Cardiology in the Young

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Mitral valve regurgitation followed by blunt chest trauma in a paediatric patient: a case report

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Brief Report

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Abstract

We report a paediatric case where severe mitral valve regurgitation occurred led by blunt chest trauma. Medical treatment was undertaken, and surgical mitral valve repair was postponed until half a year after the initial injury, followed by an uneventful postoperative recovery. We highlight the importance of echocardiographic evaluation for traumatic valve insufficiency. The medical strategy and timing of surgical intervention should be individualised.

Introduction

Blunt chest trauma is causing an increasing number of cardiac injuries, especially in civilian life.[1] About 16–76% of patients suffer from myocardial contusion,[2] while valve insufficiency takes place occasionally, of which possible mechanisms include tears of leaflets, rupture of papillary muscles, and so on.

Sporadic cases of traumatic valve regurgitation have been reported; however, there is limited agreement about therapeutic decision making, such as whether emergency operation or postponed operation should be preferred.

Case report

A 4-year-old male was transferred to the Emergency Department because of loss of consciousness and cardiac arrest after falling and being crushed by his grandfather when playing around. His previous childcare records showed no history of cardiovascular disease and no sign of a cardiac murmur. Autonomous cardiac rhythm and consciousness recovered after cardiopulmonary resuscitation. However, the patient still complained of recurrent cough and dyspnoea. The saturation was 97% with oxygen therapy of the nasal cannula. The following auscultation revealed a systolic murmur in the cardiac apex. Transthoracic echocardiography demonstrated the presence of a left ventricular aneurysm and significant mitral valve regurgitation. The posterior mitral leaflet was relatively short, possibly a congenital anomaly, while furtherly been stretched backwards due to the enlarged ventricle. The anterior mitral leaflet prolapsed, presumed to be led by the ventricular aneurysm, with stiff, thickened chordae tendineae in region A1, as a consequence of swelling by oedema. Therefore, the coaptation height was inadequate (Figure 1). The electrocardiogram was basically normal (Figure 2), without signs of myocardial ischaemia. After a multidisciplinary team discussion, we decided to perform initial medical treatment rather than emergency surgery, considering the post-traumatic myocardial oedema and the patient's relatively stable general status. A programmed operation was scheduled 6 months later. Intraoperative exploration confirmed the echocardiographic findings, showing the presence of an aneurysm and inconsistent movement of the left ventricle. The posterior mitral leaflet was relatively short. There was the loss of coaptation of the two leaflets when closing, with neither chordae nor papillary muscle rupture nor tear of the leaflets. Therefore, we performed mitral valvuloplasty considering the valvular structure and the patient's young age. The primary chordae tendineae of A1 were shortened with interrupted sutures, and the posterior leaflet was augmented with a pericardial patch. Transoesophageal echocardiography showed satisfying results as the regurgitation decreased to trivial. The patient was extubated within five hours, and the postoperative recovery was uneventful. Now, he is under follow-up for seven months. The latest echocardiography examination showed trivial mitral valve regurgitation and no stenosis.

Discussion

Mitral valve insufficiency secondary to blunt chest trauma is a relatively rare (accounting for about 0.01% of cases)[3] but significant clinical scenario that necessitates accurate diagnosis and carefully considered therapeutic strategy, especially in paediatric patients. Most cases are related

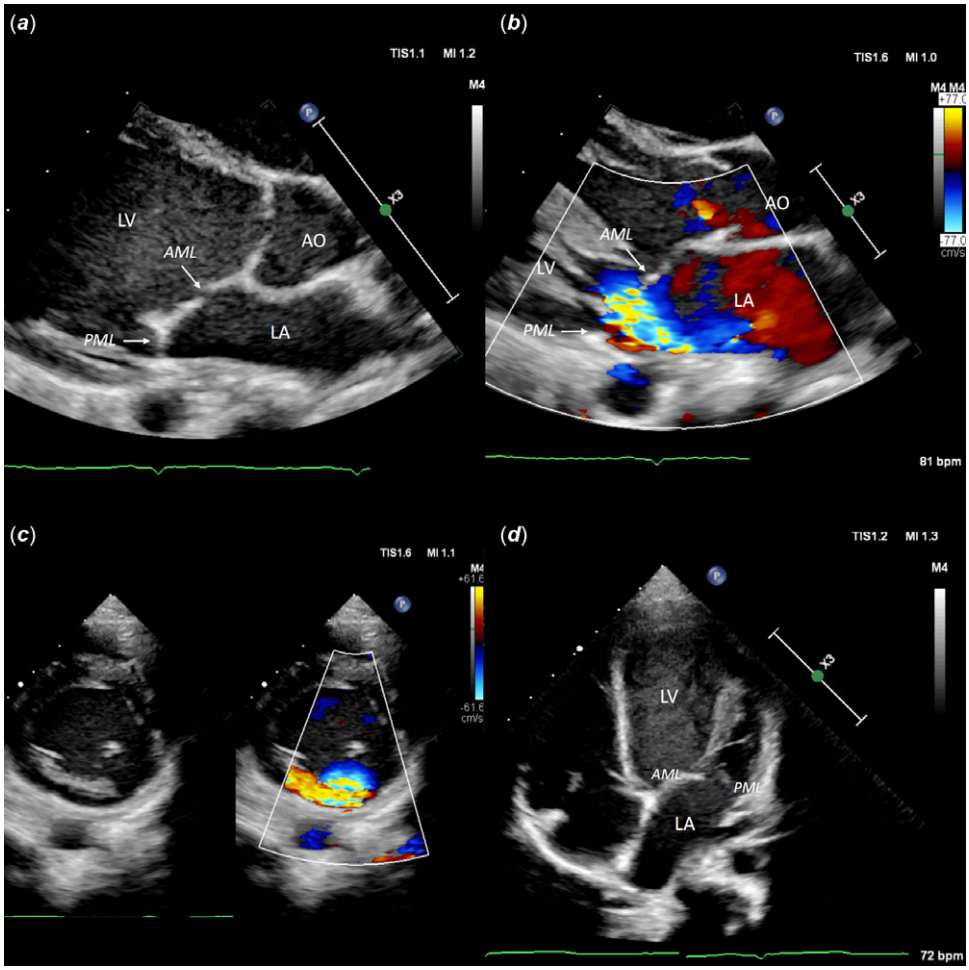

Figure 1. Preoperative echocardiogram of the patient demonstrating inadequate coaptation height of mitral valve with short PML and prolapsed AML. The coloured blood flow shows mitral regurgitation. LV = left ventricle; LA = left atrium; AO = aortic aorta; AML = anterior mitral leaflet; PML = posterior mitral leaflet.

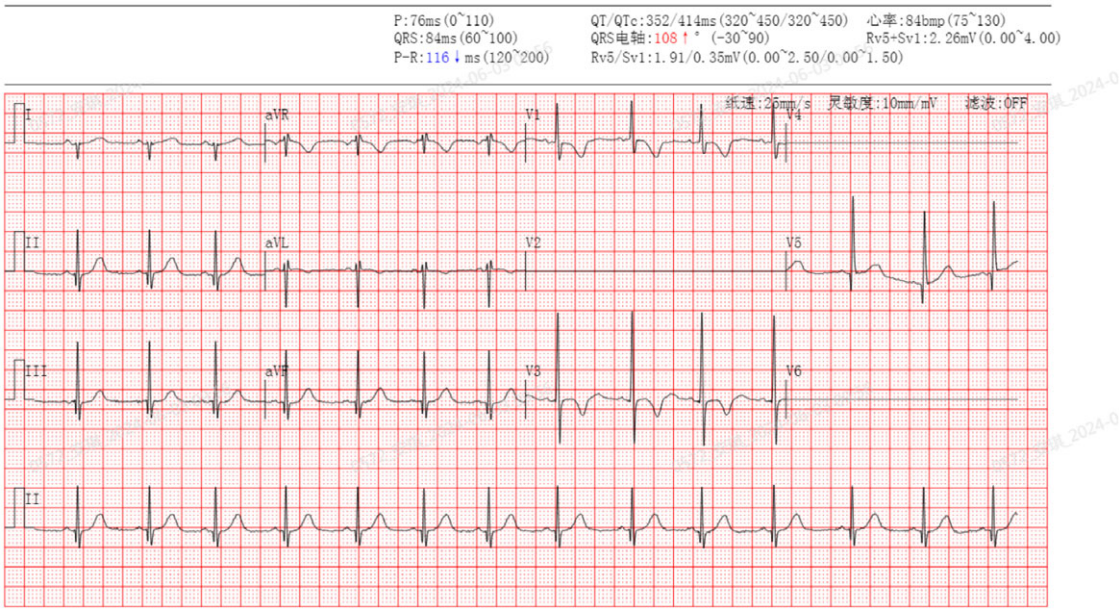

Figure 2. Preoperative electrocardiogram of the patient.

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to traffic accidents and falling from heights when sudden increases in intracardiac pressure cause cardiac structure rupture. The present case indicates that uncommon damage, such as crush injury, can also lead to traumatic mitral valve regurgitation.

The diagnosis was primarily achieved through echocardiographic evaluation, an accessible and practical test with great sensitivity in evaluating cardiac function. In the current case, preoperative transoesophageal echocardiography revealed the minor anomaly as congenital inadequate length of posterior mitral leaflet and the formation of a ventricular aneurysm, referring to the possible reasons for valvular regurgitation. This aligns with existing literature that emphasises the importance of echocardiography in identifying post-trauma valvular injuries. Besides routinely performed transoesophageal echocardiography, transoesophageal echocardiography is recommended when necessary, providing a higher resolution of sonography and enhancing diagnostic accuracy.[4]

In these circumstances, one of the significant challenges is deciding between immediate surgical intervention and a more conservative approach with delayed surgery. Our multidisciplinary team opted for an initial conservative treatment given the haemodynamic stability and the post-traumatic myocardial oedema. The perioperative outcomes were favourable. On the contrary, sometimes emergency surgeries are required because of haemodynamic instability; this brings the dilemma as the risk of residual lesions and the possibility of the following reoperation is increased.[5] In general, an individualised treatment strategy is needed to improve prognosis and minimise potential complications, considering the patient's condition, the extent of myocardial injury, and the balance of possible risks associated with immediate surgery and increased risk of heart failure when delaying surgery.

Conclusion

Traumatic mitral valve regurgitation secondary to blunt chest trauma is low incidence but can be life threatening. We highlight the critical role of echocardiographic evaluation for valve insufficiency. The therapeutic strategy should be individualised, and multidisciplinary team discussion should be performed to help with decision making and improve outcomes.

Data availability statement. The corresponding author will share the data underlying this article at a reasonable request.

Author contributions. **Ruofan Zhou:** Conceptualisation; project administration; writing – original draft. **Jing Lv:** visualisation; Writing – original draft. **Qi An:** project administration; supervision; writing – review and editing.

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Informed consent statement. Consent was obtained from the patient's family.

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