Incidental Finding of a Double Interatrial Septum in a Patient Undergoing Atrial Fibrillation Ablation

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INTRODUCTION

We report the incidental finding of a double interatrial septum (DIAS) in a patient undergoing ablation for atrial fibrillation. We demonstrate the echocardiographic features of this rare lesion and discuss the procedural challenges it presents.

CASE PRESENTATION

A 44-year-old, otherwise healthy woman presented for catheter ablation of paroxysmal atrial fibrillation. At the time of presentation, she was on diltiazem, flecainide, and apixaban. Her only other significant history was of congenital agenesis of the left kidney. One week before the procedure, cardiac magnetic resonance imaging was performed with and without gadolinium contrast. This revealed normal biventricular size and systolic function, normal biatrial size, no significant valvular abnormalities, and normal pulmonary vein anatomy. The interatrial septal anatomy was reported as normal (Figure 1).

In the procedure room, general anesthesia was induced and an endotracheal tube inserted for mechanical ventilation. A left radial arterial line and transesophageal echocardiographic probe were also placed, the latter to rule out thrombus in the left atrial appendage and to guide transseptal puncture for passage of the ablation catheter into the left atrium. The left atrial appendage velocity was 60 cm/sec, and no thrombus was seen. Inspection of the interatrial septum revealed a double-membraned structure, with an interatrial chamber (IAC) separating the septum primum from an accessory atrial septum (AAS; Figure 2, Video 1).

A bicaval view (Figure 3A, Video 2) revealed a superiorly positioned patent foramen ovale with color flow from the left atrium into the IAC. However, no defects were evident in the rightward AAS, and no communication was seen between the IAC and right atrium by color Doppler or in an air-bubble contrast study (Figure 3B). The results of a comprehensive transesophageal echocardiographic examination were otherwise normal.

Figure 4 shows an 8.5-Fr SLO sheath tenting both the primum and accessory septa, obliterating the IAC. Failed attempts at septal puncture were made with both Brockenbraugh 1 and SafeSept needles. Success was finally achieved with a radio-frequency needle, allowing introduction of a guidewire and ablation catheter into the left atrium. A second transseptal puncture was made in a similar fashion. Once left atrial access was confirmed, intravenous heparin bolus and continuous infusion were initiated to maintain an activated clotting time of 350 to 400 sec. Successful electroanatomic isolation was achieved for all four pulmonary veins. After ablation, there was evidence of normal conduction intervals.

At the conclusion of the procedure, repeat transesophageal echocardiography showed a fenestration in the AAS with associated left-to-right shunting by color Doppler (Figure 5, Video 3).

Postprocedural recovery was unremarkable. The patient was discharged home the next day, continuing on diltiazem, flecainide, and apixaban (5 mg twice daily). She maintained sinus rhythm, allowing discontinuation of apixaban and initiation of aspirin therapy after 3 months.

DISCUSSION

Double interatrial septum is a rare congenital condition with just 18 prior case reports in the literature. Only one of these involved transseptal puncture. The anatomy of DIAS was well described by Roberson and colleagues and Bandyopadhyay et al. The presence of a distinct AAS, to the right of the septum primum, enclosing an IAC below the level of the upper limbus distinguishes the condition from deviation of the atrial septum primum. Possible embryologic origins include incomplete fusion of the septa primum and secundum and persistence of the left venous valve of the sinus venosus. Of the six cases in which Roberson was aware, four were pediatric, and there was an apparent association with left-sided cardiac obstructive anomalies. He speculated that the AAS was causative by obstructing right-to-left interatrial flow in utero. However, including the present case, we now have reports of DIAS in 13 adults with otherwise structurally normal hearts.

In these adult cases, communication between the IAC and adjacent atria is highly variable. Three cases showed no communication with either atrium, five showed communication with both atria, and five were similar to the present one in having the IAC communicate with both the right and left atria. Association with systemic thromboembolism was noted in five of these cases (38%). This included one case with no clear communication with either atrium, raising doubts regarding a causal link to the cerebrovascular accident. Of the remaining four cases of systemic thromboembolism, one had IAC communication with both the right and left atria, and three were similar to our case in having the IAC communicate with the left atrium alone. The proposed mechanism was thrombosis formation within the stagnant flow of the IAC. Indeed, in one case of coronary artery embolus in a 25-year-old patient, a thrombus was identified in the IAC on transesophageal echocardiography. Our case presented a special challenge in that interatrial septal puncture was required for left atrial access and pulmonary vein isolation. In the single prior report of transseptal puncture in DIAS, Harding et al. postulated that “the presence of a double atrial septum likely confers a higher risk for thromboembolic events during left atrial
catheter mapping and pulmonary vein isolation.” In that case, the AAS did not extend completely across the fossa ovalis, and the investigators targeted a confluent portion of the IAS, avoiding puncture of the double septum. This was not an option in our case, as the AAS spanned the entire fossa ovalis. As described above, the double septum did present a considerable challenge to puncture.

Given the association of DIAS with systemic thromboembolism, we need to consider the implications for anticoagulation strategy in this patient. The newly formed interatrial communication (due to transseptal puncture) might be an added risk for a patient whose anatomy is associated with systemic thromboembolism. On the other hand, this communication likely reduces stagnant flow in the IAC and thus conceivably reduces the risk for thrombus formation within the IAC. As a result, no special anticoagulation precautions were taken for this patient.

CONCLUSIONS

The rare condition of DIAS presents a technical challenge in procedures requiring transseptal puncture. Echocardiography permits diagnosis of the condition and provides guidance for septal puncture. Association of thromboembolism with this condition has potential, but poorly defined, implications for anticoagulation strategy.
SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2017.10.009.

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