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Case Report

The role of intraoperative transesophageal echocardiography in the successful outcome after mitral replacement for infective endocarditis on the background of hypertrophic obstructive cardiomyopathy: a case report

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Abstract

Hypertrophic cardiomyopathy is most commonly an autosomal genetic disorder characterized by increased morbidity. Infective endocarditis, although rare, can complicate the course of the disease. The mitral and aortic valves are more commonly affected. Mitral valve vegetations may cause severe regurgitation and acute heart failure. In the event that the anterior valve leaflet is affected, this may result in severe left ventricular outflow tract obstruction (LVOTO), requiring immediate intervention and resulting in a significant increase in mortality. We report a rare clinical case of a patient with hypertrophic cardiomyopathy complicated by mitral valve infective endocarditis and LVOTO.

Keywords

echocardiography, hypertrophic cardiomyopathy, infective endocarditis, perioperative management, perioperative transesophageal echocardiography

Introduction

Hypertrophic cardiomyopathy is a relatively common genetic disease, characterized by the presence of increased left ventricular (LV) wall thickness.[1] Left ventricular outflow tract obstruction (LVOTO) with or without systolic anterior mitral valve leaflet motion, resulting in increased pressure gradients and clinical symptoms necessitating surgical intervention, is a common feature.[2] In addition, the presence of LVOTO has been associated with an increased risk for infective endocarditis involving both aortic and mitral valves[2,3] further complicated by symptomatic embolic

events, increasing the burden of disease morbidity.

Transesophageal echocardiography is the cornerstone for the assessment of heart function and identification of any valvular or structural pathology in cardiac surgical patients. Infective endocarditis is associated with high mortality rates during the perioperative period. The more advanced it is, the more challenging the management becomes. We describe the case of a patient with known hypertrophic cardiomyopathy complicated by infective endocarditis of the mitral valve whose intraoperative course highlights the role of intraoperative use of transesophageal echocardiography (TOE).

Case report

A 41-year-old male patient with a known history of hypertrophic cardiomyopathy presented for pre-anesthetic assessment the day before his expedited surgery for the correction of severe mitral regurgitation due to infective endocarditis. The patient was admitted to the Department of Internal Medicine for 21 days because of fever and signs and symptoms of peripheral embolism (splenic infarction) and ischemic stroke with residual left-sided hemiparesis. He had also been investigated for chronic myelogenous leukemia, though an established diagnosis could not have been made. His medication treatment included: low molecular weight heparin (LMWH), omeprazole, bisoprolol, clopidogrel (due to ischemic stroke), and empirical antibiotic treatment with vancomycin and gentamycin according to current guidelines. His past medical history was almost uneventful, with a history of cholecystectomy and repair of traumatic rupture of right-hand tendons.

During his hospitalization, a full body Computer Tomography (CT) scan was performed. Brain CT images showed ischemic lesions in the basal ganglia (right side) and right temporal lobe, consistent with right middle cerebral artery hypoperfusion. There was also an enlargement of the ventricular system of the brain, inconsistent with the patient's age, and lesions were also seen in the left frontal lobe. Chest high-resolution CT and CT angiography indicated atelectasis at the anterior section of lower left lobe and pericardial effusion (1.9 cm). Signs of enlarged ventricles and left atrium were also present. No signs of pulmonary embolism or pulmonary septic emboli were revealed. Abdominal CT findings such as an engorged spleen and multiple sphenoid areas in the spleen, indicative of splenic infarcts, were observed. Right sided ascites, probably attributed to the splenic emboli, was also observed. Since the patient's clinical history and condition precluded the performance of a noninvasive study to exclude a possible concomitant coronary disease, diagnostic coronary angiography was performed before surgery, and no critical stenoses were observed. Routine preoperative carotid Doppler testing was normal.

Bedside transthoracic echocardiography showed an LV of normal internal diameter and asymmetric hypertrophy (interventricular septum 2.1 cm – posterior LV wall 1.4 cm). Left atrium was severely enlarged. Right ventricle and atrium were found to be within normal size and function. Aortic valve was trileaflet with normal function. Obstruction of LVOT was observed with a peak pressure gradient of 60 mmHg. The mitral valve presented with a nimble formation compatible with vegetation in its anterior cusp (2.2 cm×1.9 cm), which moved into the LVOT during LV systole, contributing to the creation of systolic anterior motion (SAM). A moderate to severe mitral valve regurgitation also attributed to the vegetation was observed. Mild pericardial effusion was observed, of no clinical significance. As echocardiography is the examination of choice for the evaluation of cardiac dimensions and pericardial effusion in our patient, the results regarding cardiac dimensions, obtained by the thorax CT performed few hours before, were considered to fall within the limitations of the method.

Pre-operative transesophageal echocardiography (TOE) was also performed for better evaluation of the mitral valve, which confirmed the presence of a vegetation-like lesion in the anterior cusp of the mitral valve, contacting the LVOT and contributing to the severe obstruction (peak pressure gradient was 62 mmHg). A prolapse of the anterior cusp (A2 scallop) responsible for severe mitral regurgitation, not observed in transthoracic echocardiography (Vena contracta=0.8 cm), was also revealed.

The latter confirmed the suspected diagnosis of mitral valve infective endocarditis with multiple septic emboli and a surgical intervention for the correction of the valve was decided.

At the time of the anesthesiology assessment, routine preoperative laboratory blood tests showed a hemoglobin of 10.1 mg/dL with platelet count within normal range. The patient's renal function, his clotting factors and fibrinogen as well as the inflammation parameters such as procalcitonin and C-reactive protein were also within normal ranges. Under antibiotic treatment, the patient's blood cultures, which initially showed presence of Staphylococcus aureus, were negative.

Intraoperative management

The patient reached the operating room, standard noninvasive monitoring was applied and an invasive blood pressure monitoring through the right radial artery was initiated. Vital signs were within normal range. General anesthesia with tracheal intubation was performed and subsequently, a central venous line and a pulmonary artery catheter were placed in the right internal jugular vein. Maintenance of anesthesia was achieved with intravenous and inhalational agents. Pre-cardiopulmonary bypass (CPB), the patient remained stable, and a transesophageal echo study was obtained, which confirmed the severe mitral regurgitation with central jet and with vegetations on the anterior mitral leaflet. The aortic long axis 120 degrees view revealed an impressive dynamic condition of the vegetation of the anterior leaflet falling in the LVOT and deteriorating the preexisting obstruction due to the hypertrophy with strong suspicion of SAM of the mitral leaflet. In addition to this, an obvious asymmetrical enlargement of the basal part of the intraventricular septum, strongly contributing to the high LVOT gradients was ob-

served. LVOT gradient was calculated to be 65 mmHg under general anesthesia, even higher than the measurement on the transthoracic echo with good hemodynamic values mean arterial pressure >80-90 mmHg ***(Fig. 1)****. This finding revealed the true extent of LVOT obstruction due to interventricular septal thickening, changing the course of the procedure and indicating the need for an additional septal myectomy.*

A 31-mm metallic mitral valve (St. Jude Medical) was placed under CPB and septal myectomy was performed with a generous tissue removal. Good surgical result was confirmed with TOE. There was a significant reduction of the hypertrophic part of the basal septum with obvious removal of tissue leading to improvement of the pressure gradient in the LVOT from 65 to 10 mmHg. The metallic valve was well seated with mean PG 5 mmHg and no residual mitral regurgitation. Insignificant washing jets were seen. There was no evidence of ventricular septal defect on color Doppler.

Bypass time was 148 minutes and aortic cross clamp time was 118 minutes.

Postoperatively, the patient was transferred to the cardiac intensive care unit under general anesthesia, mechanical ventilation and continuous infusion of epinephrine and norepinephrine (0.05 mcg/kg/min and 0.2 mcg/kg/min, respectively), where he remained for 24 hours. After successful weaning from mechanical ventilation and subsequent extubation, he was transferred to the Cardiothoracic Intensive Care Unit for further treatment.

Discussion

The interesting and rare echo finding in our case was the pre-existing LVOT obstruction with asymmetric thickening of the septal wall adjacent to the aortic valve apparatus due to hypertrophic cardiomyopathy. The obstruction deteriorated from the entrapment of the bacterial vegetation of the anterior leaflet, producing remarkably high LVOT gradients, unusually seen under general anesthesia. Resting intra-

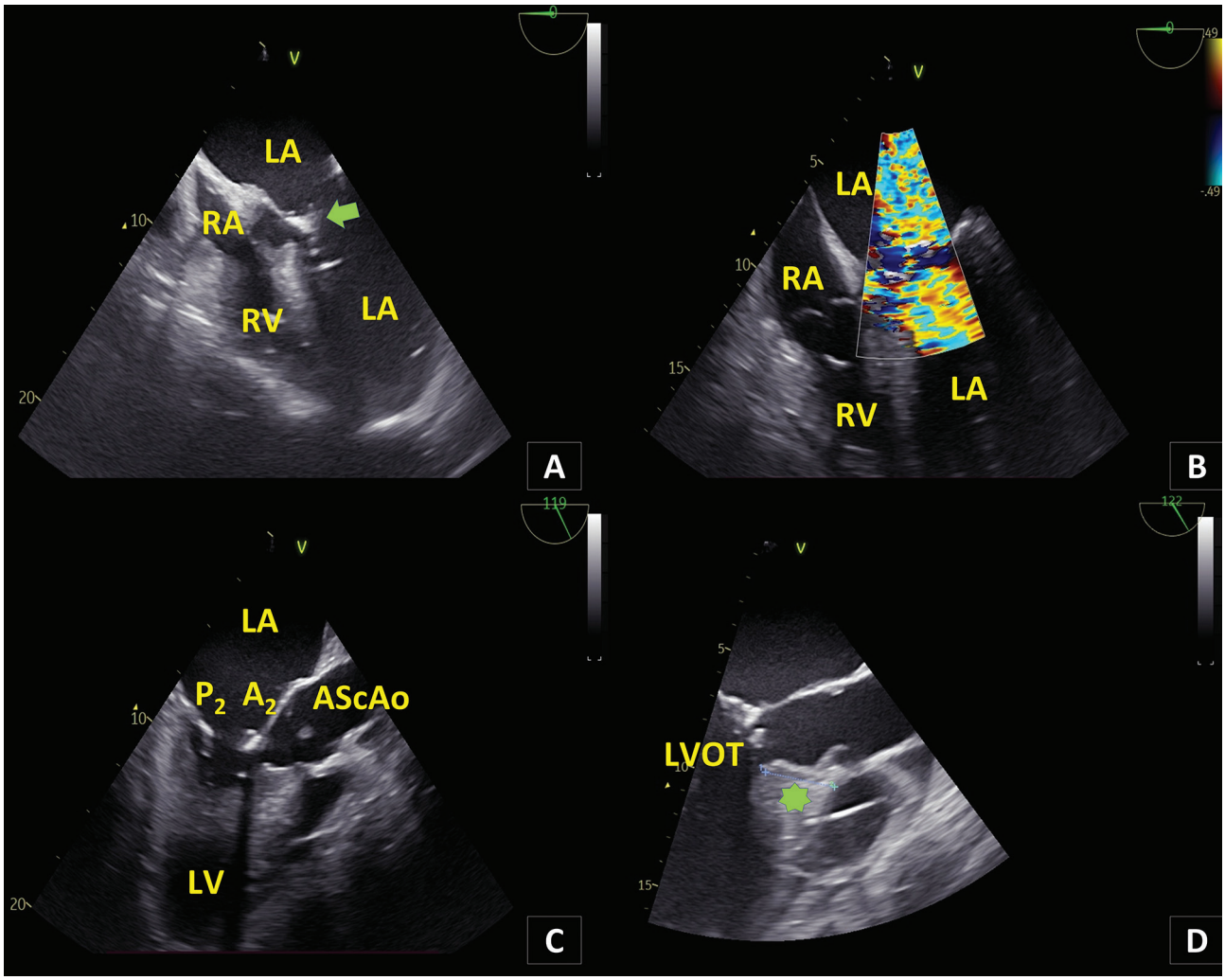

Figure 1. Periprocedural transesophageal echocardiography. Panels **A** and **B**: 4-chamber view at mid-esophageal level showing the vegetation (arrow) and the resultant severe mitral valve regurgitation. Panels **C** and **D**: 3-chamber view at mid esophageal level showing the P2 and A2 mitral cusps and the left ventricular hypertrophy (asterisk). AScAo: ascending aorta; LA: left atrium; LV: left ventricle; LVOT: left ventricular outflow track; RA: right atrium; RV: right ventricle

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operative LVOT pressure gradients are expected to be lower compared with the preoperative transthoracic echo ones, as general anesthesia may mask any SAM or outflow obstruction. Any LVOT gradient >30 mmHg – event provoked – should be considered for intervention, thus myectomy.[4]

TOE guided myectomy contributes to obvious reduction of the LVOT gradients to acceptable levels (below 10 mmHg in our case) and is associated with good long-term survival while follow up with stress echo demonstrates good hemodynamics as suggested from other studies too.[5]

Most authors suggest that the incidence of infective endocarditis on the background of hypertrophic cardiomyopathy is rare as an entity. Mortality is high with or without obstruction and the etiology of the infection sometimes remains unknown although a big number of patients had a predisposing factor (>22%).[3]

Conclusion

Surgical intervention was the only solution to the unique pathology and anatomical variation of our patient. The initially planned mitral valve replacement was accompanied by successful septal myectomy. The latter was decided intraoperatively, based on the results of the intraoperative TOE, which revealed the real severity of SAM.

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Competing interests

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