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Successful aspiration thrombectomy of large right atrial thrombus attached to atrial septal defect repair patch

CASE REPORT

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INTRODUCTION

In this case report, we present a successful aspiration thrombectomy procedure performed on a young woman with mobile right atrial thrombus attached to suture material of an atrial septal defect repair patch.

CASE REPORT

History of presentation - past medical history

A 26-year-old woman was admitted to the oupatient clinic for routine examination two months ago. She had a history of surgical repair for sinus venosus atrial septal defect (ASD) and abnormal pulmonary venous return two years ago.

Investigations

Pulse oxymetric arterial saturation was 98%, and heart rate and blood pressure were 85 beats/min and 100/60 mm Hg, respectively. Physical examination showed no abnormality. Electrocardiogram revealed sinus rhythm without any rhythm or conduction disturbances. Chest x-ray was normal. Transthoracic and transesophageal echocardiographic examination disclosed a mobile right atrial (RA) mass, 3.5×2.5 cm in diameter, which was attached to the suture material at the superior part of interatrial septal patch with a stalk (Fig. 1a, Videos 1a and 1b). Blood biochemistry and blood cell counts were normal. Rheumatologic and haematologic tests to detect risk factors for thrombophilia remained inconclusive. Despite the seven-day intravenous unfractioned heparin treatment followed by subcutaneous low-molecular weight heparin (LMWH) treatment for a two-month period, the RA mobile mass persisted without any resolution in its size. Computed tomographic pulmonary angiography revealed subclinical and subsegmentary pulmonary embolism (PE), and any findings consistent with invasion beyond the RA was not detected (Fig. 1b and 1c).

Management

Because of the prior cardiac surgery and the large and mobile mass complicated by silent PE episodes in this young woman, we decided to perform an aspiration thrombectomy via AngioVac Venous System (AngioDynamics Inc., Latham, NY, USA). A

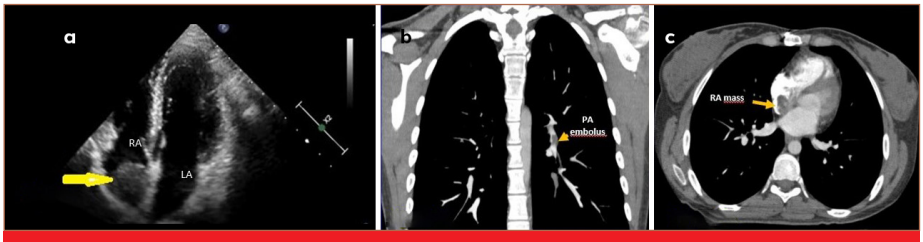

Figure 1. a: Transthoracic echocardiographic image of the mobile right atrial (RA) mass. b and c: Computerized tomographic pulmonary angiography showing pulmonary artery thrombi. There is no finding consistent with invasion beyond the right atrium

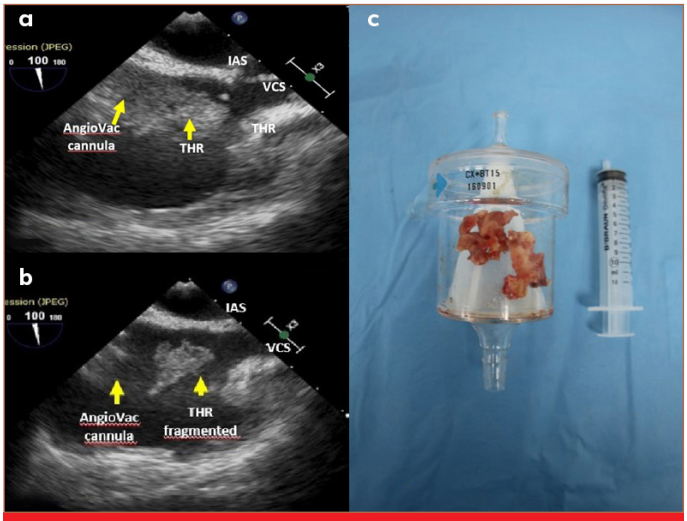

Figure 2. a and b: Two-dimensional transthoracic echocardiographic images of thrombus suction. c: Thrombus material extracted into the AngioVac filter (AngioDynamics Inc., Latham, NY, USA)

22 F venous aspiration cannula through a 24 F sheath via the right femoral and a 14 F reinfusion cannula via the left femoral venous accesses were placed using surgical support, and AngioVac cannula and dilator system was advanced over the wire to the target location under fluoroscopic and TEE guidance and general anesthesia. The AngioVac cannula was clamped and connected to a vacuum-assisted, closed circulatory bypass system driven by a centrifugal pump using two cannulae, and was primed and de-aired. The mobile mass was suctioned and aspirated several times to successfuly complete the procedure (Fig. 2a, 2b, 2c and Video 2). Only a small part attached to the suture material of the ASD repair patch persisted (Videos 3a and 3b). There was no bleeding event related to access sites. Pure thrombotic nature of the aspirated mass was confirmed by histopathology.

DISCUSSION

The AngioVac system is based on a veno-venous filtration circuit consisting of aspiration and reinfusion cannulae, a centrifugal high-flow pump generating up to 80 mm Hg of suction pressure, and an extracorporeal filter. This device was approved by the United States Food and Drug Administration in 2014 for the filtration of intravascular thrombi and emboli. This system has been reported to be used in PE, right-sided intracardiac thrombi or vegetation, or ilio-caval thrombus. Iliocaval thrombi are often approached by placing the aspiration device in the right internal jugular vein and the return cannula in the left internal jugular vein as the femoral veins are often obstructed by venous thromboses. The reinfusion cannula can be modified to include a veno-arterial extracorporeal membrane oxygenation circuit if cardiorespiratory collapse occurs during intervention. In a systematic analysis on the AngioVac series, complete success rates in RA/ iliocaval thrombi and PE were 79% and 22%, respectively (1). In another meta-analysis with 182 patients (81 with vegetation and 101 with thrombosis) from 42 studies, the pooled event rate (PER) for successful removal of vegetation versus thrombosis were 74.5 [confidence interval (CI): 48.2–90.2] and 71.6 (CI: 61.9–79.7), respectively (p=NS). Moreover, PER for successful removal of RA/caval thrombi versus PE were 80.5 (CI: 70.0–88.0) and 32.4 (CI: 17.0–52.8), respectively (p<0.0001). None of the included variables were found to predict successful removal of vegetation and thrombus. The PERs for procedural mortality were 14.6 (CI: 7.7–25.8) and 23.3 (CI: 15.2–34.1) in patients with vegetation and thrombosis, respectively, and 14.8 (CI: 8.5–24.5) and 32.3 (CI: 15.1–56.3) in patients with RA/caval thrombi and PE, respectively. The PERs for conversion to open surgery were two times more in patients with vegetations than in those with thrombosis (2).

A second meta-analysis included 101 patients treated at four centres for endovascular cardiac implantable electronic device infection with large lead vegetation. The mean lead vegetation size was 30.7±13.5 mm. Complete procedural success (per targeted lead) for AngioVac vegetectomy combined with transvenous lead extraction was 99.2%, whereas major complications were reported in 3% of the procedures (3).

Large bore cannulas for aspiration and reinfusion may be associated with access complications and hemorrhage related with vessel trauma (4, 5).

Well-known complications of extracorporeal circulation would be the main safety concerns of the procedure. Moreover in the case of vegetation, aspiration, filtration, and reinfusion may not eliminate dissemination of the infective material previously hidden and secestrated deep layer vegetation. Therefore, vacuum-assissted extraction procedures for vegetation seem to be different from those for thrombi because of reentry of the infective material into the circulation. Bacteria and cytokine filters might provide a barrier for reentry of these substances and may decrease the risk of sepsis. During extraction and approximation of the vacuum surface to the target mass, handling of the aspiration system is not difficult for right atrial and superior venacaval masses; however, the large caliper and stiffness of the aspiration cannula may carry the risk of unsatisfactory aspiration and cause a PE. During fragmentation and aspiration, some part of the fragmented material could escape the vacuum and may cause PE.

Follow-up

The patient was discharged on LMWH on the seventh day of the procedure, and treatment was switched to apixaban 5 mg bid. Transesophageal echocardiography at one-month follow-up revealed total resolution of the residual thrombus previously attacted to the sutures, and transesophageal echocardiographic examination at 2nd year control visit also showed no recurrence under apixaban therapy.

CONCLUSION

In our patient, a large and mobile RA thrombus attached to sutures at the superior part of the ASD repair patch that persisted after heparin treatment(s) was succesfully fragmented and aspirated via the AngioVac system without any complication. This system should be considered an important therapeutic tool for interventional extraction of large RA thrombi or vegetation attacted to leaflets, cannulas, or leads in patients with high surgical risk for extraction of these masses.

Learning objectives

The AngioVac system can be considered as an effective and safe alternative percutaneous technology for extraction of large and mobile right heart thrombi.

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Informed consent: The patient has given informed consent for publication of this case report, including the radiologic imaging.

Video 1. a and b: Two-dimensional and three-dimensional transesophageal echocardiographic examination revealing a mobile right atrial mass with a stalk. Arrow shows the right atrial mass with a stalk

Video 2. Real time two-dimensional transthoracic echocardiographic examination showing AngioVac suctioning of the right atrial thrombus.

Video 3. a and b: Real-time two-dimensional and three-dimensional transeosephageal echocardiographic examination showing only a small part attached to the suture material of the atrial septal defect repair patch persisting. The arrow shows a remnant of the thrombus after AngioVac suction

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