



Case Report

Suicidal knife wound to the heart: Challenges in reconstructing wound channels with post mortem CT and CT-angiography

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ABSTRACT

We present a case of an individual who stabbed himself through the heart with a large knife. Post mortem computed tomography (CT) and CT-angiography were used to assess the stab channel and to reconstruct the sequence of events. After penetrating injuries to the chest, both the intra-thoracic organs and the injury causing instrument may shift (e.g. from pneumothorax) and render forensic reconstructions more challenging. This case report illustrates the potentials and the pitfalls of CT for the reconstruction of penetrating injuries to the chest.

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1. Introduction

In depth assessment of penetrating injuries is crucial to both surgical planning and forensic case reconstructions [1–4]. Computed tomography (CT) has proved to be useful for this purpose in clinical situations, in the post mortem setting and under experimental conditions [1–6]. However, penetrating injuries to the thoracic cavity may be especially challenging to reconstruct because the lungs and the heart may shift after an injury has occurred, due to pneumothorax or tension pneumothorax. We describe a case of a suicide with a large knife where post mortem CT (PMCT) and post mortem CT angiography (PMCTA) were used to assess the penetrating injury, the stab channel and to aid the reconstruction of the peri-mortal events.

2. Case report

A 57-year-old male, suffering from bipolar disorder, escaped from a psychiatric clinic and committed suicide by stabbing himself in the chest with a large knife (Fig. 1). The deceased was discovered on a bench in a nearby wooded area, in a half-seated

position (Fig. 2a). The corpse was delivered to our institute for forensic examination and post mortem imaging. The time interval between death and postmortem imaging was 9 h. Imaging was performed using a helical 6-slice CT (Somatom 6, Siemens Medical Solutions, Forchheim, Germany). The corpse was placed in the supine position on the CT-table for both the non-contrast CT and the CT-angiography. Non-contrast CT was performed with the knife in situ (Fig. 2b), CT-angiography was performed after careful extraction of the knife. PMCTA was performed, according to the method described by Ross et al. [7]. Image reconstructions were carried out with a Siemens Leonardo workstation (Siemens Medical Solutions, Forchheim, Germany), including maximum intensity projection (MIP), and volume rendering technique (VRT). The non-contrast PMCT of the thorax displayed the position of the knife in the left hemithorax. There was a small gas collection in the subcutaneous fat, medial to the left nipple, at the level of the entry wound. The blade of the knife passed through the 5th intercostal space into the left thoracic cavity, partially severing the 5th rib. There was a left pneumothorax with mediastinal shift to the right, extensive hemorrhagic pleural effusion in the left hemithorax and blood in the mediastinum. The blade was positioned several centimeters away from the heart and mediastinum. The tip of the blade had cut through the left diaphragm and was positioned laterally of the fundus of the stomach (Fig. 3). There was no blood in the abdominal cavity. The remainder of the examined regions (e.g.

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Fig. 1. Photograph of the suicide instrument, a standard kitchen knife with a 19 cm blade, with scale marker.

head, neck, abdomen and extremities) showed no relevant pathological findings. Our initial conclusion was of a lung injury with fatal bronchial artery hemorrhage, however, PMCTA revealed a full thickness cut through the anterior wall of the left ventricle with extensive extravasation of contrast medium into the left pleural space (Fig. 4a). The stab wound of the heart appeared to be several centimeters distant from the suspected path of knife blade, based on the information from non-contrast CT. PMCTA revealed no vascular lesion in the lungs. Subsequent forensic autopsy confirmed the above presented results (Fig. 4b), including the intact lungs, but did not add any further information.

3. Discussion

In order to reconstruct the sequence events of this case, a close collaboration between radiologists and forensic pathologists was crucial. Based on scene investigation, external inspection, as well as the imaging and autopsy findings, it was safe to conclude that

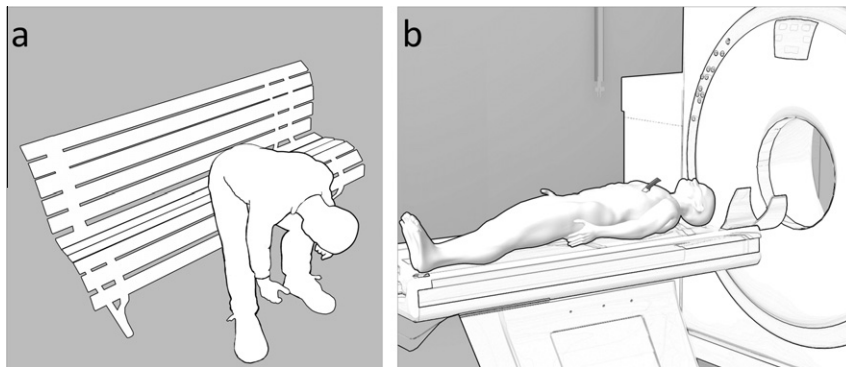


Fig. 2. Artist's rendering. (a) Artist's rendering of the position in which the body was discovered, seated on a bench, forward flexed at the waist, with the trunk resting on the thighs. (b) Artist's rendering of the body's position during PMCT scanning, with the knife left in position for the non-contrast PMCT.

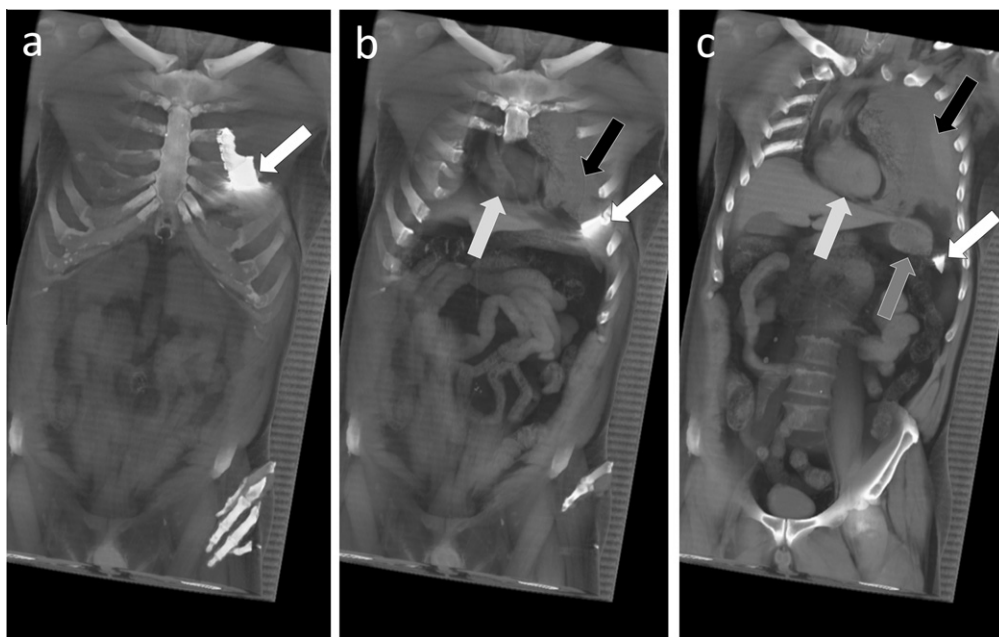


Fig. 3. Images (a) to (c) are maximum intensity projection images of the non-contrast PMCT. (a) The blade (white arrow) enters the chest at the level of the 5th intercostal space into the left thoracic cavity. (b) The blade (white arrow) is positioned quite distant from the heart (light gray arrow). Note extensive hemothorax (black arrow). (c) The tip of the blade (white arrow) is located laterally of the stomach (dark gray arrow). Hemothorax (black arrow), heart (light gray arrow).

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