

Isolated rupture of bicuspid aortic valve following blunt chest trauma: a case report and systematic review of literature

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Abstract: Blunt trauma to chest cause injury to various cardiac structures. Isolated rupture of aortic valve without aortic dissection is rare complication of blunt chest trauma and can be caused by a tear or avulsion of the valve. We report a case of a 35-year-old male who presented with severe aortic insufficiency due to rupture of a non-infected congenital bicuspid aortic valve following non-penetrating chest trauma. The diagnosis was suggested by echocardiography and was confirmed by intra-operative and histological findings. The patient was successfully treated with surgical valve replacement with uneventful postoperative course and recovery. We describe patho-physiology, clinical manifestations, management and the literature review of traumatic rupture of bicuspid aortic valve.

Keywords: Bicuspid aortic valve; traumatic rupture; blunt chest trauma; aortic insufficiency

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Introduction

Non penetrating trauma to the chest can cause life-threatening injuries involving airway, lungs and heart (1). Acute aortic insufficiency following blunt chest trauma is usually caused by aortic dissection with or without involvement of aortic valve. We describe a case of a 35-year-old male who presented after falling from a height of 25 feet and was found to have rupture of his congenital bicuspid aortic valve without aortic dissection. He underwent surgical valve replacement with uneventful post op and follow up course.

Case presentation

A 35-year-old male with significant medical history of bipolar disorder and schizophrenia was admitted after he jumped from a height of 25 feet. He landed on his anterior chest and sustained multiple internal and external organ traumas. His initial blood pressure was 92/24 mmHg and pulse was 79/min. On clinical examination he was noted to have grade 3/6 early diastolic decrescendo murmur in aortic area. Patient did not have any reported cardiac history in past. The CT scan of chest showed bilateral

hemo-pneumothoraces, pulmonary contusions, multiple rib fractures, hepatic and renal laceration. Aortic dissection was also suspected however CT angiogram of chest was non-conclusive. An aortic angiogram was then performed which showed wide-open aortic insufficiency without any dissection. Transthoracic echocardiogram which was done on day 1 of admission revealed a bicuspid aortic valve with severe aortic insufficiency (*Figure 1*).

Cardiothoracic surgery consult was obtained for severe aortic insufficiency and plan was made for elective surgical valve replacement once patient was more stable clinically. However, patient was noted to have worsening heart failure and he could not be weaned from ventilator. This led to a repeat transthoracic echocardiogram on day 12th of admission which showed a new 2 cm freely mobile structure on one of leaflet of the aortic valve, which was suspicious for vegetation. This freely mobile structure was not visualized on initial echocardiogram possibly due to suboptimal and limited picture because of hemopneumothorax. This finding was confirmed on transesophageal echocardiogram (*Figure 2*). Patient was subsequently taken to operating room for suspected endocarditis with worsening heart

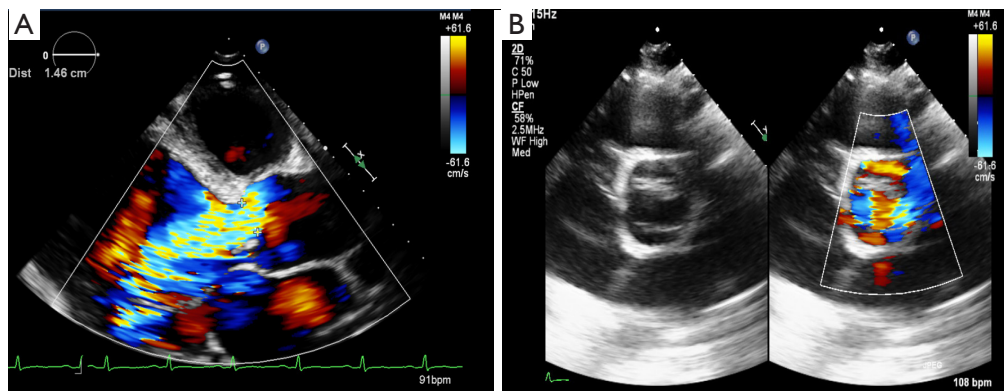


Figure 1 Transthoracic echocardiography (TTE): parasternal long axis view showing severe aortic insufficiency (A), parasternal short axis view showing bicuspid aortic valve with aortic insufficiency (B).

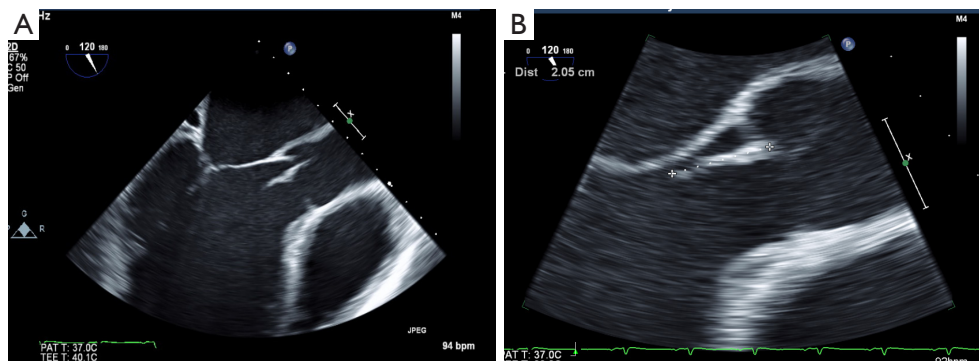


Figure 2 Transesophageal echocardiography (TEE): three chamber view showing 2 cm freely mobile mass on anterior aortic valve leaflet (A), magnified view of the aortic valve with freely movable mass (B).

failure. Intraoperative findings were remarkable for a congenital bicuspid aortic valve with one of the leaflet completely torn off from annulus (*Figure 3*). This torn leaflet gave an appearance of vegetation on echocardiogram. The valve was then excised and replaced with a 29-mm mosaic ultra bioprosthesis. Histological examination of the valve confirmed absence of any inflammation or infection. Patient had an uneventful post-operative course. He was successfully weaned off from ventilator and was ultimately discharged to a rehab facility in stable condition on day 6th post-operative. He was doing well on his follow up appointment in office 2 and 6 weeks post discharge.

Discussion and conclusions

Traumatic rupture of bicuspid aortic valve without involvement of thoracic aorta is rare cause of acute aortic insufficiency. We performed a systematic review of literature for similar

cases through PubMed and Cochrane from database inception to September 20, 2015. The medical subject headings (MeSH), Emtree and keyword search terms used in combination were: bicuspid aortic valve, traumatic rupture, and blunt chest trauma. There was no restriction for the type of study and all PubMed indexed studies were included. The comparison of three case reports (2-4) which met inclusion criteria is described in *Table 1*. It is well known that individuals with bicuspid aortic valve are more prone to develop valvulopathy and ascending aortopathies (5). There is a possibility that bicuspid aortic valves are structurally more susceptible to disruption from trauma as compared to normal trileaflet valves. The potential mechanism of injury to aorta has been reported as rapid deceleration, shearing forces, osseous pinch, and hydrostatic forces (6). These could explain injury to the valve as well. A high index of suspicion in such patients who presents after trauma can lead to early diagnosis and intervention with

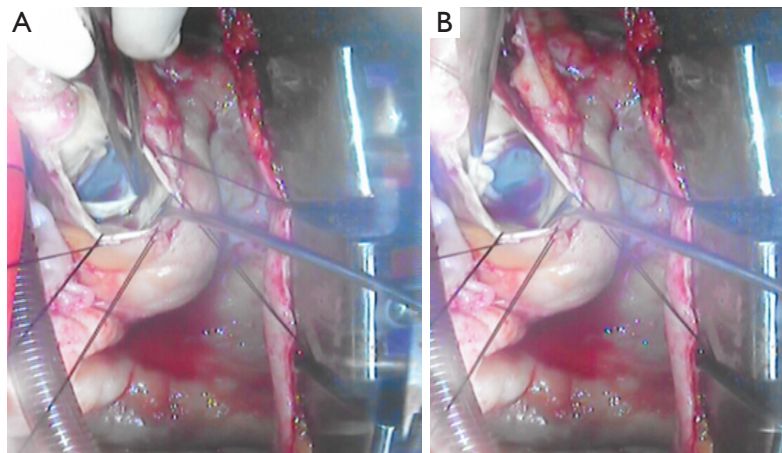


Figure 3 Intra-operative findings showing bicuspid aortic valve with completely torn right leaflet.

Table 1 The demographic comparison of previously reported cases of traumatic bicuspid aortic valve rupture

References	Age of patient (years)	Gender	Source of trauma	Aortic dissection	Ruptured leaflet	Treatment
Tokizawa <i>et al.</i> (4)	64	Male	Traffic accident	Absent	Anterior	Surgical replacement
Fujimoto <i>et al.</i> (3)	27	Male	Motocross game	Absent	Anterior	Surgical replacement
Anselmino <i>et al.</i> (2)	60	Male	Motor accident	Absent	Anterior	Surgical replacement
Current case	35	Male	Falling from height	Absent	Anterior	Surgical replacement

significant effect on clinical outcome.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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