Aortic Valve Injury Following Blunt Chest Trauma

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1. Introduction

Heart valve injury following blunt chest trauma of car accidents is increasing. Although aortic valve involvement is rare, however, in survivors of blunt cardiac trauma it is the most commonly involved valve and the most frequent valve lesion is isolated injury of the noncoronary cusp of aortic valve.

2. Case Presentation

A 31-year-old man, who was involved in a car accident several months ago and experiencing shortness of breath and paroxysmal nocturnal dyspnea, was referred to our institution for further evaluation.

On physical examination, blood pressure = 130/50 mm Hg, respiratory rate = 14 per minute, pulse rate = 78 beats per minute, temperature = 36.5°C and a grade III/VI systolic murmur and a holo-diastolic blowing murmur which radiated to the left lower sternal border were heard. Chest x-ray revealed cardiomegaly (Figure 1) and electrocardiogram revealed non-specific ST-T (ST segment and T wave) changes.

Transthoracic echocardiography revealed severe left ventricular enlargement with mild to moderate systolic dysfunction (ejection fraction = 45%), moderate right ventricular enlargement and systolic dysfunction, moderate tricuspid regurgitation and severe pulmonary hypertension (pulmonary artery pressure = 75 mm Hg). Severe aortic regurgitation (multiple distinct jets) and two long regular-edged prolapsing mobile particles on the left coronary cusp (LCC) were noted which suggested a large tear along the LCC (Figure 2). Transesophageal echocardiography was done which showed a large oval shaped tear along the base of the LCC (Figure 3) resulting in severe regurgitation mostly from the torn LCC, however, additional regurgitant jets were also seen from the suspension point of LCC and right coronary cusp (avulsion of the commissure). There was substantial prolapse of the basal portion of the torn leaflet.

The patient underwent cardiac surgery. During cardiopulmonary bypass with hypothermic anoxic arrest extensive tearing of the LCC was noted (Figure 4). Aortic valve was not repairable because of avulsion injury, so it was replaced by...
a mechanical bileaflet valve. The post-operative course was uneventful. The patient’s condition improved dramatically and he was discharged a week after the operation.

Figure 1. Chest Radiograph Showing Cardiomegaly and Interstitial Pulmonary Edema

Figure 2. Transthoracic Echocardiograms

Transthoracic echocardiograms show long regular-edged prolapsing mobile particles on the left coronary cusp (arrow) and massive aortic regurgitation by the color Doppler.

Figure 3. Transesophageal Echocardiograms

Transesophageal echocardiograms at 0 and 120 degrees show large tear of the left coronary cusp of the aortic valve (arrow) and avulsion of the free edge of the left coronary cusp; LCC: left coronary cusp.

Figure 4. Intraoperative View of the Left Coronary Cusp Rupture
3. Discussion

Clinically, cardiac injury may be missed at the initial post-trauma assessment due to the lack of suspicion of cardiac involvement. Also, other coexistent injuries such as fractured ribs and pulmonary contusion with the same chief complaints may mask the manifestations of cardiac injury. The respiratory distress may prohibit auscultation of the heart. Thus, the diagnosis of AV rupture is often delayed or missed for a time interval of days to months.

The mechanism of non-penetrating rupture of the AV is believed to be a sudden increase of intra-thoracic pressure at the time of impact, particularly during early diastole when the pressure difference across the aortic valve is maximal (7).

Although noncoronary cusp was the most torn leaflet that was found, yet multiple leaflets injury may coexist. Valve repair has been reported in a few cases (8), but avulsion-type valve injury makes primary repair difficult so valve replacement is the recommended operative procedure (7). In conclusion, in any patient after blunt chest trauma the possibility of cardiac valve injury including AV should be taken into account.

References