Cardiology in the Young

cambridge.org/cty

Traumatic mitral annular avulsion and interventricular septum dissection

Huibo Ma[1], Haizhou Zhang[2] and Xiaochun Ma[2]

[1]Department of Vascular Surgery, The Affiliated Hospital of Qingdao University, Qingdao, China and [2]Department of Cardiovascular Surgery, Shandong Provincial Hospital affiliated to Shandong First Medical University, Jinan, Shandong, China

Brief Report

Cite this article: Ma H, Zhang H, and Ma X (2021) Traumatic mitral annular avulsion and interventricular septum dissection. *Cardiology in the Young* **31**: 1034–1035. doi: 10.1017/S1047951121000044

Received: 16 December 2020
Accepted: 31 December 2020
First published online: 12 March 2021

Keywords:
Unintentional falling injury; mitral annular avulsion; interventricular septum dissection; echocardiography; haemodynamic stability

Authors for correspondence:
Dr Haizhou Zhang, MD and Dr X. Ma, MD, PhD, Department of Cardiovascular Surgery, Shandong Provincial Hospital affiliated to Shandong First Medical University, No. 324 Jingwu Road, Jinan, Shandong 250021, China.
Tel: +86 0531 6877 6353;
Fax: +86 0531 6877 6353.
E-mails: zhz_doctor@163.com; mxcmxc2008@163.com

Abstract

We presented a rare case of traumatic mitral annular avulsion and interventricular septum dissection after an unintentional falling injury in a 5-year-old female child. A successful surgical repair of mitral annulus and interventricular septum was performed to restore the haemodynamic stability.

We presented a rare case of traumatic mitral annular avulsion and interventricular septum dissection after an unintentional falling injury in a 5-year-old female child. A successful surgical repair of mitral annulus and interventricular septum was performed to restore the haemodynamic stability.

Case report

A 5-year-old female patient experienced an accidental falling injury from a height of nearly 15 metres, which caused multiple fractures. The patient was immediately transferred to a local hospital with a complaint of chest pain, dyspnoea, and left lower limb pain. After admission, the repair of left femoral neck fracture was urgently performed using external fixation after which a transthoracic echocardiography showed severe mitral regurgitation with the level of brain natriuretic peptide tested as significantly elevated. To better manage her illness, the patient was transferred to our hospital 4 days after injury before the cardiac failure worsened.

On arrival at our hospital, the patient had a heart rate of 133 bpm and a blood pressure of 107/63 mmHg. The physical examination detected a grade IV/VI systolic murmur at the apex and moist crackles at the left lower lobe. Despite the treatment with diuretics and cardiotonics after admission, the dyspnoea continued to aggravate. The traumatic moist lung, pulmonary contusion, pleural effusion, left ventricular enlargement, and pulmonary arterial hypertension were confirmed in a chest CT scan. A re-examination of transthoracic echocardiography showed that: (1) the enlarged left atrium and left ventricle with the end-diastolic diameters being about 28 mm and 42 mm, respectively; (2) the left ventricle ejection fraction being about 67%; (3) the severe mitral regurgitation due to annular avulsion in P3 area of posterior mitral valve, with the avulsed leaflet prolapsed into the left atrium; (4) the dissection detected at the base of posterior interventricular septum; (5) the pulmonary artery systolic pressure being 57 mmHg (Fig 1a and b). Two days after transfer, the illness further worsened with the blood pressure decreasing to 85/45 mmHg, transcutaneous oxygen saturation falling to 91%, and arterial partial oxygen pressure dropping to 7.9 kpa.

An urgent surgical repair of mitral regurgitation was operated under general anaesthesia and cardiopulmonary bypass. An intraoperative transesophageal echocardiography further confirmed the preoperative diagnosis of traumatic mitral annular avulsion and interventricular septum dissection. Through the right atrial transseptal approach, the mitral annulus was showed avulsed at the area of posteromedial commissure (shown in Fig 1c). The interventricular septum dissection was observed formed around the damaged mitral annulus at the base of posterior interventricular septum. The mitral annulus and interventricular septum were repaired with three bovine pericardial patches. Subsequently, the separated posterior leaflet was sutured to the repaired mitral annulus. Then, the posteromedial commissure was strengthened with one bovine pericardial patch (shown in Fig 1d and e). A verified intraoperative transesophageal echocardiography showed no extra flow through the repaired defect and only mild mitral regurgitation. The child experienced an uneventful recovery before discharge.

Discussion

Amongst only a few reports that have described the traumatic heart injuries in children, most cases were associated with traffic accidents, whereas unintentional falling injury is rarely a reported reason.[1,2] About 5–15% of patients with severe blunt chest trauma develop the cardiac

© The Author(s), 2021. Published by Cambridge University Press.

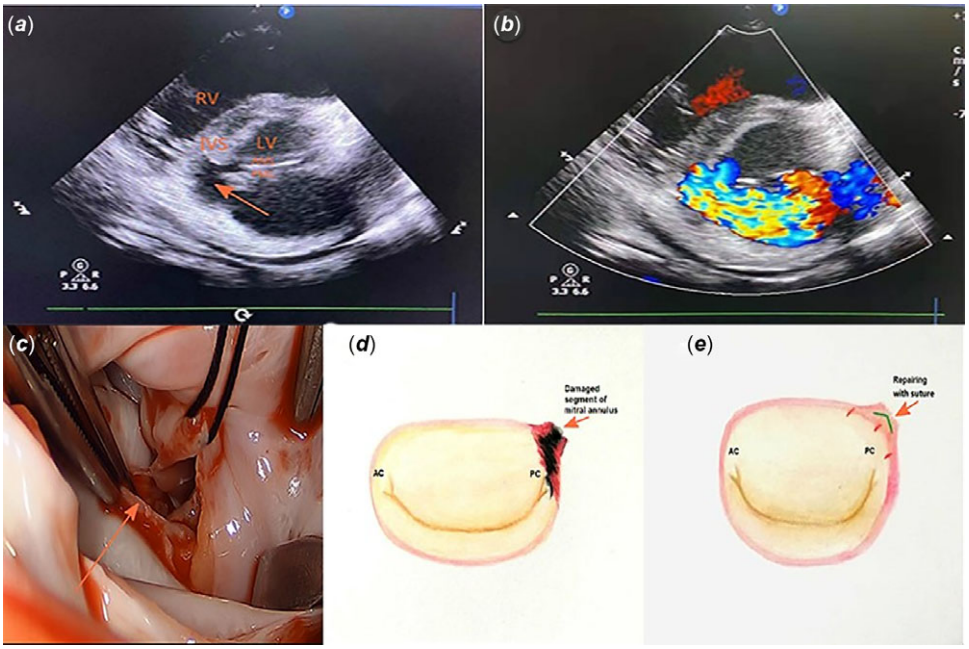


Figure 1. *(a)* The avulsed mitral annulus prolapsed into the surrounding septal dissection (arrow). *(b)* Colour Doppler flow revealing the mitral valve regurgitation into the interventricular septum. *(c)* The mitral annulus mitral avulsion (arrow). *(d)* The mitral annulus was showed avulsed at the area of posteromedial commissure. *(e)* The mitral annulus and interventricular septum were repaired with three bovine pericardial patches. Subsequently, the separated posterior leaflet was sutured to the repaired mitral annulus. Then, the posteromedial commissure was strengthened with one bovine pericardial patch.AC = anterolateral commissure; AML = anterior mitral leaflet; IVS=interventricular septum; LV = left ventricle; PC = posteromedial commissure; PML = posterior mitral leaflet; RV = right ventricle.

injuries, and myocardial contusion is the most common consequence.[3,4] The valve injuries are infrequent complications.[5] The injuries of the mitral apparatus often include the papillary muscle, chordae tendinous and valve leaflet, mitral annulus avulsion has been sparsely reported. The common clinical presentations of mitral valve insufficiency are haemodynamic shock, dyspnoea, and pulmonary oedema. However, these symptoms could easily lead to a missed diagnosis due to concomitant injuries. Therefore, making a correct and comprehensive diagnosis is indeed challenging in clinic.

A new systolic murmur at apex after trauma is a significant clue to diagnosing the traumatic mitral valve rupture. And an increase in cardiac enzymes might also indicate the presence of myocardial damage. A chest X-ray scan often demonstrates the pulmonary oedema and enlarged heart chambers, which is instrumental in the diagnosis. An echocardiography examination should be performed in all the patients. For the severe patients with uncontrollable congestive heart failure, urgent surgical intervention is the only effective treatment for correcting the haemodynamic instability. Thus, emergent mitral valve repair was performed, in this case, for the recovery of anatomy and haemodynamics of mitral valve. And the patient should be closely followed up to adulthood in case the recurrence of mitral valve prolapses or insufficiency.

Conclusion

The traumatic heart injuries in children caused by unintentional falling injury is a rare disorder, but symptoms can be misleading due to concomitant injuries. The early improvement of related inspections is necessary to diagnose the patients with risk factors, transthoracic echocardiography, especially chest CT scan, transesophageal echocardiography. For the confirmed patients, emergency surgeries should be considered.

Acknowledgements. None.

Financial support. The current work was supported by grants from the National Nature Science Foundation of China (81800255 to MX), National Key R&D Program of China (2017YFC1308000), and Natural Science Foundation of Shandong Province (ZR2018BH002 to MX).

Conflict of interest. None.

Ethical standards. Written informed consent was taken from the patient/parents/legal guardians/next of kin for reporting this. The manuscript is original work of all authors. All authors made a significant contribution to this study. All authors have read and approved the final version of the manuscript.

References

1. Masuoka A, Kimura N, Katogi T, Suzuki T. A case of ventricular septal defect and mitral insufficiency after blunt trauma. Asian Cardiovasc Thorac Ann 2014; 22: 846–848.
2. Forteleoni A, Montereggi F, Sanna GD, Portoghese M, Parodi G. Traumatic mitral valve regurgitation: a case report and state-of-the-art review. J Cardiovasc Med (Hagerstown) 2019; 20: 709–717.
3. Allemeersch GJ, Muylaert C, Nieboer K. Traumatic coronary artery dissection with secondary acute myocardial infarction after blunt thoracic trauma. J Belg Soc Radiol 2018; 102: 4.
4. Pasquier M, Sierro C, Yersin B, Delay D, Carron PN. Traumatic mitral valve injury after blunt chest trauma: a case report and review of the literature. J Trauma 2010; 68: 243–246.
5. Liedtke AJDW. Nonpenetrating cardiac injuries: a collective review. Am Heart J 1973; 86: 687–697.

https://doi.org/10.1017/S1047951121000044 Published online by Cambridge University Press