

A Medicolegal Case of Anorexia Nervosa

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ABSTRACT

A highly emaciated 37-year-old female had swerved while cycling to avoid an oncoming car and fallen on her face. The following day she died at home. She had not been examined by a physician. Because of the circumstances, intracranial injuries were suspected and a medicolegal autopsy was performed. However, no fatal injuries to the brain or other organs were found, and the cause of death appeared to be malnutrition. The malnutrition, according to her past history and the autopsy and histopathological findings, was apparently due to anorexia nervosa.

Key words: *Unexpected death, Malnutrition, Emaciation, Anorexia nervosa*

Medicolegal autopsies of highly emaciated bodies are comparatively rare, being confined mostly to cases in which those responsible for infants or elderly or disabled people are suspected of having starved them to death. In this case a 37-year-old woman, single and abnormally lean, died after a traffic accident, and a medicolegal autopsy was performed to determine whether head injuries sustained in the accident had been the cause of death. Of 1,220 cases autopsied in our department from 1974 to 1987, this was only the third medicolegal autopsy of a death by malnutrition, and the only one in which a relative or guardian was not held responsible. As the cause of death was apparently malnutrition due to anorexia nervosa, the case history, past history, autopsy findings and histopathological findings are reported.

CASE HISTORY

On June 4, 1987, a 37-year-old woman, single and highly emaciated, fell from her bicycle while swerving to avoid an oncoming car, landing on her face. After the accident she went home, arriving at about 19:00, and went to bed. She had not been examined by a physician.

The next morning, June 5, she got up as usual, but felt dizzy and at about 11:00 went back to bed.

According to her mother, she seemed to be alright at noon. At about 16:30, she was found dead in bed.

PAST HISTORY

Her birth was normal and her body weight at birth was 2,800 g. At junior high school she was overweight and was called "buta"(pig) by classmates because of her obesity. On graduation from junior high school she was about 150 cm in height and weighed more than 60 kg. In senior high school she desperately wanted to lose weight but couldn't, and in fact had put on more weight by the time

she graduated. She left school at 18 and moved to Osaka to work in a spinning factory, but after two years returned home, having been unable to adapt to her job and her circumstances. In those two years she had become highly emaciated, and ate very little. Though her mother advised her to see a doctor, she refused. Until her death she worked at home with her mother making writing brushes.

AUTOPSY FINDINGS

An autopsy was performed at 9:12 on June 6, 1987, approximately 17 h after confirmation of death. The body was 145 cm in height, and weighed 20.5 kg. A high degree of emaciation with dried skin was observed (Fig. 1). There were some subcutaneous hemorrhages and excoriations and crusts around the left eyelids (Fig. 2). No petechial hemorrhages were observed in the conjunctivae of the eyelids or eye balls. There were slight subcutaneous hemorrhages and excoriations on the upper and lower limbs. A few very fine brownish black pubic hairs were observed, no more than 2.5 cm in length. No fractures of the skull, intracranial hemorrhages or cerebral contusions were found, nor injuries to other organs or evidence of disease. The adipose tissues such as the subcutaneous tissue, greater omentum, mesentery (Fig. 3) etc., contained little fat. The weight of each organ is shown in Table 1.

HISTOPATHOLOGICAL FINDINGS

Hematoxylin-eosin stained specimens were prepared for histopathological examination. The findings were as follows: 1) Brain. Mild atrophy, and mild edema in the cerebrum, cerebellum and pons. 2) Hypophysis. No abnormal findings other than postmortem changes. 3) Heart. Extreme atrophy in the cardiac muscles, moderate deposition of lipofuscin granules in the myocardial cells, and mild edema in the interstitial tissues. 4) Lung. Mild to

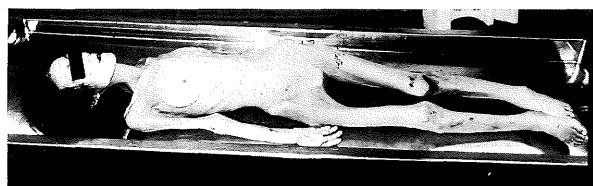
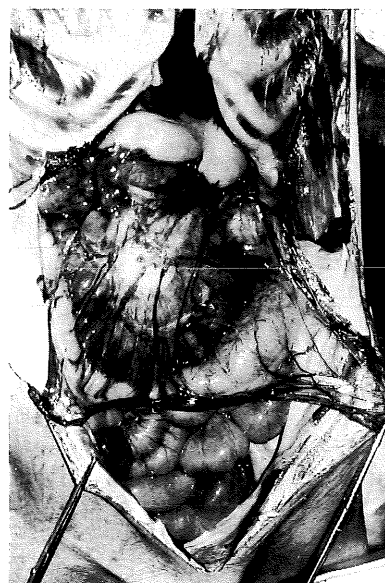
Table 1. Weight of internal organs, percentage of internal organs to body weight, and percentage of internal organs to mean weight of internal organs in adult women²⁾

Internal organ	Weight of internal organ (g)	Percentage of internal organ to body weight (%)	Percentage of internal organ to mean weight of internal organ in adult women ^{b)} (%)
Brain	1,278	6.23 (2.95 ^{a)})	98.0 (1,304 g ^{c)})
Heart	110	0.537 (0.558)	42.3 (260 g)
Spleen	30	0.146 (0.243)	30.0 (100 g)
l.-Kidney	51	0.249 (0.263)	43.2 (118 g)
r.-Kidney	76	0.370 (0.248)	68.5 (111 g)
l.-Adrenal gland	3.2	0.0156 (0.0124)	64.0 (5.0 g)
r.-Adrenal gland	3.1	0.0151 (0.0125)	63.3 (4.9 g)
Liver	558	2.72 (2.796)	44.8 (1,245 g)
Pancreas	43	0.210 (-)	- (-)

a: The mean value of the percentage of the internal organs to the body weight in adult women between the ages of 25 and 40²⁾.

b: The percentage of the internal organs in the present case to the mean weight of the internal organs in adult women between the ages of 36 and 40²⁾.

c: The mean weight of the internal organs in adult women between the ages of 36 and 40²⁾.

**Fig. 1.** Frontal view of the body**Fig. 2.** Left profile**Fig. 3.** Abdominal cavity

moderate acute congestion. 5) Spleen. Extreme atrophy and moderate acute congestion. 6) Adrenal gland. Moderate atrophy and mild acute congestion. 7) Liver. Moderate atrophy, acute congestion, and moderate deposition of lipofuscin granules and moderate fatty metamorphosis in the hepatocytes. 8) Pancreas. Moderate atrophy, mild edema, and moderate autolysis. 9) Ovary: Extreme atrophy.

DISCUSSION

Determination of whether leanness is normal or abnormal is decided by comparing body weight with the standard weight for the subject's body height. If the body weight is more than 20% lighter than standard weight, emaciation is considered to be abnormal⁹⁾. According to the Broca Index modified by Katsura⁷⁾, the body weight in this case should have been around 40.5 kg. A body weight of 20.5 kg is about half the standard weight, and indicates abnormal emaciation.

The weights of the organs were compared with the normal weights reported by Aimi et al²⁾ (Table 1). The weight of the brain was almost normal. The adrenal glands were 64% to 63.3% of the average weights of normal adrenal glands. The weights of the heart, spleen and liver were less than the half the normal weight.

Malnutrition can be due to physical constitution, psychoneurotic diseases, endocrine and metabolic diseases, diseases of the digestive system, infectious diseases, drug intoxication, lack of caloric intake, and so on⁸⁾. Atrophy of the ovary is a common finding in cases of anorexia nervosa¹²⁾. The histopathological findings of the present case show conditions virtually the same as those observed in other cases of death by starvation or malnutrition^{1,6)}. According to the case history, past history, autopsy findings and histopathological findings, the cause of malnutrition in the present case seems to be anorexia nervosa.

Anorexia nervosa, according to the Cecil Text Book of Medicine¹¹⁾, is a prolonged illness principally affecting girls after puberty and it is characterized by severe self-induced weight loss, amenorrhea, and a specific psychopathology. The incidence of anorexia nervosa per 100,000 population is from 0.6 to 1.6 according to one report¹¹⁾ or from 0.4 to 1.5 according to another⁴⁾. The diagnostic criteria of anorexia nervosa given by Feighner et al³⁾ is shown in Table 2.

Table 2. Criteria for a diagnosis of anorexia nervosa³⁾

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- A. Age of onset prior to 25.
 B. Anorexia with accompanying weight loss of at least 25% of original body weight.
 C. A distorted, implacable attitude towards eating, food, or weight that overrides hunger, admonitions, reassurance and threats.
 D. No known medical illness that could account for the anorexia and weight loss.
 E. No other known psychiatric disorder.
 F. At least two of the following manifestations.
- (1) Amenorrhea.
 - (2) Lanugo.
 - (3) Bradycardia (persistent resting pulse of 60 or less).
 - (4) Periods of overactivity.
 - (5) Episodes of bulimia.
 - (6) Vomiting (may be self-induced).
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The subject's case history indicates she had the psychoneurologic basis for anorexia nervosa. She had been considerably overweight at high school and because of the discomfort and embarrassment it had caused her to have been desperately anxious to lose weight. Emaciation must have begun sometime between the ages of 18 and 20. The histopathological findings from examination of the ovary indicated that amenorrhea had persisted for quite some time. It is possible that she had not considered herself to be ill as she had ignored her mother's advice to consult a doctor. Her past history indicated she had not had other psychiatric diseases such as schizophrenia or depression. The autopsy and histopathological findings revealed no diseases likely to cause malnutrition. All these factors suggest a diagnosis of anorexia nervosa³⁾.

A few reports have been made about sudden or unexpected death which could not be histopathologically accounted for in cases of anorexia nervosa^{5,10)}. Isner et al⁵⁾ discussed the relationship between Q-T interval prolongation in electrocardiograms recorded before death and sudden death, and proposed that electrocardiographic monitoring should be routine for anorexia nervosa patients. Rajs et al¹⁰⁾ reported that a combination of certain factors such as simultaneous treatment at different departments, lack of contact with psychiatrists, unclear criteria for admission to hospital, circulatory and electrocardiographic S-T and T wave abnormalities, hypopotassemia, and hypoglycemia in patients suffering from eating disorders may in some cases have led to circulatory catastrophe. They also reported¹⁰⁾ cases in which death may have been due to an anatomical disproportion between the normal-sized mitral valves and the atrophic left ventricle in extremely emaciated patients with an estimated 50% reduction of heart weight. This disproportion may have a functional significance similar to that of mitral valve prolapse, and may therefore have contributed to cardiac dysfunction, syncope and death. In the present case, the direct cause of death could not be clearly determined because of the lack of clinical data before death.

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