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Case report

The usefulness of post-mortem computed tomography in a crush asphyxia. An excessive enjoyed rave party resulting in a fatal sleep!

Aniello Maiese [a], Serenella Serinelli [a,*], Lorenzo Gitto [a], Pietro Falco [b], Valeria Panebianco [c], Giorgio Bolino [a]

[a] Department of Anatomy, Histology, Forensic Medicine and Orthopedics, "Sapienza" University of Rome, Rome, Italy
[b] Office of Forensic Medicine, Chieti, Italy
[c] Department of Radiological Sciences, Oncology and Pathology, "Sapienza" University of Rome, Rome, Italy

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ABSTRACT

PMCT (Post-mortem computed tomography) is a reliable diagnostic instrument for identification of body gas.

The corpse of a 28 years-old man was found under a car. According to the declaration of the owner of the car, he started the engine of the vehicle but it did not move with ease. Therefore, he alighted from the car and found an unresponsive man lying on the ground. According to the investigation, the victim had been at a rave party the night before, drinking a lot of alcohol.

A PMCT scan was performed before the traditional autopsy examination. On the report, multiple fractures were described, together with an anterior bilateral small to moderate pneumothorax and a diffuse subcutaneous emphysema of the upper anterior trunk. During autopsy, the specific test for pneumothorax was performed, showing a negative result.

The cause of death was determined to be a crush asphyxia due to the running over by the car, associated with traumatic injuries of the chest and a respiratory distress due to acute ethanol intoxication. The presence of vital signs clarified the fact that the victim was alive at the time of the trauma.

PMCT was of great help in identifying multiple fractures and also the presence and the amount of gas, even if moderate. Thanks to the PMCT we were able to clarify the mechanism of death and to identify signs of vitality (pneumothorax and subcutaneous emphysema), even before the autopsy examination. Autopsy confirmed the features observed by the radiological scans.

1. Introduction

The use of Post-mortem computed tomography (PMCT) is growing in the field of forensic pathology as a supplement to the traditional autopsy [1]. The main advantage of this method is related to its non-invasive approach and to the possibility of future re-evaluations of the obtained scans. In fact, autopsy examination is considered as a not repeatable evaluation. Then, if a particular condition is not specifically investigated at the beginning of the examination, it will be very difficult or impossible to verify its presence afterwards, due to the irreversible modifications produced by the technique on the anatomical area or because of post-mortem changes. In addition, autopsy techniques are often operator-dependent, while imaging allows to have multiple opinions in order to detect findings that may be unrecognized at the post-mortem examination. In particular, PMCT is a highly reliable diagnostic instrument in several important areas of forensic pathology, such as identification of fractures, foreign bodies and gas [2–5].

Here we present the case of a man crushed under a car, in which PMCT allowed us to reconstruct the injuries and to clarify the causes of death.

2. Case

In an unpaved road, the corpse of a 28 years old man was found under a car, just behind the front wheels (Fig. 1). The body was placed in a supine position, and transversely in respect to the longitudinal direction of the vehicle. According to the declaration of the owner of the car, in the early morning, he started the engine of his car but the vehicle did not move with ease. Therefore, he

* Corresponding author. Tel.: +39 0649912945.
E-mail address: s.serinelli@gmail.com (S. Serinelli).

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Fig. 1. (a) The car jacked up by rescuers in order to free the corpse. (b) The position of the victim under the car.

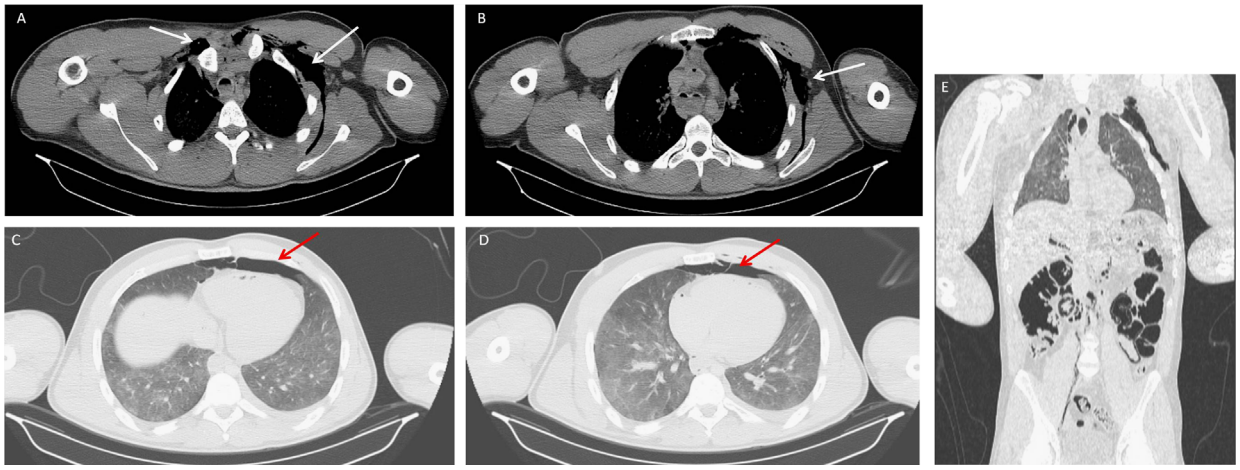

Fig. 2. (a, b, c and d) Axial computed tomography (CT) scans: bilateral pneumothorax (red arrows) and subcutaneous emphysema (white arrows). (e) Coronal CT scan: a different view of the subcutaneous emphysema.

alighted from the vehicle and noticed the presence of two feet that protruded from the area behind the left front wheel. Looking under the car, he found an unresponsive man lying on the ground and he called the ambulance. Rescuers jacked up the car and freed the corpse. The corpse worn a cotton T-shirt, showing a dirty tissue with multiple lacerations, blood stains and gravel on the back. On the lower surface of the car, traces of blood and hairs were found. According to the circumstantial evidences, the victim had been at a rave party the night before, where he had been heavily drinking.

2.1. Radiological findings

A preliminary PMCT examination was performed before the traditional autopsy examination (Fig. 2). The acquired scans were rendered using the open source software OsiriX MD 3.0 (GNU Lesser General Public License) on an Apple® Mac OS X 10.9 device in order to obtain a 3D reconstruction of the body surfaces (Fig. 3). The following findings were described on the PMCT report: atlanto-axial type 1 counterclockwise dislocation, but normal appearance of the odontoid process. Right sternoclavicular joint dislocation with postero-inferior movement and right venous anonymous trunk compression. Left sternoclavicular joint dislocation with superior movement. Fractures of the transverse apophysis of C7 (7th cervical) – T1 (1st thoracic) vertebras on the right. Fractures of the transverse apophysis of the C7 vertebra on the left. Fractures of the right I and II ribs at the costovertebral junction. Multiple fractures of the left I, II and III ribs at the costovertebral junction and on the anterior arc, and multiple fractures of the left IV-V-VI on the anterior arc. On the upper part of the thoracic cavity an anterior bilateral small to moderate amount of pneumothorax was present together with a diffuse subcutaneous emphysema of the upper anterior trunk.

2.2. Autopsy findings

At the external examination an ecchymotic mask (so-called “Morestin” mask) was observed. On the right frontal–parietal scalp and on the upper lip, multiple lacerations and grazes were present. Multiple widespread abrasions were irregularly distributed over the whole body surface. On the right side of the left nipple, a circular-shaped imprint abrasion was observed, 1.5 cm in diameter (Fig. 4). Palpation of the skin over the anterior chest showed evidence of crepitus, as result of subcutaneous emphysema.

At the internal examination, upon reflecting the scalp, there was a bilateral frontal–parietal scalp hemorrhage. A specific autopsy test for pneumothorax observation was performed, reflecting and dissecting the skin and muscles of the chest, applying a lateral traction on them in order to obtain a pocket, and filling it with water. A scalpel was introduced under the water level through an intercostal space and no leak of gas was detected. On both thorax cavities, ribs fractures (consistent with radiological findings) together with laceration of the parietal pleura and multiple lacerations of the lungs were observed. In the left thorax cavity an amount of 100 mL of blood was found. On the soft tissues surrounding the ribs fractures multiple areas of hemorrhage were present. On the soft tissues surrounding the aorta and the left kidney, a hemorrhage was found. Other organs were unremarkable, with the exception of a fatty liver.