Advances in Cardiac Research

CASE REPORT

Temporary Balloon Occlusion Test:

An Essential Step Prior to ASD Closure in The Elderly

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Abstract

The current treatment of secundum atrial septal defect (ASD) in both children and adult is transcatheter closure of the defect in the setting of appropriate anatomy. Both pulmonary hypertension and left ventricular systolic or diastolic dysfunction are a prohibitive condition for closure of ASD. Elderly patients with ASD may have left ventricular dysfunction given the frequent comorbidities in this patient population. Patients with decreased left ventricular compliance, ASD closure may trigger acute pulmonary oedema by an abrupt increase in left atrial pressure. In this population, balloon occlusion testing is recommended before closure of defect. In the current era, there is no certain cut-off value for left ventricular end-diastolic pressure (LVEDP) or left-atrial pressure (LAP) whenever device implantation is contraindicated. Here, we presented 64-year-old male patient with a large secundum ASD with left ventricular diastolic dysfunction. We decided to close the defect on the absence of left ventricular end-diastolic pressure (LVEDP) increase after balloon occlusion test.

Keywords: ASD closure, eldery patients

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Introduction

Atrial septal defect (ASD) is the most common congenital heart defect in adults[1,2]. Transcatheter closure is the preferred treatment, but certain conditions pose challenges[3]. Pulmonary hypertension and left ventricular dysfunction limit closure options[3]. Aging increases the significance of ASD, requiring careful evaluation of left ventricular and atrial pressures. Balloon occlusion testing helps assess the potential adverse effects of closure. Current guidelines suggest fenestrated devices or no closure if contraindications are present[3]. Establishing definitive cut off values for closure is lacking. Precise assessment is crucial in this complex patient population.

Here, we presented 64-year-old male patient with a large secundum ASD with left ventricular diastolic dysfunction. We decided to close the defect on the absence of left ventricular end-diastolic pressure (LVEDP) increase after balloon occlusion test.

Case Report

A 64-year-old male patient with a history of atrial fibrillation (AF) and uncontrolled hypertension was applied to outpatient clinic with a complaint of effort dyspnea and swelling in the legs. The functional capacity was New York Heart Association (NYHA) class III.

On physical examination, there was fixed split 2nd heart sound, moderate pretibial edema and systolic regurgitation murmur on left sternal border. The blood pressure was 170/100 mmHg. On electrocardiography, the rhythm was AF with right bundle branch block and average heart rate was 94 bpm. The transthoracic echocardiography revealed enlarged right heart chambers, suspicious left-to right shunt on interatrial septum (IAS) via color Doppler imaging, severe tricuspid regurgitation (TR) (TR max velocity: 3,5 m/s), pulmonary hypertension (systolic pulmonary artery pressure (sPAP): 60 mmHg), and impaired right ventricular (RV) function (tricuspid annular plane systolic excursion: 14mm, tricuspid S': 9.5 cm/s). A 33*25 mm secundum atrial septal defect causing left-to-right shunt was confirmed by 3D transesophageal echocardiography. **(Figure 1A).** Coronary angiography revealed normal coronary arteries. From the hemodynamic perspective, mean pulmonary arterial pressure (mPAP) was 39 mmHg, left atrial pressure (LAP) and LVEDP were 20 mmHg, pulmonary vascular resistance (PVR) was 1.3 Wood Unite (WU) and pulmonary:systemic flow ratio (Qp/Qs) was 4.3. Final diagnosis was combined pre and postcapillary pulmonary hypertension associated with ASD and concomitant comorbidities. We decided to close ASD via percutaneous transcatheter approach in the presence of appropriate defect rim anatomy.

According to current guidelines, we decided to perform balloon occlusion test before closure. Before procedure guideline directed medical therapy optimized to reduce cardiac filling pressures.

An 8F sheath was introduced via right femoral vein, IAS was passed through left atrium (LA) with multipurpose catheter and guidewire. After guidewire and multi catheter were inserted into left upper pulmonary vein (LUPV), 0.035 guidewire

was taken out and a stiff guidewire replaced to support balloon and delivery system. Simultaneously a pigtail was placed into LV via right femoral artery to check LVEDP during balloon occlusion test. Balloon was advanced to the IAS and inflated to stop flow via ASD **(Figure 1B).**

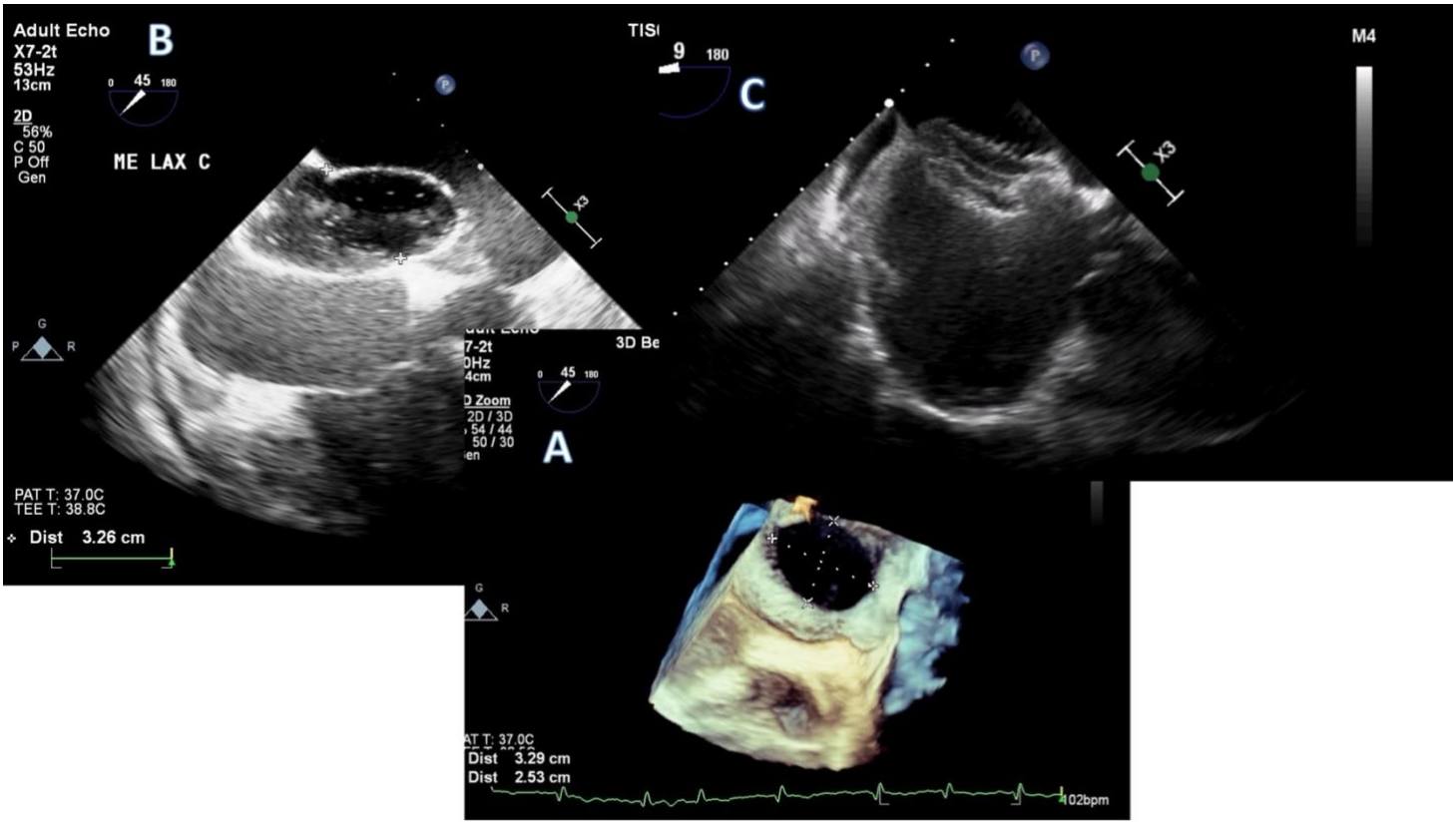

Figure.1: Transesophageal (TEE)images of ASD. A; 3D Transesophageal echocardiography showed 33*25 mm secundum ASD.B; The size of the ASD defect during the balloon occlusion test.C; The TEE image of the 33 mm Occlutech ASD Occluder device. ASD; Atrial Septal Defect

Figure 2: LVEDP, A;before, B; after the balloon occlusion test.LVEDP; Left Ventriculer End Diastolic Pressure.

Before balloon occlusion the LVEDP was 13 mmHg, and it did not get high during 10 minutes balloon occlusion **(Figure 2A-2B).** Since no pressure increase was detected, secundum ASD was successfully closed with 33 mm Occlutech ASD occluder device **(Figure 1C).**

Post-procedure, the patient was monitored in the coronary care unit and had normal hemodynamics and blood results. Follow-up echocardiography at six months showed improved right heart chamber size, RV function, and reduced severity of tricuspid regurgitation and pulmonary artery pressure. The patient was discharged on the third day after the procedure. Informed consent was obtained.

Discussion

In patients with ASD, factors such as age, coexisting cardiac conditions (hypertension, ischemia, congestive heart failure), can affect left ventricular diastolic function and compliance. Assessing LVEDP and LAP using the balloon occlusion test is crucial in this challenging patient group. The test involves temporarily occluding the ASD with a balloon and monitoring left-sided pressures for 10-15 minutes[4]. Significant augmentation of LA or LVEDP (>10 mmHg) or a drop in systemic pressure during occlusion indicates a positive test[4] and may require further intervention or a fenestrated closure device[4]. According to a study by Miranda et al[5]., patients with baseline LVEDP >15 mmHg had higher LAP/PAWP (pulmonary arterial wedge pressure) during the balloon occlusion test compared to those with baseline LVEDP <15 mmHg (13 mmHg vs. 20 mmHg, p=0.0002)[5].

Conclusion

Left ventricular dysfunction in adults with ASD, especially elderly, should be carefully evaluated to avoid an increase filling pressure causing pulmonary edema after closure. For this purpose, establishing LVEDP and LAP pressure correctly before closure or if necessary, using balloon occlusion test during procedure to determine LAP augmentation above 10 mmHg is significantly important in elderly who are candidate for ASD closure.

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