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CASE REPORT

Aneurysm of cardiac muscular interventricular septum as a result of blunt chest trauma

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Introduction

A ventricular aneurysm is an abnormal bulge or 'outpouching' of a portion of the ventricular wall, with or without paradoxical systolic expansion, and may involve the membranous portion or the muscular portion of the ventricular septum (Nguyen et al, 2008). Membranous septal aneurysms are well described. However, muscular ventricular septal aneurysms are rare compared to aneurysms of the membranous portion of the interventricular septum and most are diagnosed incidentally. This type of aneurysm is extremely rare without a ventricular septal defect, and may be congenital or acquired (Nguyen et al, 2008; Doğan et al, 2017).

Most ventricular aneurysms occur in adults and are related to coronary occlusion and myocardial ischaemia. In children, the acquired causes of left ventricular aneurysm include anomalous origin of the left coronary artery from the pulmonary artery, transient myocardial ischaemia of newborns, blunt trauma to the chest, infection, postoperative cardiac surgery, cardiomyopathies, and Kawasaki disease (Chen et al, 1991).

Traumatic cardiac injury of any type is relatively uncommon in children. This article discusses a 2-year-old boy with a muscular aneurysm, which developed between the left and right ventricle following a blunt thoracic trauma caused by a stone falling on him.

Case report

A 2-year-old boy was referred for cardiac evaluation. He was admitted to hospital following blunt thoracic trauma caused by a stone falling on him and had no symptoms. He was fully awake and conscious, with a Glasgow Coma Scale of 15/15. His heart rate was 114 beats/min and blood pressure was 95/55 mmHg. His physical examination was normal, except for a grade 1/6 systolic murmur, best heard at the left sternal border. The electrocardiogram was normal. His creatine kinase level was 1495 U/litre (reference range 0–172 U/litre), creatine phosphokinase isoenzyme MB (CK-MB) level was 129.8 µg/litre (reference range 0.0–3.6 µg/litre), troponin I was 28.7 µg/litre (reference range 0.00–0.06 µg/litre), aspartate aminotransferase level was 221 U/litre (reference range 0–50 U/litre), and lactate dehydrogenase level was 529 U/litre (reference range 180–430 U/litre). The rest of the blood analysis did not show any abnormal values during admission. The patient was admitted to the intensive care unit for close monitoring.

Transthoracic echocardiography was performed because of the high troponin level and the murmur, which was evaluated as normal. A serial electrocardiogram did not show signs of ischaemia. Transthoracic echocardiography was repeated after a few days when the murmur increased, and the high level of troponin persisted, at which point a defect in the interventricular septum was noted without interventricular communication. Subsequent serial echocardiograms demonstrated a large area of paradoxical systolic motion in the mid-muscular trabecular interventricular septum. An aneurysm was observed between the two ventricles on subcostal four-chamber echocardiographic imaging, and colour flow mapping showed the flow jet bowing into the right ventricle during systole and the left ventricle during diastole without crossing the ventricular septum (Figures 1a and b). The patient underwent a cardiac magnetic resonance angiography scan, which showed a muscular septal aneurysm bulging into the right ventricle (Figure 2). The myocardium surrounding the aneurysm showed no associated ventricular septal defect and no evidence of an intraventricular clot was found.

The patient was given low-dose aspirin once a day for anticoagulation, because of concerns about thrombus formation in the defect. There were no issues during follow up and troponin levels returned to normal within a few days. The patient did not undergo surgery, as the echocardiogram demonstrated normal left ventricular systolic function, normal right ventricle function and haemodynamic stability. Three months after the accident, the patient was asymptomatic and the cardiac lesion remained unchanged in appearance. The patient is under regular follow up at the paediatric cardiology outpatient clinic.

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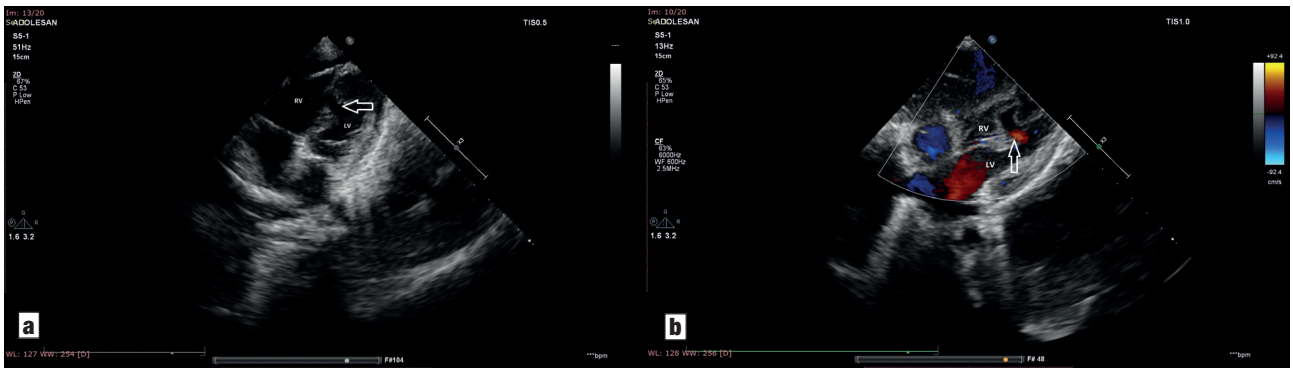

Figure 1. a. An aneurysm is observed between the two ventricles on subcostal four-chamber echocardiographic imaging and (b) colour flow mapping showed the flow jet bowing into the right ventricle during systole and the left ventricle during diastole without crossing the ventricular septum (arrows). LV = left ventricle, RV = right ventricle.

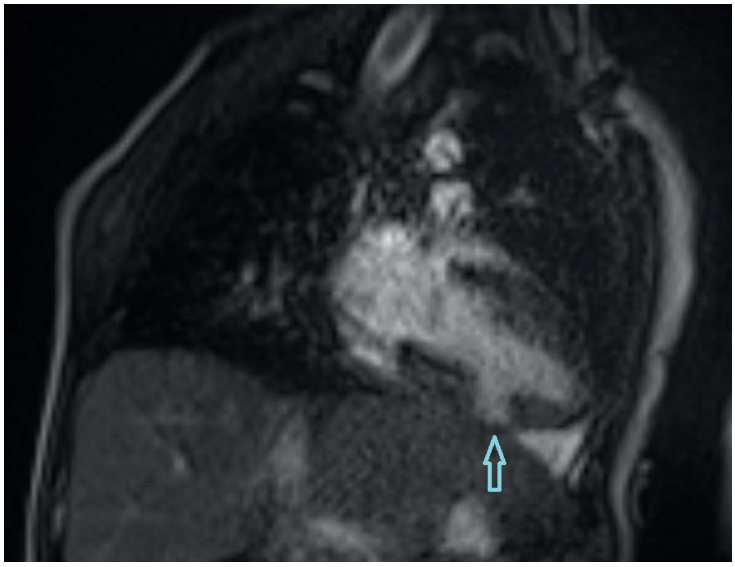

Figure 2. In the coronal plane, the fat-suppressed T2-weighted left two-chamber image demonstrates a 7x3 mm smooth-surface, thrombus-free area of aneurysm at the junction of the interventricular septum and myocardium (arrow).

Discussion

Aneurysms of the muscular septum are extremely rare (Garg et al, 2015; Ivanitskaya et al, 2018). Most cases of interventricular septal aneurysms are the result of post-myocardial infarction, previous spontaneous ventricular septal defect closure, traumas, infections and hereditary in paediatric patients (Nguyen et al, 2008; Doğan et al, 2017).

Diagnosis of myocardial injury following blunt chest trauma is difficult, because of the lack of consensus for diagnostic guidelines, so it may be easily overlooked (Behrle et al, 2018). The benefits of measuring cardiac enzymes in the evaluation of trauma are debated. Troponin I is a specific indicator of myocardial damage, and screening with a rise in troponin I levels and/or cardiac ultrasound may be helpful for early diagnosis (Behrle et al, 2018). This patient had a history of chest trauma. Elevated troponin I levels with prompt resolution and echocardiographic findings suggestive of traumatic ventricular septal aneurysm without ventricular septal defect formation lead the authors to believe that his lesion had a traumatic rather than congenital cause.

Complications of aneurysms may arise from chronic pressure erosion of the intervening septal myocardium, leading to left-to-right shunting in the form of a ventricular septal defect and paradoxical thromboembolism. Therefore, close monitoring of patients is required. However, almost half of patients with muscular septal aneurysms are asymptomatic, and most cases are diagnosed incidentally (Wong et al, 2007). Surgical management is carried out with aneurysm excision and patch closure (Garg et al, 2015).

Learning points

- Cardiac problems may develop after chest trauma.
- Children are more susceptible to myocardial injury following blunt chest trauma than adults.
- Trauma-related cardiac aneurysm may develop in children, although very rarely.
- Even if echocardiography is initially normal, patients with high troponin levels should be followed up closely.
- Cardiac aneurysms can cause serious problems and require immediate cardiac surgery.

Conclusions

Cardiac injuries are a relatively uncommon result of blunt chest trauma in children. Therefore, a detailed analysis of the heart should be performed for signs of potential sources of injury in a child with blunt trauma to the chest, and screening following a rise in troponin I levels and/or a serial cardiac ultrasound may be helpful for early diagnosis.

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