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Giant right atrial thrombus in premature newborn

Ali Baykan · Abdullah Ozyurt · Levent Korkmaz · Ozge Pamukcu · Mustafa Argun · Adnan Ozturk · Selim Kurtoglu · Nazmi Narin

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Abstract Pediatric guidelines for treatment options of right atrial thrombosis in newborn are quite limited. Herein we present a case with giant atrial thrombosis resulting from umbilical venous catheter and intend to discuss the therapy in the area of current literature on right atrial thrombus in newborn and children.

Keywords Anticoagulant · Catheter · Heparin · Premature · Thrombosis · Umbilical

Introduction

Umbilical venous catheterization has been used in neonatal intensive care units for more than 50 years for critically ill newborn infants. Despite many advantages, umbilical venous catheters (UVC) have risk of serious complications such as severe infectious, thrombosis and trauma. Although intracardiac thrombosis is a rare event in children, the most common cause of right atrial mass is thrombosis associated with UVC [1, 2]. Herein we present a case with giant atrial thrombosis resulting from UVC and intend to discuss the therapy in the light of current literature.

A. Baykan · A. Ozyurt (✉) · O. Pamukcu · M. Argun · N. Narin
Divison of Pediatric Cardiology, Faculty of Medicine, Erciyes University, 38039 Kayseri, Turkey
e-mail: duruozyurt@yahoo.com.tr

L. Korkmaz · A. Ozturk · S. Kurtoglu
Divison of Neonatology, Faculty of Medicine, Erciyes University, Kayseri, Turkey

Case

The infant was referred to the Department of Neonatology at postnatal 27th day because of persistent hypoglycemia. Upon admission, on physical examination the heart rate was 132/bpm, respiratory rate was 54 breaths/min, blood pressure was 72/41 mmHg, and peripheral oxygen saturation was 94 % by pulse oximetry. The patient had no difficulty breathing. There was a grade 2/6 systolic murmur over mesocardia area. Complete blood count revealed leucocyte 14.000/mm^3, platelet 280.000/mm^3. Hepatic, renal function tests, C reactive protein were in normal ranges and blood cultures were negative. Chest X-ray and electrocardiography were also normal.

The patient's history revealed; born vaginally at week 32 with a birth weight of 2,000 g, and 1st and 6th min APGAR score was 6/8. There was no family history of cardiac and hematologic disease. Fifth day of the birth, UVC had been placed at referring hospital because of persistent hypoglycemia. The UVC was removed to prevent potential complications at admitting day. The nurse attending the patient stated that she had had some difficulty removing the catheter. The patient underwent transthoracic echocardiography in the postnatal 32th day because of murmur. In his echocardiographic examination in the right atrium a spontaneous, echocontrast, moveable, oval shaped mass, sized 14 mm in diameter (large enough to fill half of the right atrium) was detected (Fig. 1a). This mass was noticed to be associated with catheter remnant in the vena cava inferior (VCI). (Fig. 1c). It was thought that distal part of the catheter had torn while taking out the UVC because of a thrombus on the tip of the catheter. The giant thrombus was obstructing neither right ventricle inlet nor inferior vena cava entry. The echocardiography examination and thorax computerized tomography findings do not support pulmonary thromboemboli.

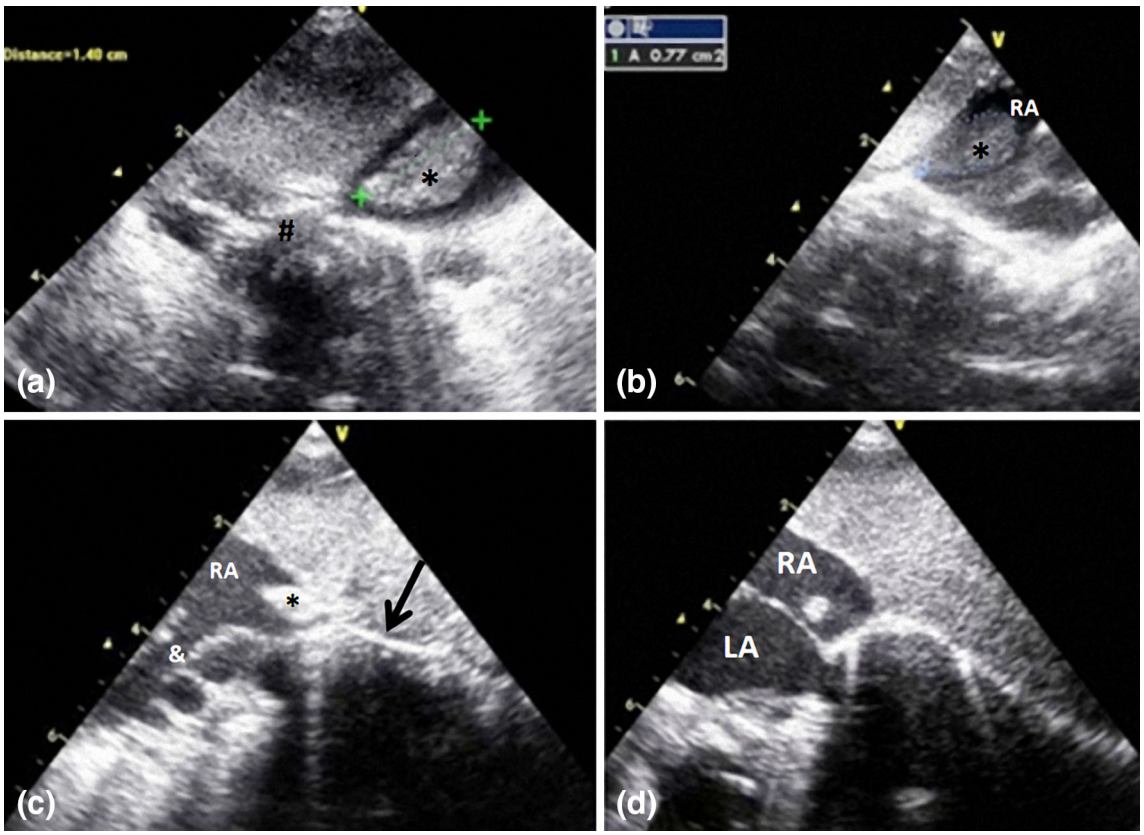

Fig. 1 The mass was monitored with serial follow-up transthoracic echocardiography in subcostal views. Echocardiogram showed the floating, oval thrombus sized 14 × 8 mm in diameter (large enough to half fill the right atrium) thrombus in 7th days of admission (**a**), The thrombus was seen to get smaller 1 week after initiation of iv heparin treatment (**b**), it was appeared gradually became smaller 1 month after initiation of iv heparin treatment and hyperechoic catheter remain (**c**), in the final image it was showed also resolution 2 months after initiation of anticoagulant treatments (**d**). *RA* right atrium, *LA* left atrium, * thrombus, # vena cava inferior, & vena cava superior, *arrow* catheter rest

The prothrombotic work-up, including assessment of antithrombin III, protein C, protein S, Factor V Leiden, antiphospholipid antibodies and the prothrombin gene, was within normal limits. Human cytomegalovirus infection, another possible cause of neonatal thrombosis [3] was also excluded. Treatment modalities like surgical resection, transcatheter removal of mass, fibrinolytic and anticoagulant therapy were discussed with cardiovascular surgeons and neonatologists. Since the thrombus was organized; fibrinolytic treatment was not done. Hence subcutaneous route enoxaparin (75 IU/Kg/twice daily) was started and enoxaparin was changed to warfarin after 1 month. He was discharged on the 2nd month of treatment. The thrombus was significantly got smaller gradually in his follow-up (Fig. 1b,c,d).

Discussion

Intracardiac thrombosis is a rare event in children but when present poses the threat of massive pulmonary and systemic embolism. The incidence of clinically apparent thrombosis was 0.7–2.4 per 1,000 admissions to neonatal intensive care unit and almost 90 % of which were related to the use of a central venous catheter (CVC) in the several studies [4]. The greatest risk for thrombosis during the first month of life is related to the use of intravascular catheters. The cause for atrial thrombosis is thought to be the direct contact of the catheter tip, the cytostatic agents and the atrial wall leading to endocardial damage and consecutive local thrombosis. Intravascular catheters can act as a nidus for fibrin and platelets, may damage the endothelium of the vessels wall, partially occlude a vessel or precipitate vasospasm [5].

No signs or symptoms have been defined specific to this complication in the literature. According to a recently published meta-analysis, murmur, the only finding as in our case, has been detected in 14.3 % of the newborns with thrombosis [6]. The frequency of asymptomatic patients appears to be higher in pediatric patients. High-risk features included any of the following: large size (>2 cm or described as large), pedunculated, snake shaped and mobile [6].

Surgical resection, catheter embolectomy, and thrombolysis are the principal options for management. In pediatric patients with thrombosis, detailed patient management is seriously hampered by the lack of appropriate clinical trials [7]. The majority of the available literature is limited to case studies or retrospective small case series. According to a current meta-analysis, anti-coagulant therapy (warfarin, unfractionated heparin or heparin with low molecular weight), has been used in only 10.4 % of patients. Heparin has been used solely with success in a newborn with right atrial thrombosis associated with atrial fibrillation [8] and in another infant with an extremely low birth weight. Successfully treated adult individual patients with left atrial thrombus by only heparin also shared [9, 10]. It was decided not to resort to surgical methods, in the view of the patient's low body weight and the mortality risk of surgical interventions. Besides, the part of the catheter remaining in VCI was not in a position to cause impairment in the flow pattern in the lumen of the vein.

We were concerned about the possibility of acute thrombus rupture with pulmonary embolization using thrombolytic therapy and decided to use standard intravenous heparin. Also it reported that if the thrombus is already organized, thrombolysis is unsuccessful [11, 12]. Complete clot dissolution was documented by two-dimensional echocardiography after 1 week of treatment, confirming the thrombotic nature of the mass. To the best of our knowledge, this is the third report of resolution of intra-atrial thrombus in a newborn using only heparin treatment.

Although the benefits CVC in neonates and infants outweigh the potential risks from those lines, better knowing of the risk factors for development of thrombosis and improved prophylaxis and treatment of central-line-related thrombosis may further decrease the rate of complications and augment the benefit of those lines. Despite its several complications, heparin can be tried, as the only therapeutic choice for premature infants, even in very big thrombus resulting from catheter.

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