

In response to “Left atrial thrombus in a case of severe aortic stenosis with severe left ventricular dysfunction: An incidental finding on transesophageal echocardiography”

The authors of this paper describe the presence of thrombus in left atrial appendage (LAA) during transesophageal echocardiography (TEE) examination in a patient undergoing aortic valve replacement (AVR).^[1] The patient was diagnosed with severe aortic stenosis (AS), severe aortic regurgitation (AR) and severe left ventricular (LV) dilatation and dysfunction with an ejection fraction (EF) of 18%. The LAA thrombus was not detected during the transthoracic echocardiography (TTE).

The presence of thrombus in LAA in patients of AS is rare, and only one case report was found in the literature.^[2] The key to avoiding surprises on the operating table is to suspect the unexpected, followed by its detection or ruling out its presence. Thrombus formation in the circulation depends on three hemodynamic factors described in the name of the famous German physician “Rudolph Virchow” as the “Virchow’s triad.” Virchow’s triad includes circulatory stasis, hypercoagulable state, and vascular endothelial injury.^[3] Left atrial (LA) thrombus is generally seen in the presence of atrial fibrillation (AF) and severe mitral stenosis with or without AF.^[4] In both the clinical situations, the flow of blood from LA to LV is slow and flow velocity in LAA is low. The presence of LA thrombus in patients with sinus rhythm (SR) is rare. Agmon *et al.* described LA thrombus in 20 patients with SR, and they found that high-risk structural heart disease (severe LV dysfunction or significant left-sided valve disease [predominantly mitral valve disease]), previous documented episodes of AF, or both (structural heart disease and AF) were present in 19 of the 20 patients.^[5]

Multiple noninvasive imaging techniques are described for the characterization of the LAA shape, mechanical function, and detection of LAA thrombus (as a common source of systemic embolization). The noninvasive imaging modalities include TEE, contrast TEE, real-time three dimensional TEE, hybrid imaging with 3D cardiac computed tomography (CT), magnetic resonance imaging (MRI), and the invasive technique include intracardiac echocardiography (ICE). In view of serious complications and morbidity associated with

thromboembolic events, the detection of LA thrombus and its appropriate management is important. Patients with LA thrombus are generally treated with anticoagulants as per CHA2DS2-VASc (congestive heart failure, hypertension, age >75-year, diabetes, previous stroke, peripheral vascular disease, age = 65–74 year, sex category = female) score for stroke risk in AF to prevent the risk of thromboembolic events.^[6] However, anticoagulants have their own risks. As mentioned earlier, the key to LA thrombus detection is to suspect its presence. Severe AS and AR are not known to be associated with LA thrombus, but the presence of dilated LV and LA and low EF (18%) suggest the presence of slow and sluggish circulation and a possibility of the presence of LA thrombus and should be evaluated by various modalities described above. In the present case report, the LAA thrombus was not detected during preoperative TTE. In a study comparing the two echocardiography methods (TTE and TEE), all nine LAA thrombi were undetected during TTE imaging but were clearly identified by the TEE, with a sensitivity of 100% and specificity of 99%.^[7] It is note worthy that LA is better imaged during TEE examination because of the proximity of the TEE transducer to posterior structures, which is often difficult with TTE as the LA and its appendage are far placed in the field and often difficult to image particularly, when LA is dilated. Apparently, if the presence of LA thrombus is suspected in a patient and not found during TTE examination, its (LA thrombus) presence should be ruled out by alternative diagnostic method, such as TEE, and other methods described above.

The intraoperative finding of LA thrombus involves major changes in surgical and cardiopulmonary bypass (CPB) management plan.^[8] The presence of LA thrombus necessitates careful handling of the heart until the initiation of CPB and clamping of the aorta, else the LA thrombus can be embolized into the systemic circulation.^[9] However, thrombus embolization in spite of adequate precaution has been reported. LA thrombus is removed through transeptal approach or after opening the LA and for both the approaches full sternotomy is required. For AVR, CPB is generally managed with a single two-stage venous

drain cannula and an aortic inflow cannula. However, for removal of LA thrombus, opening of LA or right atrium (Transseptal approach) is required for which total CPB is essential. For both the approaches, the collapse of the right atrium is necessary. This requires cannulation of both the vena cava separately for venous drain, further they need to be snugged to ensure the complete collapse of the right atrium and its easy maneuverability.

In view of serious surgical implications of the presence of LA thrombus, in patients of severe AS and AR with LV dilation and low EF and undergoing AVR, the LA and LAA should be examined for the presence of thrombus and spontaneous echo contrast. A flow velocity of >0.3 m/sec in LAA rules out the possibility of the presence of LAA thrombus. If LA thrombus is found, appropriate changes in surgical plan and CPB management should be made to prevent embolization of LA thrombus before the initiation of CPB and aortic clamping and its removal during CPB.

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