

## CASE REPORT

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# Cardiac Rupture Following Blunt Trauma

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**ABSTRACT:** A case of cardiac rupture following blunt trauma with no additional injuries is described. This can be a difficult diagnosis because of the presence of additional injuries and the lack of clinical symptoms. Here, there was a rupture of the pericardium, all chambers of the heart and the thoracic aorta.

**KEYWORDS:** forensic science, forensic pathology, death, autopsy, blunt trauma, cardiac rupture

Cardiac rupture following blunt trauma is a condition with a high mortality rate. However, the diagnosis frequently is not easy to make because of the presence of additional injuries and the lack of clinical symptoms (1). In this case report, we present a postmortem study in which there was a rupture of the pericardium, all chambers of the heart and the thoracic aorta, but where no additional injuries were present.

A 16-year-old boy, who was injured by falling over of a soccer-goal post in the school yard, was taken to a peripheral hospital via an ambulance. Besides abrasions at the back of the waist, contusion and abrasion at the front inside of the left thigh, no pathological signs were found. Radiological examination of the neck and chest were performed, but he expired before any surgical procedure could be done. To clarify the exact cause of death, he was sent to the Council of Forensic Medicine. The autopsy examination revealed multiple ruptures of the pericardium and all chambers of the heart as well as the thoracic aorta (Fig. 1).

### Discussion

Blunt cardiac rupture was first defined by Berard in 1826 in a case involving a young boy who had fallen from a window and died after 2 ½ h as a result of cardiac tamponade (2).

Blunt cardiac rupture occurs in 0.5% of blunt traumas (3) and 10 to 15% of fatal traffic accidents (4). Although many of the reported events are due to traffic accidents, non-penetrating heart ruptures occurring by falling, automobile airbag injuries and horse kicks have also been reported (1–9).

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Blunt traumatic cardiac rupture has an overwhelmingly high mortality rate. In the study of Brathwaite et al. (1), this value was given as 81.3%. In this study, all victims sustained injuries to both chambers of the heart and died.

In the study of Shorr et al. (7), none of the 14 patients survived. All four cardiac chambers may be ruptured (8,9). In a study in which 32 patients with blunt cardiac trauma were examined, the heart rupture was found in 13 cases in the right atrium, eight cases in the left atrium, 10 cases in the right ventricle, four cases in the left ventricle, three cases in both sides of the heart.

In a study in which the right atrium was ruptured by an automobile air bag (5), it is stated that the injury could be related to the fact that the atrium is one of the thinnest vascular structures in the thoracic cavity.

Fenton et al. (6) report a case in which the right atrium and right ventricle of the heart were ruptured.

In our postmortem study, massive rupture of all chambers of the heart was found.

The clinical diagnosis becomes difficult when the heart rupture is associated with other injuries. However, heart rupture could also occur even in the absence of rib fracture or additional traumatic injuries (3–5,7). In a study involving retrospective analysis of 515 cases (7), there was no fracture of the ribs or other thoracic bone structures. As in our autopsy case, especially in young men and women, flexible costal cartilage reduced the possibility of bony fractures.

There are a few accepted etiological mechanisms of blunt cardiac rupture. (a) Direct mechanism: blow injury to the front part of chest. It occurs at the end of the diastole when the ventricle is most distended. It is believed that this is the most common cause of ventricular rupture. (b) Indirect mechanism: in the absence of any chest trauma, the abdomen or lower extremities increase the intrathoracic pressure and cause the cardiac rupture. We believe that in our autopsy case, this mechanism was predominantly effective. During the fall, pressure applied by the lower extremities to the abdomen increased intrathoracic pressure and possibly caused heart rupture at the end of the diastole. (c) Bidirectional mechanism: compression of the heart between the sternum and vertebral bodies. (d) Acceleration/Deceleration: although the heart is fixed by major vessels, it is movable.

This autopsy case was reported because of the type of injury, appearance of rupture of all heart chambers and absence of other significant injuries.

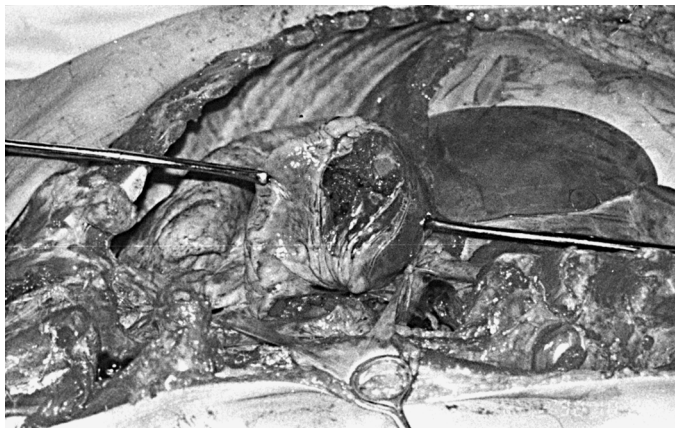


FIG. 1—Autopsy view of the blunt cardiac rupture.

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