

Cardiac Rupture due to Fall: A Case Study

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Abstract

Studies have shown that cardiac ruptures due to blunt trauma are seen more often than expected. However, epicardial injuries and atrial ruptures are common findings in deaths due to falls. Our aim is to present a unique, isolated cardiac rupture in a 2 year-old child resulting from a fall from a bed, to evaluate autopsy findings among the literature from a medico-legal point of view.

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Introduction

Studies have shown that cardiac ruptures due to blunt trauma are seen more often than expected.¹ Isolated left ventricular injuries tend to be less common in blunt traumatic injuries.^{2,3} However, epicardial injuries and atrial ruptures are common findings in deaths due to falls.⁴ Literature reveals that cardiac injury should be suspected in cases with blunt trauma using diagnostic tools in improved emergency room settings.^{1,4} In this paper, our aim is to present a unique and isolated case of cardiac rupture in a 2-year-old child which occurred from a fall, and evaluate autopsy findings with literature review.

Case Report

A 2-year-old girl was admitted to the emergency room after falling from a bed. Her blood pressure could not be obtained and after intubation and resuscitation, the patient was referred to a local university hospital for further evaluation. However, all efforts were futile and she was pronounced dead shortly after her admission. On the same day, a forensic autopsy was performed. On inspection, multiple echimosis and needle puncture sites were found on the left forearm, over the left clavicular and echimosis on the left pretibial regions. On the left side of her chest, echimosis and defibrillator marks from defibrillation were present on the thoracic wall. Internal examination and dissection of the body showed a 1 x 1 cm echimose under the scalp without any bone fracture, injury in the brain or on any intracranial structures. No pathological lesions such

as fractures were detected on the chest wall or in the rib cage musculature. Removal of the sternum revealed a 1.8-cm echimosis on the manubrium sterni and a small 0.2 cm ruptured area on the left side of the pericardium and also the hemopericardium. The heart weighed 100 g and on the anterior aspect of the left ventricle, 2 ruptured areas of 2 cm and 1.5 cm were detected (Fig. 1). No other gross or microscopical pathological lesions were detected in the chest or abdominal organs during the systematic examination. Toxicological analysis was negative. Our aim is to present and discuss this case from a medico-legal point of view as a cardiac rupture is rare in fall from low height in children. An examination of the cardiac for rupture is important to ascertain the cause or manner of death.



Fig. 1. Rupture areas on the left ventricle.

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Discussion

Cardiac ruptures due to blunt trauma are seen more frequently than expected.¹ Studies have shown that an isolated left ventricular injury is a rare consequence following blunt trauma.^{2,3} However, epicardial and atrial ruptures were frequently reported in cases of a fall.⁴ Fedakar et al² reported that the frequency of an isolated left ventricular injury in unnatural deaths involving the heart is 31.3%. Recently, there has been an increasing recognition of chamber disruption caused by blunt chest trauma. Cardiac injury is usually the result of direct compression of the heart between the sternum and the dorsal spine.^{5,6} The most common anatomic injuries are right atrial ruptures (40% to 50%), and the least common is left ventricular rupture (9% to 13%).^{7,8} In our case, left ventricular rupture on the anterior aspect is detected. Parmley et al³ reported cardiac lacerations in more than half of blunt chest trauma cases and testified that only 20% of them had a chance of survival. Mortality rate is high in cardiac rupture cases, however, external examination of the body showed severe traumatic findings in only one third of the cases.⁷ In our case, external examination showed not more than a few small bruises, but isolated cardiac rupture was detected during autopsy. Although the study by Murillo et al⁹ pointed out that heart injuries are rare in blunt trauma cases, they concluded that the reason for an absence of or a less severe external finding is due to the elasticity of the chest wall in children and this could lead to an ignoring of serious internal injuries. Feliciano and Rozycki stated that with the exception of the use of ECG to screen patients for blunt cardiac injury, advances in the diagnosis of thoracic trauma involved new technology. After initial suspicion for mediastinal injury, the use of ultrasound evaluation of the heart in children should be considered. They also reported that surgeon-operated ultrasound evaluations of patients with blunt trauma have recently become the subject of significant interest and is now a common practice in a majority of trauma centres.¹⁰

We state that the left ventricular cardiac rupture occurred as a common effect of the force generated from the compression of the heart between the sternum and the

dorsal spine and the force produced by increased intrathoracic pressure transmitted from a stroke to the chest. In the study by Murillo et al,⁹ the authors claim that children's mediastinal structures are much more mobile and therefore easily displaced, rather than torn, at the time of a rapid deceleration. However, we think that the mechanism where mediastinal structures are easily displaced in the same side is itself the cause of local increased intrathoracic pressure in relatively low impact injury in closed chest compressions, which results in cardiac injury.

Our case was an example of this condition, proving that more attention and care must be given in order to diagnose and treat such innocuous heart pathologies following blunt trauma in a young population.^{1,4}

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