



## Case Report

## Two forensic autopsy cases of death from unexpected lesions of the pituitary gland

Hideto Suzuki<sup>\*,1</sup>, Kino Hayashi<sup>1</sup>, Tatsushige Fukunaga

Tokyo Medical Examiner's Office, Tokyo Metropolitan Government, Japan

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## ABSTRACT

Herein, we report the findings of 2 forensic autopsy cases, in which unexpected pituitary lesions were the underlying cause of death.

**Case 1:** A 56-year-old woman was found dead at her home during a cold winter spell. Macroscopic autopsy findings included a difference in the color of blood that filled her left and right cardiac chambers (deep red and dark red, respectively), collapse of both lungs, atrophy of the thyroid gland, and a large tumor arising from the sella turcica. Microscopic examination revealed a pituitary adenoma along with extensive bleeding. The cause of death was considered to be hypothermia, resulting from dysregulation of thermogenesis due to the pituitary adenoma.

**Case 2:** An 86-year-old man with a history of pollakiuria was found dead in a bathtub, with his face and chest submerged in bathwater and his legs positioned outside the bathtub. The macroscopic findings of the autopsy included hyper-inflated lungs, fluid collection in the thoracic cavity, and aspiration of gastric contents in the bronchi. The atherosclerotic changes of the man's coronary and cerebral arteries were considered mild for his age. Microscopic examination showed a marked infiltration of lymphocytes and plasma cells in the posterior pituitary gland, as well as in the liver, pancreas, and submandibular gland. Considering the results of the autopsy and the findings from the investigation conducted at the death scene, we concluded that the man probably lost consciousness following a neurally mediated syncope, which was induced by diabetes insipidus (lymphocytic hypophysitis). After losing consciousness, the man likely fell in the filled bathtub and then drowned.

These 2 cases highlight the need for a thorough post-mortem investigation, including a microscopic examination of the pituitary gland. In addition, forensic pathologists should carefully study the pituitary gland in cases where the cause of death is thought to be related to dysfunction of thermoregulation or osmoregulation.

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## 1. Introduction

The pituitary gland has an important role in homeostasis. The anterior pituitary gland orchestrates the complex regulatory functions of many endocrine glands such as the thyroid and adrenal glands, whilst the posterior pituitary regulates water/osmotic pressure balance [1]. Pituitary lesions can cause hormone excess or deficiency syndromes, and when a suprasellar defect allows for their proliferation to the hypothalamus, then these lesions can affect visual perception and the autonomic nervous system of the heart [1,2]. However, in these cases a definite diagnosis is often elusive [1], and the delay in an accurate diagnosis can lead

to the development of life-threatening conditions. In these cases, forensic pathologists encounter pituitary lesions as the underlying cause of death [2–4].

Here, we present the findings of 2 autopsy cases, in which the cause of death was initially thought to have been the result of external reasons, namely hypothermia and drowning, but craniotomy and histological examination of the pituitary gland during autopsy revealed that unexpected pituitary lesions were the underlying cause of death in both these cases.

## 2. Case report

## 2.1. Case 1

A 56-year-old woman was found dead in her bathroom during a cold winter spell. Around the time of death, she had undressed her lower body. The ambient temperature of the room where her body was found was estimated at approximately 14 °C. According to her

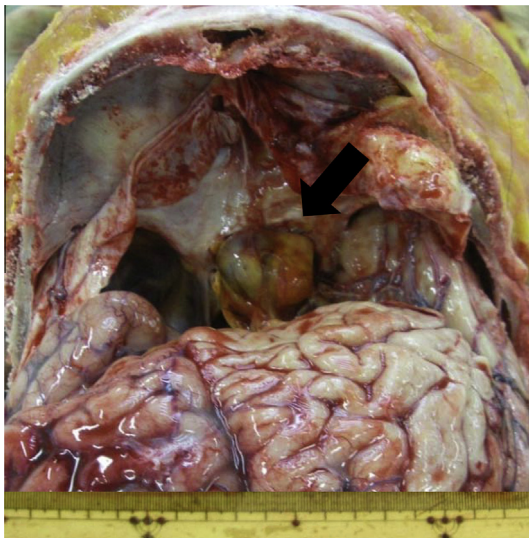
\* Corresponding author. Address: Tokyo Medical Examiner's Office, Tokyo Metropolitan Government, 4-21-18 Otsuka, Bunkyo-ku, Tokyo 112-0012, Japan. Tel.: +81 3 3944 1481; fax: +81 3 3944 7585.

E-mail address: [hideto-qk9.so-net.ne.jp](mailto:hideto-qk9.so-net.ne.jp) (H. Suzuki).

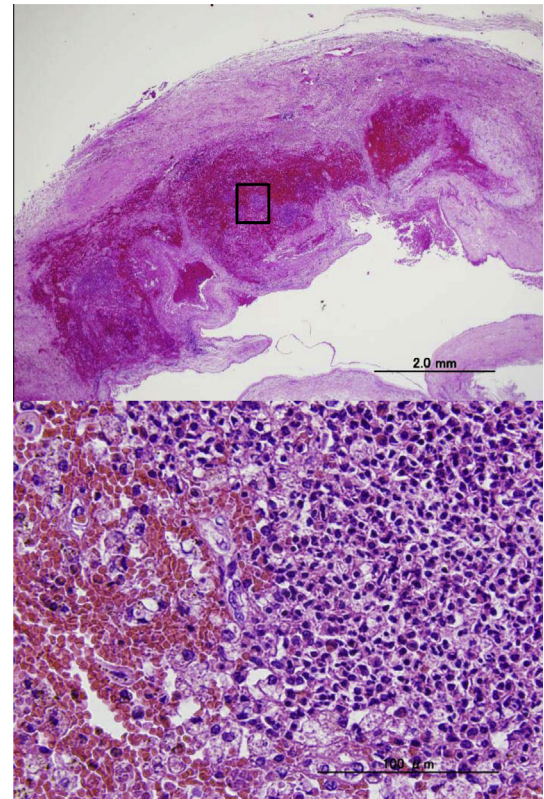
<sup>1</sup> These authors are equally contributed to this manuscript.

family, the woman had had a history of an optic disturbance for which she underwent surgery several years prior to her death. The woman's physician also prescribed her hydrocortisone therapy. Further medical information could not be obtained from the hospital where she was previously treated.

A forensic autopsy was carried out approximately 36 h after her death. The deceased was slender (height, 170 cm and weight, 51 kg), and external examination of her body revealed no visible evidence of injuries. The macroscopic findings, before craniotomy, showed a significant difference in the color of the blood in the left and right cardiac chambers (deep red and dark red, respectively), and collapse of the lungs, which were deep red in color. The serous membranes of the thoracic/abdominal cavity were dry. These findings suggested hypothermia as a possible cause of death. Further, there was evidence of a previous craniotomy after parting the skin over the cranium. After removing the calvarium, we discovered a large tumor (5.3 g,  $3.5 \times 2.8 \times 2.3$  cm) on the sella turcica (Fig. 1a). The optic chiasm was compressed into a thin band, and the basal side of the brain surrounding the pituitary gland was dark yellow in color. Other macroscopic findings included atrophy of the thyroid gland (5 g) and the adrenal cortex (adrenal gland; left 3 g, right 2 g). Microscopically, the tumor comprised round shaped cells with a bland appearance, and there was evidence of extensive bleeding and tissue granulation around the tumor (Fig. 1b). Follicles in the thyroid gland and zona fasciculata in the adrenal cortex were atrophic without evidence of chronic inflammation. No pathological findings relevant to cause of death were observed in other internal organs. Chemical analysis of blood sampled from the heart reported low concentrations of unbound thyroxine (0.3 ng/dL, clinical reference range: 1.0–1.7 ng/dL) and unbound triiodothyronine (1.4 pg/mL, clinical reference range: 2.1–4.1 pg/mL), but slightly elevated levels of thyroid stimulating hormone (TSH) (5.3  $\mu$ IU/mL, clinical reference range: 0.390–4.010  $\mu$ IU/mL). The concentration of cortisol was not lower than normal (7.3  $\mu$ g/dL, clinical reference range: 4.0–19.3  $\mu$ g/dL), whilst the concentration of adrenocorticotrophic hormone was lower than normal (<1 pg/mL, clinical reference range: 7.2–63.3 pg/mL). The concentration of acetone was elevated (75.1  $\mu$ g/mL). The toxicological analysis did not find any evidence of drugs or alcohol. The autopsy results indicated that the cause of death in this case was hypothermia, which likely resulted from adenoma-induced dysregulation of the hypothalamus and hypothalamic–pituitary thyroid (HPT) axis.



**Fig. 1a.** Findings of the macroscopic examination of the cranial cavity in case 1. The arrow shows a large tumor arising from the sella turcica.



**Fig. 1b.** Histology of the pituitary tumor in case 1. The upper part of the figure shows a low-powered image of the pituitary tumor, and the lower part of the figure shows a high-powered image of the square space in the upper figure. The pituitary adenoma with extensive bleeding and the surrounding granulation tissue are observed.

## 2.2. Case 2

An 86-year-old man who lived on his own was found dead in a bathtub at his home during a cold winter spell. His head and chest were submerged in the water, whilst his legs were positioned outside the bathtub (Fig. 2a). From the death scene investigation, it was clear that there was no possibility of incomplete gas combustion in the deceased's home, and it was suggested that the man had lost consciousness when he got out of the bathtub, causing him to fall backwards into the bathwater. The only clinical complication noted in his medical history was a gastric carcinoma, which was successfully treated with surgery. The man had complained of polyuria several years prior to his death, but he did not consult a doctor for this problem.

A forensic autopsy was carried out approximately 20 h after his death. The deceased was slender (height, 161 cm and weight, 45 kg), and putrefactive marbling was seen on the torso. The findings of the macroscopic examination included evidence of aspiration of gastric contents in the bilateral main bronchi, hyper-inflated lungs (left, 594 g and right, 702 g), and fluid collection in both thoracic cavities (left, 250 mL, and right, 100 mL). The color of the blood in the cardiac chambers was dark rather than bright red. The atherosclerotic changes of the coronary arteries and cerebral arteries were mild for his age. There was no significant stenosis of the coronary arteries, cardiomegaly (heart weight, 326 g), or lacunar infarction. Microscopic examination showed fibrosis as well as a marked infiltration of lymphocytes and plasma cells in the posterior pituitary gland (Fig. 2b). Similar infiltration of lymphocytes and plasma cells was observed in other organs, such as the liver (portal canal area), the extra-hepatic and pancreatic

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