



Research Article

DEATH DUE TO CARDIAC TAMPONADE BY INDIRECT TRAUMA – A SERIES OF TWO CASE REPORTS

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ABSTRACT

Cardiac tamponade is a life threatening condition in which the heart is compressed due to pericardial accumulation of fluid, pus, gas, blood and clots as a result of acute fluid effusion, trauma and rupture of the heart. Such fatal conditions are sometimes left undiagnosed during treatment and are detected during autopsies. We present two cases with death as result of cardiac tamponade due to indirect trauma by transmission of blunt force in which undetected and unexpected finding were present.

Key words:

Cardiac injury, blunt cardiac trauma, rupture of heart.

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INTRODUCTION

Cardiac injuries are mostly caused by direct trauma over the chest, by compressing the thorax. This may or may not be associated with external injuries or fractures of the ribs or sternum. The commonest sites of traumatic cardiac rupture in order of diminishing frequency are right auricle, right ventricle, left auricle, ventricular septum and the valves. Pericardial cavity containing around 200 to 300ml of blood and fluid can cause death by increasing intra-pericardial pressure and producing external compression of the heart, with subsequent inadequate filling of chambers and interference with ventricular contractility.¹

Contusions or lacerations of the heart are caused by direct violence on chest as by blows, fall from a height and anteroposterior compression of the thorax when the driver gets forcibly impaled on the steering wheel following an accident. At times sudden and severe cardiac injury are associated with arrhythmias, fibrillation etc.²

Cardiac injuries are usually on the front of the organ, especially to the right ventricle, though posterior bruising and laceration can occur if the heart is compressed against the thoracic spine, as in stamping assaults and steering wheel impact.³

Cardiac rupture is estimated to cause 10% to 15% of adult motor vehicular crash fatalities. Two thirds death owing to cardiac rupture occurs at the scene of the accident.

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Ventricular rupture can result from direct cardiac compression or from an indirect hydraulic ram effect that occurs during abdominal or extremity compression.⁴

Case report: -Case -1

A 30 weeks primigravida female was physically assaulted by her husband on the abdomen, followed by leaking and premature labour pain. She delivered a premature female baby in our facility. After delivery the baby showed severe respiratory distress with APGAR score 6/10. After 3 days the baby died in NICU (Neonatal Intensive Care Unit) of the Institute. The body was then sent for autopsy.

Findings on Post-Mortem Examination

External examination of baby-The body was pinkish in colour, weight and length were 1.5 Kg and 40 cm respectively. Head, chest & abdominal circumference were 29 cm, 25 cm and 25 cm respectively. Scalp hairs were dense, black in colour and 1 to 1.5 cm long. Finger nails were intact and just falling short of tip of fingers. Natural orifices were intact, both eyes were closed, eyebrows, eyelids were present and not adherent. Perineum showed dark brown colour meconium stains. Anterior and posterior fontanelle were not fused.

Internal Examination

On opening the scalp, a diffuse sub-galeal hematoma (figure 1) was present over bilateral parietal area of scalp. Pericardial cavity was full of dark red clotted blood (figure 2). On examination of heart, posterior wall of left atrium showed an oblique tear of size 1 cm (figure 3). The surrounding area of the tear and the coronary sinus showed hyperaemic patches.

Through the defect, clotted blood was seen which was attached to the wall of the left atrium. Stomach contained about 20 cc of brownish mucoid material. The small intestine also contained brownish mucous material. All other organs were congested.

Results of Laboratory Reports

- i. Biochemical examination of blood & urine:
- ii. Urine: protein 2.37mg & creatinine having 0.4mg/dl concentration. Blood: blood urea 135mg/dl, serum creatinine 2.9mg/dl, Serum uric acid 7mg/dl, serum calcium 9.5mg/dl, serum phosphate 33.7mg/dl, SGPT 373U/L and SGOT 549 U/L, Serum alkaline phosphate 661U/L and Serum protein 5.2 gm/dl.
- iii. Microbiological examination – No pathogen was seen in blood culture and blood sample.
- iv. Chemical analysis of viscera – No common poison detected.
- v. Histo-pathological report- (Heart) the representative sections of myocardium showed bleeding in and around the tear. Leucocytes infiltration around the tear.

After completion of the autopsy the cause of death was ascribed to be the injuries and the subsequent complication i.e. cardiac tamponade.



Fig 1 Subgaleal Hematoma



Fig 2 Cardiac tamponade



Fig 3 Tear of left atrium

Case-2

A 27-year-old male with history of assault on lower abdomen over supra pubic region was admitted to a private hospital where he was given treatment for above injury. The patient expired after a day. The body was then sent to autopsy the next day to our facility.

Autopsy findings: -A reddish diffuse contusion was present over lower abdomen over an area of 5 x 4 cm over supra pubic region in midline. On dissection underlying soft tissues and muscles were ecchymosed. On further exploration, anterior wall of the urinary bladder was contused.

On opening the chest wall, cardiac tamponade was noted (figure 1). On further dissection, the pericardial cavity contained about 300 to 400 cc of liquid blood (figure 2). On further exploration of the heart, a tear in the left auricle was appreciable with blood oozing out on manipulation (figure 3). On opening of right side of abdominal wall, inferior surface of liver was lacerated (figure 4). All other organs were congested. Stomach contained about 80 cc brownish mucoid material.

Results of laboratory reports

- i. Biochemical examination of blood & urine:
Urine: protein 6.56mg, & creatinine having 2 mg/dl concentration. Blood: blood urea 55mg/dl, serum creatinine 1.5 mg/dl, Serum uric acid 5mg/dl, serum calcium 11.5mg/dl, serum phosphate 22 mg/dl, SGPT 410U/L and SGOT 320U/L, Serum alkaline phosphate 224U/L and Serum protein 7 gm/dl.
- ii. Microbiological examination – No pathogen was seen in blood culture and blood sample.
- iii. Chemical analysis of viscera – No common poison detected.

Histo-pathological report- (Heart) the representative sections of myocardium showed bleeding in between the myocytes. On completion of the autopsy, the cause of death was ascribed to the injuries and their completion i.e. cardiac tamponade.



Fig-4 Cardiac tamponade



Fig-5 Rupture Heart

Fig-6 Lacerated Liver

DISCUSSION

Cardiac rupture due blunt traumatic is a relatively uncommon diagnosis and is usually associated with a high mortality rate. A case of delayed cardiac rupture is described in an elderly person who sustained blunt chest trauma following a fall into a roadside ditch. In the case reported the preliminary investigations at the time of admission did not show any evidence of haemopericardium. The patient deteriorated suddenly, possibly due to a delayed rupture of the right ventricle that was diagnosed postmortem. Acute cardiac tamponade resulting from rupture of the right ventricle is a serious and life threatening state⁵

Blunt cardiac ruptures most commonly follow road traffic accidents and have a high mortality rate. A truck driver who lost his life following a fatal accident involving his semi-truck and a low viaduct is described. The driver did not have his seat belt fastened and was going at about 70km/h. His truck was wedged under the bridge by its rear causing his fatality. The autopsy found a rupture of the right ventricle and bruises of the right lung associated with fractures of the sternum and ribs. Histological examination revealed myxoid degeneration of the mitral valve which could be involved in this road accident.⁶ In a series of case report Turk KK, and Tsokos M, it was summarised that, although it was the pericardial tears that predominated (45 %) among heart injuries following falls from height, rupture of the right ventricle (39 %) was also more frequent than tear of the left ventricle (9 %).⁷

Tassiopoulos *et al* described the Indirect mechanism in such cases as the sudden deceleration produced by the abrupt stop of the rear of a truck under a bridge. Resulting in intense changes in intrathoracic and intracardiac pressure during sudden deceleration.⁸

Nagahama H *et al* described 67-year-old man hospitalized due to sustain multiple blunt trauma. Chest computed tomography (CT) and ultrasonic echocardiography revealed cardiac tamponade. Abdominal CT indicated left renal contusion.⁹

Suzuki K *et al* report two cases of surgical treatment of blunt cardiac trauma. In the first case, a 34-year-old male, hit in the chest by a collapsing 700-kg steel rod, was transported to hospital via ambulance. The patient was diagnosed as having a cardiac rupture by echocardiography and underwent

emergency thoracotomy. In the second case, a 63-year-old female was hit by a car and transported to hospital due to blunt trauma to the chest. Low blood pressure and chest computed tomography demonstrated cardiac tamponade.¹⁰

A case of an unusual homicidal cardiac contusion is described by Gonin J *et al*. A previously healthy 24-year-old woman suddenly died after being kicked on the chest by her boyfriend. A forensic autopsy was performed showing no external sign of thoracic trauma. A hemopericardium and a cardiac contusion of the basal and posterior surface of the left ventricle were found to be the cause of the death. Death could be a direct consequence of the myocardial contusion through electrical instability or/and consequence of the hemopericardium because its volume and sudden apparition were sufficient to cause tamponade. Numerous associated recent skin contusions mainly located on the face were consistent with inflicted blunt force trauma, supporting homicide as a manner of death. This case report underlines the importance of a systematic complete autopsy in all cases of sudden death occurring in a young adult, to rule out a possible homicide. The present case also shows that myocardial injury must be ruled out in every living patient presenting blunt chest trauma even in the absence of external sign.¹¹

Modi K *et al*. Described There was three cases that did not exhibit any external chest injury revealed hemopericardium following rupture of a cardiac chamber. Thus it is uncommon finding i.e. cardiac laceration in cases of blunt trauma to the chest and there is no evident injury to the chest wall. These case reports underline the importance of a systematic and complete autopsy in all cases of blunt trauma deaths even though they may be having no external injury.¹²

Doll *et al*. Have also reported a patient in whom abdominal blunt trauma leading to massive venous return resulted in rupture of the auricle without pericardial rupture.¹³

CONCLUSION

In the two cases reported, there was blunt trauma which resulted in indirect rupture of the heart leading to fatal cardiac tamponade. It is always advisable to perform thorough and meticulous autopsy in all cases of blunt trauma as underlying cardiac tamponade may be associated with the overlying injuries.

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