Needles in the Lungs: An Autopsy Case of Pulmonary Ossification in a Putrefied Body

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Case Report and Discussion

The deceased was a 54-year-old man who lived alone and was found dead by his landlord. Four-month-old mails were present on his front door, and his putrefied body was found on the bed. A forensic autopsy was performed to investigate the death within 2 days of recovery of the body, per a court-issued warrant at the request of the public prosecutor. His medical history was not recorded before the autopsy. The autopsy revealed a well-nourished body contour and body mass index of 22.9 kg/m². External and internal examinations revealed no injuries. The cause of death could not be determined by examination of the internal organs due to putrefaction. However, sharp materials ranging from sub-centimeters to several centimeters in diameter...
were identified in the pulmonary parenchyma of both the lower lobes of the lungs, which the forensic pathologist described as needle-like. However, the cause and manner of death could not be determined during gross dissection.

Laboratory tests were conducted on postmortem (PM) tissues sampled during autopsy. Toxicological tests of the hepatic and renal tissues revealed no drugs or toxic materials. Ethyl alcohol and normal propyl alcohol concentration in the muscle tissue was 0.031% and 0.0005%, respectively. A pathological examination revealed pulmonary ossification. Calcified lamellar bone spicules were identified in the fibrotic interstitium and putrefied pulmonary tissues. Marrow tissue composed of fat and blood cells was identified within the osseous tissue. Immunoreactivity is thought to decrease because of putrefaction. Nevertheless, some cells in the marrow were reactive to CD117, suggesting the presence of hematopoietic progenitor cells (Fig. 1). Following autopsy, the medical history of the deceased was obtained, including chronic kidney disease, gout, and an unruptured cerebral artery aneurysm. Pulmonary ossification was thought to have developed due to chronic kidney disease in the deceased. After reviewing

**Fig. 1.** Pathologic examination reveals calcified branching bone spicules in the background of fibrotic interstitium and putrefied pulmonary tissue (A; H&E, ×40). Marrow tissue is identified within osseous tissue (B; H&E, ×100). The bone tissue shows lamellar bone matrix and osteocytes within the lacuna (C; H&E, ×200). Some cells in the marrow tissue reacted to CD117 (D; CD117, ×400).
his medical history and comprehensive PM examination, including gross dissection, microscopic examination, and PM laboratory tests, it was assumed that the deceased died of renal problems, implying that the manner of death was natural.

Forensic autopsy is performed to investigate death and determine important factors, including the cause, manner, and timing of death. However, such investigations are difficult in some cases, such as those involving putrefaction, which is the most common cause [1]. Autopsy (Aut-opsy) literally means "self" and "seeing"; in other words, it means an eyewitness. Gross dissection is undoubtedly the basis of this. Therefore, seeing the body is the basis of an autopsy; however, forensic pathologists should use other senses, as well. In particular, the visual analysis is disturbed by PM changes in cases of putrefaction. Needle-like materials were found in the pulmonary parenchyma during autopsy and could hint at the pulmonary pathology of the deceased in the present case. Furthermore, using a comprehensive approach that includes microscopic examination, PM imaging, and PM laboratory tests, the cause and manner of death can be further clarified beyond the visible autopsy findings.

Diffuse pulmonary ossification is a rare condition characterized by metaplastic bone formation in the lung parenchyma. Diffuse pulmonary ossification involves nodular and dendritic types. It is usually asymptomatic; however, a dendriform pulmonary ossification case showing progressive restrictive ventilatory impairment has been reported [2]. The lesion was not visible on chest radiography. Several recent cases of diffuse pulmonary ossification have been diagnosed due to radiologic developments; however, this condition often remains under- or misdiagnosed [3]. Pulmonary ossification can also be incidentally identified during autopsy. Diffuse pulmonary ossification is reported in 0.16% of autopsies. A predilection was noted in men (88%, 15/17) and in individuals with underlying pulmonary diseases (88%, 15/17). Dendriform pulmonary ossification is more common than nodular ossification (11/17) [4]. Nodular ossification can develop in cases of passive congestion due to chronic heart failure (e.g., mitral stenosis). Nodular pulmonary ossification occurs pathologically within the intra-alveolar space and is considered a consequence of alveolar exudate due to secondary congestion [5]. Dendriform ossification, also known as dendriform pulmonary ossification, is idiopathic or associated with various underlying pulmonary and systemic disorders [6]. Pathological findings of dendriform pulmonary ossification were defined as interstitial branching spicules of the bone and marrow elements [3]. Pathological examination revealed branching bone spicules containing marrow tissue in this case, as well as lesions in both lower lobes of the lungs. These findings are consistent with those of dendriform pulmonary ossification. PM computed tomography (CT) was performed, but no pulmonary ossification was observed. Pulmonary ossification is not always visible on CT because of its microscopic size [3]. Microscopic examination revealed pulmonary ossification, accompanied by calcification. Pathological calcification occurs via two basic mechanisms: dystrophic and metastatic calcification. These distinct mechanisms describe calcific deposits in abnormal and normal soft tissue. Dystrophic calcification occurs in dead or degenerated tissues. Metastatic calcification occurs in conditions of altered calcium phosphate metabolism, such as chronic renal failure and hyperparathyroidism [7]. After autopsy, we verified that the deceased had a medical history of chronic kidney disease. It is assumed that this condition contributes to the calcification and ossification observed in the pulmonary parenchyma. Similarly, two cases of diffuse pulmonary ossification in patients with end-stage renal disease were reported in a previous study [6].

This case shows that a comprehensive autopsy, including gross dissection, pathological examination, and PM imaging, is important even in putrefied bodies for both forensic and pathological examinations.

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