



Case report

Rupture of the left ventricle due to blunt trauma – A pediatric case study and literature review

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ABSTRACT

Tamponade due to rupture of the chambers of the heart, in particular the left ventricle, after blunt thoracic trauma is described only sparsely in the literature. Most cases involve multiple thoracic trauma following motor vehicle accidents.

We present the case study of a five-year old victim of a household accident, in which two concrete basins apparently fell on him. He died rapidly, despite attempted resuscitation.

The autopsy showed essentially a hemorrhagic extravasation of the diaphragm and mediastinum, hemopericardium, and massive damage to the apex of the left ventricle. Pathological exam confirmed the traumatic origin of the cardiac rupture, with no underlying pathology.

We will discuss the mechanisms described in the literature that result in such lesions, the mechanism which we believe most probable in this case, and the importance of background information. In our case study, lack of specific information concerning the accident prevents a definitive conclusion of the exact mechanism that caused this massive trauma particularly due to the fact that the external examination couldn't find any lesion in favor of a thoracic or abdominal traumatism. To our knowledge, in context of a household accident, such an isolated lesion causing almost immediate death has not previously been described in the literature.

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1. Introduction

According to the Ministry of Health, in France, every day, 2000 children between 0 and 6 years old are victims of household accidents. In 2002, the Ministry of Health recorded three hundred and eight mortalities of children between the ages of 0 and 15 due to household accidents of which 64% were less than 4 years old. Such accidents are rarely the object of medico-legal postmortems. The findings all showed that 80% of household accidents of the children less than 6 years occurred during playtime inside and outside the house.

We will explore a special case study involving a child's death caused by a material structure. In this instance we will show that the death of a child resulting from this structure, in fact a fountain wall, will implicate the liability of a number of parties. It requires an investigation of the cause of death and the circumstances,

particularly in respect to a faulty structure which became a mechanism of death.

2. Clinical case study

We will explore the case of a child with a fatal cardiac rupture which is exceptional due to the characteristic of the injury and the circumstances in which it took place; a household accident.

This 5-year-old boy was hit, in an afternoon, by two cast-concrete basins that fell from a fountain, that was comprised of three elements (column and two basins), after climbing in it. His family was alerted by a deaf noise coming from the garden where played the child. Found upright and staggering by his family, he then collapsed. Nobody saw really the accident take place. He was transported to the nearest physician's office where he died soon after despite attempted resuscitation, which consisted in a cardiac massage essentially.

Examination of the premises by the investigators showed that the two upper basins had broken off. Following appraisal by an expert, it appears that the concrete (which was crumbling) broke

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Table 1

Description of the fountain.

Measures from the ground	Height (meter)	Diameter (meter)
Column	0.60	0.30
Basin	0.20	0.80
Column	0.45	0.15
Basin	0.15	0.60
Column	0.25	0.11
Basin	0.10	0.30
statuette		

following traction after being pulled toward the ground. This suggests that the child climbed onto the first basin and gripped the second basin, causing the foot of the column to break off. The weight of the block (the two upper basins and their column) that fell was evaluated at around 40 kg (Table 1) (Fig. 1).

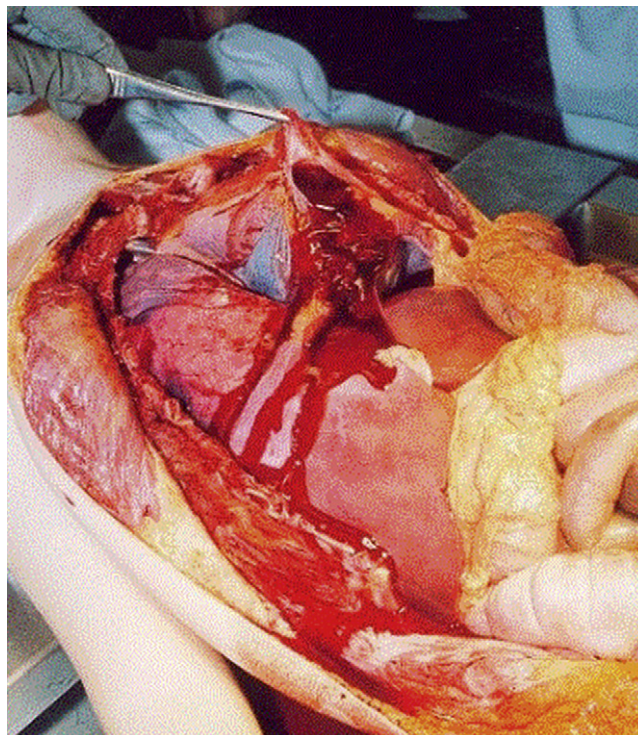
Upon his arrival in the mortuary, the child was naked and No information about clothes carried(worn) at the time of the accident was passed on.

The autopsy showed the following:

- A normal statur-weight development of the child for his age (size 110 cm, weight 23 kg)
- A single external lesion — an ecchymotic scrape next to the lumbar spine, measuring 4.5 cm by 7.5 cm,
- No bone lesions, in particular neither the sternal plastron or the dorsolumbar spine,
- Bilateral pulmonary contusions at the base of each lung and hemorrhagic extravasation in the substernal region of the diaphragm and mediastinum,
- Hemopericardium and massive damage to the left ventricle, but no pericardial lesion. The heart presents an opening along the left edge of the ventricle, being situated in 1 cm over the apex of the myocardium. This opening finds up to the mitral pillar (Figs 2 and 3).

The Pathological evaluation showed the following

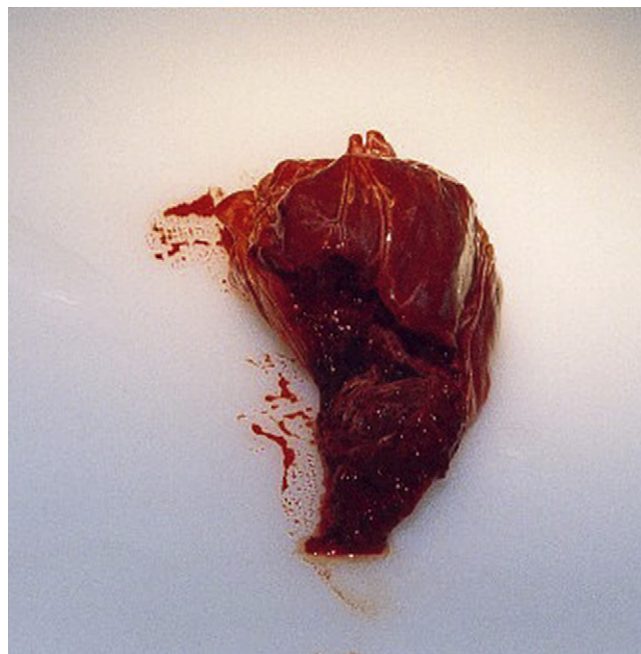
- Heart(80 g): Except the traumatic perforation of the left ventricle, the histology of the heart was normal. Gross and histological examination rule out the presence of other morphological abnormalities.
- Lungs: Intrapulmonary hemorrhage of the right lung with traumatic emphysema.
- Liver, brain, spleen, kidneys were normal.

**Fig. 1.** The fountain after the accident.**Fig. 2.** Massive hemopericardium.

The others organs were normal.

Death followed left ventricular rupture, an injury incompatible with prolonged survival, and which appeared beyond the reach of treatment in view of its extent.

The investigator's findings suggest that the child fell, landing on his back, with possible blunt thoracic and/or abdominal trauma from the upper basins. Because there were no witnesses to the accident, we cannot confirm this hypothesis. Data from previous

**Fig. 3.** Massive damage to the left ventricle.

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