants. *J Thorac Cardiovasc Surg* 87:244–250
8. Ross P, Ehrenkranz R, Kleinman CS, Seashore JH (1989) Thrombus associated with central venous catheters in infants and children. *J Pediatr Surg* 24:253–256
9. Marsh D, Wilkerson S, Cook L, Pietsch J (1988) Right atrial thrombosis in neonate receiving central venous lines after extracorporeal membrane oxygenation. *Crit Care Med* 16:202–203
10. Mercier JC (1988) Prévention des thromboses sur cathéter. In: Beaufils F, Schlegel N (ed) *Hémorragies et thromboses en pédiatrie*. Arnette, Paris, pp 259–274

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