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Case Report

Lethal visceral traumatic injuries secondary to child abuse: A case of practical application of autopsy, radiological and microscopic studies

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ABSTRACT

A 3-year-old boy child died at home. The circumstances of death appeared unclear to the police investigators and a medicolegal autopsy was carried out. External examination revealed diffuse ecchymoses of varying colours. Postmortem imaging using plain X-rays and multislice computed tomography (MSCT) was performed prior to autopsy and pathological study. These investigations revealed fractures at the posterior arch of the ninth left rib. No cerebral and pericerebral traumatic lesions were diagnosed. In the abdomen, haemoperitoneum and pneumoperitoneum secondary to duodenal perforation and liver laceration were observed. At autopsy, a complete pancreatic fracture and duodenal transection were noted, accounting for the MSCT appearance. Furthermore, autopsy revealed the presence of bilateral intramuscular intercostal haemorrhages and a fracture of the eighth left rib at its posterior arch. This case report illustrates the valuable assistance rendered by MSCT as well as its limitations in diagnosing abuse when a child dies in unclear circumstances.

1. Introduction

A 3-year-old boy child with no particular past medical history was discovered at home by his mother's male cohabitee. The child was pale and unconscious on the wall-to-wall carpet of his sleeping room, near his bed. The bed had safety rails whose height was 89 cm from the floor. The rescue team, called by the step-father, found the child unconscious in cardiopulmonary arrest of unknown duration and performed external cardiac massage, nasotracheal intubation, mechanical ventilation and vasopressor drug administration. Numerous external cardiac electric shocks were also delivered. Thirty minutes of attempted resuscitation were unsuccessful and the emergency physician pronounced the death of the child. The circumstances of the infant's death at home were unclear and a medicolegal autopsy was ordered. Postmortem plain X-rays and multislice computed tomography (MSCT) examinations were performed prior to autopsy to study the skeleton and internal organs of the child.

2. Materials and methods

2.1. Imaging studies

Postmortem full-body MSCT investigation was performed on the day of death. Axial MSCT was carried out with 16 mm × 0.75 mm collimation on a Sensation 16 unit (Siemens, Erlangen, Germany). Two- (2D) and three-dimensional (3D) reconstructions were obtained on a Leonardo workstation (Siemens, Erlangen, Germany). 2D reconstructions were obtained using multiplanar reconstruction (MPR). 3D reconstructions were obtained using volume rendering technique (VRT) and maximum intensity projection (MIP) modes. The images were interpreted by a board-certified radiologist.

Postmortem full-body radiological study was performed in the medicolegal department. Plain X-rays of the skull (anteroposterior and lateral incidences), thorax, abdomen and pelvis (anteroposterior incidence) and the upper and lower limbs were obtained.

2.2. Autopsy and pathological studies

Autopsy was performed by two board-certified forensic pathologists. All three body cavities (cranium, thorax and abdomen) were examined. Pathological examination was performed after fixation in 10% formalin. Finally, the results of the different investigations were compared.

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3. Results

3.1. Imaging studies

3.1.1. MSCT

On cranial CT, diffuse oedema was visible with loss of grey matter/white matter contrast. No peri- or intra-cerebral haematomas or haemorrhages and no skull or facial fractures were visible. On thoracic CT, no pleural or pericardiac effusion was noted. Skeletal examination revealed a subtle left ninth rib fracture, at its posterior part. This fracture was not displaced and showed no signs of healing (Fig. 1a). The lungs appeared oedematous and congestive. In front of the rib fracture, a zone of subpleural pulmonary condensation was visible. It was interpreted as a possible pulmonary contusion (Fig. 1b).

A large gaseous and fluid effusion was noted within the peritoneal cavity and interpreted as an indirect sign of intestinal perforation (Fig. 2a). Examination of the liver revealed complete laceration of the right liver, between Couinaud segments V and VI (Fig. 2b). Air bubbles were visible behind the posterior part of the liver, interpreted as possible extraintestinal air (Fig. 2b). No other traumatic visceral or bone lesions of the abdomen or pelvic bones were clearly visualised, but poor natural contrast and lack of internal fat did not allow good analysis of internal organs, of the pancreatic gland in particular. Examination of the appendicular skeleton revealed no direct or indirect signs of fracture. Permeability of the right inguinal canal was noted, with fluid around the right testicle.

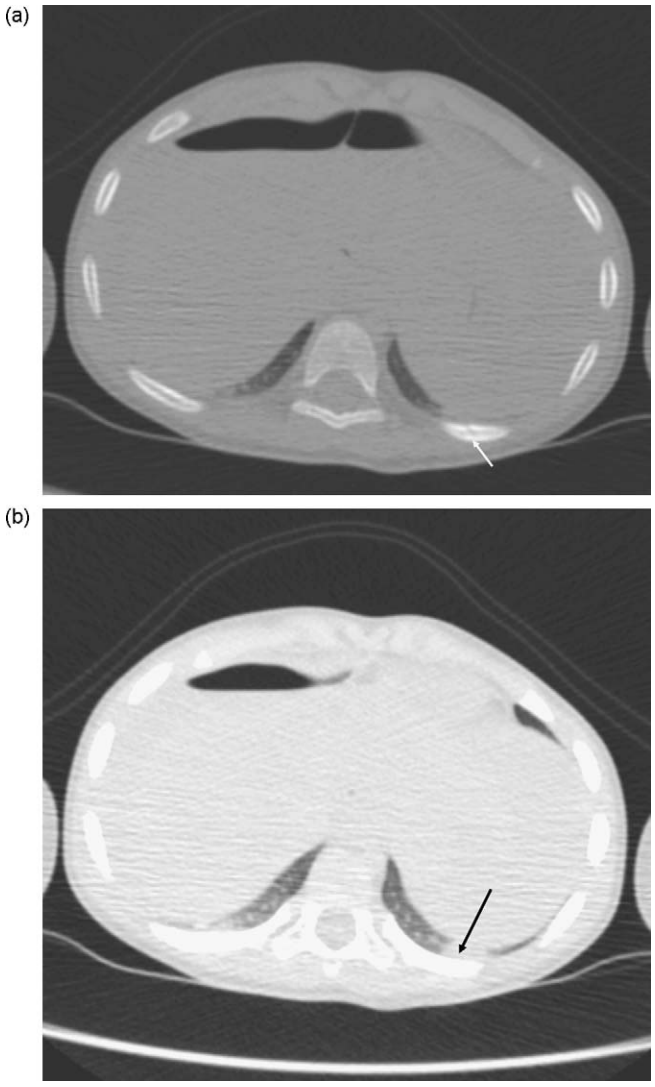

Fig. 1. Postmortem chest MSCT study. (a) Axial image of the chest: subtle fracture of the posterior arch of the left ninth rib (arrow). (b) Axial image of the chest: lung parenchyma condensation in front of the rib fracture at the inferior and posterior part of the left lung (arrow).

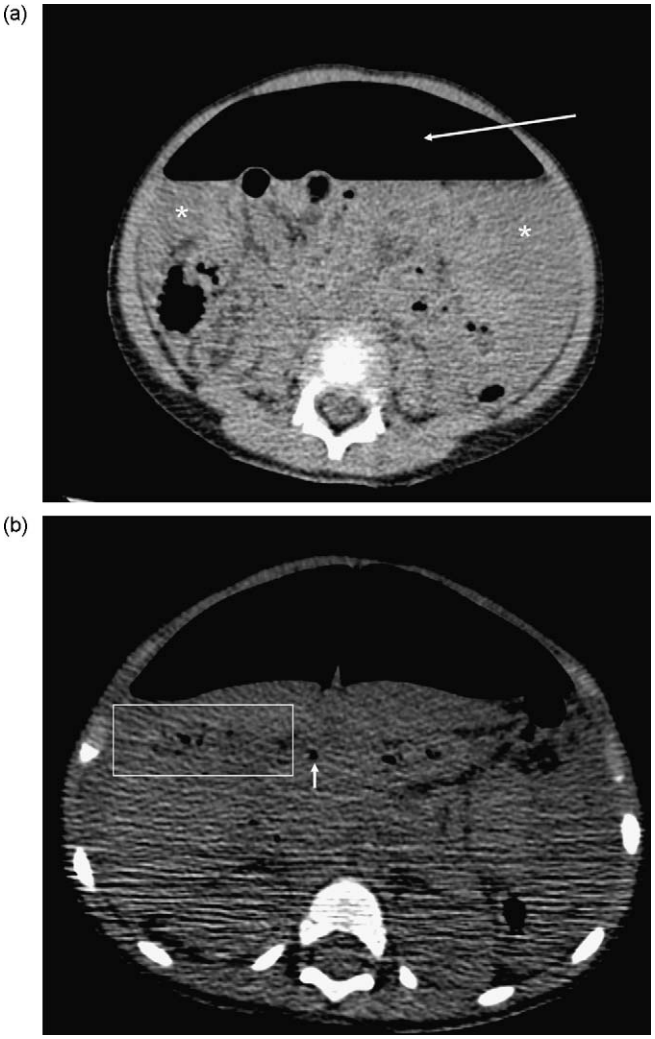

Fig. 2. Postmortem abdominal and pelvic MSCT study. (a) Axial image of the pelvis: presence of an intra-abdominal air-fluid level with a large amount of gas (arrow) and a large quantity of fluid (stars) surrounding the intestinal structures. (b) Axial image of the abdomen: large right liver fracture (rectangle) with a retrohepatic bubble of gas (arrow).

In summary, pneumoperitoneum was diagnosed secondary to intestinal perforation. The exact intestinal segment injured and perforated was not clearly visible on the postmortem CT scan. Haemoperitoneum secondary to severe laceration of the liver was diagnosed. In the chest, a posterior left fracture of the ninth rib with a pulmonary contusion was noted. None of these features were consistent with a fall from a height of less than 1 m.

3.1.2. Plain X-ray

This examination confirmed the left rib fracture (Fig. 3). No other traumatic bone injury was noted.

3.2. External examination

The body was of thin build, naked, length 96 cm and weight 14.4 kg, with a body mass index of 16, corresponding to the 50th percentile for a 3-year-old boy. Numerous ecchymoses of varying