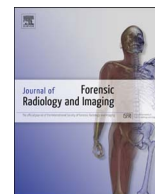




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Peculiar radiopaque foreign body in the upper aerodigestive tract in a newborn corpse from the Indian Ocean

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ABSTRACT

The authors present a single case report illustrating on the body of a newborn found on the seashore of the island of Mayotte in the Indian Ocean, the diagnostic difficulties inherent in the detection during the post-mortem scan of a voluminous highly radiopaque foreign body in the upper aerodigestive tract. The internal examination has highlighted black sand in abundance in the upper aerodigestive tract. The CT scanning of a sand sample from the lagoon shore confirmed its high-density radiopaque nature. In a specialized laboratory, the magnetic part of this sample was investigated by means of energy dispersive X-ray spectroscopy (EDS), powder X-ray diffraction (XRD), and Mössbauer spectroscopy. The mineral composition is dominantly magnetite (Fe₃O₄) but contrary to pure magnetite, a relevant fraction of titanium was detected.

This case demonstrates how post-mortem CT may lead to inappropriate diagnosis and highlights the interest of the physicochemical study in the forensic context.

1. Introduction

Mayotte, an overseas department of France located in the northern Mozambique Channel in the Indian Ocean off the coast of Southeast Africa, is the oldest of the 4 major islands of the Comoro archipelago, with a volcanic activity origin. Mayotte is backed by a 160 km long coral reef surrounding a 1100 km² lagoon, one of the largest in the world.

Through the case of the discovery of the unidentified body of a newborn male, the authors present the diagnostic difficulties inherent in the detection during the post-mortem CT scan (PMCT) of a voluminous highly radiopaque foreign body. This case demonstrates how PMCT may lead to inappropriate diagnosis and emphasizes the possible importance of a physicochemical study in the forensic context.

2. Case report

In November 2014, the unidentified body of a newborn male was discovered floating on his back in the shallow surf of a beach lagoon of the island of Mayotte. This body, with an incomplete umbilical cord, was coated with blackish sand.

2.1. Imaging: post-mortem computed tomography

The postmortem CT performed at day 7 after the discovery of the body demonstrated in this child born at term a hyperdense cervical-cephalic formation (3000 UH) compatible with a mono-block foreign body in the upper aerodigestive tract, originating in the nasal cavity and oral cavity and down to the mediastinum, facing the second, third and fourth thoracic vertebrae. This formation measured about 10 cm (4 in.) in height. The distal end, situated opposite the esophagus and

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Fig. 1. Whole-body PMCT of the newborn corpse.

trachea, appeared bifid (Fig. 1).

In addition, post-mortem scanning objectivized unpaired and expanded lungs without peripheral opacities. No bone lesions, both cephalic and peripheral, were detected.

2.2. External examination

In this newborn, it objectified only black sand at the integument and within the natural orifices of the face.

2.3. Autopsy

The lungs were expanded and occupied the entire pleuro-pulmonary cavity. The heart-lung as well as each of the isolated lungs floated in the crystallizer. Only black sand had been found and aspirated in abundance in the oral cavity, the pharynx, the larynx, the trachea and the upper third of the esophagus (Fig. 2).

2.4. Additional examinations

After the autopsy, a sand sample was taken from the body discovery site (Fig. 3). The scanner examination carried out with an identical setting with respect to that of the post-mortem examination confirmed the radiopaque nature of the sediment, compatible with its high density

and chemical composition.

Concomitantly, the initially realized scanner benefited from three-dimensional reconstructions confirming the existence of an extremely dense and homogeneous structure with irregular edges at the level of the upper aerodigestive tracts and of the trachea, extending up to the height of the carina (Fig. 4). This material, possibly liquid or powdery, molds the walls of the nasal fossae, the three stages of the pharynx and the trachea.

2.5. Histology

The histological study was not very contributory in view of deficient conditioning conditions and/or storage of samples. The demonstration of the intra-bronchial and intra-alveolar position of birefringent particles that can evoke silica grains proved in favor of inhalation.

2.6. Sand sample physicochemical analysis

The sand sample was separated into a magnetic and a non-magnetic component by means of a strong permanent spherical magnet (Fig. 5).

The magnetic fraction accounts for about 95% of the total mass. Only the magnetic fraction was further characterized by means of energy dispersive X-ray spectroscopy (EDS), powder X-ray diffraction (XRD), and Mössbauer spectroscopy [1]. The elements composing the

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