Very Late Amplatzer Device Thrombosis and Stroke

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INTRODUCTION

Atrial septal defect (ASD) is among the most common congenital heart diseases, accounting for 7% to 10% of all congenital heart diseases diagnosed in children and up to 30% to 33% in adults.[1] Ostium secundum is the most frequent congenital heart disease, representing 80% of all cases. In ostium secundum, a left-to-right shunt develops; some patients have pulmonary hypertension, atrial remodeling, arrhythmias such as atrial fibrillation, and paradoxical embolism.[2] According to European Society of Cardiology and the American Heart Association guidelines, ASD closure is recommended when there is a significant shunt with signs of right ventricular overload; also, ASDs should be closed in all patients with suspicion of paradoxical embolism.[2,3] ASD closure can be performed either surgically or by percutaneous device implantation; however, devices are not free of complications, one of which is the formation of thrombus and embolism, usually in the first year.

CASE PRESENTATION

A 59-year-old man was admitted for disorientation and right hemiparesis after an episode of acute loss of consciousness of unknown duration with loss of sphincter control; once conscious, he showed aphasia, disorientation, and right hemiparesis. His vital signs were normal, with weakness in the arm, leg, and the right side of the face and no other findings. A blood test showed mild anemia, with normal renal function. Computed tomography without contrast showed an acute ischemic stroke in the left medial cerebral artery territory, so acetylsalicylic acid (ASA) and atorvastatin were initiated. The patient's medical history included a mesenteric thrombosis 8 years earlier, during which an ASD was diagnosed and treated percutaneously with an Amplatzer Septal Occluder (St. Jude Medical, St. Paul, MN); he was not taking any medication. Transesophageal echocardiography showed a normal left ventricle, without valvular abnormalities; in the atrial septum there was a device compatible with an Amplatzer occluder, and on the left side of the device there was a mass compatible with thrombus (Figure 1, Video 1).

Formal anticoagulation was initiated with low–molecular weight heparin. The case was discussed with a multidisciplinary team (hematology, cardiology, and neurology), which recommended anticoagulation, follow-up with echocardiography, and cardiovascular surgery consultation in case of therapy failure or according to clinical condition. The hematology department believed that it was not necessary to rule out a hypercoagulable state in view of the fact that after two venous thrombotic events and one embolism to the brain, the anticoagulation would have an indefinite duration. Five months later, the patient was asymptomatic, without neurologic deficit, and receiving anticoagulation with low–molecular weight heparin. Transesophageal echocardiography showed no evidence of thrombi adhered to the Amplatzer device (Figure 2, Video 2).

DISCUSSION

Since the first description of percutaneous ASD closure by King *et al.*[4] in 1976, new-generation devices have demonstrated similar efficacy to surgical closure with a lower incidence of complications associated with the procedure.[1,5] Hence, this technique is presently considered the first choice for the closure of ostium secundum–type defects.[2,3] There are several devices for percutaneous ASD closure, two with US Food and Drug Administration approval: the Amplatzer Septal Occluder and the Gore Helex Septal Occluder (W.L. Gore, Newark, DE), the former being the most frequently used in our practice.[1] The European Society of Cardiology recommends antiplatelet therapy for 6 months after implantation[2]; however, different antiplatelet and anticoagulation therapies have been reported in the literature. Krumsdorf *et al.*[6] studied 1,000 patients, 511 receiving ASA, 391 receiving ASA plus clopidogrel, and 98 receiving warfarin. There were no significant differences in the incidence of thrombus formation between dual-antiplatelet therapy and ASA alone. Another study that included 37 patients who underwent percutaneous ASD or patent foramen ovale closure, managed with ASA plus clopidogrel, showed that after 6 months, none of the patients presented thrombi associated with the device, although it did not include a control group.[7]

Several complications associated with the placement of these devices have been described, including migration, poor positioning, atrioventricular block, and atrial fibrillation.[1] One infrequent complication is the occurrence of thrombus attached to the device; Krumsdorf *et al.*[6] studied 1,000 patients undergoing percutaneous ASD or patent foramen ovale closure, monitored for 36 months, and found a 2% incidence of thrombosis; the most frequent location of the thrombus was on the left side of the device, more frequent after patent foramen ovale closure. In addition, in almost 75% of these cases, the thrombus was detected in the first 4 weeks after the procedure and in three patients after 1 year; atrial fibrillation

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VIDEO HIGHLIGHTS

Video 1: Transesophageal echocardiography with three-dimensional reconstruction of the interatrial septum, from the left atrial aspect. A 14 × 12 mm rounded echo-dense image compatible with a thrombus can be seen in the Amplatzer Septal Occluder.

Video 2: Transesophageal echocardiography with three-dimensional reconstruction of the interatrial septum, from the left atrial aspect of the same patient 5 months later. The Amplatzer Septal Occluder in the interatrial septum was without thrombus; anticoagulation was continued.

View the video content online at www.cvcasejournal.com.

and the persistence of interatrial septal aneurysms were identified as risk factors for device thrombosis.[6] Another finding was that the Amplatzer device showed a significantly lower incidence of thrombus compared with other devices. In a systematic review published in 2004 that included 17 case reports, thrombosis was seen with all currently used devices, with a lower incidence with new-generation devices such as the Amplatzer Septal Occluder and Gore Helex Septal Occluder; the mean time of diagnosis was 5 months, with a range of 0 to 24 months, and most thrombi were found on the left side.

Late thrombosis associated with these devices is a rather unusual complication, being even more uncommon with the Amplatzer device. Belgrave and Cardozo[8] reported the case of a 46-year-old woman who presented with ischemic stroke 5 years after the implantation of an Amplatzer device, in which a left-sided thrombus was identified; in that case, a prothrombotic state was ruled out. Misra *et al.*[9] reported a case with late (5 years) thrombosis of a StarFLEX device in a 74-year-old patient, although it was suspected that a nickel allergy could have contributed to the onset of this complication. With regard to treatment, the first option is anticoagulation, which in most cases leads to thrombus resolution. In a systematic review carried out by Sherman *et al.*,[10] among 54 patients who had thrombosis, 35 were treated with warfarin, two received thrombolysis, and one was treated with heparin; surgical removal was indicated in 15 patients. The duration of anticoagulation ranged from 1 to 6 months; Krumsdorf *et al.*[6] recommended 3-month therapy with periodic echocardiographic follow-up and even extended anticoagulation depending on the diameter and mobility of the thrombus.

Manufacturers' recommendations include clinical and echocardiographic follow-up after 1 week and at 1, 6, and 12 months after device implantation, while European guidelines recommend 2 years of follow-up by a team specialized in adult congenital cardiopathies after percutaneous closure. However, this case and others have generated concerns about the long-term safety of these devices and the pertinence in prolonging clinical and echocardiographic evaluations given the risk for late thrombosis and serious complications such as cerebrovascular events.

CONCLUSION

We present a case of very late (8 years) thrombus formation associated with a closure device (Amplatzer) for an ASD and stroke, to our knowledge the latest for this device so far published. There is no consensus regarding the type and extent of antiplatelet or anticoagulation therapy after implantation, but it is reasonable to prescribe antiplatelet therapy from 3 to 6 months and perform periodic clinical and echocardiographic follow-up from 1 to 2 years after implantation. This case prompted questions about the optimal duration of follow-up, taking into consideration the risk for late appearance of this serious complication.

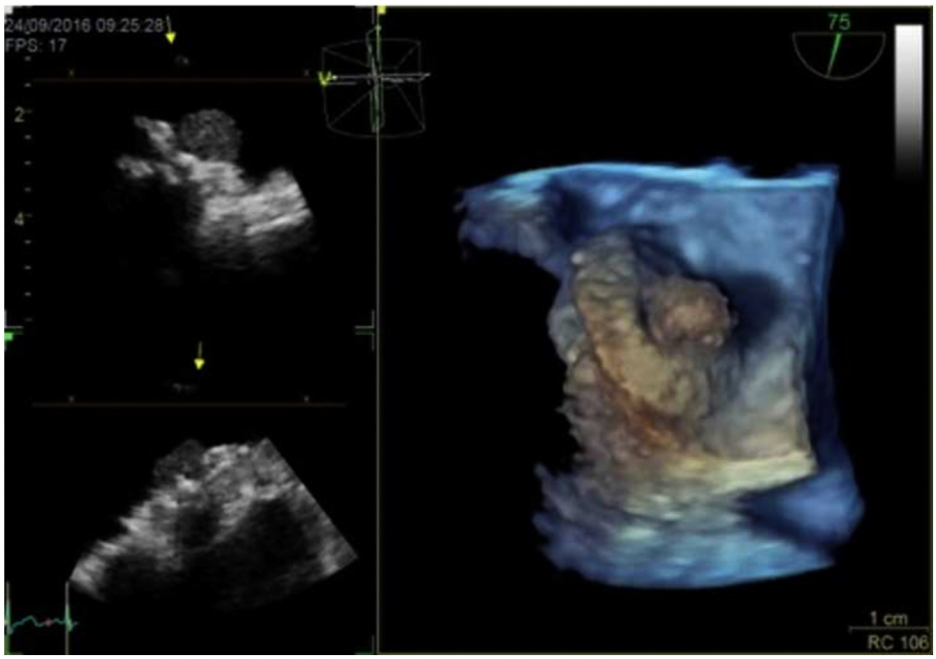

Figure 1 Thrombus on the left side of the Amplatzer Septal Occluder and large mobile mass compatible with a 14 × 12 mm thrombus.

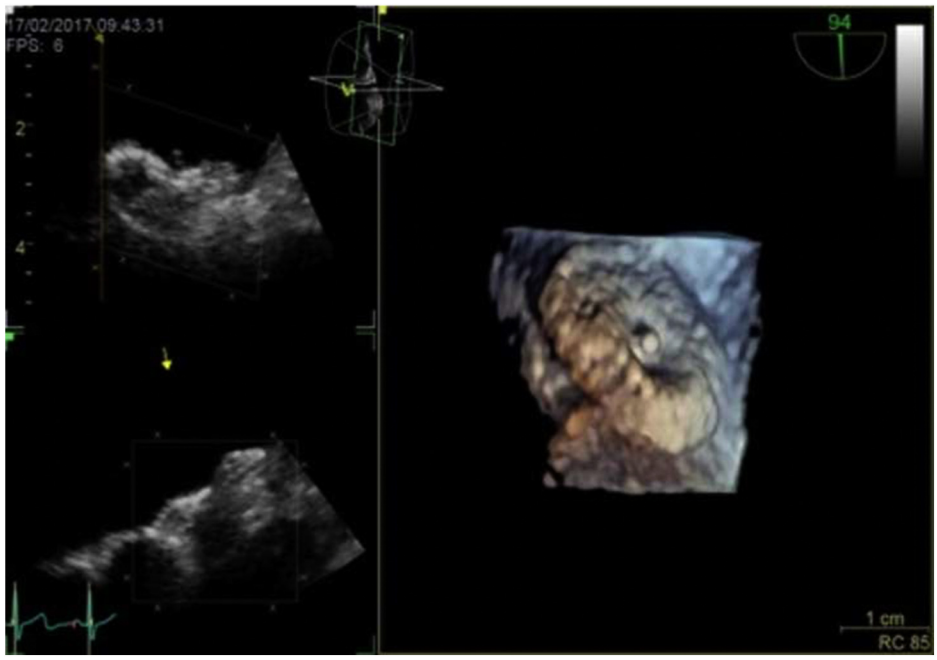

Figure 2 Amplatzer device without thrombus. Five-month follow-up with anticoagulation.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2019.09.008.

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