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## Four Cases of Valvular Diseases Due to Nonpenetrating Cardiac Trauma

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## Abstract

During the past 15 years we have managed four patients who suffered isolated valvular lesions from blunt chest trauma. Three patients were injured in traffic accidents and another fell from a height. Injured valves were mitral valves in three patients, tricuspid valves in two and aortic valve in one. One individual had a combination of aortic, mitral, and tricuspid valvular lesions. The procedures performed were mitral valve replacement in 2 patients and mitral repair in one, tricuspid valve replacement in one and repair in one, aortic valve replacement in one. The outcome of those patients were fairly well and all returned to their regular jobs.

**KEYWORDS:** blunt chest trauma, traumatic valvular disease

## Four Cases of Valvular Diseases Due to Nonpenetrating Cardiac Trauma

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During the past 15 years we have managed four patients who suffered isolated valvular lesions from blunt chest trauma. Three patients were injured in traffic accidents and another fell from a height. Injured valves were mitral valves in three patients, tricuspid valves in two and aortic valve in one. One individual had a combination of aortic, mitral, and tricuspid valvular lesions. The procedures performed were mitral valve replacement in 2 patients and mitral repair in one, tricuspid valve replacement in one and repair in one, aortic valve replacement in one. The outcome of those patients were fairly well and all returned to their regular jobs.

*Key words* : blunt chest trauma, traumatic valvular disease

Injury of the heart secondary to blunt chest trauma usually becomes clinically evident when multiple cardiac structures are involved. We report four cases of isolated valvular lesions due to nonpenetrating chest trauma.

*Case 1.* A previously healthy 51-year-old man fell from a bridge which was 3 m high. Rib fractures were noted, and he complained of severe abdominal pain. A laparotomy was immediately performed. Lacerations of the liver and the duodenum were repaired. Fifteen years after the injury, he developed dyspnea and palpitation. On auscultation, a grade 3/6 systolic murmur was heard in the fourth intercostal space. A pulsatile liver was palpable 8 cm below the right costal margin. Echocardiography revealed a marked enlargement of the right ventricle and paradoxical septal motion. There was no evidence of Ebstein's anomaly. Angiography

revealed a markedly dilated right ventricle and severe tricuspid regurgitation (Fig. 1). During surgery, the annulus of the tricuspid valve was severely dilated and a flail anterior leaflet of the tricuspid valve was noted secondary to rupture of multiple chordal attachments. Replacement of the tricuspid valve was accomplished using a porcine bioprosthesis (1).

*Case 2.* A previously healthy 22-year-old man sustained blunt chest trauma by rapid deceleration in a motor vehicle accident. Four months after the accident, the patient developed severe congestive heart failure. His blood pressure was 160/0 mmHg, a grade 4/6 to and fro murmur was heard most clearly over the aortic area. A chest roentgenogram showed a cardiothoracic ratio of 0.68. An echocardiogram revealed an enlarged left ventricle with depressed contractility, severe deformation of three aortic cusps and poor coaptation of the leaflets near the postero-medial commissure. Doppler echocardiography revealed

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Fig. 1 Right atrigram showing markedly dilated right ventricle and severe tricuspid regurgitation in Case 1.

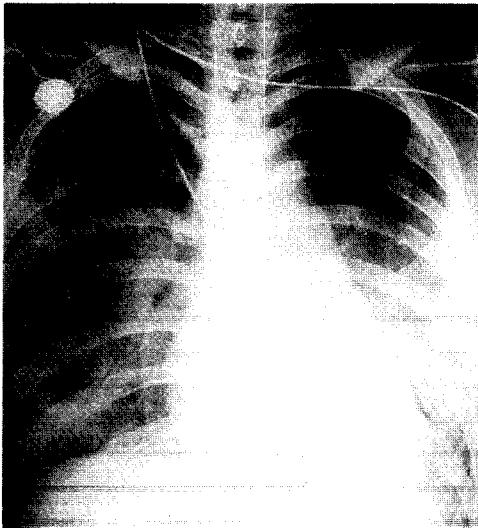


Fig. 2 Chest roentgenogram showing severe pulmonary edema immediately after blunt chest trauma in Case 3.

moderate to severe regurgitant flow across the aortic, mitral and tricuspid valves. Cardiac catheterization confirmed the presence of a grade 4/4

aortic regurgitation and a grade 3/4 mitral regurgitation with moderate pulmonary hypertension. Inspection of the aortic valve during surgery showed nearly total disruption of the right coronary cusp from its attachment. The aortic valve was replaced with a mechanical valve. A flail anterior mitral leaflet near the postero-medial commissure was repaired using Kay's method. The dilated tricuspid annulus was repaired using DeVega's method. Histologic examination of the excised aortic valve revealed myxomatous degeneration. The patient's condition is significantly improved to the New York Heart Association functional class I (2).

*Case 3.* A 23-year-old woman was involved in a high speed automobile accident. She was observed to have multiple injuries. A previously undetected grade 4/6 systolic murmur was heard at the cardiac apex after the accident. Chest roentgenogram showed multiple rib fractures and pulmonary edema (Fig. 2). An echocardiogram revealed a flail posterior mitral leaflet secondary to the torn chordae tendineae, and a grade 4/4 mitral regurgitation. During surgery, the posterior papillary muscle of the mitral valve was found torn from its septal attachment. The anterior mitral leaflet was normal by gross inspection. Replacement of the mitral valve was accomplished using a porcine bioprosthesis. The patient returned to her regular job two months after surgery.

*Case 4.* A 67-year-old man suffered multiple injuries in a motorcycle accident. Initial evaluation in the emergency room of a local hospital revealed multiple superficial lacerations and rib fractures. He developed congestive heart failure 3 days after the accident, but his symptoms were improved by digoxin and diuretic treatment. Seven years after the accident, he again developed congestive heart failure. An echocardiogram revealed a grade 3/4 mitral regurgitation with a depressed left ventricular motion. Mitral valve replacement using a mechanical prosthesis was performed. He returned to his regular job two months after surgery.

Rupture of the mitral or tricuspid valves may

occur in the isometric phase of ventricular systole by compression of the heart with obstruction to the outflow tract (3). The usual cause of the nonpenetrating cardiac trauma is an automobile or industrial accident, other causes include falls from a height such as Case 1. As shown in Case 2, the associated valvular lesions such as myxomatous degeneration may have attributed to the susceptibility to the blunt chest trauma. Preexisting disease or congenital deformity predisposes to valvular injuries after chest trauma (4), but normal valves can be injured in this way.

The interval between the occurrence of trauma and the operation varied from a few hours to 24 years in isolated posttraumatic injury of the mitral valve (5). Some patients develop congestive heart failure immediately after accidents, requiring emergency surgery, others reveal no signs or symptoms for many years after blunt chest trauma. The length of the interval is related to the site of the involved valve and the severity of injury to the valve. As shown in Case 2 in this report, there are some patients who return to their regular jobs unaware of the valvular lesions, and thereafter, develop rapid hemodynamic deterioration by exercise, which is one of the characteristic clinical pictures of traumatic valvular disease.

The diagnosis of traumatic valvular disease rests on the following criteria: antecedent blunt chest trauma, absence of history of heart disease, development of signs and symptoms after trauma. Operative approach will disclose the apparent injury of the valve. Blunt cardiac trauma is often

found in combinations with other organ system injuries including head injuries, major fractures, ruptured viscera, and other less serious but more noticeable injuries, all of which tend to overshadow the cardiac damage. Cardiac injury can occur without any fractures or external bleeding as shown in Case 2, so that the diagnosis of cardiac injury from nonpenetrating trauma is more difficult than penetrating wounds. Surgical management is the treatment of choice, and should be considered before a patient deteriorates.

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