A RIGHT ATRIAL THROMBUS, ATTACHED TO THE INFERIOR LIMB OF THE FOSSA OVALIS

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A right atrial thrombus was incidentally found in a 65-year-old male during mitral valve surgery. A mushroom-like thrombus was attached to the inferior limb of the fossa ovalis with broad based stalk. It developed in sinus rhythm and in the absence of evidence of blood stasis in the right atrium. The most likely pathogenesis of right atrial thrombus formation in this case is endocardial damage from right heart catheterization prior to surgery.

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THROMBOSIS in the left side of the heart is fairly common, but a thrombus originating in the right atrium unusual. We describe a case of right atrial thrombus which was incidentally found during mitral valve surgery. Endocardial damage due to catheterization is likely to be related to the thrombus formation.

CASE REPORT

A 65-year-old male was admitted to our hospital in November 1989 to have a cardiac catheterization. Auscultation was suggestive of mitral regurgitation. A chest X-ray film showed typical mitral configuration. The cardiothoracic ratio was 55%. Echocardiography showed mitral valve prolapse with moderate mitral regurgitation and slightly increased left cardiac dimensions.

Cardiac catheterization revealed the following: mean right atrial pressure 5 mmHg, pulmonary capillary wedge pressure (V wave) 25 mmHg, main pulmonary artery pressure 30/10 (mean 20) mmHg, right atrial pressure 32/3 mmHg, left ventricular pressure 130/5 mmHg, left ventricular endo-

diastolic pressure 10 mmHg, aortic pressure 130/90 mmHg and cardiac index 2.8 L/min/m². Left ventriculography indicated mitral valve prolapse with mitral valve regurgitation (Sellers III°). Surgery was advised but the patient discharged himself from the hospital because of the absence of subjective symptoms. Eight months later at second admission, the patient appeared complaining of slight exertional dyspnea. No evidence of congestive heart failure, deep vein thrombosis or pulmonary embolisations were found. On physical examination, his heart rate was 72 beats/min and regular. His blood pressure was 132/66 mmHg. On auscultation, a grade 4/6 harsh pansystolic murmur was heard at the apex. His neck veins were slightly distended and abdomen and lower extremities unremarkable. Electrocardiogram revealed sinus rhythm, QRS axis +45° and left ventricular hypertrophy pattern with slight ST segment and T wave changes in the V₅ and V₆ leads. Echocardiography in parasternal long axis view revealed mitral valve prolapse with moderate mitral regurgitation. Overall cardiac dimensions were slightly increased as compared with those taken at previous examination. The cardiac dimensions were as follows: right ventricle 3.2 cm, aorta 3.1 cm, left atrium 4.5 cm, and left ventricle 6.1 cm. No

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Fig.1. Echocardiography prior to surgery (panel A) and at previous admission 8 months before (panel B). Absence of definite abnormal echoes at the right atrial septum. In spite of slight differences in angulation and cardiac cycle between the 2 recordings, the cardiac dimensions prior to surgery were dilated.

Fig.2. Mushroom like mass, arrow, indicates the right atrial septum.

definite abnormal echoes were found in the right atrium (Fig. 1). A chest x-ray showed no signs of pulmonary congestion and a cardiothoracic ratio of 61%. Biochemical values were normal. Blood coagulation time and bleeding time were 6 min 30 sec and 7 min 30 sec respectively.

As surgery, a transseptal approach was

taken because of the slightly dilated right atrium. The right atrium revealed a small, round, black, mushroom-like mass attached to the inferior limb of the fossa ovalis. The fossa ovalis was completely closed. The mass including the fossa ovalis was removed (Fig. 2). The mitral valve was replaced by a prosthetic valve and the postoperative course was uneventful. Pathological studies of the removed specimen showed it to be a mass of organized thrombus covered with coagulated blood (Fig. 3).

DISCUSSION

In this case, an immobile and broad based right atrial mass was incidentally found attached to the right atrial septum.

The differentiation between thrombus and tumor is important in this case. During the operation, the diagnosis of a right atrial myxoma seemed possible because of attachment to the interatrial septum and morphology^{1,2}. Furthermore, 25% of all atrial myxoma are found in the right heart¹. However, a right atrial thrombus fixed to the interatrial septum has been reported. A right atrial thrombus fixed to the interatrial septum has also been reported¹. In this case, pathological examination of the mass disclosed an organized thrombus. The main problem in diagnosis in this case is to determine whether the mass was thrombus originating in the right atrium or an embolus from a deep vein. Thromboemboli from deep veins are long, extremely mobile, move across the tricuspid orifice,

Fig.3. Microscopic section of the removed mass, amorphous structure of fibrin, and a few blood cells throughout fibrin at the surface of the mass (upper portion of the figure).
(original magnification $\times 33$, Hematoxylin-eosin)

and cause frequent pulmonary embolisation. Emboli wedged within a probe-patent foramen ovale are also mobile and long^{4,6}. In contrast, thrombi originating in the right atrium are round, shorter, immobile and fixed to the right atrial wall with a broad based attachment³⁻⁷.

We considered the mass as a thrombus originating in the right atrium, because of its morphology, its broad based attachment to the atrial septum with nonpatent foramen ovale, its immobility and the absence of any clinical evidence of peripheral venous thrombus.

Atrial thrombus formation is uncommon. Right atrial thrombus is found in patients with right atrial and ventricular dilation with reduced right ventricular contractility, leading to relative stasis of blood, including congestive cardiomyopathy, idiopathic dilation of the right atrium and atrial fibrillation^{3,7}.

Although this patient's cardiac dimensions were slightly increased compared with those at the previous admission, he was in sinus rhythm with moderate heart beats and there was no atrial fibrillation, reduced right ventricular contractility, or marked dilation in the right atrium and ventricle and congestive heart failure. Therefore, in this patient, blood stasis was unlikely to be responsible

for the thrombus formation. Furthermore, since the bleeding time and coagulation time were in the normal range, coagulability was unlikely to relate to thrombus formation.

It is difficult to account for the pathophysiological mechanism of the right atrial thrombus formation in this case. Retrospectively, the only clue to the possibility of thrombus formation was the endocardial damage resulting from the right heart catheterization prior to surgery. In some reported cases, right heart manipulation by catheter is presumed to have resulted in focal endocardial damage, perhaps leading to right heart thrombus formation^{8,9}.

The uncommon progression of atrial thrombus due to endocardial damage to myxoma was reported¹⁰. Many of the morphological features of mural thrombi in the process of organization and these of myxomas were identical. The degree of vascularity of the tissue underlying the thrombus and the rate of granulation tissue ingrowth are important factors determining the final form of a thrombus, whether it may progress as organized thrombus or develop into myxoma. The relatively avascular nature of the tissues in the vicinity of the fossa ovalis may reduce ingrowth into thrombi at that site, resulting in failure to

develop myxoma!¹⁰ In this case, the mass proved to be an organized thrombus and there was no vascularity or myxomatous tissue.

The thrombus is acoustically intense, echogenic and distinguishable from surrounding intracavitary blood and adjacent myocardium!¹¹⁻¹³ A thrombus with a maximal dimension of 0.6 cm can clearly be delineated on echocardiogram!¹³ However, in our patient, an echocardiogram was not diagnostic of the right atrial thrombus attached to the atrial septum. The size of the thrombus might be too small for visualization on echocardiogram. The right atrium is too near to chest wall to obtain appropriate visualization. Varying transducer angulation and gain settings might make possible visualization of the thrombus, as emphasized in a previous report!^{11,12}

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