Traumatic Aortic Valve Injury Sustained Despite the Deployment of an Automobile Air Bag*

Juliann Reiland-Smith, M.D.; Ronald M. Weintraub, M.D., F.C.C.P.; and Frank W. Selike, M.D.

Blunt chest trauma is a rare cause of aortic valve dysfunction. A case of the successful management of traumatic injury to the aortic valve is reported. The aortic valve injury was sustained in an automobile accident despite the use of a seat belt and the deployment of an air bag. The literature is briefly reviewed. Aortic valve injury remains a consideration in cases of automobile-associated chest trauma, even in automobiles equipped with seat belts and air bags. (Chest 1993; 103:1603)

Blunt chest trauma is an uncommon cause of aortic valve dysfunction. We present a case of successful management of severe aortic insufficiency due to avulsion of the noncoronary cusp. This injury was sustained despite the use of a seat belt and the deployment of an air bag.

CASE REPORT

A previously healthy 83-year-old man sustained multiple injuries when he ran his car into a light pole at high speed. The man was found unconscious, with seat belt restraints in place and air bag deployed. The patient was taken to a local hospital. Chest roentgenogram revealed a widened mediastinum, an enlarged heart, and loss of contour of the aortic arch. The patient was transferred to Boston's Beth Israel Hospital. On arrival, the patient had a precordial diastolic thrill, a grade 2/6 diastolic murmur, and a grade 3/4 systolic murmur. The patient was noted to have hypotensive episodes associated with a widening pulse pressure, central venous pressure of 30 mm Hg, and pulmonary artery diastolic pressure of 30 mm Hg. Cardiac tamponade was suspected. A pericardial window was performed, but exploration revealed only a small amount of pericardial fluid. Following stabilization, postoperative transesophageal echocardiography revealed a dilated ascending aorta and severe aortic regurgitation without dissection or transection. The patient remained hemodynamically stable and intubated while recovering from his other injuries that included pulmonary contusion, hip fracture, sternal fracture, and flank hematoma. The patient underwent aortic valve replacement 18 days following injury. His aortic valve showed slight degenerative disease, with a torn and avulsed noncoronary aortic valve cusp. A 23-mm Carpentier-Edwards porcine xenograft was implanted. After a prolonged course in the ICU, the patient recovered and was discharged from the hospital.

DISCUSSION

Traumatic rupture of the aortic valve in the absence of dissection is infrequent. Parmley et al reported autopsies on 546 patients dying as a result of blunt chest trauma. In only one case was there an isolated injury to the aortic valve. Associated valvular disease such as bacterial endocarditis, rheumatic heart disease, syphilis, atherosclerosis, cystic medial necrosis, and congenital anomalies may predispose to traumatic aortic valve injury.

Aortic valve injury may present clinically as aortic insufficiency. Symptoms are frequently mild, and a high index of suspicion is required to make an early diagnosis. The clinical picture may be further confused by the presence of multiple injuries. Dyspnea may be attributed to pulmonary contusion or fractured ribs. Schweitzberg et al reported two cases of auto accident victims with traumatic aortic valve injury who had development of fulminant pulmonary edema that required emergency valve replacement.

Diagnosis of traumatic aortic valve injury is suggested by the presence of chest pain and dyspnea. On physical examination, the patient may have a previously unreported aortic diastolic murmur. Echocardiography has become the noninvasive technique of choice to diagnose and assess severity of aortic valve lesions. Diagnosis can be confirmed by cardiac catheterization and aortography.

In 1955, Leonard et al reported the first surgical treatment of traumatic aortic valve injury, by the placement of a Hufnagel valve in the descending aorta. In their review of 27 cases of surgically treated traumatic aortic insufficiency, German et al found an equal distribution of cusp tears and annulus avulsions among the three valve cusps. Although both valvuloplasty and prosthetic replacement have been employed for treatment, valvuloplasty has a high recurrence rate. For this reason, both German et al and Devineni et al have concluded that aortic valve replacement remains the treatment of choice.

In summary, traumatic aortic valve injury is rare in the absence of aortic dissection. Diagnosis may be difficult unless the index of suspicion is high, because symptoms are often mild or moderate and masked by multiple associated traumatic injuries. In the case presented, it occurred despite the use of a seat belt and the deployment of an air bag. Aortic valve replacement is the treatment of choice.

REFERENCES

1 Parmley LF, Manion WC, Mattingly TW. Nonpenetrating traumatic injury of the heart. Circulation 1956; 18:371-96
3 Schweitzberg SD, Khalil KC. Isolated traumatic aortic valvular insufficiency with rapid pulmonary deterioration. Arch Surg 1985; 120:971-3

*From the Division of Cardiothoracic Surgery Beth Israel Hospital and Harvard Medical School, Boston, Mass (Drs. Weintraub and Selike), and The University of South Dakota School of Medicine Vermilion, SD (Dr. Reiland-Smith).

Reprint requests: Dr. Selike, Beth Israel Hospital, Dana 905, 330 Brookline Avenue, Boston 02215