CASE REPORT

Acute aortic valve rupture after blunt chest trauma and cardiac catheterization

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Introduction

Blunt chest trauma infrequently causes cardiac injury, including cardiac contusion, cardiac rupture, dissection of the great vessels and valvular rupture. Severe acute aortic regurgitation (AR) due to aortic valve rupture is an even less common complication. We present a case of acute AR caused by the laceration of the left coronary cusp of the aortic valve following impact of the steering wheel and a cardiac catheterization. The patient did not present with acute AR immediately after injury but showed signs of severe AR complicated with retractive heart failure following a cardiac catheterization two days later. The timing of acute AR in this patient was very unusual. We discuss the causes of acute AR in this patient, the importance of early diagnosis, and treatment in such rare case.

Case report

A 55-year-old man was taken to our emergency room after involvement in an automobile accident with his chest impacted the steering wheel. He suffered pain in the parasternal area and left lower limb. Physical examination revealed that he was awake with stable vital signs initially. Blood pressure was 143/62 mmHg, heart rate 81 beats/min and respiratory rate 20 per min. There were no bruises on the chest wall or deformities of the chest wall. However, there was local tenderness in the sternum and parasternal areas. Auscultation disclosed a grade 2/6 diastolic murmur on left lower sternal. The abdomen was normal upon examination. In addition, there was local tenderness and laceration wound on the left calf. Chest radiography demonstrated an enlarged cardiac size and increased lung markings. Blood tests revealed creatinine kinase 4995 U/L and CK-MB 25 U/L. Transthoracic echocardiography showed a dilated left atrium, left ventricle (LV), concentric left ventricular hypertrophy, adequate LV performance and mild AR. Meanwhile, an X-ray disclosed a fracture of the left tibial and fibular bones. Tracing back his history, he had had hypertension for more than 10 years without medical treatment and he suffered shortness of breath on exertion for about 2 years.

The patient was transferred to a regional hospital after fixation of the bone fracture. Cardiac catheterization was performed due to persistent chest pain at this regional hospital. The ventriculography...
revealed adequate LV performance; aortography showed mild AR without aortic dissection and coronary angiography disclosed a significant stenosis of a diagonal branch of the left anterior descending artery. Acute pulmonary edema with respiratory failure developed two days after the procedure. Follow-up with echocardiography demonstrated flailing of the aortic valve with increased severity of AR from mild to severe (Fig. 1). Therefore, the patient was transferred to our hospital, and surgical intervention was performed thereafter. A laceration on the left coronary cusp that caused it to flail was noted during the operation (Fig. 2). The aortic valve was replaced with a 23 mm Edwards MIRA mechanical valve. The patient was quickly extubated one day after the operation. He was discharged from the hospital without congestive heart failure.

1. Discussion

With the increase in the number of high-speed automobile accidents, blunt trauma has attracted much attention. The most common injury after blunt chest trauma is myocardial contusion that varies widely, depending on diagnostic criteria, but the estimate would be about 15%.6,7 The post-mortem series, including studies in the clinical literature, have disclosed that acute aortic valve rupture after such trauma is extremely rare.6,7 The mechanism of rupture of the aortic valve is thought to be a sudden increase in intrathoracic pressure during diastole, when the pressure gradient across the aortic valve is maximal and the valve is closed.8 The cusp most frequently involved is the non-coronary one and the tear appears at or close to the annulus. The non-coronary cusp is the least supported apparatus explaining the consistent pathological features in most cases.9

Timing of the onset of symptoms due to trauma-related acute aortic valve rupture was variable.8 Reports of occurrence immediately after trauma to several years later have been reported. However, the determinants of timing in the onset of the symptoms are still unknown. The diagnosis of traumatic aortic valve rupture is based on rapid progression of dyspnea in association with a new or louder murmur. Under the suspicion of acute traumatic AR, echocardiography is the most rapid and non-invasive tool for diagnosis. Although transesophageal echocardiography achieves better visualization of the valvular anatomy and great vessels,11 we chose transthoracic echocardiography and it provided enough information on aortic valve morphology, AR severity and aortic root. According to ACC/AHA guidelines for the management of patients with valvular heart disease,2 coronary angiography is an important component in the evaluation of aortic dissection and acute AR, provided that it does not delay urgent surgery.

There were two special features of this case that differed from previous reports. First, the onset of acute pulmonary edema occurred five days after the accident. Initially, mild AR, dilated left atrium and left ventricle were noted by transthoracic echocardiography.
diography. We thought that these findings were related to chronic hypertension without medical treatment. However, acute lung edema and severe AR developed two days after a cardiac catheterization. Second, laceration of aortic valve was on the left coronary cusp, rather than on the non-coronary cusp that has been most frequently reported in previous studies. Although there was no direct evidence to support that cardiac catheterization resulted in acute AR, the unusual location of the laceration, mild AR at the beginning and rapid progression of AR after the procedure indicated that the procedure probably contributed to the development of the progression of AR. We highly suspected that cardiac catheterization might worsen original injury to the aortic valve. Cardiac catheterization is a relatively safe procedure but has the well-defined risks of morbidity and mortality. A Medline search from 1966 to 2005 on the topic of traumatic AR did not reveal any cases of acute AR related to cardiac catheterization. Our case suggests that clinicians should take great care in performing cardiac catheterization in such case of severe chest trauma.

The timing of surgical intervention is an important and often controversial issue in patients with traumatic valvular injuries. Since early death due to left ventricular heart failure is frequent in patients with acute severe AR, despite intensive medical treatment, surgical intervention should be undertaken as soon as possible. Although Halstead and coworkers presented three aortic valve injury cases treated with valvuloplasty, there was a high failure rate in the long-term, and aortic valve replacement was the better choice. Our case confirmed that aortic valve replacement can be an effective therapeutic choice for these patients.

References