

## Case reports

# Early Diagnosis of Traumatic Aortic Valve Rupture in ICU Patients Using Transoesophageal Echocardiography

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### ABSTRACT

*A case is presented of a 60-year-old man who sustained spinal and chest wall injuries following a collision between his glider and an aeroplane. The severity of his injuries required him to be managed with bilateral underwater seal drains, cervical spine stabilisation and sedation with mechanical ventilation. Due to the severity of his chest trauma, a transoesophageal echocardiograph was performed which revealed a partial dehiscence and prolapse of the left coronary cusp of the aortic valve with mild to moderate aortic regurgitation. Despite conservative treatment, severe cardiac failure developed six days later requiring aortic valve replacement. After a prolonged stay in the Intensive Care Unit during which the patient developed acute respiratory distress syndrome, methicillin resistant Staphylococcus aureus pneumonia and Enterobacter septicaemia, the patient was discharged, returning to his pre-admission lifestyle.*

*In patients with complex and severe chest trauma, transoesophageal echocardiography is of great benefit, not only in allowing good image quality, compared with transthoracic echocardiography, but having a greater reliability and accuracy in diagnosing cardiac and mediastinal trauma in complex monitoring environments. (Critical Care and Resuscitation 2000; 2: 114-116)*

**Key words:** Aortic valve rupture, transoesophageal echocardiography, trauma

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Aortic valve rupture caused by blunt chest trauma is rare,<sup>1-3</sup> but may be a surgically correctable cause of cardiogenic shock in critically ill trauma patients. Transoesophageal echocardiography (TOE) has been increasingly recognised as a valuable diagnostic tool to detect cardiac pathology in mechanically ventilated, critically ill patients who are often difficult to image using conventional transthoracic imaging<sup>4</sup>. TOE is also useful in trauma patients to detect traumatic aortic injury and other mediastinal pathology.<sup>5-8</sup> Aortic valve injury from non-penetrating trauma is rare and is usually a late diagnosis following acute haemodynamic deterioration.<sup>9-13</sup> This case highlights the value of transoesophageal

echocardiography when used early in the intensive care unit to screen asymptomatic patients with high risk, severe, non-penetrating chest trauma.

### CASE REPORT

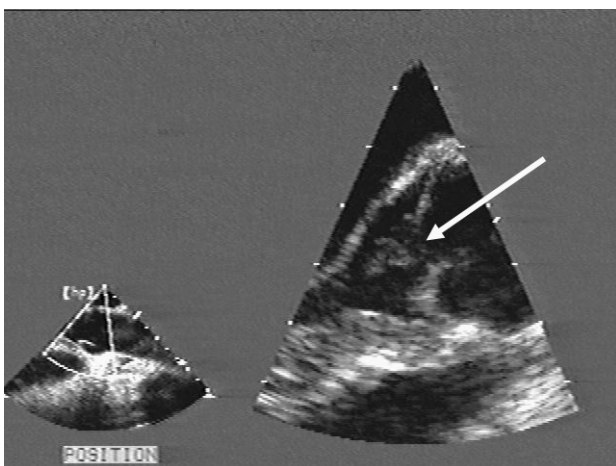
A previously healthy 60-year-old British tourist was admitted to the Alfred Trauma Centre, following a mid air collision between his glider and a plane, and his subsequent fall of 1000 feet to the ground. On admission the patient was conscious and haemo-dynamically stable. He had an unstable cervical spine fracture with subluxation at C 4-5 and fractured spinous processes of C 2-4, but had no neurologic deficit. He also had a

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wedge fracture of the eleventh thoracic vertebra, a fractured right acetabulum, multiple bilateral fractured ribs, a flail chest, and bilateral pneumo-thoraces. A CT scan of the chest demonstrated small bilateral haemothoraces and an apparently normal heart. An electrocardiograph (ECG) demonstrated a newly developed right bundle branch block. Clinical examination of the heart was difficult but apparently normal.

The patient was intubated, mechanically ventilated, had bilateral intercostal catheters inserted and was transferred to the Trauma Intensive Care Unit. His cervical spine was stabilised using cranial tongs and traction. In the ICU, the patient had a blood pressure of 130/55 mmHg with no cardiac murmur or other signs of cardiac failure identified. Owing to the severity of the chest trauma, the ECG changes and the difficulty of reliable clinical examination in this setting, a transoesophageal echocardiogram was performed on day two. This examination identified a partial dehiscence and prolapse of the left coronary cusp of the aortic valve with mild to moderate aortic regurgitation (Figure 1). Left and right ventricular functions were normal with no evidence of myocardial contusion. It was decided to initially manage the aortic regurgitation conservatively.



**Figure 1.** Transoesophageal echocardiograph showing flail aortic leaflet.

On day three, the patient developed right lower lobe pneumonia which gradually resolved with antibiotics and physiotherapy. On day seven, he had an anterior cervical spinal fusion performed, followed by placement of a Halo thoracic brace. On day eight, acute congestive cardiac failure developed. An urgently repeated echocardiogram demonstrated worsening aortic regurgitation and a Swan-Ganz catheter was inserted. The right atrial pressure was 9 mmHg, pulmonary artery occlusion pressure 11 mmHg, pulmonary artery pressure 25/14 mmHg, cardiac index 3.35 L/min/m<sup>2</sup>, systemic

vascular resistance index 1552 dyne.s/cm<sup>5</sup>/m<sup>2</sup> and pulmonary vascular resistance index was 310 dyne.s/cm<sup>5</sup>/m<sup>2</sup>. Cardiac function and blood pressure were optimised using intravenous infusions of nitroprusside and glyceryl trinitrate. The cardiac failure initially stabilised and then worsened and emergency aortic valve replacement surgery was then undertaken.

At surgery, there was a moderate sized haemo-serous pericardial effusion, a complex tear in the belly of the left coronary cusp and a small hole in the non-coronary cusp of the aortic valve. Myocardial function was assessed as good. A 25 mm St. Jude aortic valve prosthesis was inserted. The post-operative course was complicated by hyperkalaemia, transient ventricular tachycardia, adult respiratory distress syndrome, methicillin resistance *Staphylococcus aureus* pneumonia and *Enterobacter* bacteraemia. The patients' neurologic function was always judged to be normal. The patient was discharged from ICU on day 40 and from hospital on day 69. He returned to his pre-morbid lifestyle, professed a desire to return to gliding and is now living in the United Kingdom.

## DISCUSSION

The mechanism of traumatic non-penetrating rupture of the aortic valve is believed to be due to a sudden increase in intra-aortic pressure at the time of impact.<sup>1, 14</sup> The incidence of traumatic aortic valve rupture is rare, but cardiac injuries of all types are frequently missed or diagnosed late in patients with chest trauma.<sup>1</sup> Most reported cases of traumatic aortic valve rupture have been diagnosed many days after ICU admission and following the development of a new cardiac murmur or of haemodynamic instability.<sup>9-13</sup>

In our reported case the diagnosis was made definitively in the Intensive Care Unit using TOE during the first 24 hours while the patient was stable and asymptomatic. This early diagnosis enabled careful observation of the patient and rapid surgical intervention immediately signs of cardiac compromise were identified. TOE provided all the necessary pre-surgical information and obviated the need for further investigations including aortography. Because the aortic valve pathology involved a complex tear of the left coronary cusp, surgical valve repair was technically unsuitable and the more traditional method of aortic valve replacement was undertaken.<sup>1, 14</sup>

TOE is superior to conventional transthoracic echocardiography for the diagnosis of cardiac pathology in intubated, mechanically ventilated, critically ill patients. In patients with complex chest trauma including extensive chest wall and pulmonary pathology, TOE has even greater potential advantage because image quality remains uniformly excellent in contrast to

transthoracic images which in this setting are often unsatisfactory. TOE has also been reported to be reliable and accurate in the early diagnosis of cardiac pathology following emergency sternotomy and repair of superficial cardiac lacerations after penetrating stab wounds.<sup>15</sup> Although traumatic aortic regurgitation is rare, TOE should be considered and used early as a non-invasive screening investigation to exclude cardiac pathology in all critically ill trauma patients with high risk mechanisms of injury.

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