A New Right Atrial Mass Following Cardiopulmonary Bypass Mimicking a Thrombus

Abstract
This report describes a patient who underwent mitral valve replacement. After completion of cardiopulmonary bypass, an unexpected finding of a right atrial mass was noticed on transesophageal echocardiography. The actual finding, possible differential diagnosis, and the management strategy are discussed.

Keywords: Cardiopulmonary bypass, right atrial mass, thrombus, transesophageal echocardiography

Introduction
Detection of a new-onset atrial mass on transesophageal echocardiography (TEE), especially in the immediate postbypass period, leads us to think toward a possibility of formation of a thrombus. Such a finding needs to be confirmed with other relevant TEE views before making any definitive decision. Moreover, there are various other diverse entities that can replicate such a TEE finding, and one needs to keep in mind these possibilities before arriving at a diagnosis.

Case Report
A 45-year-old female presented for mitral valve replacement secondary to severe mitral stenosis (MS). Her preoperative workup was typical of a patient with MS with electrocardiogram showing atrial fibrillation and transthoracic echocardiography revealing a stenosed mitral valve with an orifice area of 0.8 cm², mild regurgitant jet, and right ventricular systolic pressure of 45 mmHg.

Intraoperative baseline TEE further reiterated the preoperative echocardiographic findings and also excluded the presence of any thrombus in atria/atrial appendages. The mitral valve was replaced using standard anesthetic and cardiopulmonary bypass (CPB) techniques. CPB was terminated with a mean arterial pressure of 7 mmHg with modest inotropic support. The aortic cross-clamp time was 63 min. Protamine administration was started, and concomitantly, a review TEE was performed to assess the prosthesis.

The bileaflet mitral valve prosthesis was functioning normally, but in addition to that on mid-esophageal (ME) modified 4-chamber view, an echogenic mass (1 cm x 1 cm) with distinct borders was observed fixed to the right atrial wall [Figure 1 and Video 1]; the presence of the mass was confirmed using other views (ME long-axis view, ME aortic valve short-axis view, ME bicaval view), and a diagnosis of the right atrial thrombus was made. After discussing the findings with the surgical team, a decision was taken to re-establish the CPB to have a relook.

To our surprise, on performing atriotomy, the right atrial mass mimicking a thrombus was in fact the right atrial wall that got invaginated/inverted as a result of tying of the purse-string suture taken for insertion of the venous cannula. After careful examination of the right atrium and ruling out presence of thrombus, CPB was terminated uneventfully.

Discussion
The pathophysiology of acute-onset intracardiac thrombus in the immediate postbypass period is multifactorial. Associated factors include the use of antifibrinolytic agents, transfusion of blood components, prolonged CPB, heparin...
reversal with protamine, and presence of coagulation disorders. 

The present case demonstrates that it is important to distinguish an intracardiac thrombus from the artifacts or pitfalls that are not uncommon during a routine TEE examination. Kim et al. have published a similar case about how they misjudged a folding of the right atrium that appeared to be a mass like a thrombus through TEE. Pressman and Figueredo reported misdiagnosing an inverted left atrial appendage (LAA) as a thrombus in their case report. Occurrence of such an inversion can be attributed to the negative pressure created by the de-airing maneuvers. There also have been instances of a coumadin ridge being diagnosed as an intracardiac thrombus on the left side. Other differential diagnoses that could be considered in this scenario are ruling out the possibility of a large hypertrophic trabecula or stagnant blood.

Coming back to the present case, on retrospective analysis of the same image [Figure 1 and Video 1], we realized that we missed out on two points which may have gone against the diagnosis of a thrombus – the high echogenicity of the mass and the presence of a dirty acoustic shadow. Both the features are unlikely to be present in case of a freshly formed thrombus.

The important question that this case raises is whether a finding as seen in this patient can be ignored? The answer seems to be “NO,” as no one would like to leave a suspected thrombus in any patient, especially when the patient is on the operating table with an open sternum and CPB can be easily established. However, it is also justified to avoid an unnecessary second run of CPB. It is in this respect that careful TEE evaluation of the mass should be carried out. The authors believe that evaluation of the echo-density of the suspected thrombus and also the presence/absence of dirty acoustic shadow is important in such a scenario. The echo-density of a thrombus would differ from the surrounding tissue. The thrombus usually has smooth contours and does not cast an acoustic shadow.

The use of three-dimensional (3D) TEE may be useful in such a scenario considering its proven superiority in differentiating the LAA thrombus from the normal trabeculations of the LAA. However, no large comparative studies have been reported. The role of 3D echocardiography has not been studied sufficiently in evaluation of the right atrial mass.

We conclude that in a situation described as in the present patient, the possibility of any tied purse-string suture invaginating or inverting into the atrial cavity should be a consideration before it is decided to reinstitute the CPB.

**Financial support and sponsorship**
Nil.

**Conflicts of interest**
There are no conflicts of interest.

**References**

1. Cooper JR Jr., Abrams J, Frazier OH, Radovancevic R, Radovancevic B, Bracey AW, et al. Fatal pulmonary microthrombi during surgical therapy for end-stage heart failure: Possible association with antifibrinolytic therapy. J Thorac Cardiovasc Surg 2006;131:963-8.
2. Schmitz A, Hartmann M. Acute intracardiac thrombus formation during thoracoabdominal aortic surgery. Anesth Analg 2006;102:1658-69.
3. Kim SH, Yoon TG, Kim TY. Folding of right atrium misdiagnosed as a thrombus after mitral valve replacement: A case report. Korean J Anesthesiol 2008;54:566-8.
4. Pressman GS, Figueredo VM. Development of an intraoperative left atrial thrombus? J Am Coll Cardiol 2009;54:1.
5. Kumaran S, George G, Varsha AV, Sahajanandan R. Inverted left atrial appendage masquerading as a left atrial mass. Ann Card Anaesth 2017;20:248-9.
6. Manning WJ, Weintrab RM, Waksmonski CA, Haering JM, Rooney PS, Maslow AD, et al. Accuracy of transesophageal echocardiography for identifying left atrial thrombi: A prospective, intraoperative study. Ann Intern Med 1995;123:817-22.
7. Delange Segura L. Limitations of transesophageal ultrasound in the assessment of intracardiac masses: A case report. Rev Esp Anestesiol Reanim 2005;52:421-4.
8. Kim SH, Ryu JS, Kim TY, Yoon TG, Kang W, Song JE, et al. Abrupt formation of intracardiac thrombus during cardiopulmonary bypass with full heparinization: A case report. Korean J Anesthesiol 2012;62:175-8.
9. Turhan S, Ozcan O, Erol C. Imaging of intracardiac thrombus. Cor Vasa 2013;55:176-83.