Single Access Transcatheter Ventricular Septal Defect Closure through Trans radial Approach

Anil M Podhar, Jivtesh S Pahwa*, Devendra V Patil and Ankur Phatarpekar

Parisoha foundation, Hindusabha Hospital, India

Abstract

Percutaneous device closure of perimembranous ventricular septal defects (pm VSD) has shown a lot of progress and is considered a feasible alternative to intra cardiac surgery. Transcatheter device closure remains controversial for pm VSDs secondary to the risk of heart block [1]. Antegrade closure of pmVSD using an arteriovenous (AV) wire loop as part of the closure is still the norm world over [2]. We have been practicing retrograde arterial closure of pmVSDs by an off-label use of the Amplatzer duct occluder II (ADO II) device (St. Jude Medical, St. Paul, Minnesota) at our centre for defects ≤ 6mm through femoral access. We report first in the world single access transcatheter closure of a 4.5mm pmVSD in a 16-years-old male with an ADO II device via right transradial route.

INTRODUCTION

Learning objective- Small VSD ≤ 6mm in adolescents and adults can be easily closed using radial access. This technique is safe with lesser access related complications. Moreover pmVSDs are easier to cross from radial route as compared to femoral route.

Case

A 16-year-old male, weighing 40 kg and 140 cm tall known case of perimembranous ventricular septal defect presented for routine follow-up. A transthoracic echocardiogram (TTE) revealed an aneurysmal perimembranous ventricular septal defect with left to right shunt. The defect size was 4.5 mm and a peak left to right gradient of 80 mmHg across the defect. Mild left ventricular (LV) volume overload was seen. Defect was 6 mm away from aortic and tricuspid valve. There was no evidence of aortic valve prolapse, aortic regurgitation or evidence of infective endocarditis. LV systolic function was normal. The anatomy of the defect appeared suitable for device closure. We decided to attempt the closure through transradial route using ADO-II.

Procedure

Right radial arterial access was achieved using a 6 French hydrophilic coated sheet. Procedure was monitored under transthoracic echocardiography. 4000 IU of intravenous heparin was given. We used a 6 French pigtail catheter to perform left ventriculography in deep left anterior oblique (LAO) cranial angulation. Ventriculography revealed a defect size of 4.5mm, 7 mm away from the aorta. Under fluoroscopy guidance the pmVSD was crossed using a 4 french Judkins right 4 (JR-4) diagnostic catheter and an angled hydrophilic 0.035inch, 260 cm glide wire (Terumo, Somerset, NJ). The wire was parked in pulmonary artery. JR -4 was exchanged with a 5-F (internal diameter 0.059 inch) right coronary artery guiding catheter (Launcher Cordis, Cordis, Miami Lakes, Florida) over the glide wire and was used as the delivery catheter. The guide catheter was then advanced over the wire into the right ventricle. Under angiographic and TTE guidance, a 9-PDA2-05-06 Amplatzer duct occluder II (ADO II) (St. Jude Medical, St. Paul, Minnesota Amplatzer) was deployed in the standard fashion [3]. The TTE showed excellent result with no encroachment on the aortic valve, no aortic regurgitation and no residual left to right shunting. No heart block or conduction disturbances were noted. A vigorous “tug test” was performed. The device was stable and hence was released. Post-release TTE showed excellent alignment of the device into the ventricular septum and no disruption of the aortic valve. Repeat LV angiography showed no residual shunt across the VSD. The right radial sheath was removed and hemostatic band applied. Repeat follow-up TTE on the following day showed well-seated...
AD0-II device that appeared without aortic regurgitation or left ventricular outflow tract (LVOT) obstruction. The patient was discharged home the next day without any complications on Tb Asprin 75 mg a day and clopidogrel 75 mg a day for next 6 months. A 6 month follow-up TTE revealed a well seated device and a patent right radial artery with no aforementioned complications and reduced LV size.

DISCUSSION

Ventricular septal defect (VSD) is a common congenital heart disease accounting for approximately 20% of all forms of congenital heart defects occurring in isolation [4]. Perimembranous is the most common form of VSD (70%) [5]. Indications for VSD closure include symptomatic congestive heart failure, signs of left ventricle overload, and a history of endocarditis [6]. Although open heart surgery is considered a standard treatment for pmVSD, catheter-based intervention is a promising alternative [7]. Transcatheter device closure of pmVSD is not currently approved in the most of the western countries because of high rate of post-procedural and late-onset heart block (2.9% to 5.7%). Nevertheless, this procedure is widely used in developing countries, with a low mortality and morbidity rate using nitinol devices [8]. Currently, the most widely used device for closure of VSD is the Amplatzer VSD Occluder with a technical success of 90% [9]. Transcatheter device closure has a lower incidence of myocardial injury, less blood transfused, faster recovery, shorter hospital stay, and lower medical expenses [10].

Traditionally transcatheter VSD closure involves primary vascular access via a central vein with a secondary access via an artery. The closure device is loaded through the transvenous trans-aortic route for sizes ≤ 6mm and have done over 35 procedures so far with good success and no major complications. So far we had attempted all the procedures via femoral route. Major complication included embolization in one case and minor site related complications. Crossing of the high pmVSDs is easier from the radial arterial approach using a JR4 catheter. The larger curve of JR4 makes it difficult to cross the pmVSD. In such situation we have to shift to a smaller curve JR, usually a modified JR 1.5 or 2.5 (Cordis, Miami Lakes, Florida). With advantages of lower access-related complications, improved morbidity, early ambulation, and overwhelming patient preference, the radial artery is a safer alternative to traditional femoral access in older patients. With 5Fr radial approach largest size of ADO II can be deployed. Routine VSD closure in asymptomatic patient and no volume overload is not recommended in current guidelines, but recent studies have shown that these patients are at an increased risk of infective endocarditis in later life [11]. With ever changing research in medical field where routine closure of small and residual VSDs may become an indication in the near future transradial retrograde VSD closure can become the procedure of choice for adolescents and adults.

Here, we demonstrate that percutaneous closure of a pmVSD using transradial approach is successful, safe and can avoid the potential risks of bleeding and vascular complications associated with the transfemoral approach.

REFERENCES