Enlargement of the Excluded Left Atrial Appendage With Thrombus

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SUMMARY

We report progressive enlargement of the excluded left atrial appendage (LAA) with a thrombus in a patient who had undergone valve surgery and endocardial suture closure of the LAA previously. Echocardiography and CT detected no communication between the LAA and the left atrium. Magnetic resonance imaging showed the LAA was filled with fresh and old thrombi. Coronary arteriography demonstrated small left coronary artery-LAA fistulae. At surgery, successful exclusion of the LAA was confirmed after removal of the thrombi. Persistent inflow of blood through the coronary artery fistulae to the excluded LAA may be the primary mechanism of this pathology. (*Int Heart J* 2017; 58: 144-146)

Key words: Atrial fibrillation, Embolism, Exclusion of the left atrial appendage, Left atrium

In patients with atrial fibrillation (AF), exclusion of the left atrial appendage (LAA) is recommended to prevent thromboembolic events,¹⁻³⁾ and it can be accomplished with various techniques such as suture ligation or stapling devices.⁴⁾ Generally, the successfully excluded LAA is filled with a thrombus and the thrombus eventually organizes late after exclusion.⁵⁾

In this paper, we report progressive enlargement of a successfully excluded LAA that was filled with a thrombus in a patient who had undergone valve surgery and endocardial suture closure of the LAA previously, and discuss a pathophysiologic mechanism of enlargement of an LAA with a thrombus.

The current study was approved by our Institutional Research Ethics Board at St. Mary's Hospital, and patient consent was waived.

CASE REPORT

A 79-year-old woman with persistent AF was admitted for an abnormality on cardiac silhouette. The patient had a history of valve surgery for rheumatic valve disease and endocardial suture exclusion of the LAA 13 years before. On admission, she was asymptomatic and on anticoagulant therapy with warfarin. Chest X-rays showed moderate cardiomegaly with progressive local protrusion of the left border of the cardiac silhouette. Transthoracic echocardiography (TTE) revealed a dilated left atrium (LA) and normally functioning aortic and mitral prosthetic valves. A solid mass, 45 × 51 mm in size, which was just adjacent to the body of the LA and was clearly demarcated from the enlarged LA, was also delineated on both TTE and chest CT, but contrast enhancement of the mass was not observed on CT (Figure 1A, 1B). Magnetic resonance im-

aging demonstrated that the mass contained fresh and old thrombi (Figure 1C, 1D). Coronary arteriography revealed normal arteries, however, small fistulae from the left coronary artery to the LAA were observed (Figure 2). Based on these findings, enlargement of the successfully excluded LAA filled with a thrombus was suspected. Surgical removal of the LAA was planned because of its expanding nature. Intraoperative transesophageal echocardiography (TEE) showed no communication between the LA and the LAA. After dissection of the pericardium through a median sternotomy, the solidified and enlarged LAA was found and was opened under normothermic cardiopulmonary bypass and cardioplegic arrest. The LAA was filled with fresh and old thrombi. After removing the thrombi, it was confirmed that there was no communication of the LAA with the body of the LA, and the LAA was excised from outside the heart. Pathohistologic findings were compatible with thrombus.

DISCUSSION

Surgical LAA closure has been performed to prevent thromboembolic events during valve surgery and coronary artery bypass grafting or, more recently, as an isolated procedure using a thoracoscopic approach,^{3,4)} because most of the atrial thrombi are seen within the LAA.³⁾

Schwartz and colleagues⁵⁾ experimentally and clinically studied mechanisms of healing and intracardiac integration in LAA exclusion by a mechanical device and demonstrated that the excluded LAA filled with a thrombus early after exclusion, and that the thrombus subsequently organized over time. However, in our patient, progressive enlargement of the excluded LAA continued, despite the successful exclusion of the LAA.

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Figure 1. CTs and MRIs showing the enlarged LAA and thrombus in the excluded LAA. **A:** Non-enhanced and **B:** enhanced CTs showing the enlarged LAA (50 mm in size) that was clearly demarcated from the body of the LA without enhancement. **C:** T1-weighted and **D:** T2-weighted MRIs showing fresh and old thrombi in the excluded LAA.

Figure 2. A coronary arteriograph showing small fistulae between the left coronary artery and the LAA.

The pathogenesis of thrombus formation in the LAA has not been fully elucidated, however, stasis of blood flow is thought to play a major role.⁶⁾ Considering this mechanism, persistent blood flow into the excluded LAA through fistulous communications between the coronary artery and the LAA and/or the atrial branches of the coronary arteries may have

caused stagnation or accumulation of the blood in the LAA leading to enlargement of the excluded LAA and expansion of the thrombus in our patient. In addition, it is speculated that the accumulated blood in the excluded LAA can be partly drained through the angiogenesis within the organized appendage thrombus and its communication with pectinate appendage muscle in the distal part of the appendage, as shown in the study by Schwartz and colleagues.⁵⁾ Terasaki, *et al*⁷⁾ reported a similar case of enlargement of the closed LAA, and have indicated the presence of a small coronary artery fistula to the LAA as the causative mechanism of enlargement of the LAA secondary to thrombus formation after its closure. Indeed, a coronary artery fistula to the LAA is commonly observed in patients with an LAA thrombus. Bhutto and coworkers⁸⁾ also documented a case of a mobile thrombus within a successfully excluded LAA. They indicated that the etiology of the thrombus was likely periprocedural with the remaining blood in the LAA, however, the presence of coronary artery fistulae to the LAA was not mentioned. In addition, the easy distensibility of the LAA resulting from preoperative LA dilatation, rheumatic changes in the LA wall, and the loss of atrial contraction due to long-standing atrial fibrillation may also have contributed to enlargement of the excluded LAA and expansion of the thrombus. Furthermore, anticoagulant therapy with warfarin could have some effect on persistent blood inflow to the excluded LAA in our patient. Considering these mechanisms of thrombus formation in the excluded LAA, excision of the LAA would be more advantageous than exclusion by a method such as suture closure or closure with staples in patients with AF, particularly patients with fistulous communication between the

coronary artery and the LAA. With the advance of interventional techniques, transcatheter closure for coronary artery fistula has been recently reported as a safe and effective treatment.⁹⁾ However, recanalization of fistulae after complete coil occlusion was experienced in a patient taking an oral antiplatelet,¹⁰⁾ therefore, close follow-up is very important, particularly for patients on anticoagulant therapy.

Excision of the LAA was carried out due to the progressive enlarging nature of the LAA with the thrombus in our patient, despite the fact that no other structural and functional cardiac abnormalities were found. Although the natural history of this rare pathology is unclear, removal of the LAA should be performed when symptoms and hemodynamic impairment caused by an enlarged LAA filled with a thrombus, such as cardiac and mediastinal compression, are observed or when cardiac surgery is necessary for another cardiac disease.

Conclusion: We report progressive enlargement of a successfully excluded LAA that was filled with a thrombus in a patient who had undergone valve surgery and endocardial suture exclusion of the LAA 13 years before. Persistent blood flow into the successfully excluded LAA through fistulous communications between the coronary artery and the LAA may be a primary mechanism of progressive enlargement of an excluded LAA with thrombus.

DISCLOSURE

Conflict of interest: The authors have no conflict of interest.

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