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**Address for Correspondence:** Dr. Beytullah Çakal,  
İstanbul Medipol Üniversitesi Tıp Fakültesi,  
Kardiyoloji Anabilim Dalı,  
İstanbul-Türkiye  
Phone: +90 506 284 55 88  
E-mail: bcakal@hotmail.com



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## A rare cause of mitral regurgitation after aortic valve replacement: Iatrogenic mitral valve perforation 🎧

📍 Begüm Uygur, 📍 Ömer Çelik, 📍 Anıl Şahin, 📍 Ali Rıza Demir,  
📍 Mehmet Ertürk

Department of Cardiology, University of Health Sciences, İstanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Training and Research Hospital; İstanbul-Turkey

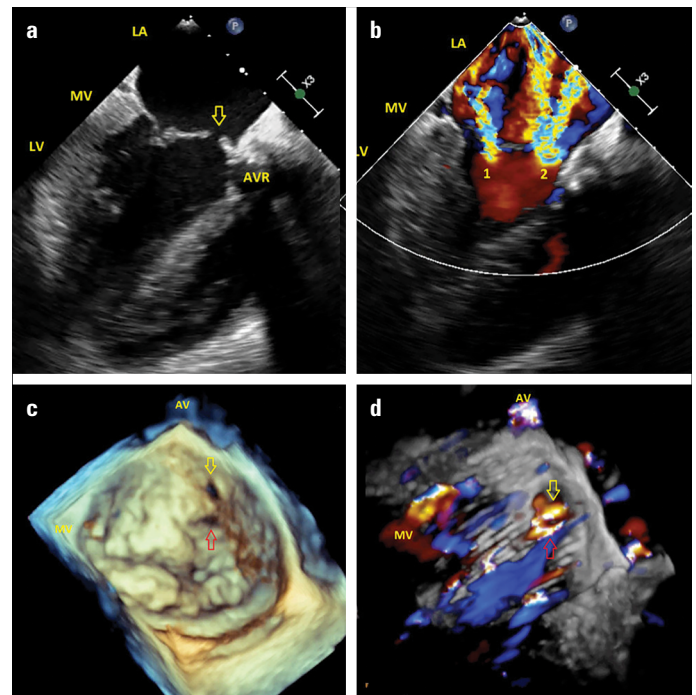
### Introduction

Mitral leaflet perforation is frequently associated with infective endocarditis (IE). Iatrogenic mitral valve (MV) injury after aortic valve (AV) surgery is a well-known but extremely rare reported complication. Herein, we report the case of a 19-year-old male patient who underwent AV replacement (AVR) and developed severe mitral regurgitation (MR) immediately postoperatively.

### Case Report

A 19-year-old male patient was admitted because of shortness of breath and fatigue. He had no past medical history. Electrocardiogram showed sinus rhythm with a heart rate of 98 bpm. On auscultation, grade 5/6 systolic murmur was heard. Transthoracic echocardiography (TTE) revealed that the ejection fraction (EF) was 60%, 76/42 mm Hg gradient on bicuspid AV with AV area of 0.8 cm<sup>2</sup>. Other valves were normal in structure, and mild MR was seen. The patient underwent AVR, but no intraoperative transesophageal echocardiography (TEE) was performed after implantation of the prosthetic valve. During intensive care unit follow-up, new-onset severe MR was detected by TTE. TEE was performed to determine the etiology of MR. Two-dimensional (2D) images showed a 4-mm defect on the base of the anterior mitral leaflet (AML), which caused

severe MR, together with mild central MR (Fig. 1a, 1b, Videos 1, 2). Three-dimensional (3D) TEE, showing MV from the enface view, revealed two different defects on the A2 scallop of the AML, with sizes of 6×3 and 7×4 mm (Fig. 1c, Video 3), and 3D color Doppler drop-out artifacts were ruled out, and true defects were confirmed (Fig. 1d, Video 4). The patient had no history of IE or fever, and all infective markers were within normal limits. Considering that MR developed just after surgery with multiple defects in the AML, iatrogenic perforation of the AML was concluded. Because the patient was asymptomatic with normal EF and ventricular size, conservative follow-up with medical therapy was recommended. However, dyspnea and heart failure symptoms developed after 3 years of follow-up. The patient was referred for MV surgery. Two defects in the AML were seen intraoperatively, as well as in the 3D images. MV replacement was performed because the repair was not successful. Postoperative TTE revealed normal-functioning mechanical prosthetic AV and MV with normal EF. The patient was discharged uneventfully.



**Figure 1.** (a) Transesophageal echocardiography, mid-esophageal long-axis view. The yellow arrow indicates the perforation in the anterior mitral leaflet. (b) Transesophageal echocardiography, mid-esophageal long-axis view with color Doppler imaging. 1 shows central mitral regurgitation (MR), 2 shows severe MR from the perforated area in the anterior mitral leaflet. (c) Three-dimensional transesophageal echocardiography image shows MV from surgical view. The yellow and red arrows indicate two different perforations in the anterior mitral leaflet. (d) Three-dimensional transesophageal echocardiography with color Doppler imaging. The yellow and red arrows indicate two different mitral regurgitations from different perforation sites in the anterior mitral leaflet

AVR - aortic valve replacement, LA - left atrium, LV - left ventricle; MV - mitral valve, AV - aortic valve

## Discussion

Leaflet perforation is commonly associated with IE. However, iatrogenic leaflet perforation can be seen after perivalvular surgeries (1). Surgical forceps or needle injury is among the causative factors (2). AV perforation due to MV surgery is a well-known complication. Previous reports showed 19 patients with iatrogenic AV perforation after MV surgery (3-5). Iatrogenic MV perforation after AV surgery has been reported to be extremely rare. Van Dyck et al. reported only two cases of AML perforation in 475 AV surgery cases (6). Maddali et al. (7), Dogan et al. (8), Velasco et al. (9), and Raj et al. (10) each showed one case of iatrogenic AML perforation after AVR. Highly calcified AV avulsions (7) and redo operations with severe adhesions (8) can be reasons of iatrogenic MV perforation. For detection of iatrogenic perforation, intraoperative TEE is the most important diagnostic tool. Especially, 3D offers the exact surgical view of the MV from the enface approach, which establishes a great communication between the surgeon and the imager, creating an opportunity to comment on possible complications and success of surgery. In our patient, intraoperative TEE was not performed, and iatrogenic severe MR was detected immediately postoperatively. Post-operative 2D TEE images only showed a single defect in the AML with size in one dimension, but with 3D, two different defects were found in the A2 scallop of the AML with true size in multiple dimensions. 3D echocardiography has superiority over 2D for detecting location, size in multiple dimensions, and numbers of defects, which can show structures from the enface view. Acute severe valvular regurgitation may require emergent surgery, but our patient tolerated new-onset severe MR well. Thus, medical therapy was recommended instead of emergent surgery.

## Conclusion

Intraoperative TEE is an important diagnostic tool to detect and manage surgical complications. In circumstances of new-onset murmur after cardiac surgery, iatrogenic valve injury should be considered.

**Informed consent:** The patient has given informed consent to the publication of this case report, including the results of imaging methods.

**Video 1.** Transesophageal echocardiography, mid-esophageal long-axis view. Perforation in the anterior mitral leaflet and prosthetic aortic valve are seen.

**Video 2.** Transesophageal echocardiography, mid-esophageal long-axis view with color Doppler imaging. Central mitral regurgitation (MR) and severe MR from the perforated area in the anterior mitral leaflet are seen.

**Video 3.** Three-dimensional transesophageal echocardiography image shows MV from surgical view. Two different perforations in the anterior mitral leaflet are seen.

**Video 4.** Three-dimensional transesophageal echocardiography with color Doppler imaging. Two different mitral regurgitation from different perforation sites in the anterior mitral leaflet are seen.

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**Address for Correspondence:** Dr. Begüm Uygun,

Sağlık Bilimleri Üniversitesi,  
İstanbul Mehmet Akif Ersoy,  
Göğüs Kalp ve Damar Cerrahisi,  
Eğitim ve Araştırma Hastanesi,  
Kardiyoloji Kliniği,  
İstanbul-Türkiye

Phone: +90 533 434 48 81

E-mail: uygurbegum@gmail.com

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