

AORTIC VALVE REPLACEMENT AND ASCENDING AORTIC ANGIOPLASTY – CASE REPORT

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Abstract: INTRODUCTION: Aortic stenosis (AS) is a serious cardiovascular condition characterized by narrowing of the aortic valve, resulting in an obstruction to blood flow from the left ventricle to the aorta. This can lead to symptoms such as angina, syncope and dyspnea, especially during physical exertion. The treatment of severe AS generally involves aortic valve replacement, a surgical intervention that replaces the diseased aortic valve with a valve prosthesis, with the choice between biological or mechanical prosthesis depending on several factors. **DESIGN AND METHODS:** This case report details the diagnosis, treatment and evolution of a 56-year-old male patient with severe aortic stenosis. Data collection involved a comprehensive review of medical records, laboratory tests, and imaging. Furthermore, a bibliographical review was carried out to support the case with current and relevant information about aortic stenosis and its therapeutic interventions. **CASE REPORT:** The patient initially presented with complaints of myalgia and chronic fatigue, along with a systolic murmur during physical examination. Examinations revealed severe aortic stenosis, left ventricular diastolic dysfunction and aortic ectasia. He underwent aortic valve replacement surgery with a number 23 metal prosthesis and ascending aorta plasty. Postoperative follow-up included drug treatment and monitoring of INR levels to adjust anticoagulation. **DISCUSSION:** Aortic stenosis can have several causes, including senile calcification, rheumatic fever, and congenital malformations. Your symptoms may vary depending on the severity of the valve obstruction. Treatment involves aortic valve replacement, which can be performed by conventional surgery or minimally invasive procedures, such as transcatheter aortic valve replacement (TAVR). **CONCLUSION:** This case illustrates

the importance of a multidisciplinary approach in the management of severe aortic stenosis, highlighting the effectiveness of surgical interventions to improve the patient's symptoms and cardiac function. Long-term follow-up is essential to ensure satisfactory clinical results and the patient's quality of life.

Keywords: Systolic murmur; Heart disease; Aortic ectasia.

INTRODUCTION

Aortic stenosis (AS) is a condition characterized by the narrowing of the aortic valve, which results in an obstruction to blood flow from the left ventricle to the aorta and, consequently, to the rest of the body. This narrowing may be due to various etiologies, including degenerative calcification, rheumatic fever or, less frequently, congenital malformations such as bicuspid aortic valve (Yu Chen H et. al, 2023; Willner N et. al, 2023). Clinically, Aortic stenosis is frequently manifested by symptoms of angina, syncope and dyspnea, particularly during physical exertion, due to the increased pressure load imposed on the left ventricle, which results in ventricular hypertrophy and, eventually, heart failure (Willner N et.al, 2023;).

For the treatment of severe aortic stenosis, aortic valve replacement is often indicated (Siontis GCM et. al, 2019; Swift SL, 2021). This surgical intervention involves replacing the diseased aortic valve with a valve prosthesis, which can be biological or mechanical. The choice of the type of prosthesis depends on several factors, including the patient's age, comorbidities, and individual preferences, considering the risks of anticoagulation and the durability of the prosthesis (Swift SL, 2021). Aortic valve replacement has been shown to significantly improve symptoms, ventricular function and patient survival (Siontis GCM et. al, 2019; Yokoyama Y et. al, 2023).

On the other hand, angioplasty of the

ascending aorta, a less common and more specific procedure, may be indicated in cases of pathologies of the ascending aorta, such as coarctation or aneurysms. This minimally invasive procedure involves inserting a catheter with a balloon or stent to dilate the narrowed area or reinforce the aortic wall, respectively. Although angioplasty is most often associated with coronary interventions, its application to the ascending aorta offers an alternative for selected patients, especially those at high surgical risk (Dowling C et. al, 2020).

Both procedures, aortic valve replacement and ascending aortic angioplasty, represent significant advances in interventional cardiology and cardiac surgery, providing effective therapeutic options for complex and potentially fatal conditions. However, the choice of the ideal treatment must be carefully individualized, taking into consideration, anatomical and clinical characteristics and patient preferences (Dowling C et. al, 2020; Siontis GCM et. al, 2019; Swift SL, 2021).

Thus, this aims to describe and discuss the clinical manifestations, diagnosis, treatment and evolution of a patient with this cardiological condition. The report aims to contribute to medical knowledge and highlight the importance of recognizing and adequately managing this disease to improve the diagnosis and treatment of future cases. Furthermore, we seek to provide relevant information for healthcare professionals, including characteristic symptoms, laboratory and imaging tests used in diagnosis, therapeutic options and preventive measures.

DESIGN AND METHODS

This case report follows a descriptive approach, in which the clinical case of a 56-year-old male patient was analyzed in detail. Data collection involved a comprehensive review of medical records, laboratory tests, and imaging. Initially, the medical record review included a detailed analysis of the patient's medical history, where pre-existing conditions, comorbidities, medications in use and relevant family history were documented.

Additionally, previous physical examinations were considered, allowing a complete understanding of the patient's clinical evolution over time.

Laboratory tests, which provided data on hematological, biochemical parameters and specific markers of cardiac function, were essential to confirm differential diagnoses and monitor disease progression. Analysis of imaging exams, such as echocardiograms, computed tomography (CT) and magnetic resonance imaging (MRI), allowed a detailed assessment of the morphology and function of the aortic valve, as well as the identification of other possible associated cardiac and vascular anomalies.

To complement the case analysis, a literature review was carried out on the topic, focusing on relevant articles from the last five years. This bibliographic review was conducted using the PUBMED and LILACS platforms, selecting free articles available in Portuguese and English. The inclusion criteria for the reviewed articles were direct relevance to the topic of aortic stenosis, therapeutic approaches, clinical results of aortic valve replacement and ascending aorta angioplasty, in addition to demographic and epidemiological data that could enrich the discussion of the case.

The choice of articles took into consideration, the methodological quality, representativeness of the findings and clinical applicability,

ensuring that the information obtained was the most current and relevant for understanding the case and for clinical practice. This way, the case report was based not only on the patient's clinical data, but also on the broader context of recent literature, providing a comprehensive and updated view of aortic stenosis and its therapeutic interventions.

CASE DESCRIPTION

Male patient, 56 years old, born and resident in Florianópolis - Santa Catarina, with no known history of comorbidities or use of alcohol and drugs, sought the Saco Grande Health Unit with complaints of myalgia and chronic fatigue that worsened a week ago.

During the physical examination, a systolic murmur was identified, mainly in the mitral and tricuspid foci. Laboratory tests, electrocardiogram (ECG) and transthoracic echocardiogram were requested.

The results of the exams revealed on the electrocardiogram of 04/04/2022 a heart rate of 55 bpm, block of the anterior-superior division of the left bundle branch and rapid progression of V1-V2 and a wide R wave in V2, possibly related to right ventricular overload. The echocardiogram performed on the same date showed preserved biventricular systolic function, grade I left ventricular diastolic dysfunction, severe aortic stenosis and severe aortic ectasia (ascending segment), with an ejection fraction of 57.78%. Laboratory tests on 04/04 indicated Hemoglobin: 16.1; Hematocrit: 46.9; Fasting glucose: 105.9; Total cholesterol: 184.3; HDL: 43.2; Triglycerides: 163 e; Creatinine: 1.03.

Due to severe aortic stenosis, the patient was referred to a cardiologist, where he consulted at the Hospital de Caridade and underwent cardiac surgery on 02/07/2023, performing aortic valve replacement with a number 23 metallic prosthesis and ascending aorta plasty with extracorporeal circulation.

During follow-up with the cardiologist, treatment was started with Warfarin 5mg, Simvastatin, Carvedilol and Enalapril. The patient returned to the Health Unit for follow-up in primary care, where echocardiogram, exercise stress test, chest x-ray and follow-up laboratory tests were requested.

Laboratory tests on 03/31 showed TAP of 21.9s and INR of 1.78, indicating the need for pharmacological adjustment. On 04/28, the TAP was 23.7s and INR was 1.93, requiring a new Warfarin adjustment. On 05/11, TAP was 52.7 and RNI was 5.87, and on 06/01, TAP was 36.5s and RNI was 3.64. In the last exam on 07/18, the RNI was 3.73 and TAP was 45.4. This way, the patient continues to seek the INR goal between 2-3, being monitored in both primary and tertiary care.

DISCUSSION

The patient in question, a 56-year-old man, presented with complaints of myalgia and chronic fatigue, symptoms that can have different causes, from simple muscle overload to more complex conditions such as anemia or metabolic disorders (Billones R et. al, 2021). During the physical examination, a systolic murmur was identified, suggesting a possible change in the structure of the heart valves. A systolic murmur is a sound heard during cardiac auscultation that may indicate abnormalities in the heart valves, such as stenosis or insufficiency (TARASOUTCHI F. et al, 2020).

To investigate these suspicions, laboratory tests, an electrocardiogram (ECG) and a transthoracic echocardiogram were requested. The electrocardiogram is an exam that records the electrical activity of the heart, providing information about the heart rhythm and electrical conduction (DE SOUSA et. al, 2024). Transthoracic echocardiography is an imaging technique that allows visualization of cardiac structures in real time, including

heart valves, systolic and diastolic function of the heart, and possible changes in cardiac morphology (Parente G. B. et. al, 2019).

The results of these examinations revealed a number of significant findings. On the electrocardiogram, a block of the antero-superior division of the left bundle branch was observed, indicating a possible change in the electrical conduction of the heart. Furthermore, the rapid progression of V1-V2 waves and the broad R wave in V2 suggest right ventricular overload, which may reflect conditions such as pulmonary hypertension or structural heart dysfunction. On transthoracic echocardiogram, significant aortic stenosis and significant aortic ectasia in the ascending segment were identified.

Aortic stenosis is a heart condition in which the aortic valve, responsible for controlling blood flow from the left ventricle to the aorta, becomes narrowed. This results in an obstruction to blood flow and overload of the left ventricle, leading to symptoms such as dyspnea, angina and syncope (Willner N et. al, 2023). The epidemiology varies according to the country's income, and its main therapeutic approach is valve replacement (DA CUNHA M. P. C. P. et. al, 2024).

The pathophysiology of aortic stenosis is associated with progressive calcification and fibrosis of the aortic valve. Initially, factors such as atherosclerosis, hypertension and advanced age can trigger the deposition of lipids and inflammation in the valve. Over time, these processes lead to calcification and thickening of the valve cusps, thereby reducing the effective opening area of the valve (Yu Chen H et. al, 2023).

As a result, blood flow through the aortic valve is restricted, increasing pressure in the left ventricle during systole. This pressure overload leads to the development of left ventricular hypertrophy, an adaptation of the heart muscle to compensate for the

obstruction to blood flow (Yu Chen H et. al, 2023). However, this hypertrophy can eventually lead to diastolic dysfunction and, in advanced stages, heart failure (KHANJAR A. et. al, 2024).

The main causes of aortic stenosis include senile calcification, which is the age-related degenerative process, and congenital aortic stenosis, which can occur as a result of abnormalities in the development of the aortic valve from birth (Willner N et. al, 2023). Furthermore, rheumatic aortic stenosis, a complication of rheumatic fever caused by *Streptococcus pyogenes* infection, can also lead to aortic valve damage (Rong LQ et. al, 2020).

Aortic stenosis is one of the most common valvular heart diseases, especially in elderly populations. The prevalence of aortic stenosis increases with age, being more common in individuals over 65 years of age. Risk factors such as hypertension, hypercholesterolemia, smoking and family history of valve disease is also associated with the development of aortic stenosis (Willner N et. al, 2023).

Aortic stenosis symptoms may vary depending on the severity of the valve obstruction. In the early stages, patients may be asymptomatic or present with mild symptoms such as exertional dyspnea, angina, or palpitations during exercise (Yokoyama Y et. al, 2023). As the stenosis progresses, more severe symptoms may occur, including dyspnea at rest, angina at rest, syncope, or even congestive heart failure (Willner N et. al, 2023; Yokoyama Y et. al, 2023).

The diagnosis of aortic stenosis is based on a combination of clinical history, physical examination, laboratory tests and imaging techniques. Transthoracic echocardiography is the gold standard imaging test for diagnosing and evaluating the severity of aortic stenosis. It allows you to visualize the anatomy of the aortic valve, blood flow velocity, valve area

and global cardiac function (NUNES F. I. et al, 2023).

Treatment of aortic stenosis depends on the severity of symptoms and the presence of complications (Dowling C et. al, 2020; Siontis GCM et. al, 2019; Swift SL, 2021). Aortic valve replacement is the definitive treatment for severe aortic stenosis (MEDINA L. M. M. et. al. 2022). This can be done through aortic valve replacement surgery, which may involve the use of a mechanical or biological prosthesis, or through minimally invasive procedures such as percutaneous aortic valve replacement (Dowling C et. al, 2020; Siontis GCM et. al, 2019; Swift SL, 2021). Furthermore, aortic stenosis treatment may also involve controlling cardiovascular risk factors, such as hypertension, hypercholesterolemia, and smoking, as well as managing symptoms, such as dyspnea, angina, and heart failure, with medications (Siontis et. al, 2019).

Aortic ectasia is an abnormal dilation of the aorta that can occur due to factors such as atherosclerosis, high blood pressure and connective tissue diseases. This condition can be asymptomatic in most cases and is often identified incidentally on imaging tests. However, in more severe cases, aortic ectasia can lead to complications such as aneurysms or aortic dissection (Cavalcante F. S. S.; Costa L. G. B. D.; & Brito V. H. B., 2020).

At this juncture, the findings mentioned in the text were decisive for referring the patient to a cardiologist at Hospital de Caridade, where he underwent heart surgery on 02/07/2023. The surgery involved aortic valve replacement with a number 23 metallic prosthesis and ascending aorta plasty with cardiopulmonary bypass. Aortic valve replacement is a common surgical procedure to correct AS by replacing the narrowed aortic valve with an artificial prosthesis (Smith CR et. al, 2021). However, aortic stenosis treatment varies according to the severity of symptoms and the individual

characteristics of each patient (Siontis GCM et. al, 2019).

For asymptomatic patients or those with mild symptoms, such as exertional dyspnea or mild angina, regular clinical monitoring may be indicated. This involves periodic consultations to monitor aortic stenosis progression, evaluate symptoms, and perform imaging tests, such as echocardiograms (Baumgartner H., 2017). However, drug treatment can also be used to control cardiovascular risk factors, such as hypertension and hypercholesterolemia, in addition to relieving symptoms such as dyspnea and angina. However, this is not indicated as definitive treatment for serious cases (COSTA L. R. PASSOS, VASCONCELOS E.; SILVESTRE, O. M., 2021).

At this juncture, there are two approaches to aortic valve replacement, including conventional heart surgery (aortic valve replacement) and minimally invasive procedures, such as catheter-based aortic valve replacement (TAVI/TAVR) (Dowling C et. al, 2020; Siontis GCM et. al, 2019;).

The minimally invasive transcatheter aortic valve replacement (TAVR) procedure is used to treat severe aortic stenosis in patients at high surgical risk (Siontis GCM et. al, 2019). However, the presence of concomitant valvular heart disease, such as mitral regurgitation, mitral stenosis (MS), and tricuspid regurgitation, may increase the risk of post-TAVR mortality. Studies indicate that moderate to severe mitral regurgitation, tricuspid regurgitation and severe MS are associated with a greater number of deaths after the TAVR procedure (SIDDIQUI T. J. et. al, 2022). This procedure involves dilating the narrowed aortic valve using a balloon, providing temporary relief of symptoms in selected patients (Baumgartner H., 2017).

It is important to note that each treatment option has its own indications and contraindications. Therefore, the decision on

the appropriate treatment for each patient must be made jointly between the doctor and the patient, taking into consideration, all clinical aspects, risks and benefits of each therapeutic option (Dowling C et. al, 2020; Siontis GCM et.al, 2019; Swift SL, 2021).

Continuing, after surgery, the patient began treatment with Warfarin 5 mg, an oral anticoagulant used to prevent the formation of blood clots. Warfarin works by inhibiting the synthesis of clotting factors in the liver, thus reducing the risk of thrombosis (BARBOSA R. A. et al, 2019.). Furthermore, other medications such as simvastatin, carvedilol and enalapril were prescribed to manage other aspects of the patient's heart health, such as cholesterol control, heart function and blood pressure (COSTA L. R. PASSOS, VASCONCELOS E.; SILVESTRE, O. M., 2021).

Patient monitoring at the Health Unit included echocardiogram exams, exercise testing, chest x-ray and follow-up laboratory tests. These exams are essential to monitor the evolution of the patient's cardiac status after surgery and adjust treatment as necessary (Swift SL, 2021; MEDEIROS F. et, al, 2023).

Follow-up laboratory tests revealed variations in INR (International Normalized Ratio) levels, an indicator of the effectiveness of anticoagulation with Warfarin. Maintaining the INR within the desired therapeutic range is crucial to prevent thromboembolic events, such as stroke or pulmonary embolism, without increasing the risk of hemorrhage (LEAL P. M. et. al, 2020).

CONCLUSION

In conclusion, the case of aortic valve replacement and ascending aorta angioplasty illustrates the successful management of a complex cardiovascular condition. Surgical interventions were effectively targeted to correct the patient's valvular and aortic pathologies, resulting in a significant improvement in hemodynamic function and relief of clinical symptoms.

This success is attributed to several critical factors, including meticulous preoperative planning, precise execution of surgical techniques, and implementation of comprehensive postoperative care.

The clinical improvement observed after surgical interventions highlights the effectiveness of these approaches in the treatment of severe aortic stenosis and

ascending aortic anomalies. However, long-term follow-up is imperative to monitor the durability of valve prostheses and the continued effectiveness of interventions, in addition to early detection of any signs of complications or the need for additional interventions.

This case report contributes significantly to the medical literature, offering valuable insights into the management and outcomes of complex aortic and valvular pathologies. It serves as an important reference for healthcare professionals, guiding future treatment approaches and improving understanding of surgical and post-operative care practices. In short, the report reinforces the importance of a multidisciplinary and integrated approach in the treatment of cardiovascular diseases, always aiming to improve clinical results and quality of life for patients.

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