Case Report

Latent Avulsion of the Posterior Mitral Leaflet Base from the Mitral Annulus Following a Motor Vehicle Accident: A Case Report

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Abstract

Injuries to the heart and great vessels should always be considered after blunt chest trauma. Valvular damage rarely occurs after blunt trauma, but symptoms may be delayed. A 58-year-old woman was referred to our hospital with exertional dyspnea (functional class III) and palpitations for elective transesophageal echocardiography. Her symptoms had exacerbated in the preceding 2 or 3 months. Physical examination showed holosystolic murmurs (IV/VI) at the lower sternal border with extension to the apex. Transesophageal echocardiography revealed avulsion of the base of the posterior mitral valve leaflet (P3) from the annulus. In the past medical history, there was a history of a motor vehicle accident 9 months earlier. The patient was recommended for mitral valve surgery. Mitral valve replacement was performed, and the diagnosis was confirmed by surgery. The patient was discharged without any complications.

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Introduction

Blunt chest trauma is common after motor vehicle accidents, causing injuries to the heart by different mechanisms. Heart valves are not immune to such injuries; however, mitral leaflet avulsion is rare. The most common types of cardiac involvement following blunt trauma are cardiac contusion and cardiac valve injuries. The cardiac valve most commonly involved is the tricuspid valve, followed by the aortic valve and the mitral valve (MV).[1-3] As MV injuries are rare, their diagnosis requires a high index of suspicion. The clinical picture of a patient with MV injuries may vary from none to cardiogenic shock. The echocardiogram is the main modality for the evaluation of MV injuries. Transthoracic echocardiography (TTE) or transesophageal echocardiography (TEE) is valuable for assessing cardiac injuries. Due to the rarity of this clinical entity (MV injuries secondary to blunt chest trauma), data are scarce on mortality following diagnosis and surgical repair.[1, 3] The clinical presentations of such patients and their clinical condition will indicate the timing and type of surgery. In addition, the diagnosis of such injuries can be significantly

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delayed secondary to the presence of other injuries.[4, 5]

Herein, we describe a 58-year-old woman who sustained substantial chest wall trauma in a high-speed motor vehicle accident.

Case Report

A 58-year-old woman was referred to our hospital because of exertional dyspnea (functional class II), palpitations, and acute severe mitral regurgitation (MR) in TTE for elective TEE. Nine months later, the patient presented with exertional dyspnea and palpitations secondary to the avulsion of the posterior mitral valve leaflet (PMVL) from the annulus and significant MR. Physical examination showed a blood pressure of 110/70 mmHg and a pulse rate of 80 beats per minute. Laboratory data were normal. Surface electrocardiography demonstrated a normal sinus rhythm, a normal axis deviation, and no ST-T changes. Heart auscultation revealed pansystolic murmurs (IV/VI) at the left sternal border with radiation to the apex.

TTE indicated severe acute MR (Figure 1A and Figure 1B). Additionally, TTE showed a normal left ventricular size, a normal left ventricular systolic function, a severe acute MR, and a pulmonary arterial systolic pressure of 52 mmHg.

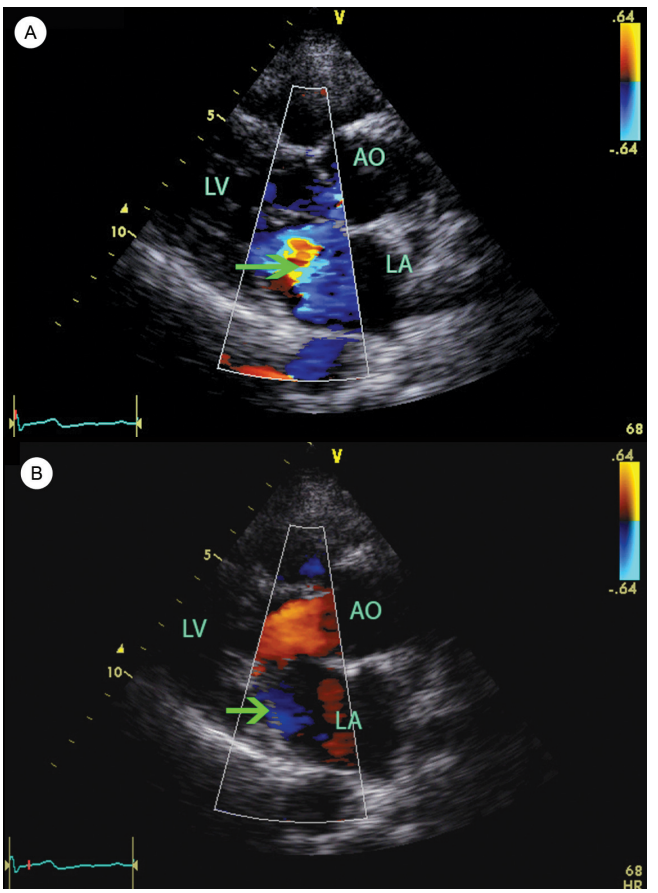

Figure 1A. Transthoracic echocardiography in the parasternal long-axis view shows acute severe MR in the early systole (arrow).

Figure 1B. Transthoracic echocardiography in the parasternal long-axis view shows acute severe MR in the early systole (arrow), which disappears soon due to an elevated LA pressure.

MR, Mitral regurgitation; LA, Left atrium; LV, Left ventricle; AO, Aortic root

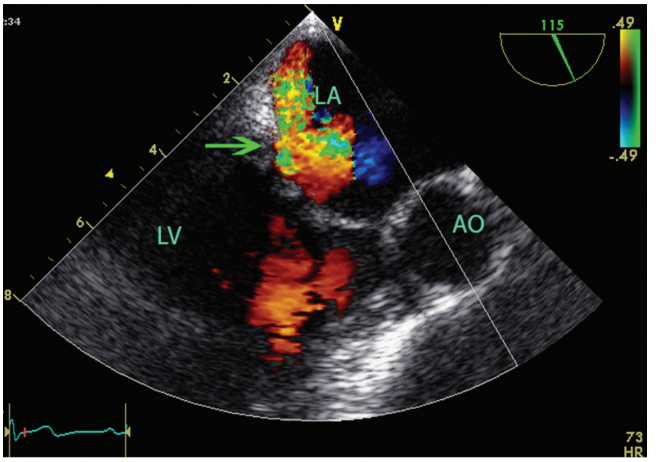

Figure 2. Transesophageal echocardiography in the long-axis view (115°) shows MR originating from the base of the PMVL (P3) (arrows).

MR, Mitral regurgitation; PMVL, Posterior mitral valve leaflet; LA, Left atrium; LV, Left ventricle; AO, Aortic root

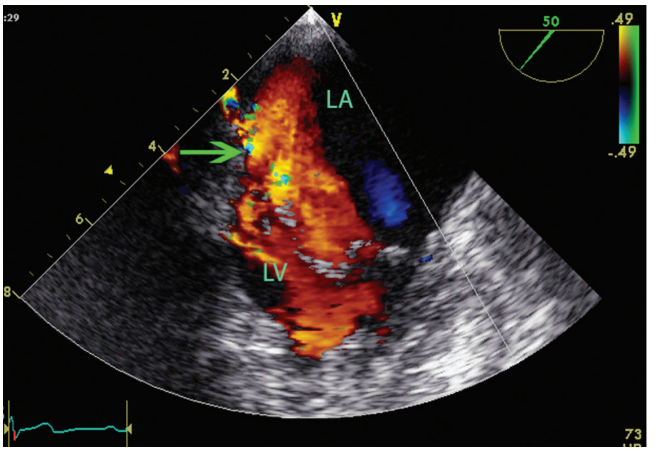

Figure 3. Transesophageal echocardiography in the long-axis view (50°) shows MR originating from the base of the PMVL (P3) (arrow).

MR, Mitral regurgitation; PMVL, Posterior mitral valve leaflet; LA, Left atrium; LV, Left ventricle

Severe MR in the setting of a normal left ventricular size is in favor of acute MR, which often occurs after myocardial infarction, acute ischemia, or chordal rupture due to the prolapse or rupture of the leaflets secondary to infective endocarditis. Avulsion begotten by trauma is a rare cause of acute severe MR.

TEE revealed that the MR was due to the avulsion of the P3 from the MV annulus secondary to previous trauma. Further, the MR originated from the rupture of the PMVL

(Figure 2 and Figure 3). A mobile, round mass was also seen on the atrial side of the PMVL between the PMVL and the left atrium (Figure 4). The MR originated from this site of the rupture (Figure 5). Mitral valve replacement (MVR) was performed, and the diagnosis of PMVL avulsion was confirmed. Finally, the patient was discharged from hospital without any complications.

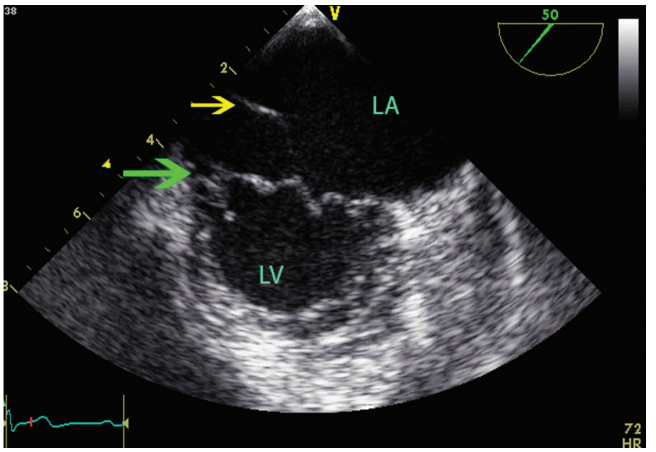

Figure 4. Transesophageal echocardiography in the short-axis view (50°) shows the site of the avulsion of the P3 (small arrow). Additionally, a mass is seen in the LA (large arrow).
LA, Left atrium; LV, Left ventricle

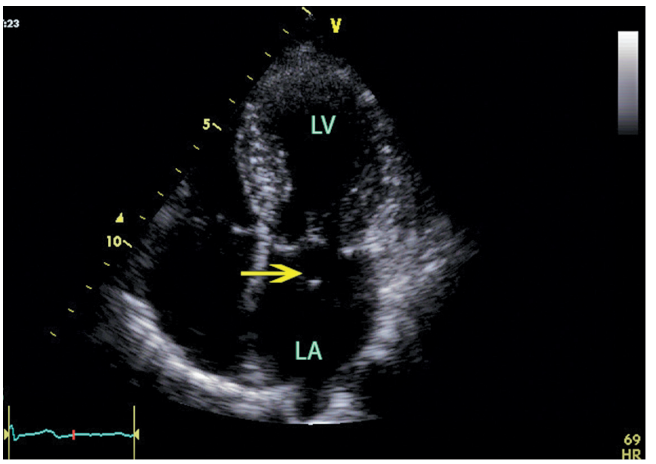

Figure 5. Transesophageal echocardiography in the apical 4-chamber view shows the site of the avulsion (arrow).
LA, Left atrium; LV, Left ventricle

Discussion

Injuries to the heart and great vessels should always be considered after blunt chest trauma.[5] Traumatic valvular injury is often suggested by acute or progressive heart failure or a new heart murmur and a history of blunt chest trauma. The rupture of the MV causes sudden or gradually worsening MR and progressive congestive heart failure. Patients with valvular dysfunction, including leaflet tear, papillary muscle rupture, and chordal rupture, can initially appear without symptoms but later demonstrate the delayed sequela of heart failure.[6, 7] Marchese et al5 similarly described a 49-year-old man with a history of blunt chest trauma due to a motor vehicle accident a year previously with symptoms of progressive dyspnea 1 month before presentation. Although the patient was admitted to the hos-pital right after the trauma, he had no immediate cardiovascular signs and symptoms. TEE revealed a trivial central mitral regurgitant jet and a severe perivalvular regurgitant jet, with the latter originating from a ventriculoatrial fistu-lous communication behind the P1. After the surgical exposure of the MV, a small tear was seen behind the posteri-or leaflet, in a lateral position, involving the annulus and the left atrial wall. The absence of leaflet abnormalities or vegetations suggested the posttraumatic origin of the perivalvular leak.[6] Other investigations have also reported cas-es of acute MR 12 hours to 2 weeks after blunt chest trauma.[7, 8]

Traumatic MV injuries are rare and difficult to diagnose as other obvious injuries divert the attention of the treat-ing physician. Traumatic MV injuries can progress to congestive heart failure. A high index of suspicion is required to diagnose isolated MV injuries. Echocardiography is the diagnostic tool for MV injuries and associated injuries. The time of the injuries and their diagnosis can dictate the surgical management plan for MV injuries.

Therefore, it is vital to diagnose MR as quickly as possible in order to assess the general condition of the patient and to determine the order of priority in the treatment.

Chest roentgenography, TTE, and TEE are performed for the diagnosis of valve injuries. TTE and TEE are valu-able modalities for the diagnosis of MV rupture and can be done at the bedside. The buckling of 1 or both mitral leaflets into the left atrium during the systole on 2D echocardiography or the mid or late systolic posterior motion of the MV on M-mode can be specific signs in TTE that strongly suggest MV prolapse.[9] TTE offers the advantage of being a noninvasive diagnostic test that can be used over and over again during a course. The area around the MV can be clearly visualized by TEE. Another advantageous feature of TEE is that it provides real-time information, which is especially significant in cases involving MV repair, to evaluate the degree of MR and the laceration of the valve leaflet.

MV rupture is caused by a variety of mechanisms. The damage most likely occurs when pressure is applied in the early systole during the isovolumic contraction between the closure of the MV and the opening of the aortic valve. Traumatic rupture of the MV occurs at the papillary muscle, chordae tendineae, and valve leaflets.[9] A study de-scribed a 64-year-old man who developed dyspnea 1 month after blunt chest trauma. His echocardiography showed severe MR caused by the chordal rupture of the anterior leaflet of the MV, corresponding to the A2-A3 segments (the Carpentier

classification).[10] Each papillary muscle is supplied by 1 or more long, penetrating vessels, arising from one of the epicardial arteries. If it sustains damage, the muscle and the chordae may undergo progres-sive ischemia and subsequent infarction with elongation and paresis, resulting in delayed rupture. Rupture of a pa-pillary muscle on the left side of the heart with its relatively high pressure would not be tolerated as well as rupture of one of the tricuspid papillary muscles on the low-pressure side of the heart. Severe MR and subsequent conges-tive heart failure may be present immediately or may be delayed, depending on the volume of regurgitation and the state of left ventricular function. The posterior leaflet has much thinner chordae than the anterior leaflet, and the thinner chordae are weaker than the corresponding chordae associated with the anterior leaflet and are more vul-nerable to rupture.[11, 12]

A review of 40 reported operative cases of traumatic MR (Table 1) revealed that among 17 cases followed up for over 1 month from the time of injury to the time of operation, congestive heart failure occurred in only 4 cases, and all underwent surgery within 24 hours. The papillary muscle was the most vulnerable valvular structure and had ruptured in 25 cases. In addition, MVR was performed in 23 cases.[13] Surgeons need to determine whether to per-form MV repair or MVR based on intraoperative findings in each case.[14] MVR is a reliable and simple procedure.[15-17] Valvuloplasty can also be performed with low operative mortality and is associated with superior late survival in patients with prolapsed valves.[18, 19]

As an overall strategy, we suggest that it is of great value to use TTE and TEE for real-time monitoring in cases where this type of injury is suspected. In cases of blunt chest trauma, it is clinically important to detect any new systolic murmurs and any symptoms of heart failure that can potentially lead to fatality. Further, surgery must be performed in a timely fashion.

Conclusion

Herein, we introduced a case of acute moderate-to-severe mitral regurgitation. Scintillatingly, the symptoms of dyspnea appeared in the preceding 2 or 3 months; accordingly, the symptoms had a delayed occurrence. The possible explanation is that our patient had mitral valve prolapse before the trauma, and the blunt chest trauma caused the avulsion of the posterior mitral valve leaflet from the mitral annulus. The condition of this patient highlights the significance of follow-up as the clinical presentation can sometimes be postponed after trauma. Echocardiography might be used earlier after trauma and, if necessary, repeatedly in all patients who sustain blunt chest-wall trauma.

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