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CASE REPORT

ROLE OF THE TRANSESOPHAGEAL ECHOCARDIOGRAM IN THE DIAGNOSIS OF PERIOPERATORY LEFT VENTRICULAR DYSFUNCTION AFTER MITRAL VALVE IMPLANTATION. CASE REPORT

ARTHUR MAROT DE PAIVA[1,2], GABRIEL BAÊTA BRANQUINHO REIS[1,2], ARTUR HENRIQUE DE SOUZA[1], GUSTAVO SIQUEIRA ELMIRO[1], STANLLEY OLIVEIRA LOYOLA[1], CLOVES GERALDINO DA SILVA JÚNIOR[1], GIULLIANO GARDENGHI[1]

ABSTRACT

The mitral regurgitation (MR) is a highly prevalent valve disease worldwide and it can lead to important repercussions for the patient, with surgical mitral valve replacement being one of the main therapeutic approaches in these situations. Our case report refers to a male patient, 67 years old, alcoholic, with previous diagnoses of tricuspid regurgitation, right ventricular (RV) dysfunction and dilatation, ostium secundum interatrial communication and mitral valve disease. After presenting with dyspnea (NYHA III), orthopnea and oliguria, the patient was admitted at the intensive care unit being diagnosed with acute MR due to posterior leaflet chord rupture and pulmonary hypertension. Therefore, urgent surgical intervention with mitral bioprosthesis implantation, tricuspid valve repair and atrioseptorrhaphy was proposed. After anesthetic induction, a transesophageal echocardiogram (TEE) was performed, which showed RV volume overload, leading to suspicion of dysfunction that could hinder the removal of extracorporeal circulation (ECC). At surgery, ECC time was 90 minutes and aortic clamping time was 64 minutes. Upon discharge from ECC, TEE revealed left ventricular (LV) insufficiency, which was masked by MR that normalized the LV ejection fraction in the preoperative period. Thus, doses of inotropic and vasoactive drugs were optimized, in addition to early use of an intra-aortic balloon, resulting in an effective therapeutic approach and early hospital discharge. This highlights the importance of the TEE in defining an effective postoperative approach, which should be used whenever available in the service.

KEYWORDS: TRANSESOPHAGEAL ECHOCARDIOGRAM; MITRAL PROSTHESIS IMPLANTATION; MITRAL REGURGITATION.

INTRODUCTION

Mitral regurgitation (MR) is one of the most prevalent valvular diseases in the world, being diagnosed in more than 2 million people in the United States of America alone in the year 2000 and this number is expected to double to 2030.[1]

The mitral valve (MV) consists of 2 leaflets (anterior and posterior) positioned within a ring. It allows blood inflow from the left atrium (LA) to the left ventricle (LV) during diastole, while preventing systolic blood reflux. To perform this task, a delicate interaction between LV contraction and/or relaxation, papillary muscle contraction, annular and leaflet movement is required. Any disturbance of this interaction affects the coaptation of the systolic leaflet and can result in a regurgitation of blood from the LV to the LA.[1,2]

In the early stages of MR, the LV wall stress due to volume overload is compensated by the increase in the ejection fraction, due to the passage of blood to the LA, which occurs due to the low resistance of this cardiac chamber. If compensatory mechanisms are maintained, an evolution from the acute stage to the compensated chronic stage of MR may occur. In this compensated stage, there will be LV dilation to maintain the stress and diastolic pressure of the heart wall, causing patients to remain asymptomatic during this phase for years or even decades.[3]

However, as this chronic disease progresses, there is an alteration in the ventricular structure, assuming a spherical mass of greater weight, increasing the systolic stress on the LV wall due to greater pressure on the ventricular axis. This leads to an increase in end-diastolic pressure and, eventually, to a decreased contractile state, with reduced myofiber content and ventricular interstitial fibrosis, which can lead to heart failure (HF).[3]

In addition to the repercussions on the LV, MR can also have consequences on the right ventricle (RV) and on the systemic circulation. An example of this is pulmonary hypertension (PH), which is an important contributor to morbidity and mortality in patients with valvular heart disease. In this situation, elevated left atrial pressure causes the develop-

1. Hospital ENCORE
2. UFG-GO

MAILING ADDRESS
GIULLIANO GARDENGHI
Hospital ENCORE
Rua Gurupi, Qd.25, Lt.06/08 - Setor Vila Brasília
Aparecida de Goiânia GO - CEP: 74905-350
E-mail: ggardenghi@encore.com.br

ment of postcapillary PH, which worsens blood oxygenation and can lead to RV insufficiency by increasing the contractile force necessary for the ventricle to eject blood into the pulmonary capillaries, causing an overload of volume in the RV, with ventricular interstitial fibrosis and thickening of its wall, similar to the process that occurs in the LV.[4]

In view of this picture of several MR repercussions, intraoperative transesophageal echocardiography (TEE) emerges as an important guiding tool for therapeutic approaches to guide hemodynamic management more rationally and significantly influence decision-making in patients undergoing MV exchange surgery.

The aim of this study is to report a case of change in medical conduct from the use of TEE in intraoperative MV replacement surgery.

The Research Ethics Committee of the Emergency Hospital of Goiânia, linked to Plataforma Brasil, approved this study (CAAE: 08498819.80000.0033).

CASE REPORT

Male patient, 67 years old, alcoholic and with previous diagnoses of tricuspid insufficiency (TI), RV dysfunction and dilatation, ostium secundum interatrial communication and mitral valve disease. Before hospitalization, he used Selozok 25 mg.

After dyspnea on minimal exertion (NYHA III), orthopnea and oliguria, a clinical investigation followed, which led to the diagnosis of acute MR due to posterior leaflet chord rupture and consequent PH, leading to the patient's admission to the Intensive Care Unit (ICU). Therefore, urgent surgical intervention was proposed, performed on the same day after compensation of the clinical picture with mitral bioprosthesis implantation, tricuspid valve repair (DeVega suture) and atrioseptorrhaphy.

The procedure started with the performance of general anesthesia and, after anesthetic induction, the TEE probe was passed, used as an intraoperative monitor. The initial examination showed RV volume overload, leading to suspicion of dysfunction, which could make CPB withdrawal difficult. (figure 1)

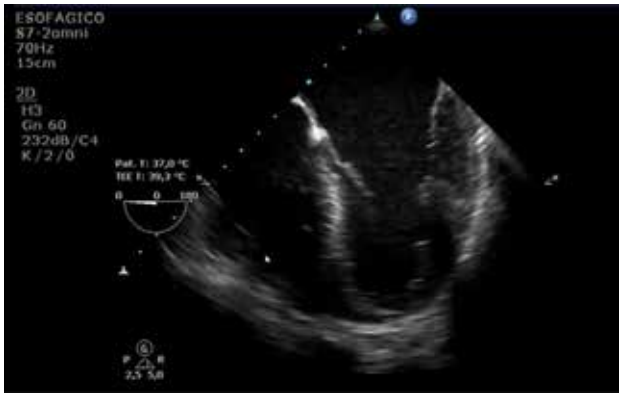

Figure 1: Transesophageal echocardiogram image before patient admission to CPB. Image reveals right ventricular (RV) volume overload. With this finding, it was expected that there would be some difficulty in leaving CPB due to RV dysfunction.

The procedure was followed by sternotomy and pericardiotomy followed by full heparinization and entry into the CPB system. To expose the MV, a right atriotomy with septostomy was performed, removing the MV with signs of significant degeneration. Afterwards, long-lasting mitral bioprosthesis No. 31 was implanted. Afterwards, tricuspid valve repair (DeVega suture) was performed, followed by atrioseptorrhaphy. Aortic clamping was released after 64 minutes and CPB time was 90 minutes. Finally, a mediastinal drain was passed, followed by sternal closure in layers. At the end of the procedure, at the end of CPB, another TEE was performed, which revealed correction of the patient's MR (figure 2), but also showed significant LV insufficiency, which was masked by the MR that normalized the ejection fraction before the surgery. (figure 3)

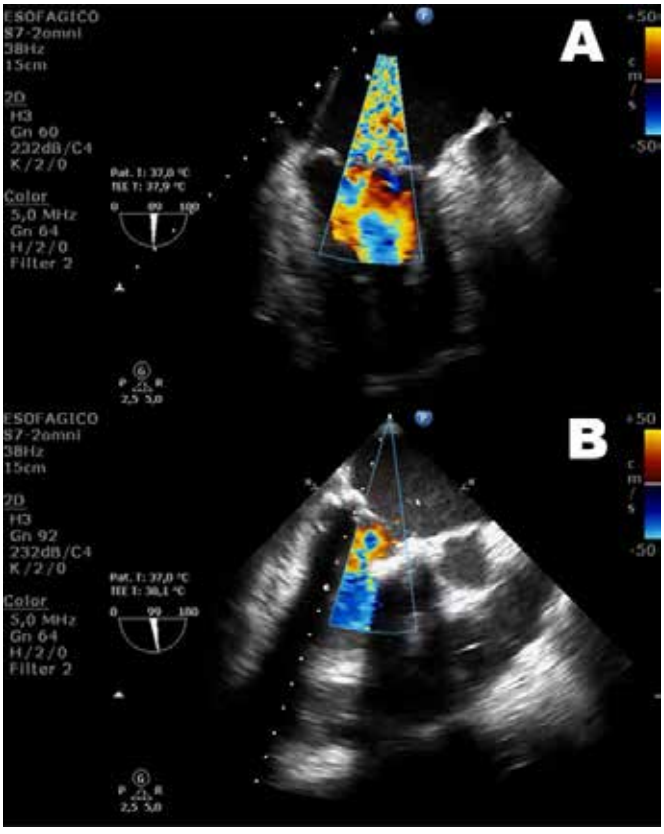

Figure 2: TEE cut-away image for mitral valve (MV) evaluation. A: Flow with mixed blue and red when MV is closed: indicating severe mitral regurgitation. B: Image after mitral prosthesis implant, with disappearance of regurgitation.

Figure 03: TEE cross-sectional image showing the left ventricle (LV). The figure shows LV dysfunction after mitral valve replacement that was previously concealed.

The patient left the operating room still intubated and on mechanical ventilation, using norepinephrine (1.13 mcg/kg/min) and dobutamine (14 mcg/kg/min). Then, vasopressin therapy was started to maintain adequate mean arterial pressure. With the need for increasing doses of noradrenaline, an early intra-aortic balloon (IAB) implant was indicated due to cardiogenic shock, in order to achieve hemodynamic stability, while still optimizing inotropic/vasoactive drugs.

The patient presented progressive clinical improvement, which led to weaning from the vasoactive drugs and withdrawal of the IAB. In 16 days, the patient was discharged from the ICU and after another 15 days he was discharged from the hospital in good general condition, hemodynamically stable and without complaints.

DISCUSSION

The latest guidelines published in 2013 and 2014 by the American Society of Echocardiography, the American Society of Cardiovascular Anesthesiologists, and the European Association for Cardiovascular Imaging state that intraoperative TEE should be performed in all open heart surgery and thoracic aortic surgery procedures, some coronary artery bypass surgery and intracardiac transcatheter procedures, such as transcatheter aortic valve implantation (TAVI), mitraclip, atrial appendage closure, atrial communication closure, ventricular assist implantation, and extracorporeal membrane oxygenation (ECMO).[5]

In general, monitoring with TEE during cardiovascular surgery is currently recommended in all patients undergoing cardiac intervention, unless there is a contraindication.[5]

In a prospective observational study in cardiac surgery patients operated from January 2009 to May 2012, in which the total number of patients studied was 1,273, TEE monitoring showed "new pre-CPB findings" in 98 patients (7,7%) and 43.8% of them modified the scheduled surgery. The incidence of "unexpected post-CPB findings" was 6.2% (79 patients) and, of these, 46.8% required reestablishment of CPB and modification of the surgery performed. In that study, unsuccessful valve repair and dysfunctional valve prostheses were the main causes of CPB re-entry.[6]

In another prospective and descriptive study carried out in patients undergoing scheduled surgery with CPB, in which TEE was performed before and after surgery, it was shown that of the 488 patients included in the study, new findings were found in 122 patients (25%), which led to a change in planned surgery in 57 (11.68%). Of the 31 patients (6.35%) in whom postoperative problems were found, 13 (2.6%) required re-entry into CPB, changing the intraoperative medical management and leading to a better outcome.[7]

In the present case report, the TEE was essential for the change of conduct, as it demonstrated that the RV insufficiency evidenced in the intraoperative TEE was actually a LV insufficiency that was masked by an MR. This finding in the post-CPB TEE changed the previously planned approach, leading to the early use of the IAB and optimizing the use of inotropic and vasoactive drugs, resulting in an effective therapeutic approach and hospital discharge in a reduced period.

CONCLUSION

The use of intraoperative TEE plays an important role in defining an effective postoperative approach and optimizing the use of resources at an early stage, which can reduce patient morbidity and mortality and the length of stay, as well as being a form of safe monitoring. In cases of MR, especially, which can mask other cardiac dysfunctions, such as LV insufficiency, intraoperative TEE should be used whenever available in the service.

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