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# PERCUTANEOUS OCCLUSION OF ATRIOVENTRICULAR SHUNT AFTER SURGICAL CORRECTION OF INTERATRIAL COMMUNICATION: CASE REPORT

***Júlia Eduarda Nóbrega de Melo e Castro***
Internal Medicine Resident at the institution: Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/6100548633657846

***Fernanda Cristine Zanotti***
Internal Medicine Resident at the institution: Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/7578163817956320

***Larissa Pimentel Guimarães***
Internal Medicine Resident at the institution: Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP

***Flávia Cristina de Freitas Maia***
Internal Medicine Resident at the institution: Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/2233042202677369

***Henrique Nogueira Mendes***
Cardiologist of the Brotherhood of the institution: Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/6543698002902181

***Virgínia Graciela Rivas Arcia***
Cardiovascular Surgeon at the institution's Brotherhood: Santa Casa Misericórdia de São Carlos - SP da Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/2999337772485636

***Said Assaf Neto***
Hemodynamicist and Interventional Cardiologist at the institution: Irmandade de Santa Casa Misericórdia de São Carlos - SP
São Carlos-SP
http://lattes.cnpq.br/6355645967052816

**Abstract:** Left Ventricle-Right Atrial Shunt is a rare anomaly of the ventricular septum, accounting for less than 1% of congenital heart defects. Such anomaly is classified etiologically as the congenital or acquired and its treatment consists of surgical correction of the shunt. The aim of this study was to report a case of transcatheter closure of this iatrogenically acquired defect after performing an atrial septal defect.
**Keywords:** Atrioventricular Shunt; ventricular anomalies; Device for septal occlusion.

## INTRODUCTION

Left Ventricle-Right Atrial Shunt, also known as Gerbode defect, is a rare anomaly of the ventricular septum, accounting for less than 1% of congenital heart defects and approximately 0.08% of intracardiac shunts. 1

Such a shunt is classified etiologically as the congenital or acquired, iatrogenically or not. According to Yuan et al., congenital pathologies represent 24.6% of cases, while the acquired form comprises 72.7% of case reports. 4 In the direct defect, the problem is found in the membranous part of the ventricular septum above the tricuspid valve, diverting blood directly from the LV to the right atrium (RA). The indirect defect comprises the most common form of the anomaly, in which blood is shunted from the LV to the right ventricle (RV) through a ventricular septal defect, and from the RV to the RA through the defective tricuspid valve. Thus, blood shunting occurs indirectly from the LV to the AD. In both forms of defects, blood is shunted to the RA during ventricular systole, as there is a significant pressure difference between the LV and the RA during systole. Depending on the magnitude of this left-to-right shunt, volume overload and enlargement of the right heart chambers will occur.2

The clinical picture can range from asymptomatic pathology, severe heart

failure, and even death. Most patients are symptomatic, with dyspnea being the main manifestation. 3 Increased blood flow in the pulmonary circulation leads to congestion and signs of right heart failure. Regarding the physical examination, the most evident finding of the LV-AD shunt is a loud, pansystolic, harsh murmur, grade III/IV, invariable with breathing, associated with thrill at the left sternal border. According to Vogelpoel et. al, it can be difficult to distinguish systolic murmurs from an interventricular communication (IVC) with Gerbode defect. However, IVC murmurs have a higher frequency that varies with respiration, being softer during inspiration. Findings such as the jugular stasis, hepatojugular reflux, lower limb edema are also common, indicating right heart failure. These result from moderate to severe shunts. In acute cases, rales may be present, when rapid onset of hypotension and jugular stasis may mimic acute cardiac tamponade. 4

Transthoracic echocardiography (ECO) has limited diagnostic accuracy. However, findings such as the normal pulmonary artery end-diastolic pressure, increased RA, left interatrial septum curvature, atypical jet direction, and high Doppler gradient may suggest the complication. Two-dimensional transesophageal echo is the most sensitive method for detecting this shunt. However, its three-dimensional method shows the anatomical location of the anomaly in a more adequate way. Cardiac magnetic resonance imaging reveals anatomical details, quantifying intracavitary flows and left and right cardiac volumes. 1

The classic treatment consists of surgical correction of the defect by suturing a patch on the atrial side of the defect, avoiding recurrence and possible complications. However, percutaneous shunt occlusion has been shown to be an effective therapeutic alternative with good results, especially in patients with previous surgical approaches.1, 3, 4

The present study aims to report a case of iatrogenically acquired transcatheter shunt closure after performing ASD repair, in addition to the early diagnosis of this anomaly, which can lead to worsening of the patient's clinical condition.

## CASE REPORT

L.B.P., female, 36 years old, from São Carlos/São Paulo, with atrial fibrillation, using amiodarone 200 mg daily, referred for elective repair of intracardiac shunt by the HEART team after performing atrioseptoplasty for ASD correction at age 28, with worsening of functional class - CF II of the New York Heart Association (NYHA). On physical examination, she had a grade 2/6 systolic murmur at the left sternal border, with no changes in other devices or laboratory tests. The electrocardiogram showed sinus rhythm and right bundle branch conduction disorder, without other changes. Transthoracic echocardiogram (ECO) showed asynchronous septal motion, with significant dilation with high-velocity flow directed from the to the right atrium and 5 mm discontinuity, as well as systolic prolapse of the anterior mitral leaflet and preserved left ventricular (LV) systolic function.

The defect was repaired by percutaneous occlusion, through the puncture of the right femoral vein and femoral artery. Left ventriculography was performed and the Gerbode defect was visualized. The shunt was passed through the arterial route with a 0.035 hydrophilic wire and JR catheter, looped guide in the vena cava with a snare catheter, the defect was transposed through the right side with a 7F sheath, a 10-mm asymmetric Ceraflex IVC prosthesis was implanted (Figure 2) and echocardiographic control with

angiography was performed. end revealing minimal residual shunt. After the procedure, the patient was referred to the Coronary Care Unit and, on the second postoperative day, the patient was discharged from the hospital without complications during hospitalization and outpatient follow-up with a cardiac surgery and cardiology team.

## DISCUSSION

The Left Ventricle-Right Atrium shunt was first described in 1857. However, it was not until 1956, in Pennsylvania, that the first successful surgery for such anomaly was performed. Although rare, there is an increase in reports of acquired defects. This is due to the increasing number of invasive cardiological procedures and the improvement in diagnostic methods.4

Non-iatrogenic acquired defects occur due to acute myocardial infarction in the territory of the right coronary artery, infective endocarditis and cardiac trauma. On the other hand, iatrogenic defects occur secondary to cardiac surgeries or previous percutaneous interventions and correction of atrial septal defects. Valve replacement is one of the main causes of this anomaly, through a lesion in the tissue of the membranous septum due to excessive removal of calcium from the mitral annulus during correction.. 5

Catheterization was previously the gold standard for evaluating hemodynamic repercussions, especially in cases of poorly characterized flow and pulmonary arterial hypertension. Through technological advances, non-invasive methods allowed the visualization of anatomical structures, replacing catheterization as the preferred modality in diagnosis. 3 Despite the good results of percutaneous occlusion of the defect, especially in patients with previous surgical approaches, multiple comorbidities, advanced age, there are still no formal recommendations or specific devices on the correct therapy for these patients. The choice of approach method depends on several factors, such as the symptom severity, concomitant anatomic abnormalities, shunt magnitude and associated comorbidities. According to Toprak et al, asymptomatic patients with insignificant intracardiac shunt, without associated circulatory overload, must undergo rigorous clinical follow-up and surgery must not be performed. On the other hand, as described by Yacoub et al, all these defects must be repaired, regardless of their size, to avoid infective endocarditis. 4 Congenital and acquired LV-RA shunts have traditionally been surgically corrected, with high success rates. In these cases, flap repair is performed on the right atrial side to prevent recurrence and complications such as the atrioventricular block. In addition to patch with sutures from the ventricular side through the leaflets. According to other authors, Dacron patch closure can be implemented with septal leaflet reimplantation in the patch. Prifti et al observed the use of two single prolene sutures and reconstructed the septal leaflets using an autologous pericardium patch. His technique allows for the reconstruction of the tricuspid valve if necessary, while repairing the defect with a patch that may be favorable in an infectious presentation. Long-term follow-up results showed that a small fraction of these shunts close spontaneously, while some develop infective endocarditis during follow-up. 4

This work brings to light the correction of an iatrogenic defect with percutaneous occlusion, which is rarely performed. The use of transcatheter techniques has been used in candidates with high surgical risk, such as the previous valve replacement, advanced age, anticoagulation and multiple comorbidities. The Amplatzer occluder is a mainstay in treatment as it provides less radial force than

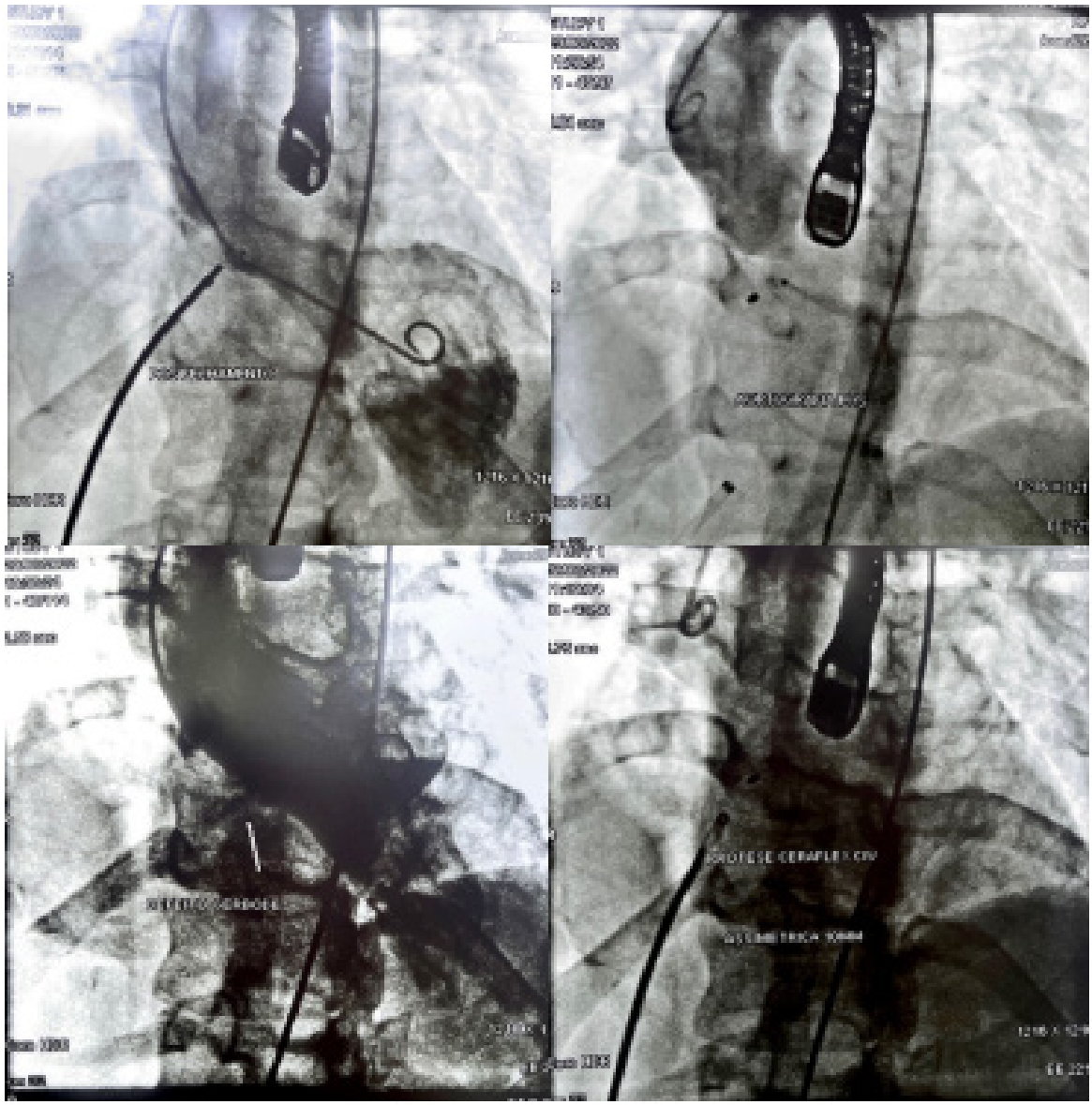

Figure 1: Ventriculography showed communication at the level of the interventricular septum. Figures 2 and 3: Placement of the prosthesis and closure of the defect. Figure 4: Aortography after procedure.

the muscular interventricular communication closure device, causing fewer complications. It is important to always observe the occurrence of an infectious condition as a cause or consequence of the AD-VE shunt, as percutaneous devices must not be inserted during the infection, and surgical correction is the method of choice in this case. 4

## CONCLUSION

Left Ventricle-Right Atrial Shunt represents a rare anomaly of the ventricular septum, but with an increase in the number of cases due to greater performance of surgical procedures. Such a defect must be suspected from clinical and imaging findings, such as the echocardiography. 1

The ideal therapy still remains a challenge nowadays, with few case reports published. Furthermore, due to the numerous types and etiologies, an individualized approach to treatment is essential for the successful management of this pathology.

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