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CLINICAL IMAGE

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Three-dimensional critical care transesophageal echocardiography: A bedside tool in the diagnosis and management of shock

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Abstract

Critical care echocardiography has become fundamental in diagnosis, management, and monitoring of patients in shock. Transesophageal echocardiography has gained importance, particularly in critically ill patients under mechanical ventilation. We describe echocardiographic findings concerning a patient admitted with confusion, pulmonary edema, hypotension, and systolic murmur at apex.

KEYWORDS

circulatory shock, critical care echocardiography, endocarditis, hemodynamic monitoring, transesophageal echocardiography

1 | INTRODUCTION

Critical care echocardiography has become fundamental in diagnosis, management, and monitoring of patients in shock. Consensus on circulatory shock and hemodynamic monitoring suggests that echocardiography is the preferred modality for initial evaluation.[1] Transesophageal echocardiography (TEE) has gained importance, particularly in critically ill patients under mechanical ventilation.[2]

2 | CASE PRESENTATION

We present a case of a 65-year-old female patient admitted with confusion, pulmonary edema, hypotension, and systolic murmur at apex. Blood tests revealed elevated CRP (56 mg/L) with hyperleukocytosis (16,400/μl), renal failure (MDRD: 23/ml/min/1.73 m^2), hepatitis (ALT: 1017 IU/L), elevated NT-proBNP (>35,000 pg/ml), and hyperlactatemia (4.0 mmol/L). Transthoracic echocardiography demonstrated a severe mitral regurgitation. After stabilization, TEE was performed for its incremental value in terms of diagnosis and hemodynamic monitoring.

3 | RESULTS

TEE illustrated the mechanism of the multiple-valve disease, which was not clearly defined by transthoracic examination. The mitral valve disease was characterized by a perforation of the anterior mitral valve leaflet (AMVL) with a 9-mm defect responsible for a severe and eccentric mitral regurgitation, as documented by the presence of a convergence flow over the hole of the mitral valve (Figure 1A). 3D imaging showed a well-circumscribed hole in the A2 segment (Figure 1B; Video S1; Supplementary Material). TEE aortic valve assessment revealed a moderate aortic regurgitation with a

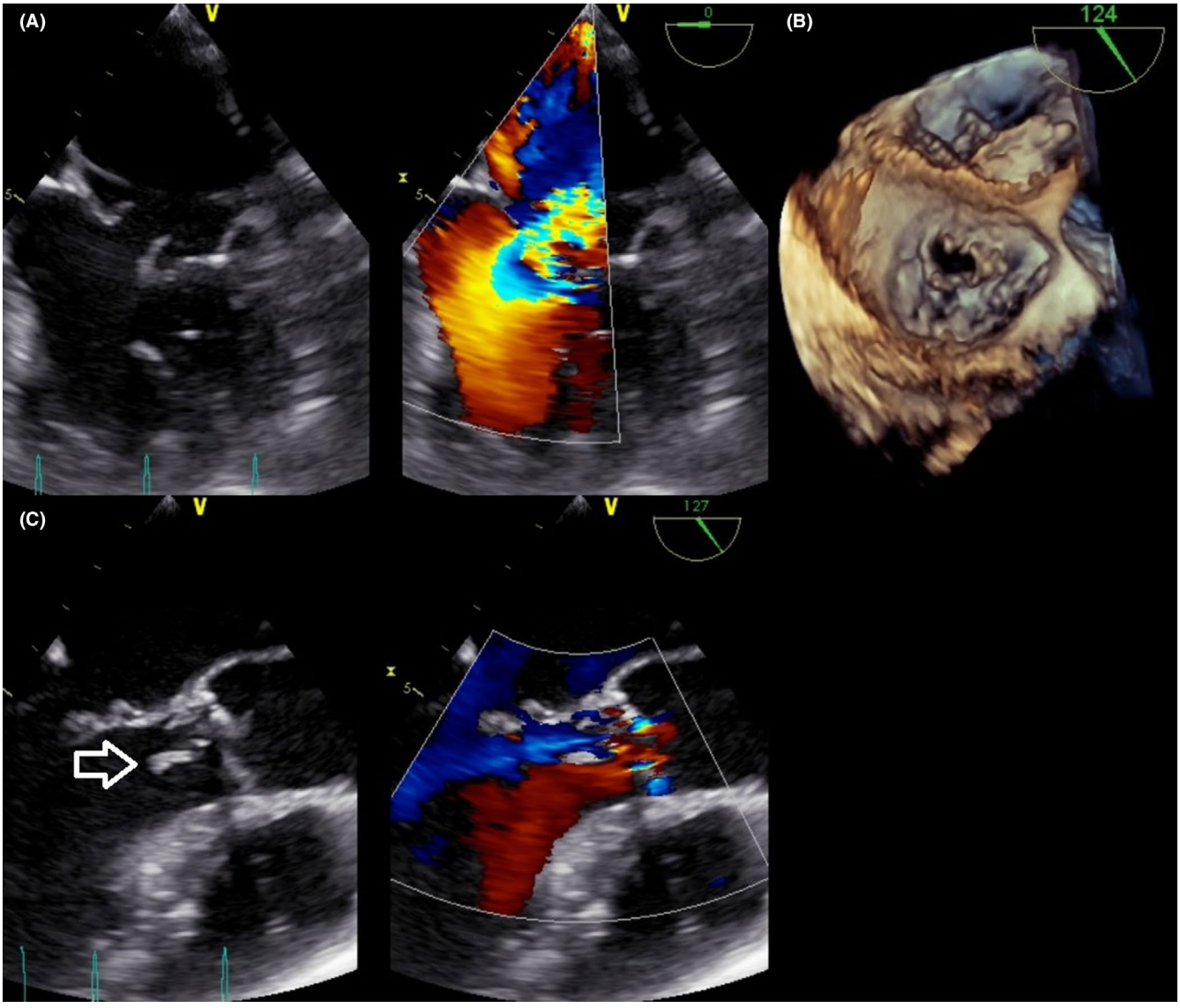

FIGURE 1 Panel A. 9-mm defect of the AMVL due to perforation seen by 2D TEE from the apical 4-chamber view. Panel B. Perforated AMVL seen by 3D TEE in the "surgeon's view." Panel C. Mobile vegetation attached to the right aortic cusp and prolapsing toward the left ventricle with a moderate aortic regurgitation

bulky vegetation (12 × 3 mm) attached to the right cusp and prolapsing toward the left ventricle (Figure 1C). Hemodynamic assessment demonstrated a normal LVEF with elevated LV filling pressure (early mitral inflow velocity (E) to early diastolic mitral annular tissue velocity (E′) ratio: E/E′ > 15), pulmonary hypertension (systolic pulmonary artery pressure: 50 mm Hg + central venous pressure), and no respiratory variation in superior vena cava diameter. After diagnosis, the treatment consisted of broad-spectrum antibiotics infusion after repeated blood cultures, diuretic therapy to achieve negative fluid balance and surgical management with double valve replacement. Unfortunately, the patient fell into refractory septic shock with multiple organ failure and deceased 48 h later.

4 | CONCLUSION

Critical care echocardiography is a key in characterizing shock states. Cardiac causes of acute pulmonary edema with normal LVEF and elevated left atrial pressure include significant valvular pathology. We illustrated by 3D TEE technology a bi-valvular infective endocarditis complicated with mitral leaflet perforation and moderate aortic regurgitation. This case report demonstrates that 3D ultrasound imaging provides additional information when more detailed analysis of cardiac structures is required.

ACKNOWLEDGEMENTS

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

AUTHOR CONTRIBUTIONS

All authors have made substantial contribution to the preparation of this manuscript. JH acquired the images, interpreted the data, and drafted the manuscript. FF performed literature search. PFL made critical revision and approved the final manuscript.

CONSENT

Written informed consent was obtained from the patient to publish this report for educational/research purposes in accordance with the journal's patient consent policy.

DATA AVAILABILITY STATEMENT

The datasets generated during the current report are available from the corresponding author on reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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