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CASE REPORT

Gas embolism following intraosseous medication application proven by post-mortem multislice computed tomography and autopsy☆

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Summary The post-mortem use of modern imaging techniques such as multislice computed tomography (MSCT) is becoming increasingly important as an aid for conventional autopsy. This article presents a case of a 4-month-old boy who died from sudden infant death syndrome (SIDS) with intravascular gas after an intraosseus medication application documented by post-mortem MSCT. It is most likely that the gas entered the body during resuscitation.

This case emphasises the advantage of post-mortem imaging as a complementary aid for the autopsy. We conclude that during emergency treatment, the medical staff should be aware of the possibility of causing a gas embolism following intraosseus medication. Resuscitation with an inserted, disconnected intraosseous needle should be avoided.
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Introduction

The post-mortem use of multislice computed tomography (MSCT) is becoming increasingly important as an aid for conventional autopsy.[1—4] The main advantages of post-mortem imaging are observer-independent documentation of the findings, data storage with the option to review a case years later and the possibility to emphasise points of interest to the forensic pathologist prior to autopsy.

In the following, a case of SIDS with intravascular gas due to intraosseous medication application, which was detected by post-mortem MSCT, is presented.

Case report

A 4-month-old boy was found lifeless in his bed, lying in a prone position under his bed-sheet

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without any movement restriction. His father started resuscitation which was continued by the emergency crew after 20 min. By the arrival of the emergency crew the child showed apnoea and pulselessness. The resuscitation according to ABC principles of Paediatric Life Support guidelines, including opening the airway, ventilation by bag-mask and chest compressions (ratio 1:5) was initialised by board-certified anaesthesiologists.[5] Due to the absence of any visible vein an intraosseous portal was immediately performed in the proximal tibia using a bone marrow aspiration needle (15 gauge) (Medilink, Lugano, Switzerland). Using this intraosseous needle, adrenalin was twice administered; the first dose was 50 μg (10 μg/kg body weight) and the second 500 μg (100 μg/kg body weight). In-between and after the injections a syringing infusion of NaCl 0.9% was also applied through the needle. No other fluid or medication was administered. The attempts proved futile and after appearance of livor mortis the resuscitation was ceased approximately 20 min after begin.

A post-mortem MSCT examination was performed on a six-slice scanner (Emotion 6, Siemens, Germany) 8 h after death. The entire corpse was scanned with a collimation of 6×1.0 mm, a slice thickness of 1.25 mm and a field of view of 300 mm. Reconstructions were made with a sharp (B80s) and a smooth (B30s) kernel. A 3D volume rendering analysis using an air structure protocol was performed.[1,4] Image interpretation was carried out by a board-certified radiologist.

Subsequent traditional autopsy with the opening of all three body cavities and a soft tissue dissection of the back was performed by board-certified forensic pathologists 24 h after cessation of resuscitation attempts.

At the external examination, 2 h after cessation of resuscitation efforts, rigor mortis was developing in every joint, except for the cervical spine, and livores were present but not fixed. Rectal temperature was 33 °C at an ambient temperature of 21 °C. According to these signs it was assumed the boy died approximately 3 h before the external examination, so he must have been dead at the time of resuscitation. On the right proximal tibia a puncture mark was noticed. Externally, no pathological findings or traumatic injuries were observed.

MSCT showed gas in the hepatic veins, the right atrium (Figure 1) and the right ventricle, the upper pole of the right kidney and the cerebral vessels. A major gas accumulation was seen in the right leg (Figure 2). The exact localisation, however, could not be confirmed because of the small size of the vessels and the absence of a contrast medium. Since the finding of gas in the right heart indicates a venous port of entry, it was postulated that the gas in the leg was located in the vena poplitea and in the vena tibialis posterior (Figure 2).[6]

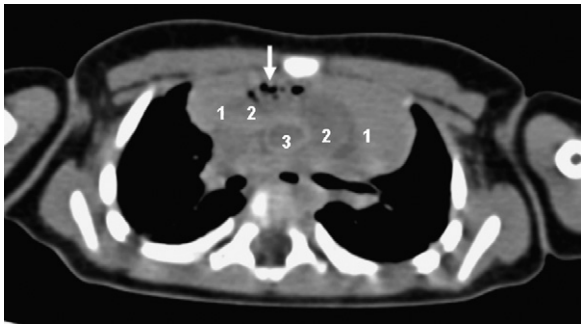

Figure 1 Axial MSCT image of the thorax (B30s) showing the thymus (1), the heart (2), and the aorta (3). The hypodense areas (arrow) can be defined as gas in the top of the lumen of the right atrium.

A hyperdense region was found in the subcutaneous fat tissue below the right patella. This indicates a haemorrhage, although the presence of other fluids cannot be excluded radiologically. There were three puncture marks visible in the right

Figure 2 A 3D reconstruction of the legs using an air structure protocol. Gas in the right leg is observable (arrows).

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