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Recurrent Stroke after Percutaneous Placement of Post-Infarct Septal Occluder Device

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Abstract

Surgical intervention for post-infarct ventricular septal defect (VSD) is a challenging procedure due to patients' complex preoperative conditions. While percutaneous VSD closure can be considered as an alternative to surgical repair, complete closure of the defect remains difficult and is associated with various procedural complications. We report a rare case of a patient with postoperative residual shunts who experienced recurrent stroke episodes, requiring surgical intervention for repair. The patient, a 71-year-old female, developed acute anterior myocardial infarction and post-infarct VSD. Percutaneous closure with a 14-mm Amplatzer VSD occluder device was performed, yet the closure was incomplete. Following discharge, she developed multiple embolic stroke episodes, likely stemming from the residual VSD, which led to the surgical extraction of the device and VSD repair. Fibrous tissue was found to be solely attached to the core and right ventricle side of the device, whilst no fibrous tissue was observed on the side of the left ventricle. The patient has not experienced new neurological symptoms at an 18-month follow-up. Thus, it is paramount to keep in mind that an embolic stroke may occur in the setting of percutaneous post-infarct VSD closure. Surgical repair of VSD with device removal should be considered as a treatment option to such a complex case.

Keywords

Ischemic Heart Disease, Post-Infarct Ventricular Septal Defect, Percutaneous Closure

1. Introduction

Post-infarct ventricular septal defect (VSD) is a life-threatening complication following acute myocardial infarction [1] [2] [3] [4]. Early surgical intervention for post-infarct VSD is challenging due to several reasons; first, patients are often in cardiogenic shock with mechanical circulatory support; second, the VSD itself is complex due to surrounding edematous and necrotic tissue, causing an open repair to be challenging; and lastly, its incidence has decreased to less than 1% of acute myocardial infarction cases, with an average number of annual procedures ranging from 0.09 to 3.7 cases/year in the United States [1] [5]. According to the Society of Thoracis Surgeons Database, the overall mortality rate after post-infarct VSD repair was reported to be 42.9% [1]. With the hope of improving early operative outcomes, one of the alternative techniques considered for percutaneous ischemic VSD closure involves using an occluder device [2] [3]. However, there is limited clinical evidence regarding potential complications related to percutaneous ischemic VSD repair that ought to be considered. We report a case of a patient with residual shunts following percutaneous closure of an ischemic VSD in which open surgical repair was required due to post-operative recurrent stroke episodes.

2. Case

A 71-year-old woman developed acute anterior myocardial infarction which was treated with drug-eluting stenting. The hospital course was subsequently complicated by anterior post-infarct VSD. Percutaneous VSD closure with a 14-mm Amplatzer VSD occluder device (Abbot, Chicago, IL) was performed. However, residual shunts were present causing the Qp/Qs ratio to decrease from 2.9 to 1.9. After discharge with aspirin 81 mg and clopidogrel 75 mg, the patient experienced several syncopal episodes and developed dysarthria, right upper hemiparesis, and transient visual loss within three months of the myocardial infarction. Diagnosis of an embolic stroke in the left corona radiate and temporoparietal region was made with the probable source being the residual VSD and closure device. The patient was placed on warfarin potassium and dual antiplatelet therapy, yet a total of 6 similar episodes were followed. In addition, the clinical course was complicated by melena with supratherapeutic INR requiring blood transfusion. She was then transferred to our hospital for further management.

Transthoracic echocardiography showed a 14-mm Amplatzer device in place (**Figure 1(A)**) with two residual shunt flows around the device (**Figure 1(B)**). Fifteen weeks after percutaneous closure of VSD, she proceeded to undergo a surgical extraction of the device and VSD repair. Following aortic cross-clamp, a free wall of the left ventricle (LV) was incised along the left descending coronary artery. No clots were found on the LV side of the Amplatzer device (**Figure 2(A)**), yet the device was adhered to a free wall of the right ventricle. Gross inspection of the explanted specimen showed that fibrous tissue was only attached

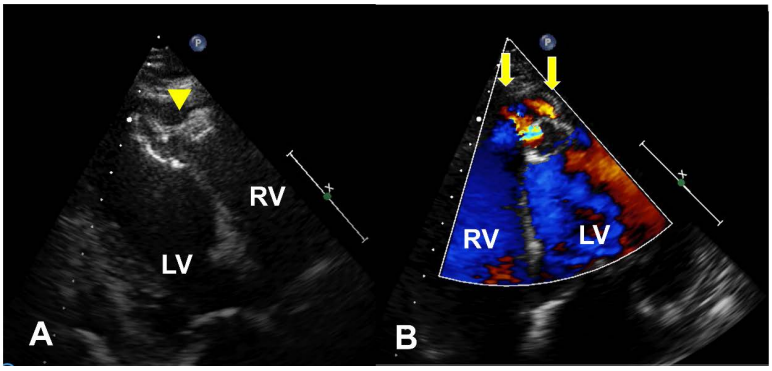

Figure 1. Representative images from preoperative transthoracic echocardiography. (A) A 14-mm Amplatzer VSD occluder device is seen on the anterior septum (arrow-head). (B) There are two residual left-to-right shunt flows close to the Amplatzer device (arrows).

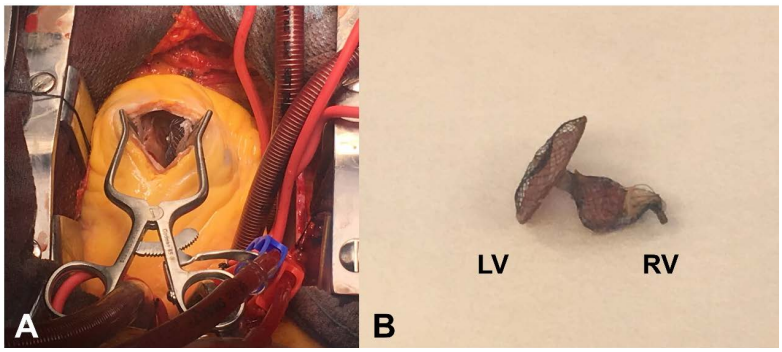

Figure 2. (A) An intraoperative picture from LV ventriculotomy. A metal part of the device is shown without any tissue attachment. (B) Pathological specimen of a 14-mm Amplatzer VSD occlude device. Organized tissue filled the inside of the nitinol meshwork, yet there is space on the LV side. The RV side of the occluder device was deformed during intraoperative extraction as a result of adhesion to the RV free wall. LV = left ventricle. RV = right ventricle.

to the core and right ventricle side of the device, while no fibrous tissue was attached to the LV side (**Figure 2(B)**). After device removal, the VSD was closed with a bovine pericardial patch and LV ventriculotomy was closed using a double-layered closure technique. The patient was discharged with oral aspirin 81 mg. No new neurological symptoms were experienced by the patient at an 18-month follow-up.

3. Discussion

Outcomes of early surgical repair of post-infarct VSD have remained unchanged throughout the last two decades [1] [5]. Although delayed surgical intervention may seem associated with better survival, unstable hemodynamic conditions in ischemia does not always permit for this delayed approach. In this type of critical setting, percutaneous ischemic VSD closure may potentially be a more attractive alternative to surgical repair due to the reduced invasive nature of the procedure [3] [4]. A large multi-center study from the United Kingdom reported that an

immediate complete reduction of the shunt by percutaneous VSD closure technique was attained in only 15% of patients, while a partial reduction of the shunt was seen in 64% of patients [3]. As a result, several complications have been reported to be related to percutaneous ischemic VSD closure, such as a residual shunt, hemolysis, device dislodgement/embolization, infection, atrioventricular block, and LV rupture [4].

Following an embolic stroke, anticoagulation and/or antiplatelet agents act as standard therapy to prevent a recurrent thromboembolic event. In this present case, after developing an embolic stroke, the patient was treated with dual antiplatelet therapy and warfarin potassium. However, despite these medical interventions, the patient suffered a recurrent stroke following the initial episode. Furthermore, gastrointestinal bleeding had developed as a result of the dual antiplatelet and anticoagulation therapy. Although a revision procedure of VSD percutaneous closure may have been a potential management option, it is technically more challenging. Therefore, surgical repair of the residual VSD and removal of the occluder device was performed.

In a previous report regarding percutaneous VSD closure, an excised pathological specimen collected during autopsy showed that the nitinol mesh of the VSD occluder device was fully filled with organized tissue, which typically takes a few weeks to form [3]. In the present case, even 3 months following percutaneous VSD closure, the excised specimen showed that there was no organized tissue on the LV side of the Amplatzer device's surface. Thus, it is difficult to determine whether shunt flow or the presence of the device itself was the cause of embolism. Nevertheless, the patient has not had any new neurological symptoms after the surgical extraction of the Amplatzer device and VSD closure, supporting the feasibility of surgical repair.

4. Conclusion

In conclusion, we experienced a rare case of a recurrent stroke following percutaneous VSD closure with residual shunts which required an open surgical repair. It is paramount to keep in mind that an embolic stroke may occur after percutaneous post-infarct VSD closure with a residual shunt.

Consent for Publication

The patient has provided permission to publish this case and the identity of the patient has been protected.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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