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Case report

Autopsy findings for a case of acute gastric volvulus in a child

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ABSTRACT

Acute gastric volvulus resulting in abdominal compartment syndrome was determined to be the cause of death in a 4-year-old girl who presented with abdominal distension. At about 1 AM on the day of her death, she was brought to our emergency medical center. Physical examination and plain abdominal X-ray revealed pronounced gastric dilatation. A decompression procedure was performed, followed by observation. She went into cardiopulmonary arrest around 1 PM on the same day and died. Postmortem investigation, including an autopsy and computed tomography (CT), was performed to determine the cause of death. The findings included that the stomach was severely distended. Evidence was seen of mucosal hemorrhage in the gastric mucosa on the greater curvature side, which was thinned in places but without perforation. No necrosis of the gastric mucosa was observed; reversible changes were evident on histopathological examination. The postmortem CT images suggested that the pyloric region was positioned cranioventrally to the cardiac region. None of the findings indicated sudden blockage, and the cause of death was determined to be acute gastric volvulus resulting in abdominal compartment syndrome. The abnormal placement of the organs was difficult to determine based on physical examination alone; postmortem CT and careful examination were helpful in conducting the autopsy in this case.

1. Introduction

The onset of acute abdomen in children follows various courses and can have a variety of causes that should be taken into consideration. However, the underlying causes of acute abdomen are often difficult to diagnose clinically, and sudden, unexpected death occurs in some cases. Determining the cause of sudden, unexpected death in infants and children remains difficult in forensic medicine, and it is difficult to determine positional abnormalities of organs, such as in acute gastric volvulus, on forensic autopsy [1–3]. We report a case in which severe distension of the stomach and impaired transport from the pyloric region toward the anus was evident at autopsy, and, based on postmortem computed tomography (CT) scan findings, the cause of death was considered to be acute gastric volvulus resulting in abdominal compartment syndrome.

2. Case report

2.1. Case history

Two days before her death, a 4-year-old girl became ill with symptoms including general malaise and vomiting. Abdominal pain appeared after lunch on the day before her death, and because her abdominal distension suddenly worsened, she was brought to the emergency medical center at around 1 AM. On examination, her abdomen was severely distended and hard overall, pronounced gastric dilatation was evident on plain abdominal X-ray. A nasogastric tube was inserted, and decompression was achieved with the aspiration of 1400 ml of pale brownish, watery fluid. The girl's condition subsequently stabilized, and she returned home at around 7 AM. After returning home, her condition suddenly deteriorated into cardiopulmonary arrest at around 1 PM on the same day. She was transported to hospital in an ambulance, but she died

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Table 1
Laboratory findings.

Parameter	Measured value (standard range)	Directional change
WBC ($10^2/\mu L$)	33.9 (4.0–9.0)	↑
ALT (IU/L)	16 (4–35)	
LDH (IU/L)	473 (119–229)	↑
Creatinine kinase (IU/L)	195 (20–190)	↑
BUN (mg/dL)	29.7 (7.6–20.0)	↓
Creatinine (mg/dL)	0.8 (0.3–1.2)	
Amylase (IU/L)	583 (42–132)	↑
C-reactive protein (mg/dL)	1.8 (<0.3)	

without regaining consciousness. Laboratory findings suggested renal failure based on elevated BUN, creatinine and amylase (Table 1), but the cause of death was apparent.

The girl had been diagnosed as having an interatrial septal defect at 3 months of age, and she had been under the continued outpatient care of a specialist hospital since the age of 4 months. However, at 3 years of age, no mitral valve regurgitation was evident, and the intention was to perform surgery around the time she started elementary school.

2.2. Autopsy findings

Autopsy findings showed that the girl had a height of 102 cm and weight of 12.8 kg. The stomach, the small intestine, and the ascending and transverse colon were severely distended and protruding, and the stomach was particularly distended. The stomach, which was enclosed by the omentum, protruded when the abdominal and thoracic cavities were opened, but the cardiac and pyloric areas were able to be identified after pulling the stomach downward. Ascites was 120 mL and bloody. The heart weighed 80 g, and there were 2 ml of blood in the right heart and 75 ml in the left heart. The blood was dark-reddish with soft hemocoagulation. There was a large atrial septal defect. The left and right lungs were not congestive and weighed 33 and 44 g, respectively. No particular positional abnormality of the spleen, which weighed 34 g, was evident. The left and right kidneys were not congestive in the cortex but were in the medulla and weighed 40 and 30 g, respectively. The urinary bladder was empty. Further examination showed that not only was the side of the stomach with greater curvature directed upward, it was somewhat twisted to the left overall (Fig. 1). The size of the stomach was $16 \times 11 \times 6.5$ cm in its distended state, and hemorrhage was evident at the site of attachment to the omentum. Observation of the gastric and duodenal mucosa showed a mucosal hemorrhage with an overall size of 10×14 cm in a hemorrhagic area that was visible from the outer surface of the gastric mucosa. Although the mucosa was thinned in places, no perforation was evident (Supplement Fig. S1). The stomach contents were 50 ml of a blackish-red and viscous substance, but the contents and mucosa of the duodenum were bilious.

2.3. Histopathological findings

Tissues were taken from the bronchi in the lung and from the pyloric and gastric regions based on suspected impaired transport from the pyloric outlet toward the anus. Squamous epithelial cells were identified in the bronchi. There was mild thickening and fibrosis of the pyloric area; however, no particular abnormality indicating a sudden blockage was evident. The gastric mucosa appeared free from necrosis and showed reversible changes as the result of ischemia caused by interstitial edema, infiltration of inflammatory cells (mainly neutrophils), presence of streptococcus, and fresh venous thrombosis (Fig. 2).

2.4. CT findings

The postmortem CT images showed that the stomach was dilated with a large amount of accumulated air and fluid, and the region from the vestibule to the pyloric area was positioned cranioventrally to the region from the esophagus to the cardiac area. The stomach was twisted with the side of greater curvature in a superior position and the descending colon displaced to the right of the dilated stomach. The internal density of the liver was heterogeneous, and the abdominal aorta was collapsed (Fig. 3 and Supplement Fig. S2).

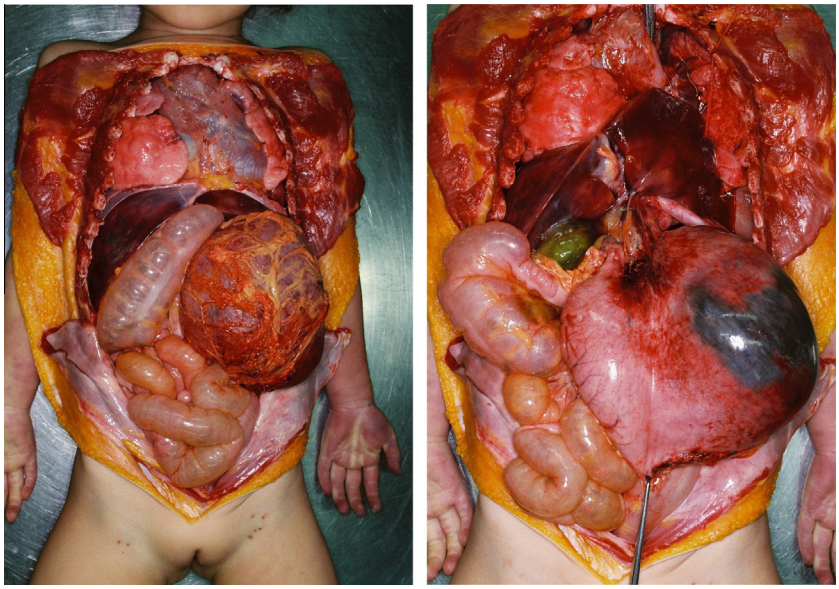

Fig. 1. Examination of the abdominal cavity and stomach (cardiac and pyloric areas) showed the stomach to be severely distended. In the right panel, the stomach is rolled downward, and the anterior wall of the stomach shows hemorrhaging. In the left panel, the anterior wall of the stomach is turned dorsally, and the greater curvature of stomach was facing upward and located over the lesser curvature of stomach.