CASE REPORT

HEART TRAUMA FOLLOWING BLUNT CHEST INJURIES

Syed Azhar Hassan Shirazi
Gomal Medical College, Dera Ismail Khan

ABSTRACT

Violent chest injuries due to road traffic accidents account for the majority of deaths in persons under 40 years of age and among these cardiac trauma due to road traffic accidents is one of leading cause of death.

I present a case report in which a 45 years old taxi driver sustained road accident. On auscultation there was no cardiac murmur. ECG showed normal sinus rhythm with non specific ST-T changes. Echocardiography was unremarkable. He was sent home. After four days he turned up with shortness of breath. On auscultation there was grade 4/6 early diastolic murmur down the left sternal boarder, a loud S3 and fine basal crackles. X-ray chest showed widening of mediastinum with upper lobe shunting suggestive of left ventricular failure. Patient underwent cardiac catheterization and coronary angiography. It revealed left anterior descending artery occlusion distal to first septal perforator and frank aortic regurgitation. Trans-oesophageal echocardiography showed moderately severe aortic regurgitation. Patient underwent cardiac surgery. Aortic cusp was excised and prosthesis inserted. Left anterior descending artery was grafted with left internal mammary artery. Patient recovered uneventful and was sent home on oral anticoagulant.

Key words: Heart trauma, Blunt injury, Road accident.

INTRODUCTION

Violent chest injuries due to road traffic accidents account for the majority of deaths in persons under 40 years of age and among these victims cardiac trauma is one of the leading cause of death. Cardiac trauma may include; Myocardial infraction, Ventricular septal defect,[1] Valvular damage,[2,3] Pseudo and true ventricular aneurysm,[4] Pericardial effusion /pericarditis.[2] The most common cause of non-penetrating chest injury in civilian life is directly related to vehicular impact by direct compression with steering wheel squeezing the heart between the sternum and spine.[5] Blunt chest trauma occurs usually after high speed motor automobile and motor-cycle accidents.[1,2] Rupture of the thoracic aorta as a result of sudden deceleration may vary in degree from incomplete to complete transaction. With horizontal deceleration, as in automobile accidents, 80% of aortic rupture occurs at the isthmus of thoracic aorta just distal to the origin of left subclavian artery near the attachment of ligamentum arteriosum.[6,7]

Causes of non penetrating chest injuries other than high speed motor vehicles crashes include direct blow to the chest by any kind of blunt object or missile such as clenched fist and various kind of sporting equipments as well as the kicks of animals and cardiopulmonary resuscitation procedures. Fractures of the bony structure of chest wall may or may not be associated with cardiac injuries in any of this situation.[8,9] The clinical manifestations may not be apparent for days or even week after the accident. Valvular injury is rare, only few cases have been reported in literature.[10]

Radiological findings may include widening of mediastinum, the presence of left pericardial effusion and associated ribs, clavicle, or sternal fracture may also be seen.

Among the valvular trauma aortic valve is the most often involved, followed by mitral valve and tricuspid valve. The mechanism involved in both mitral and aortic valve injuries is a sudden increase in intracardiac pressure during an isovolumetric contraction of cardiac cycle when a tremendous pressure gradient build up across the competent aortic valve. Tear or avulsion from annulus of one aortic cusp especially in non coronary cusp is the most frequently observed aortic lesion.[11]

The mitral valve and sub-valvular apparatus are vulnerable during late diastole and early systole when the delivered impact force suddenly changes the full flooded ventricle and stretches and mitral valve apparatus ultimately causing mitral valve injury most commonly at level of papillary muscle (papillary muscle rupture) cardae tendineae and a leaflet tear.[10,12]

When aortic valve is injured due to blunt chest injury it usually has a tear on the cusp or on a commissure as well. The injury is often combined with trauma of ascending aorta.

Diagnosis of traumatic valvular injury is often suggested by acute or progressive heart failure or heart murmurs following blunt chest trauma.[9] Clinical finding vary widely from asymptomatic to acute cardiogenic shock. New, loud, musical murmurs are characteristic of injury to valvular and supporting structures. The combination of high pitched diastolic blowing murmur with a wide pulse pressure following blunt trauma to the chest suggests the rupture of aortic valve.

Sometime murmur and hemodynamic effect of the rupture may not appear for several days following chest trauma. Aortic regurgitation may also occur due to perivalvular edema or hemorrhage.

Rupture of the tricuspid valve is not rare and is benign than mitral valve rupture, with symptoms ranging from fatigue to ascites and edema. Physical findings can be striking, with prominent systolic venous pulsations, hepatic pulsation, and a typical pan-systolic murmur with inspiratory accentuation.

Cardiac rupture: Heart may be ruptured due to; acute laceration following the compression of heart by direct force,[9,13] or contusion and hemorrhage leading to necrosis, softening and subsequently rupture several days following the trauma. Ventricular rupture is far more common than atrial rupture. Wearing of seat belt does not necessarily prevent this complication of motor vehicle accident.[9]

Aortic trauma: Aortic injuries are associated with severe blunt trauma to chest. Rupture of aortic has been found in 1/6th of all victims who have been autopsied after fatal automobile accidents.[13] It most commonly results from injuries associated with sudden high speed deceleration upon impact such as motor vehicle accident, severe fall, blast injuries or crash injuries.[11] When the body is suddenly arrested against the obstacle, the heart and horizontal portion of arch continue their forward movement (ascending aorta is mobile while descending aorta is fixed to the spine by intercostal arteries). During accident high velocity deceleration force causes the aortic rupture exact at a point where the mobile aorta is attached with fixed descending aorta.[11]

Although the aorta may be torn anywhere along its length, the most frequent point of rupture in 90% of cases is in the aortic isthmus at the site of insertion of the ligamentum arteriosum just distal to the origin of left subclavian artery.

In addition to aortic isthmus other areas of injury include the supra-valvular portion of ascending aorta, the innominate artery, which may be avulsed from the aorta, the aortic arch, etc. Diagnosis is best suspected from the chest roentgenogram by using Marsh and Sturm diagnostic criteria for rupture of aorta based upon a 40 degree antero-posterior supine chest film.[13] These criteria includes:

- Widening of mediastinum measuring greater than 8 cm at the level of the aortic knob.[11]
- Shift of the trachea toward the right.[9]
- Blurring of the normally sharp outline of the aorta.
- Obliteration of the medical aspect of the apex of the upper lobe of the left lung.
- Depression of the left main stem bronchus below 40 degrees.
- Opacification of the clear space between aorta and pulmonary artery.
- Increased mediastinal width compared to chest width, m/c ratio >0.20 considered to be abnormal.

About 80% of the patients die instantly with aortic rupture.[20] About 2 to 5% of patients with partial tear of aorta go on to develop a local aneurysm over a period of months or year usually anterior to the aortic isthmus. Usually this aneurysm may either calcify or may become infected.[13]

CASE REPORT

A 45 years old taxi driver sustained high velocity road accident. During accident his chest was pressed against steering wheel. He too received minor multiple bruises on his head along with fracture of right clavicle. He was restless with mild degree of breathlessness.

On physical examination he appeared stable haemodynamically with stable vital signs. He was clear in consciousness. On auscultation no cardiac murmur was heard. The ECG showed normal sinus rhythm with non specific ST-T changes. Echocardiography with Doppler study was performed on first day it showed good L.V function with ejection fraction was 60%. There was no evidence of any pericardial effusion.

After four days he turned up with following complaints:

- Breathlessness NYHA (New York Heart Association) Class III.
- On Physical examination there was grade 4/6 early diastolic murmur over left sternal boarder. There was loud S3 (ventricular gallop) in addition to fine basal crepitations bilaterally.
- X ray chest showed widening of the mediastinum with upper lobe shunting (interstitial edema) suggestive of left ventricular failure. There was moderate pericardial effusion on left side of the chest.

- Repeat ECG showed sinus rhythm with definite ischemic ST- T changes, deep symmetrical T inversion in all leads.

Patient was started on analgesic treatment and referred to cardiology unit of Post Graduate Medical Institute LRH, Peshawar, for further evaluation and work up. Patient underwent cardiac catheterization and coronary angiography. Coronary angiography revealed left anterior descending artery occlusion distal to first septal perforator and frank aortic regurgitation.

After procedure he got worse with deteriorating haemodynamic state. Transoesophageal echocardiography was performed which showed moderately severe aortic regurgitation (AR+3). Patient was observed for 24 hours and put on aggressive medical treatment but unfortunately patient did not show positive response to medical treatment. After complete failure to medical treatment cardiothoracic surgeon was consulted immediately and patient was transferred to cardio thoracic unit. At cardiothoracic unit patient underwent cardiac surgery, chest was open through midline incision with standard by-pass procedure.

There was eccymosis on the right ventricle beside avulsion of left coronary cusp of aortic valve. The aortic cusp was excised and a 23 mm Edward MIRA valve prosthesis was inserted. The left anterior descending artery grafted with left internal mammary artery. Patient remained hospitalized for ten days and discharged with uneventful recovery. Patient was put on oral anticoagulant medication and its was adjusted according to the International normalized ratio (INR). Patient was also advised to report regularly for follow up and for future monitoring and dose adjustment of anticoagulant (warfarin) according to INR. INR was maintained on 3.5.

REFERENCES

1. Shaikh KA, Schwab CW, Camishion, RC. Aortic rupture in blunt trauma. Am Surg 1986; 52: 47.
2. Greendyke RM. Traumatic rupture of aorta: special reference to automobile accidents. JAMA 1966; 195: 527.
3. Fleeming AW and Green DC. Traumatic aneurysms of the thoracic aorta: Report of 43 patients. Ann. Thorac. Surg 1974; 18: 91.
4. Faro RS, Monson DO, Weinberg M, Javid H. Disruption of aortic arch branches due to non penetrating chest trauma. Arch Surg 1983; 118: 1333.
5. Sturm JT, Billiar TR, Dorsey JS, et al. Risk factor for survival following surgical treatment of traumatic aortic rupture. Ann Thorac Surg 1985; 39: 418.
6. March DG, Sturm JT. Traumatic aortic rupture: Reontgenographic indications for angiography. Ann. Thorac Surg 1976; 21: 337.
7. Sturm JT, Olson FR, and Cicero JJ. Chest roentgenographic findings in 26 patients with traumatic rupture of the thoracic aorta. Ann Emerg Med 1983; 12: 598.
8. Brooks AP, Olson LK, Shackford SR. Computed tomography in the diagnosis of traumatic rupture of the thoracic aorta. Clin Radiol 1989; 40: 133.
9. Miller FB, Richardson JD, Thomson HA, et al. Role of CT in diagnosis of major arterial injury after blunt thoracic trauma. Surgery 1989; 106: 596.
10. Atkins CW, Buckley MJ, Daggett W, et al. Acute traumatic disruption of the thoracic aorta: A ten year experience. Ann Thorac Surg 1981; 31: 305.
11. Symbas PJ, Horsley WS, Symbas PN. Rupture of the ascending aorta caused by blunt trauma. Ann Thorac surg 1998; 66: 113-7.
12. Banning AP, Pillai R, Non-penetrating cardiac and aortic trauma. Heart 1997; 78: 226.
13. Egoh Y, Okoshi T, Ane J, et al. Surgical treatment of traumatic rupture of the normal aortic valve. Eur J Cardio Thorac Surg 1997; 11: 1180-2.

Address for Correspondence:

Dr. Syed Azhar Hassan Shirazi
Senior Lecturer & District Cardiologist
Gomal Medical College
D.I. Khan, Pakistan