






A Thrombus within an Interventricular Membranous Septal Aneurysm Leading to Cerebral Infarction: A Case Report

심실간 막 중격류에 생긴 혈전으로 인한 뇌경색: 증례 보고

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Interventricular membranous septal aneurysms are rare. Since these aneurysms can lead to complications such as obstruction of right ventricular outflow and thromboembolism, the detection of this aneurysm has clinical significance. Herein, we report a case of an interventricular membranous septal aneurysm with an internal thrombus thought to be the cause of a cerebral infarction.

Index terms Thrombus; Cerebral Infarction; Computed Tomography, X-Ray; Echocardiography; Aneurysm Of Interventricular Septum

INTRODUCTION

The membranous portion of the interventricular septum, located near the cardiac region, is the most common site of defects (1). The absence of myocardium in this region can lead to an interventricular membranous septal aneurysm (2). Although most patients with interventricular membranous septal aneurysms are asymptomatic, symptomatic cases are often associated with complications, including obstruction of right ventricular outflow, arrhythmia, and thromboembolism (3). Here, we report the case of a patient with a thrombus within an

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interventricular membranous septal aneurysm that led to repeated cerebral infarctions.

CASE REPORT

A 54-year-old male was referred to our emergency room with aphasia that had started approximately 3 hours previously. He had a history of cerebral infarction (in the right middle cerebral artery territory) 6 years previously, from which he recovered without sequelae and was being treated with antiplatelet agents.

Brain MRI and angiography revealed a cerebral infarction in the left frontal lobe (Fig. 1A) and no significant stenosis or other abnormalities (MR angiography; MRA) (Fig. 1B). He had no overt stroke risk factors, including medical or family history. He was relatively young and had no specific findings on MRA; therefore, he was hospitalized and was suspected of having an acute cerebral infarction due to embolism.

No abnormal findings, such as atrial fibrillation, were observed on electrocardiogram (ECG) or on 24-hour Holter monitoring. Transthoracic echocardiography revealed no lesions that could be a source of the embolism, such as an intracardiac shunt or patent foramen ovale; however, an aneurysm was detected in the membranous portion of the interventricular septum (Fig. 1C). To examine the aneurysm in detail, cardiac CT with 128-slice dual source system (Somatom Definition Flash, Siemens, Erlangen, Germany) was performed. This examination revealed an outpouching lesion in the membranous portion of the interventricular septum protruding towards the right ventricle, suggesting an interventricular membranous septal aneurysm (Fig. 1D). A low-attenuation lesion within the aneurysm was detected on the reconstructed image (Fig. 1E). Because the lesion did not show enhancement (its CT number was measured as approximately 50 Hounsfield units on enhanced images), it was considered unlikely to be a tumorous condition such as myxoma, and it was judged to be a

Fig. 1. Images of a 54-year-old male with a thrombus within an interventricular membranous septal aneurysm leading to cerebral infarction.

A. Brain MR image (diffusion weighted image) shows an acute cerebral infarction in the left frontal lobe.

B. Brain MR angiography shows no significant stenosis or other abnormality.

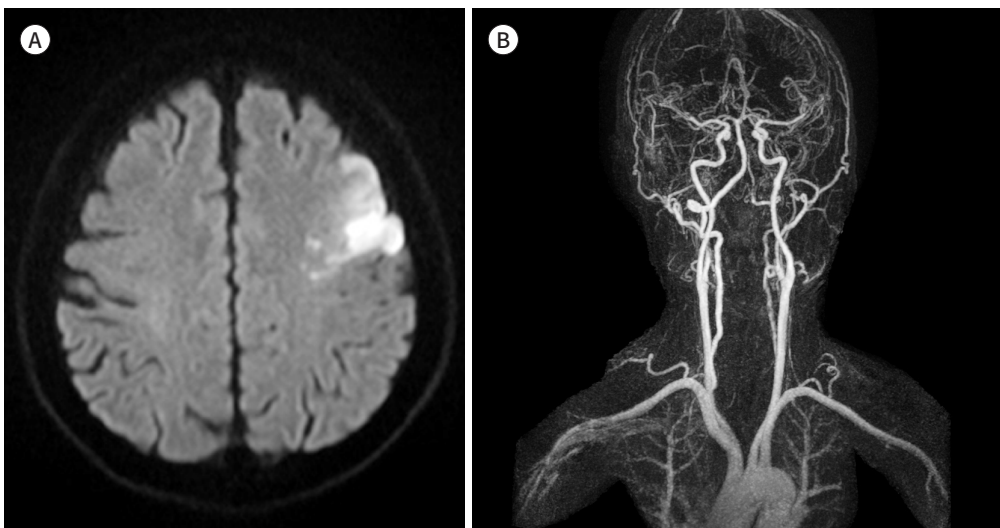
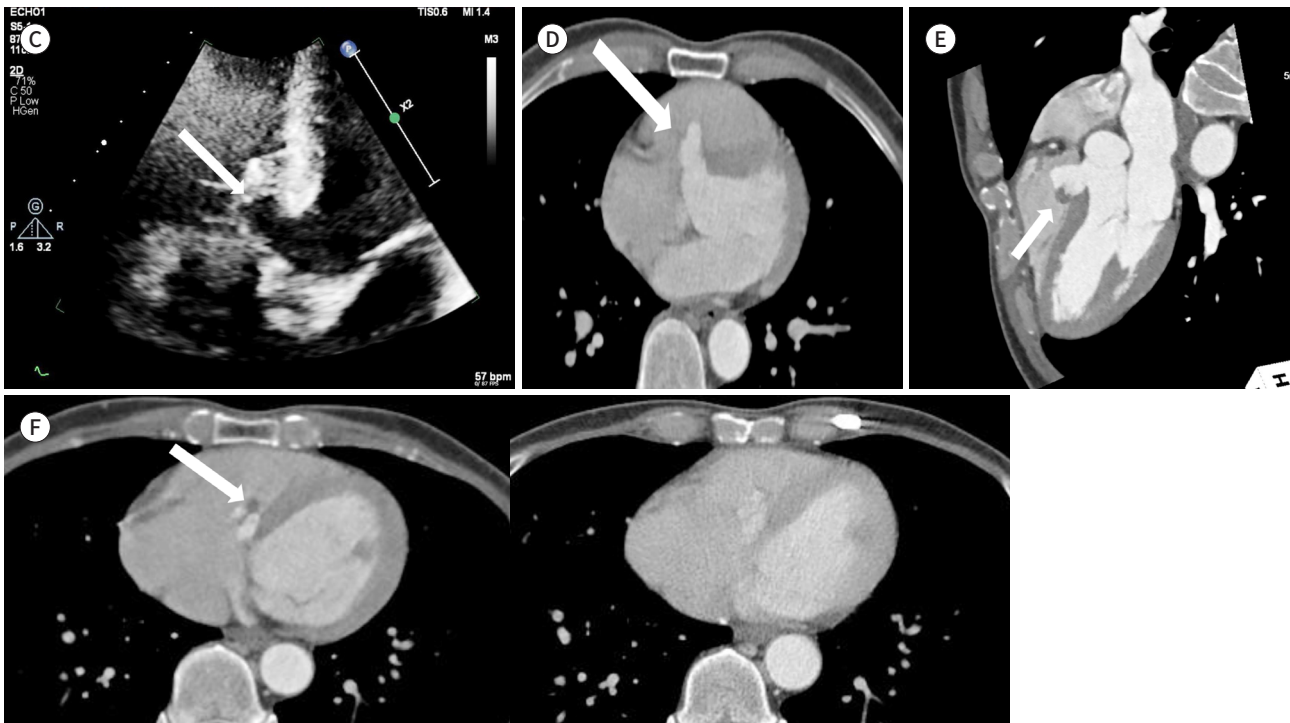


Fig. 1. Images of a 54-year-old male with a thrombus within an interventricular membranous septal aneurysm leading to cerebral infarction. **C.** Transthoracic echocardiography shows an aneurysm in the membranous portion of the interventricular septum, protruding into the right ventricle (arrow). **D.** Cardiac CT shows an interventricular membranous septal aneurysm (arrow). **E.** CT image reconstructed in a 4-chamber view shows a low attenuating thrombus within the aneurysm (arrow), with a CT number of the thrombus of approximately 50 Hounsfield units. **F.** Follow up imaging of the aneurysm within the interventricular membranous septal aneurysm is shown. A low attenuating thrombus within the interventricular membranous septal aneurysm is shown on initial CT image (left, arrow). The thrombus within the aneurysm nearly disappeared on follow-up CT image about one month after starting of warfarin (right).



thrombus within the aneurysm. The aneurysm showed no connection to the right ventricle and no significant coronary artery stenosis, myocardial thinning, or low endomyocardial attenuation in the left ventricular myocardium, including the apex of the left ventricle. In addition, the patient showed no specific findings on subsequent coronary angiography.

Eventually, the patient was diagnosed with embolic cerebral infarction caused by a thrombus within an interventricular membranous septal aneurysm. We decided to follow up with life-long warfarin and to operate if the embolic event recurred. The thrombus within the interventricular membranous septal aneurysm had nearly disappeared on follow-up CT approximately one month after starting warfarin (Fig. 1F).

This study was performed according to the latest ethical principles in the Declaration of Helsinki.

DISCUSSION

The interventricular septum begins to develop in the 5th week of gestation and consists of four portions: membranous, muscular, inlet, and infundibular. The membranous interventricular septum is formed by downward proliferation of tissue from the endocardial cush-

ions, and the muscular interventricular septum is formed by upward proliferation of tissue from the cardiac apex to the endocardial cushions. The complete interventricular septum is formed by fusion of the membranous and muscular interventricular septum (3, 4). The membranous portion of the interventricular septum is located near the cardiac base, immediately below the right and noncoronary cusps of the aortic valve (1).

Interventricular membranous septal aneurysms reportedly occur in approximately 0.2% of adults and 20% of patients with perimembranous ventricular septal defects (VSDs) (5). Although the etiology of interventricular membranous septal aneurysms remains to be fully understood, it is known to be related to the spontaneous closure of the VSD, infection, and trauma (5). The clinical course of most patients with interventricular membranous septal aneurysms is silent. The most common symptoms are exertional dyspnea and fatigue, whereas cardiac murmurs can be detected in some cases (3).

A significant number of interventricular membranous septal aneurysms are incidentally detected on echocardiography, which allows for accurate diagnosis of the aneurysm (5). However, the diagnosis of aneurysms by using echocardiography depends on the proficiency of the operator. In this case, the thrombus within the aneurysm was not visible on echocardiography. ECG-gated multi-detector CT is useful for detecting aneurysms and finding evidence of possible complications, including thrombi (5). In addition, CT may help differentiate thrombi from other tissues (6). Cardiac MRI is a useful alternative for assessing cardiac anomalies (3).

Interventricular membranous septal aneurysms can cause several complications such as obstruction of the right ventricular outflow, arrhythmia, and thromboembolism. Obstruction of right ventricular outflow is the most common complication of aneurysms. As the aneurysm protrudes into the right ventricle, outflow obstruction of the right ventricle occurs during left ventricle contraction (3). In addition, arrhythmic events, including ventricular tachycardia and complete atrioventricular block, often occur because the aneurysm is located in a cardiac electrical circuit (7). Moreover, an aneurysm may cause thrombus formation due to the abnormal movement of the ventricular wall. Detection of an internal thrombus is important as it can cause fatal embolisms, including cerebral embolisms (8). Considering that lesions of the heart and aorta are often the cause of cerebral embolic infarction, cardiovascular work-up is necessary when embolic infarction is suspected, and inspecting for the involvement of a cardiac source, including interventricular membranous septal aneurysm, is necessary (9).

Surgical treatment is not recommended for patients with interventricular membranous septal aneurysms except in cases of serious complications or hemodynamic instability. For patients with internal aneurysms, periodic echocardiographic follow-up and anticoagulation treatment are recommended, and surgery is recommended if a cerebral embolism occurs despite anticoagulation treatment (10). However, no guidelines have been established for this purpose.

Here, we report a case of an interventricular membranous septal aneurysm with an internal thrombus. Although most patients with interventricular membranous septal aneurysms are asymptomatic, the detection of this aneurysm is clinically significant given its potential complications.

Author Contributions

Conceptualization, K.J.; investigation, K.S.; supervision, K.J.; visualization, K.S.; writing—original draft, K.S.; and writing—review & editing, all authors.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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심실간 막 중격류는 드문 질환이다. 이 동맥류는 우심실 유출 폐색이나 혈전색전증과 같은 합병증을 유발할 수 있으므로 이 동맥류를 발견하는 것은 임상적으로 의의가 있다. 우리는 뇌경색의 원인으로 생각되는 심실간 막 중격류에 생긴 혈전을 보고하고자 한다.

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