Emergency and Critical Care Medicine

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An unusual anterior mitral leaflet perforation in a patient with no infective endocarditis: a case report

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Abstract

Background: Mitral valve perforation refers to the occurrence of cracks or openings in the structure of the mitral valve, allowing blood to escape through these gaps. Typically, this is caused by infective endocarditis and the most common site is the anterior leaflet. However, it is crucial to explore other potential causes of valve damage, particularly when conventional risk factors are not apparent.

Case presentation: We present a case of a middle-aged male patient who developed mitral valve perforation because of aortic valve regurgitation in the absence of infective endocarditis.

Conclusion: Exploring such rare cases contributes to a deeper understanding of valvular diseases and enhances clinical decision making for effective management.

Keywords: Anterior mitral leaflet, Aortic valve, Case report, Perforation, Prolapse, Regurgitation

Introduction

Mitral valve perforation refers to the occurrence of cracks or openings in the mitral valve structure that allow blood to escape, which differs from mitral regurgitation. Mitral valve perforation is typically caused by infective endocarditis (IE), connective tissue disorders, or other structural issues.[1,2] Its clinical presentation varies according to the severity of perforation and associated complications. Patients may experience symptoms, such as acute heart failure, shortness of breath, rapid heart rate, and chest pain. Fever and other signs of infection may also occur in cases of IE-related perforation. However, it is crucial to explore other potential causes of valve damage and regurgitation, particularly when conventional risk factors are not apparent. Early diagnosis and appropriate management are essential for preventing adverse outcomes and optimizing cardiac function. Our patient, an adult male with mitral valve anterior leaflet perforation and aortic right coronary valve prolapse, did not have IE. His condition may perhaps have been associated with mitral valve disease and blood flow shock.

Case presentation

A 58-year-old afebrile man with an uneventful medical or family history was admitted to the respiratory department with dyspnea, which was obvious at night and aggravated in the supine position. Auscultation of the heart revealed an enhanced systolic murmur. The patient underwent several auxiliary examinations. Chest computed tomography scans showed symptoms of pneumonia, and cardiac color Doppler ultrasound and transthoracic echocardiography revealed both aortic valve and mitral valve severe regurgitation (The mitral valve leaflet fissure was not excluded) (Fig. 1). He had a more than 10-year history of cigarette smoking and alcohol consumption, which ceased only on hospitalization. Physical examination revealed the following: temperature, 36.1°C; pulse, 89 beats per minute; respiratory rate, 25 times per minute; blood pressure, 132/66 mmHg; and a systolic murmur in the apical area. His results in relation to a preantibiotic blood culture, erythrocyte sedimentation rate, and a high-sensitivity C-reactive protein test were negative. On hospital day 2, a cardiologist evaluated the patient and recommended transfer to the cardiac surgery unit. On hospital day 8, a transesophageal echocardiography was performed to assess the structure and function of the heart valves, which showed mitral valve anterior leaflet root perforation, prolapse of the aortic right coronary valve, and severe aortic valve regurgitation bundles in the left ventricular outflow tract during diastole; no obvious vegetation was detected (Figs. 2A and B). Three-dimensional echocardiography showed a hole in the valve root in the A2 area of the anterior leaflet of the mitral valve (approximate size, 9.2 × 7.1 mm), along with aortic regurgitation jet impingements on the perforated area of the anterior mitral valve leaflet (Fig. 2C).

Treatment

After thorough discussion and preoperative preparation, the patient underwent both mitral and aortic valve replacements on hospital day 11. Prolapse of the aortic valve leaflet and perforation of the anterior mitral leaflet were observed, and no vegetation was observed intraoperatively (Fig. 2D). A microbiological examination revealed the absence of bacteria and a pathological examination revealed myxoid degeneration of the mitral valve without vegetation (Fig. 3). After discharge, the patient continued to receive oral anticoagulants and underwent regular outpatient follow-ups.

All data generated or analyzed during this study are included in this published article.

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Emergency and Critical Care Medicine (2024) 4:1

Received: 21 October 2023; Accepted: 14 December 2023

Published online: 29 February 2024

http://dx.doi.org/10.1097/EC9.0000000000000111

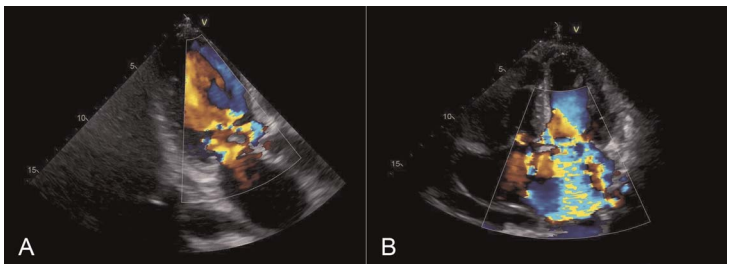

Figure 1. Transthoracic echocardiography images. (A) Severe aortic valve regurgitation. (B) Severe mitral valve regurgitation.

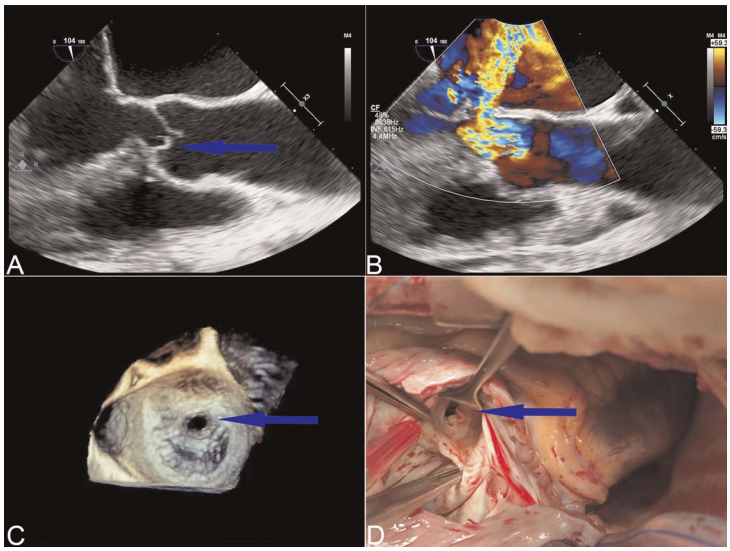

Figure 2. Transesophageal echocardiography images. (A) The prolapse of the aortic right coronary valve. (B) Aortic valve regurgitation beam in the left ventricular outflow tract impinged exactly on the mitral valve perforation area. (C) Mitral valve anterior leaflet root perforation. (D) Perforation in the anterior mitral leaflet during the operation.

Figure 3. Pathological examination: mucinous degeneration of the mitral valve.

Patient outcome

The patient did not complain of chest tightness, wheezing, or other symptoms postoperatively. He was discharged on the 22nd day after admission and has returned to normal life and work.

Discussion

Both the mitral and aortic valves are mainly involved in IE, with vegetation forming to cause prolapse, perforation, or rupture, resulting in acute valvular insufficiency.[3,4] In recent decades, aortic valve prolapse and mitral valve perforation have been reported in many patients with IE.[5–7] However, in this patient, no obvious valve vegetation was found on preoperative echocardiography, and no positive results were observed in blood cultures or resected pathological specimens. In fact, pathological examination of the resected specimens showed mitral valve perforation with myxoid degeneration, but no infectious vegetation. However, we did not assess immunological markers, such as extractable nuclear antigen, anti-neutrophilic cytoplasmic antibody, and immunoglobulin, nor perform brain and abdominal imaging, to rule out systemic embolism to confirm a diagnosis of negative blood culture IE. In addition, the perforation size was 9.2 × 7.1 mm, which is rare clinically. Given the negative microbiology and histology, this was a rare case of anterior mitral leaflet perforation with a severe aortic valve regurgitation; however, the underlying cause was not explored.[8]

A careful review of the patient's cardiac color Doppler ultrasound revealed that neither the local hospital nor the operating hospital's transthoracic echocardiography suggested aortic valve prolapse. The transesophageal echocardiography revealed prolapse of the right coronary valve of the aortic valve, perforation of the anterior leaflet of the mitral valve, and no obvious vegetation in either the aortic or mitral valves. The high-velocity aortic regurgitation beam continued to impinge on the mitral valve perforation area, suggesting that mitral valve perforation is strongly correlated with aortic valve prolapse and regurgitation. During surgery, the location of the mitral valve perforation was associated with the impact of the aortic valve prolapse and regurgitation on the mitral valve. Finally, the pathological findings suggested myxoid degeneration of the mitral valve. Usually, eccentric regurgitation due to right aortic valve prolapse impinges on the anterior mitral leaflet but does not cause mitral valve perforation. In this case, myxoid degeneration of the valve was intrinsic to the mitral valve perforation.

This case report describes a patient with mitral valve perforation of a rare etiology involving myxoid degeneration of the mitral valve itself, a lack of elastic fibers, valve thinning, and aortic valve prolapse regurgitation. Mitral valve perforation is characterized by the presence of a rupture or hole in the mitral valve, which can lead to abnormal blood flow patterns and potential complications. Early diagnosis and appropriate management are crucial for preventing adverse outcomes and optimizing cardiac function.

Conclusion

This case highlights both the complex and varied etiologies underlying mitral valve regurgitation and the importance of comprehensive assessment and advanced imaging techniques for making accurate diagnoses. Further research and exploration of such distinctive cases is likely to contribute to a deeper understanding of valvular diseases and their management.

Conflict of interest statement

The authors declare no conflict of interest.

Author contributions

All authors listed have made substantial, direct, and intellectual contributions to the work and approved it for publication.

Funding

None.

Ethical approval of studies and informed consent

The study followed the principles of the Declaration of Helsinki as revised in 2013. This study was approved by the Ethics Committee of Qilu Hospital of Shandong University, and written informed consent was obtained from the patient (KYLL-2023-09-030, September 27, 2023). This article has the consent of the patient for the use of his data and for the publication of the data that appear in the article.

Acknowledgments

None.

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How to cite this article: Wei K, Yao Y, Liu C, Cao Y. An unusual anterior mitral leaflet perforation in a patient with no infective endocarditis: a case report. *Emerg Crit Care Med*. 2024;4(1):39–41. doi: 10.1097/EC9.0000000000000111