

Inadvertent ascending aortic perforation after transseptal puncture: Successful treatment with an Amplatzer Duct Occluder II device

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ABSTRACT

Transseptal puncture is a routine technique to access the left atrium during catheter ablation, but carries a small risk of perforation into the pericardium or aorta. When conservative management fails, surgical repair is usually needed. We report an 81-year-old male in whom aortic root perforation occurred after transseptal puncture and was treated successfully by percutaneous deployment of an Amplatzer Duct Occluder II device.

Keywords: Aortic perforation, percutaneous devices, transseptal puncture

INTRODUCTION

Transseptal puncture is a commonly used technique to access the left atrium for diagnostic and therapeutic cardiac catheterization, including catheter ablation and valve intervention.^[1] Although the risk is low, complications include atrial and aortic perforation and arterial thromboembolism.^[2-4] We report an ascending aortic perforation following a transseptal puncture for catheter ablation and its subsequent successful treatment by percutaneous deployment of an Amplatzer Duct Occluder II device.

CASE REPORT

An 81-year-old male, with a history of ischemic heart disease, impaired left ventricular systolic function, and coronary artery bypass graft surgery, presented for elective ablation of slow ventricular tachycardia. After femoral venous access was obtained, an 8-French transseptal sheath and Brockenborough's needle were positioned in the fossa ovalis, and a single puncture was made under fluoroscopy followed by passage of the dilator and sheath. A test injection of contrast showed the dilator/sheath to be in the aortic root [Figure 1a]. A subsequent transesophageal

echocardiogram demonstrated hematoma adjacent to the aortic root posteriorly and along the atrial walls with the dilator/sheath visualized within the aortic root.

To avoid uncertainty with withdrawal of the dilator/sheath and conservative management, and possible need for open-heart surgery with its attendant morbidity, a decision was made to proceed with transcatheter device closure of the perforation. The transseptal sheath was passed fully into and maintained in the ascending aorta, over a 0.035" guidewire. An Amplatzer Duct Occluder II 6 mm × 4 mm (St. Jude Medical, Cardiovascular Division, St. Paul, MN, USA) was successfully deployed through the transseptal sheath with the distal disc opposed against the aortic wall, guided by transesophageal echocardiography. After an aortogram showed the device to be in a good position with no residual leak, and the echocardiogram confirmed normal aortic valve function, the device was released [Figure 1b]. Following this, a repeat transseptal puncture, guided by transesophageal echocardiography and full systemic heparinization, allowed the patient to have a successful ablation with an uneventful postprocedural recovery.

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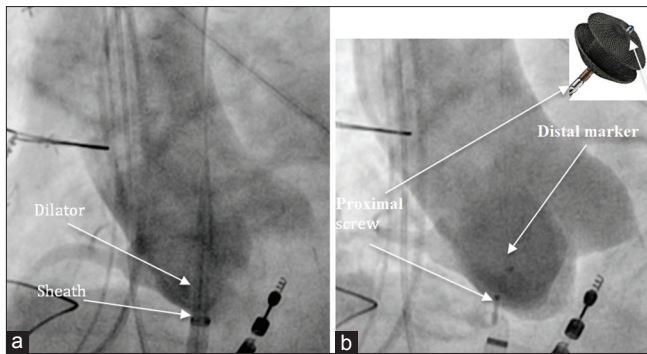


Figure 1: Iatrogenic perforation of the aorta following transeptal puncture with 8-French sheath and dilator in the aortic root with guidewire passed through the dilator for stabilization before occlusion (a). Aortogram after percutaneous deployment of Amplatzer Duct Occluder II device (arrows, inset) and the perforation is sealed (b)

DISCUSSION

Transeptal puncture is generally considered a low-risk technique and is commonly used for accessing the left atrium during interventional and electrophysiological procedures. One early series of 1279 transeptal punctures for direct left atrial or left ventricular pressure measurements in patients with aortic or mitral valve disease, or for percutaneous aortic or mitral valvuloplasty, reported complication rates of approximately 1%, including aortic and atrial perforations leading to cardiac tamponade, and systemic arterial embolism, with one death.^[4] Similarly, a large, single-center study of 450 cases revealed three aortic perforations, which were either asymptomatic or self-limiting after pericardiocentesis.^[2] More recent studies have also reported slightly lower complication rates, with one multicenter study of 5520 arrhythmia ablation patients, reporting only three cases of aortic and six cases of cardiac perforation, as well as four cases of arterial thromboembolism.^[3] This study also reported needle puncture of the aortic root in two cases and the right atrium in 13 cases. However, provided that the puncture is recognized early and that the dilator and sheath are not advanced further into the pericardium or the aorta, adverse outcomes associated with needle punctures are rare.^[4] In this case, the initial transeptal puncture was attempted without transesophageal echocardiographic guidance. Unfortunately, by the time the ascending aortic perforation was recognized, the dilator and sheath had already been pushed into the aorta. Subsequently, transesophageal echocardiography was used for guiding the transesophageal puncture. Because of some contrast extravasation in the area of the perforation, the echocardiographic images were less than optimal quality, but sufficient to help guide the transeptal puncture.

If perforation of a cardiac structure occurs, it will usually be self-limiting after pericardiocentesis in

most cases, if only the needle has been advanced.^[5] However, for larger perforations caused by passing the dilator/sheath assembly that continue to bleed, the mainstay of treatment has been surgical exploration and direct suturing of the perforation.^[6] Transcatheter glues such as fibrin^[7] or cyanoacrylate^[8] have also been tried as an alternative to open surgery. More recently, percutaneous devices, used to close atrial and ventricular septal defects, are under investigation for their utility in such complications. The possible advantages of this technique include relatively easy device deployment, provided that the perforating catheter has remained *in situ*, as well as avoidance of surgery in those who are not considered fit for it. Webber *et al.* reported a case of aortic perforation following transeptal puncture and its subsequent successful closure with an atrial septal defect closure device.^[9] Mijangos-Vázquez *et al.* also reported on a similar complication, which was dealt with by Amplatzer Duct Occluder I.^[10] However, we used an Amplatzer Duct Occluder II device, which is a softer device, to avoid any potential interference with the aortic valve cusps. As the 8-Fr sheath (effectively at least 3-mm diameter perforation) that was passed into the aorta, to avoid ongoing residual leak, we selected a 6-mm diameter device. Because of the distance between the aorta and the right atrium, we felt that a double-disc device had some advantages in providing stability of the device and rapid hemostasis of the perforation. Other double-disc devices, such as those used to close atrial and ventricular septal defects, could have been used too. We felt that the Amplatzer Duct Occluder II had similar characteristics and would seal the perforation. The patient was then proceeded to a successful ablation procedure under full systemic heparinization and had an uneventful postprocedural recovery. Due to very limited experience with these devices for cardiac perforations, complications remain largely unknown but are likely to be rare.^[10]

CONCLUSION

Aortic perforation is a potential complication of transeptal puncture. To avoid surgical repair and its attendant risks, percutaneous closure devices can be considered as an acceptable alternative for repair.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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