



# A Confounding Mobile Mass Observed in Transthoracic Echocardiography After Mitral Valve Replacement Performed by the Preservation of the Native Mitral Apparatus

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## ABSTRACT

Severe mitral regurgitation is associated with significant morbidity and mortality. Mitral valve repair or mitral valve replacement is recommended for symptomatic patients. Preservation of the subvalvular apparatus has the merits of postoperative outcomes during mitral valve replacement for mitral regurgitation. We report a case of a remnant mitral subvalvular apparatus detected by echocardiography after chordal preserving mitral valve replacement. It was performed as mitral valve replacement with posterior leaflet chordal preservation in a 44-year-old male patient due to rheumatic, symptomatic severe mitral regurgitation. On the third post-operative day, routine postoperative trans-thoracic echocardiography showed an unknown mobile mysterious formation in the left ventricle. We clarified the mysterious mass with the help of laboratory, blood culture and serial echocardiographic assessment and presented this case. We emphasize the importance of post-operative echocardiographic evaluation and a complete evaluation of the patients who have undergone mitral valve replacement. Serial echocardiographic evaluation is the main part of this assessment.

**Key Words:** 2D Echocardiography; heart valve prosthesis; rheumatic heart disease; mitral apparatus

## Mitral Aparatların Korunması Yöntemi ile Yapılan Mitral Kapak Replasmanı Sonrasında Transtorasik Ekokardiyografide Görülen Kafa Karıştırıcı Hareketli Kitle

### ÖZET

Ciddi mitral yetmezlik anlamalı morbidite ve mortalite ile ilişkilidir. Semptomatik ciddi mitral yetmezliği olan hastalara mitral kapak onarımı ya da mitral kapak replasmanı önerilir. Mitral kapak replasmanı sırasında subvalvular aparatın korunması postoperatif iyi sonuçlara sahiptir.

Biz burada mitral aparat korunarak yapılan mitral kapak cerrahisi sonrası ekokardiyografi ile tespit ettiğimiz mitral aparat kalıntıları olan bir vaka taktim ettik. Vakamız 44 yaşında idi. Romatizmal, semptomatik ciddi mitral yetmezliği olan hastaya subvalvüler aparat korunarak mitral kapak replasmanı yapıldı. Post-operatif 3. günde yaptığımız ekokardiyografide sol ventrikül içinde hareketli bir kitleye rastladık. Laboratuvar parametreleri, kan kültürü ve seri ekokardiyografi yardımı ile kitle sebebini aydınlattık ve vaka olarak taktim ettik.

Bu vakada mitral kapak replasmanı yapılmış hastalarda, postoperatif ekokardiyografik değerlendirmenin ve hastayı bir bütün olarak değerlendirmenin önemini vurgulamak istedik. Ardışık ekokardiyografik değerlendirme bu kapsamlı değerlendirmenin en önemli öğelerinden biridir.

**Anahtar Kelimeler:** 2 boyutlu ekokardiyografi; protez kalp kapağı; romatizmal kalp hastalığı; mitral aparat

## INTRODUCTION

The mitral subvalvular apparatus is extremely important since it provides annular-papillary continuity and preserves left ventricular (LV) function<sup>(1)</sup>. So, preserving the mitral subvalvular apparatus is essential for a surgeon during mitral valve replacement (MVR). Kansız et al.<sup>(2)</sup> have found that preserving the subvalvular apparatus is superior to the standard technique in terms of ensuring LV function but there is no significant difference between preserving the anterior mitral leaflet versus posterior mitral leaflet. Due to the concern of LV outflow tract (LVOT) obstruction and interference with the prosthetic valvular function, preserving only the posterior leaflet is preferred by surgeons; however, David et al.<sup>(3)</sup> have clearly demonstrated that preserving all chordae tendineae increases the postoperative LV ejection fraction with exercise, as well as LV performance.

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However, there are some disadvantages of leaving the subvalvular apparatus intact during MVR, such as confusion chordal remnants with valve vegetation or thrombus, prosthetic leaflet immobilization, rupture of chordae and left ventricular outflow tract obstruction.

Rheumatic valve disease occurs due to an autoimmune response to the mitral valve and affects all parts of the mitral valve. Surgical treatment of the rheumatic mitral valve disease is still mitral valve repair (MVR<sub>e</sub>). Although preservation of the subvalvular apparatus (PSVA) is recommended in non-rheumatic patients, this benefit, in mitral regurgitation (MR), has not been clearly established in rheumatic patients, especially in stenotic valves. It can be speculated that autoimmune response to the mitral valve continues after MVR and effects preserving mitral apparatus.

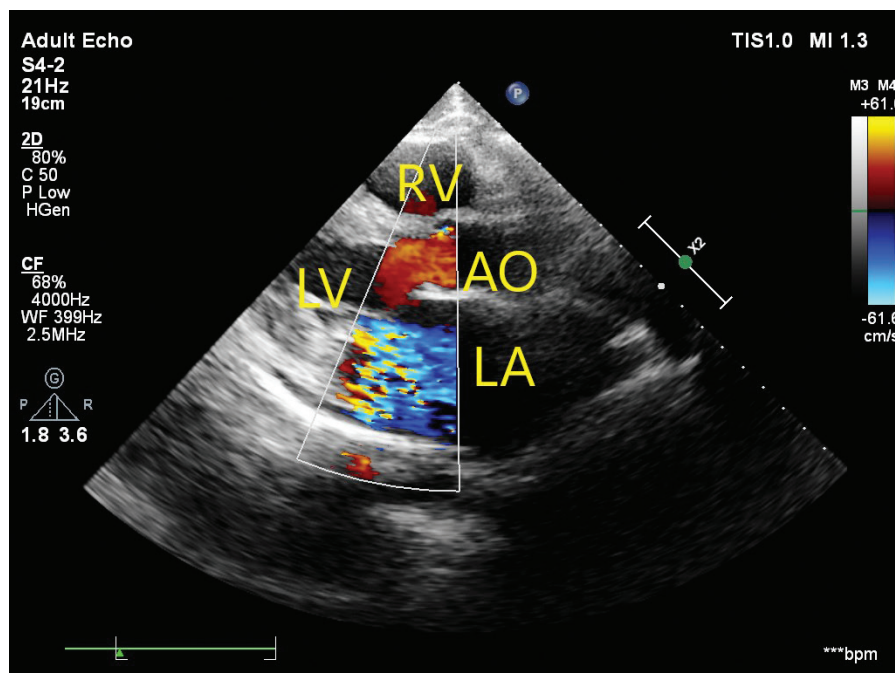
### CASE REPORT

A 44-year-old male patient was admitted to our clinic with progressive dyspnea. We evaluated the patient using transthoracic and transesophageal echocardiography (TTE and TEE), and we detected severe MR due to rheumatic mitral disease enlarging the left part of the heart (Figures 1,2). The end-diastolic diameter was 58 mm, end-systolic diameter was 43 mm, and ejection fraction was calculated to be 60%. No major pathology was detected with other native valves. We performed coronary angiography, and the results were normal. There were no pathological laboratory results with the following findings obtained: hemoglobin, 13.9 g/dL; glucose, 100 mg/dL; urea,

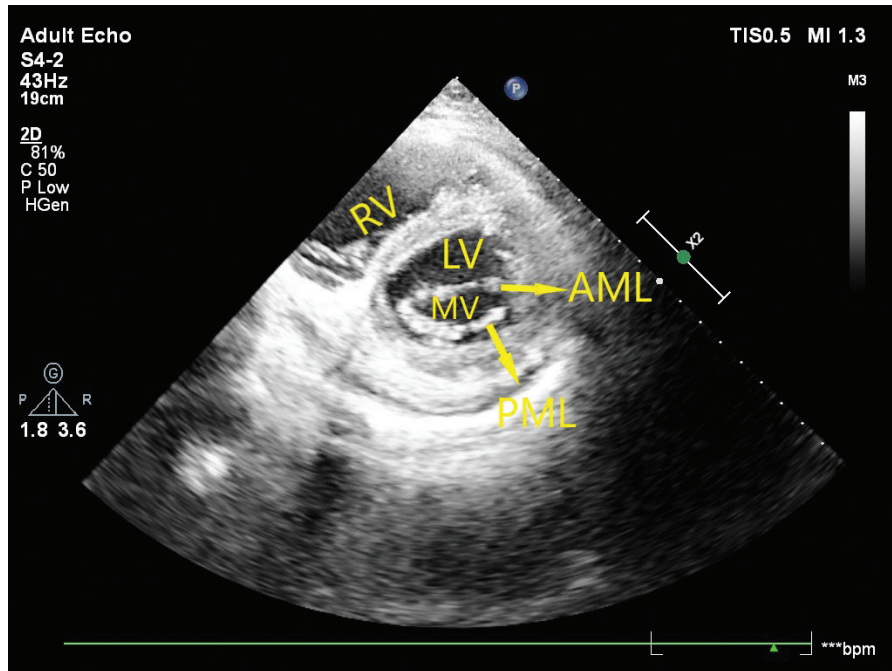
29 mg/dL; and creatinine, 0.7 mg/dL. A bi-leaflet mechanical prosthesis (31/33 mm) was implanted. In this technique, the posterior leaflet alone was preserved, while the anterior leaflet was excised by cutting the tip of the papillary muscle with the attached chordae tendineae together. The posterior leaflet was reattached to the mitral ring of the respective commissural area, and then the prosthetic valve was implanted. After MVR, the patient's vital signs were stable.

On the third day, we controlled the patient with TTE as a routine practice. We observed a mobile mass (about 34 mm in length and 17 mm in width) attached to the posterior papillary muscle (Figure 3); it was circulating in the left ventricle (Figure 4). We could not diagnose the mass immediately, and we could not exclude thrombi, vegetation or infective endocarditis. In order to rule out infective endocarditis, we performed serial blood cultures and TTE. We also performed TTE after a month. Serial TTE showed a normally functioning mitral prosthesis valve (Figure 5) and no change in the size of the mobile mass (Figures 6,7); moreover, no microorganisms grew in serial blood cultures. Inflammation markers, C-reactive protein, and erythrocyte sedimentation rate were normal. The patient had no symptoms related to infective endocarditis or thrombi. The mobile mass did not have low echogenicity like a thrombus would.

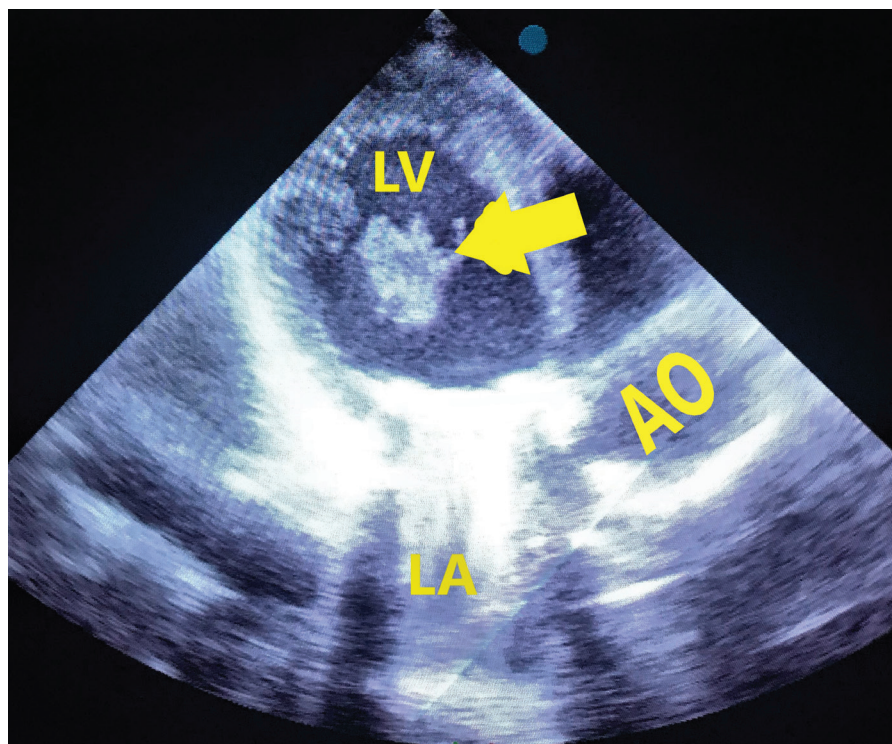
We also performed transesophageal echocardiography; we could not obtain good images with this modality, but we were able to visualize the mobile mass tip reaching toward the aortic root. With the help of echocardiographic, laboratory, and clinical findings, we ruled out vegetation and thrombi, and finally, we



**Figure 1.** Preoperative transthoracic echocardiography parasternal long axis demonstrating severe mitral regurgitation. LA: Left atrium, AO: Aort, LV: Left ventricle, RV: Right ventricle.



**Figure 2.** Preoperative transthoracic echocardiography parasternal short axis demonstrating mitral annular calcification. MV: Mitral valve, AML: Anterior mitral leaflet, PML: Posterior mitral leaflet LV: Left ventricle, RV: Right ventricle.

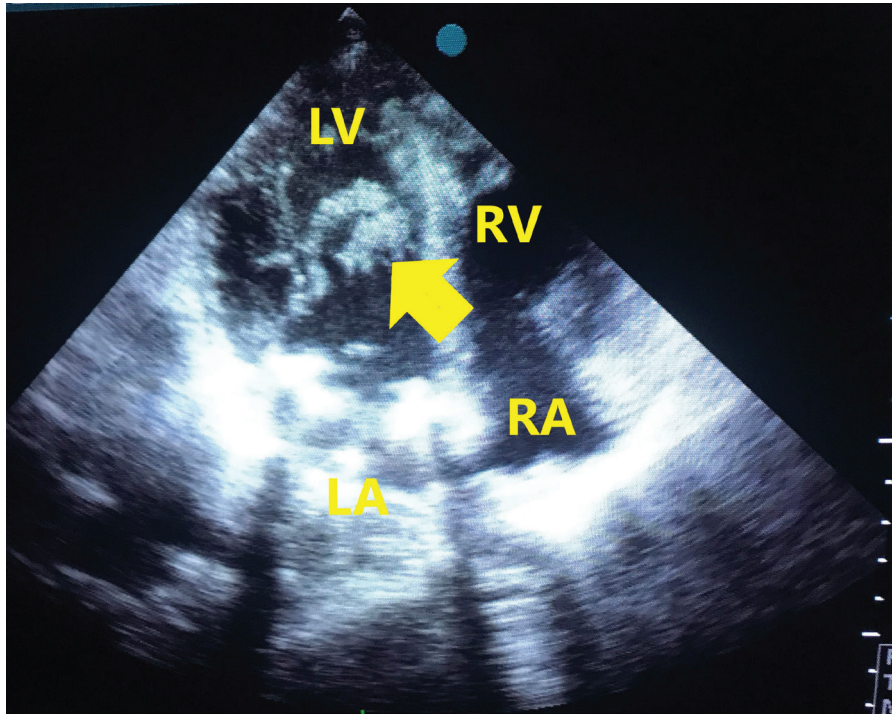


**Figure 3.** Postoperative 3<sup>rd</sup> day transthoracic echocardiography apical three chamber view showing a mobile mass. LA: Left atrium, LV: Left ventricle, AO: Aorta.

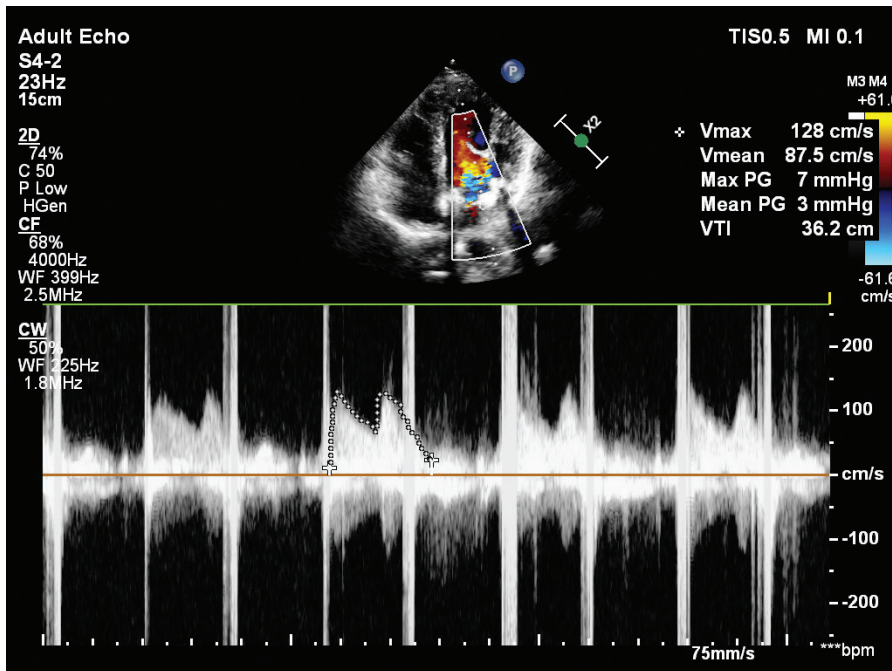
defined the mobile mass as a remnant mitral subvalvular apparatus. We also communicated with the surgeon about the method of operation, so we obtained some technical information about

the surgical procedure. The remnant mitral subvalvular apparatus and a drift leaflet segment were thought to be composed of a separated posterior leaflet and its associated chordae.





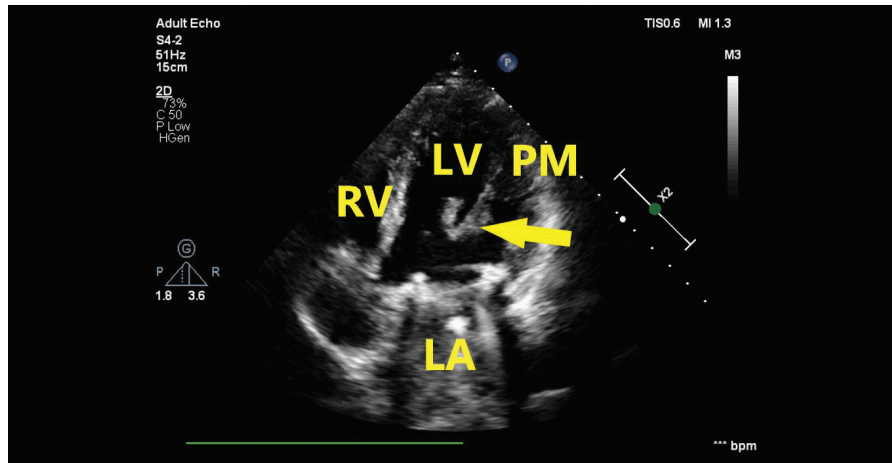
**Figure 4.** Postoperative 3<sup>rd</sup> day transthoracic echocardiography apical four chamber view showing a mobile mass and normal function of the mechanical mitral valve. LA: left atrium, LV: left ventricle, RA: Right atrium, RV: Right ventricle.



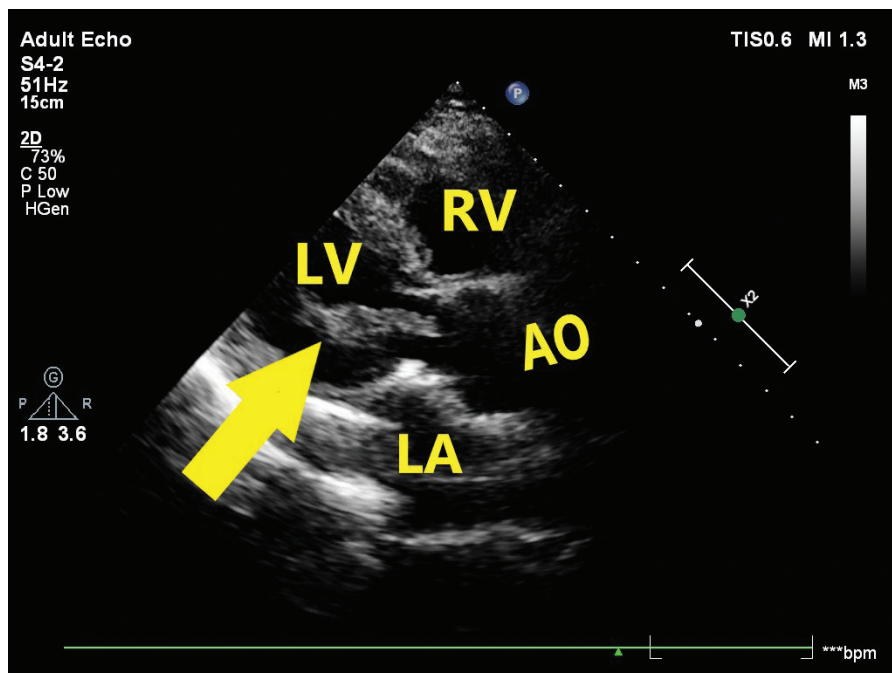
**Figure 5.** Doppler image shows that there is no pathological trans mitral gradient a well-functioning mechanical mitral valve.

We thought to discuss the surgeon to perform redo-operation first, but the patient was stable and had no symptoms. TTE appearance of the functioning prosthesis was good, and TTE showed no change in the size of the remnant mitral ap-

paratus. We discussed the patient's images with the surgeon, and after consulting the surgeon, we decided to follow-up the patient. Therefore, we followed the patient monthly after being discharged from the hospital. We regulated anticoagulant



**Figure 6.** Postoperative first month transthoracic echocardiography apical four chamber view showing a mobile mass. LA: Left atrium, LV: Left ventricle, PM: Papillary muscle, RV: Right ventricle.



**Figure 7.** Postoperative first month transthoracic echocardiography parasternal long axis view showing a mobile mass reaching toward the aortic valve. LA: Left atrium, LV: Left ventricle AO: Aort, RV: Right ventricle.

medication and also performed TTE. He is still followed up by us.

## DISCUSSION

Severe MR is associated with morbidity and mortality. Mitral valve repair is often recommended in severe MR. If the native valve is not feasible for MVRe, MVR is preferred. However, if MVR is performed, there are some concerns like LV function problems and LVOT obstruction. An ideal mitral valve replacement includes good LV performance and no LVOT obstruction after MVR. The chordal preservation technique

is used for this purpose, but this approach also has some disadvantages, such as LVOT obstruction and interference with the prosthetic valve function. After the understanding that preservation of the subvalvular apparatus reduces morbidity and mortality has been established<sup>(4,5)</sup>, many studies have been performed to determine whether preservation mitral apparatus technique is suitable or not for patients with rheumatic mitral valve disease. Discrepant findings have been reported in the literature regarding the benefit of PSVA during MVR in patients with rheumatic mitral valve disease. Coutinho et al. have found that PSVA did not improve late survival in this setting<sup>(6)</sup> and

Kessel et al. have presented two cases which undergone MVR due to rheumatic mitral valve disease. They have shown that total chordal preservation in rheumatic valve disease can be associated with severe adverse events, such as severe thickening of the leaflet and severe stenosis due to heavy calcification and fibrous deposition around the bioprosthetic valves<sup>(7)</sup>. The gradual deterioration in valve performance as a late complication that is seen with the slow in-growth of fibrous tissue (pannus) over the sewing ring is a phenomenon also observed with patients undergoing preservation of PSVA during MVR due to rheumatic heart disease. On the other hand, Chen et al. have speculated that complete mitral leaflet preservation during MVR is feasible in rheumatic patients and confers significant short-term and long-term advantages<sup>(8)</sup>. Furthermore, Fuster et al. and Chowdhury et al. have also shown that total chordal preservation confers significant long-term advantage by preserving left ventricular function<sup>(9,10)</sup>. So, it is hard to say whether chordal preservation confers advantages or not. Longitudinal studies are needed to clarify this issue.

Sometimes, the subvalvular apparatus can be confused with vegetation or thrombi when echocardiography is performed after MVR surgery. Kim et al. have reported a case mentioning a remnant mitral subvalvular apparatus mimicking aortic valve vegetation<sup>(11)</sup>. After evaluating the clinical, laboratory and echocardiographic findings of the patients, they decided it was mitral subvalvular apparatus like in our study. There have also been reports of spontaneous tearing of the anterior mitral leaflet remnants. Nežić et al. have presented a case with spontaneous tearing of the anterior mitral leaflet remnant 1 month after surgery, and having been afraid of possible thrombosis and embolization, they performed urgent redo-surgery<sup>(12)</sup>. Rupture of the papillary muscle caused by hemorrhagic necrosis and spontaneous rupture of papillary muscle after chordal-sparing MVR have also been noted<sup>(13,14)</sup>. We could not absolutely rule out the rupture of papillary muscle, but our patient had no symptoms and his vital signs were stable and in addition, TTE appearance of the functioning prosthesis was good, so we focused on other alternative diagnoses. The possibility of subvalvular tumors, such as rhabdomyomas and myxomas, was ruled out because no lesions were identified in preoperative echocardiograms. Another possible diagnosis was thrombi. A thrombus is defined as soft and homogeneous, similar to myocardium, located at the valve occlude, hinges, and/or valve struts. In our case, TTE showed that the prosthesis's function was good and the mass was related to the papillary muscle and had no echodensity or low echodensity, similar to the myocardium like a thrombus. Furthermore, the patient had no symptoms related to thrombi.

In our case, we faced spontaneous tearing of the posterior leaflet and posterior mitral leaflet remnants. We could not iden-

tify any study including such a case in the literature. Lemke and colleagues<sup>(15)</sup> have argued that increased tension on preserved remnants may cause tearing of the leaflet remnants. Heavily calcified mitral valve annulus, especially posterior annulus, may also cause this complication. Mitral annular calcification is a common feature in patients with chronic rheumatic heart disease. In our case, mitral annular calcification due to chronic rheumatic heart disease may have also been the reason of this complication. In addition, bacterial endocarditis with annular abscess requiring extensive debridement and ventricular wall trauma due to large prosthetic valve and small ventricular cavity may cause this complication<sup>(16)</sup>. This trauma usually occurs at the time of valve insertion. In our study, we could not find any evidence related to bacterial endocarditis, and there was no left ventricular trauma related to the operation. We think annular calcification and increased tension on preserved remnants may be the logical hypothesis for explaining the TTE images we faced in our case.

This case was difficult to diagnose, so we performed serial TTE and evaluated laboratory and clinical findings. We also communicated with the surgeon. Finally, we defined the mobile mass floating in the left ventricle as a remnant subvalvular apparatus of the mitral valve.

The decision of redo-surgery depends on many variables, and it is complex. The indications of redo-valve surgery include<sup>(1)</sup> failed repair/new native valve disease,<sup>(2)</sup> prosthetic valve dysfunction,<sup>(3)</sup> prosthetic valve leaks,<sup>(4)</sup> valve thrombosis, and<sup>(5)</sup> prosthetic valve endocarditis. In our study, the patient was stable hemodynamically and had no symptoms during follow-up. TTE showed a normal functioning mitral prosthesis and aortic valve and no significant change in mass size, and the patient did not have any redo-surgery indications mentioned above.

In conclusion, we emphasize the importance of a complete evaluation of patients who have undergone MVR when encountering a mobile mass in the left ventricle. Serial echocardiographic evaluation is the main part of this assessment. Laboratory and clinical findings also help to rule out other possible diagnoses.

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**Informed Consent:** Informed voluntary consent form was signed and permission was obtained from the patient for this case report.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept/Design - ÜT; Data Collection - ÜT, ST; Writing - ST; Critical Revision - ÜT; Final Approval - ST; Overall Responsibility - ST.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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