

## Case report

# Gastric duplication cyst: evaluation by endoscopic ultrasonography and magnetic resonance imaging

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**Abstract:** Endoscopic ultrasonography (EUS) and magnetic resonance imaging (MRI) are becoming popular methods for examining tumorous lesions along the upper gastrointestinal tract. Though duplication cysts are uncommon, EUS findings from gastric duplication cysts have accumulated and proven very useful for preoperative diagnosis. There have been few reports, however, concerning MRI findings from these cysts. We report herein the case of a 25-year-old man with a gastric duplication cyst. EUS demonstrated a cystic mass adjacent to the fourth layer of the stomach wall. MRI revealed a cyst containing low signal-intensity fluid and high signal-intensity fluid separated by levels. In addition to the characteristic findings from preoperative examinations, the unique histological findings from the cyst are also described.

**Key word:** gastric duplication cyst

## Introduction

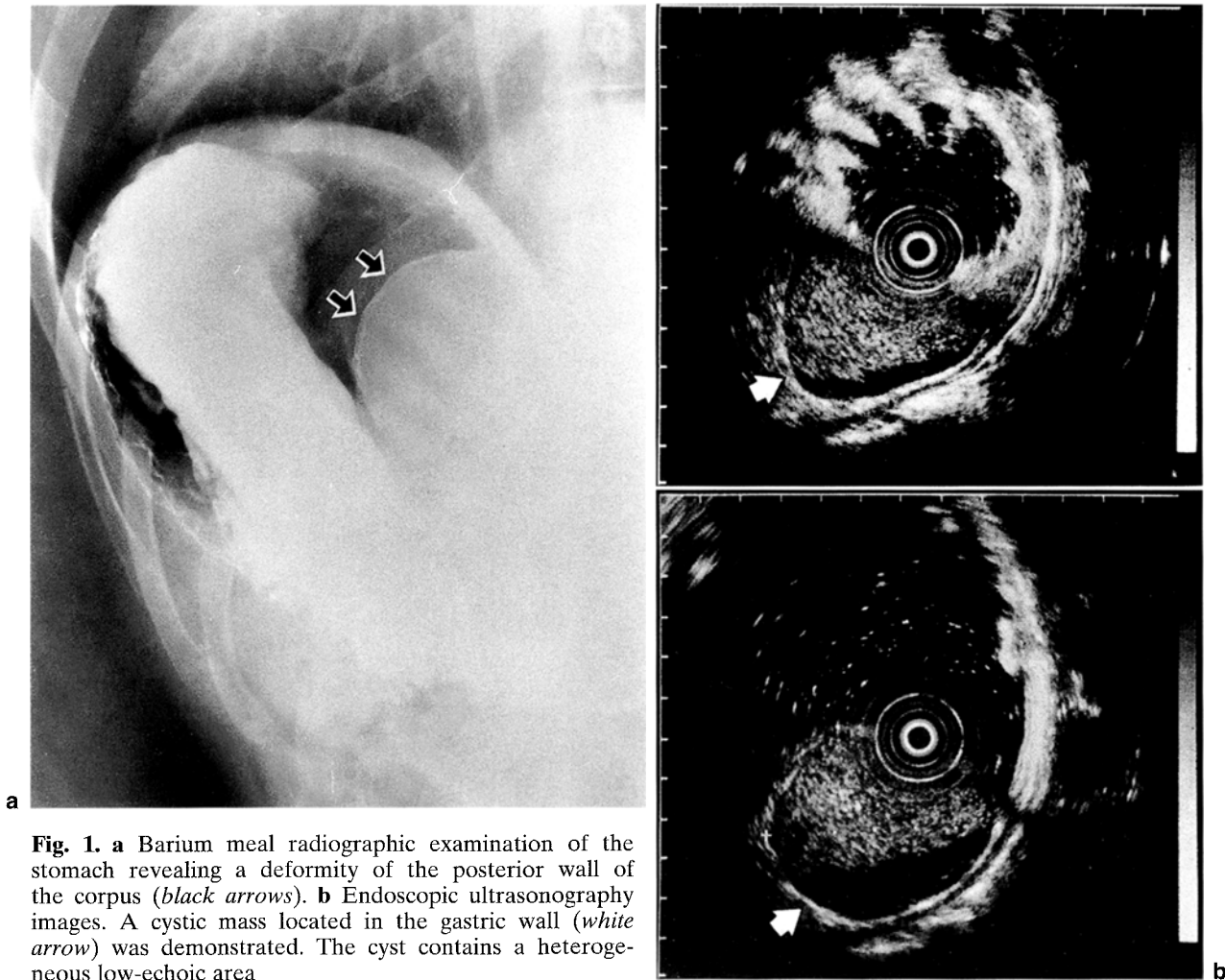
Cystic lesions of the stomach are uncommon and generally comprise heterogeneous groups such as developmental anomalies and posttraumatic, infectious, and neoplastic lesions. A gastric duplication cyst is considered to be a cystic form of gastric duplication which stems from congenital anomaly. Though there have been a number of reports regarding the gastric duplication cyst,<sup>1-13</sup> few cases have been evaluated preoperatively by endoscopic ultrasonography (EUS) and magnetic resonance imaging (MRI). We present a case of gastric duplication cyst and describe the characteristic EUS and MRI findings together with the histological findings.

## Case report

A male aged 25 years was admitted to our hospital on September 11, 1994, after a mass was demonstrated by the radiographic upper gastrointestinal (GI) series. The patient had no complaints on admission. The family history and the patient's own medical history included nothing remarkable. The patient was a well-nourished, healthy-appearing young man with a height of 160 cm and a weight of 62 kg.

On physical examination he appeared normal. There was no organomegaly or mass palpable on the abdomen. There were no abnormal data on routine chemical and hematological laboratory studies and on urinalysis. Radiography of the stomach demonstrated a remarkable deformity of the posterior wall of the corpus (Fig. 1a). On gastroscopy, there was no mucosal lesion observed except for the extrinsic compression of the corpus. Endoscopic ultrasonography (EUS) revealed a well-defined mass located adjacent to the fourth layer (muscle propria) of the gastric wall. A heterogeneous low-echoic pattern was circumscribed by a high-echoic thin wall, suggesting a cystic lesion filled with fluid containing a small amount of sludge-like material (Fig. 1b). A computed tomography (CT) scan of the abdomen showed a cystic mass with homogeneous density and a well-defined adjacent posterior gastric wall (Fig. 2a). T<sub>1</sub>-weighted magnetic resonance imaging (MRI) demonstrated a cystic mass beneath the diaphragm (Fig. 2b). The axial section of MRI revealed a fluid level separating an upper layer of low signal intensity and lower layer of high signal intensity inside the cyst. These findings implied that the contents of the cyst might be composed of fluids containing different concentration of solutes or sanguinopurulent fluid which were layered gravity-dependently.

The preoperative diagnosis of the lesion was benign intramural gastric cyst, and an operation was performed on October 13, 1994. At laparotomy, the lesion was



**Fig. 1.** **a** Barium meal radiographic examination of the stomach revealing a deformity of the posterior wall of the corpus (*black arrows*). **b** Endoscopic ultrasonography images. A cystic mass located in the gastric wall (*white arrow*) was demonstrated. The cyst contains a heterogeneous low-echoic area

identified on the greater curvature of the fornix (Fig. 3a). A well-defined subserosal cyst measuring approximately  $6.5 \times 5 \times 5$  cm produced a discrete nodule on the external gastric surface (Fig. 3b). On incising the cyst after partial gastrectomy, grayish mucoid material was disclosed inside the cyst. Subsequent cytological examination showed degenerative epithelial cells, macrophages, neutrophils, and lymphoid cells. A pH analysis of the material showed 6.0. No communication was observed between the stomach and the cyst. The patient has been well without recurrent disease.

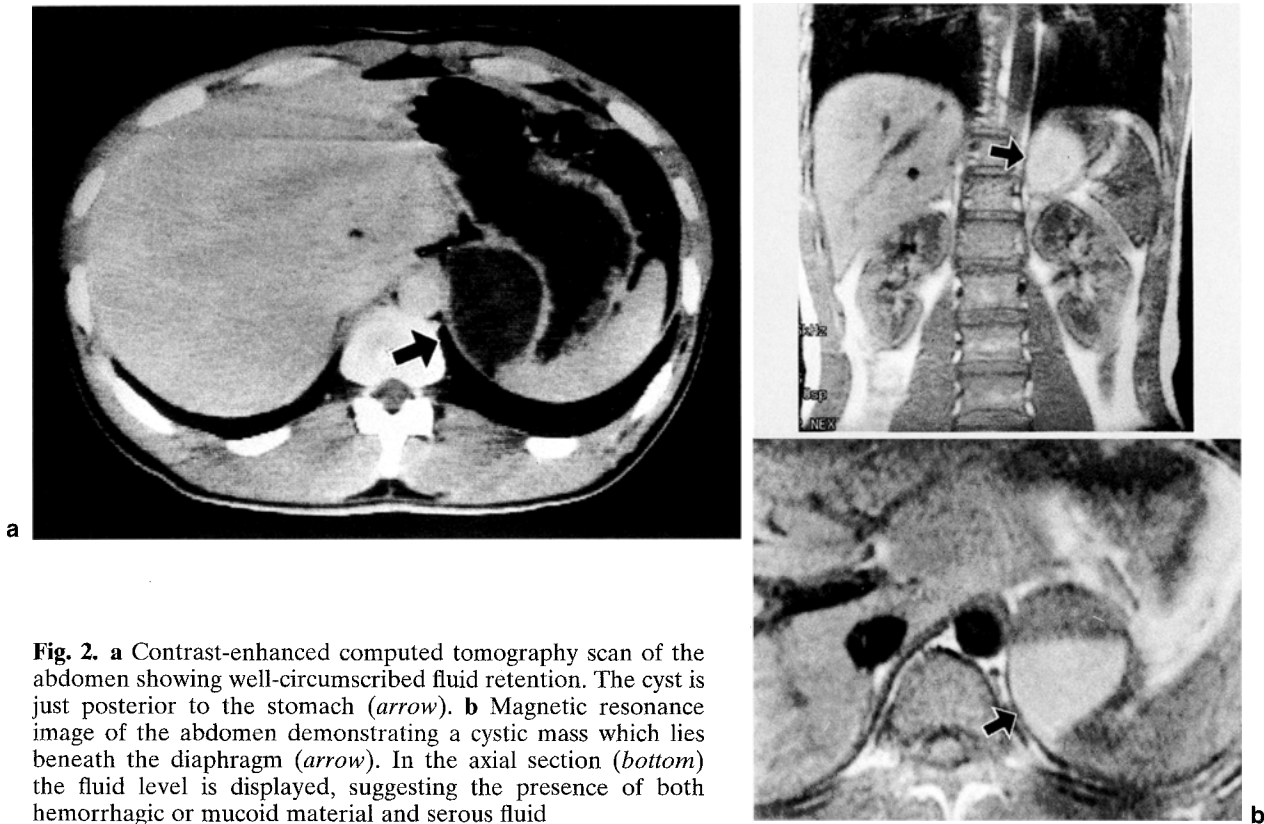
Histological examination of the cyst showed the characteristic features of a gastric duplication cyst. The cyst wall was composed of the epithelial layer, the lamina propria layer including gastric glands, and subjacent bundles of smooth muscle (Fig. 4a). The epithelial layer comprised ciliated pseudostratified columnar epithelium with focal squamous metaplasia (Fig. 4b) and gastric foveolar epithelium with focal

intestinal metaplasia (Fig. 4a). A small part of the mucosa-like wall had ulceration accompanied by inflammation (Fig. 4c). There was no evidence of cartilaginous tissue in the wall.

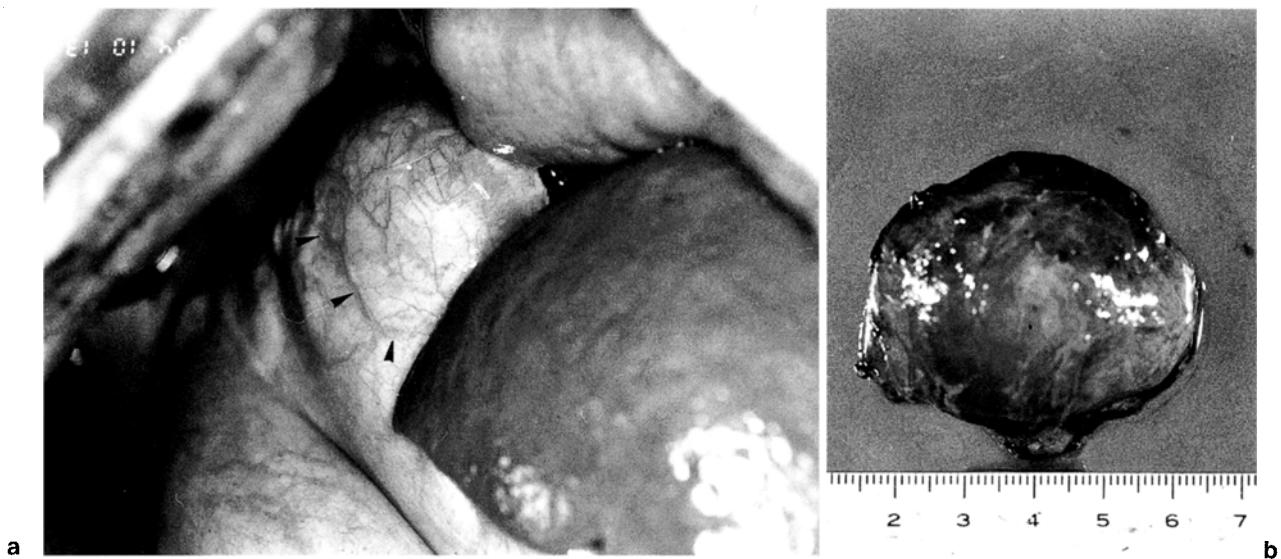
### Discussion

Gastric cysts are uncommon lesions which are sometimes responsible for obstruction of the alimentary tract, anemia due to bleeding, or peritonitis resulting from perforation.

Gastric duplication cyst is rare, especially in the adult population. Though gastric duplication cyst has been reported under different names such as developmental cyst, gastroenteric cyst, or enterogenous cyst,<sup>1-13</sup> it is recognized as a cystic form of GI tract duplications. Since duplications may be formed anywhere along the alimentary tract, duplication cysts have been found in



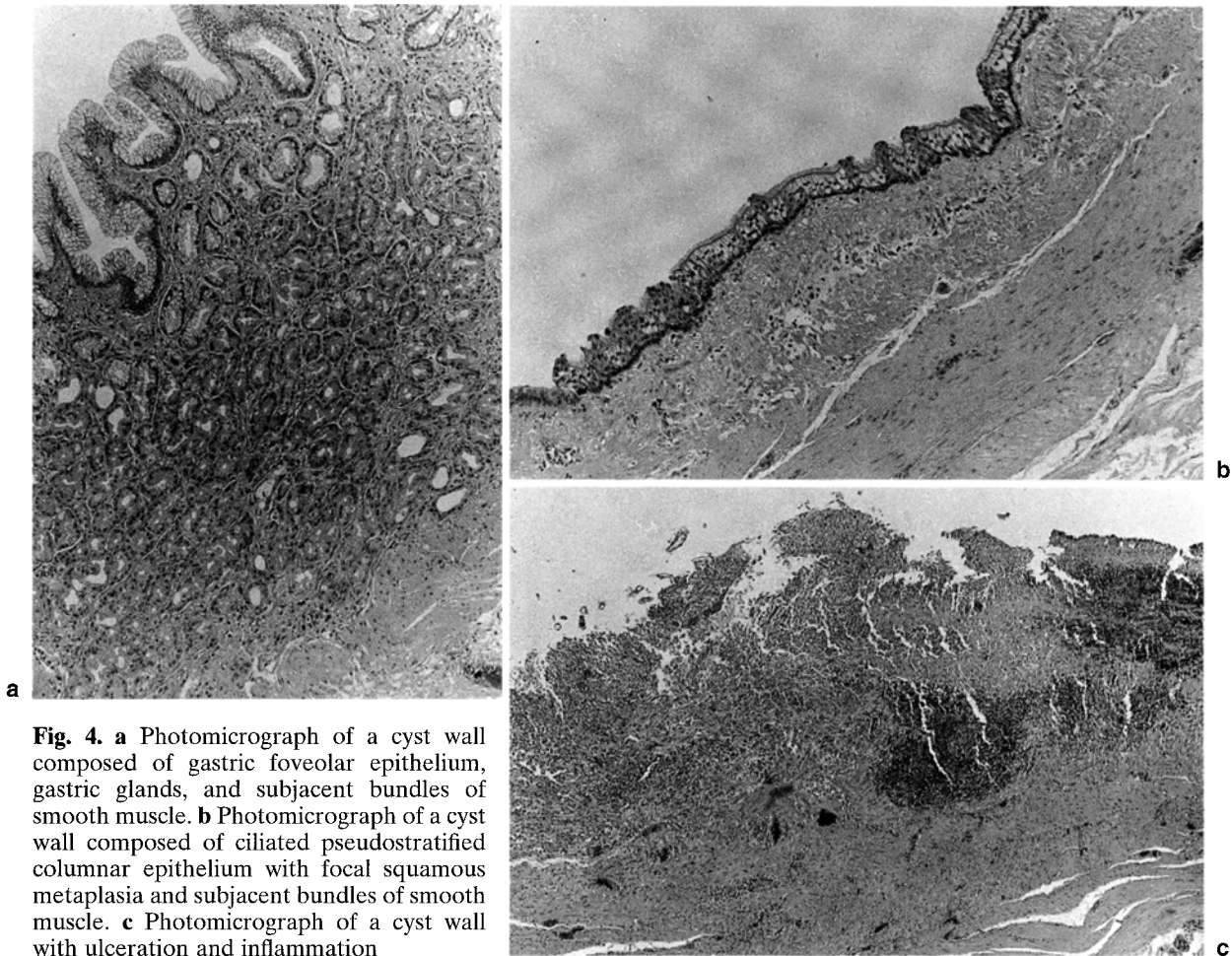
**Fig. 2.** **a** Contrast-enhanced computed tomography scan of the abdomen showing well-circumscribed fluid retention. The cyst is just posterior to the stomach (*arrow*). **b** Magnetic resonance image of the abdomen demonstrating a cystic mass which lies beneath the diaphragm (*arrow*). In the axial section (*bottom*) the fluid level is displayed, suggesting the presence of both hemorrhagic or mucoid material and serous fluid



**Fig. 3.** **a** Tumor found on the greater curvature of the fornix (*arrowheads*) at laparotomy. **b** A circumscribed subserosal cystic mass measuring approximately  $6.5 \times 5 \times 5$  cm. The cyst contained grayish mucoid material

various locations from the esophagus to the large intestine. Tubular duplications are most common in the region of the terminal ileum, whereas duplication cysts are often found in the mediastinum and related to the esophagus.<sup>4</sup> It is reported, however, that only 2%–3.8%

of GI tract duplications are related to the stomach.<sup>5,6</sup> With rare exceptions, duplications are distributed dorsal to the primitive gut developmentally.<sup>3</sup> Thus, gastric duplication cyst usually appears along the greater curvature adjacent to the gastric wall.



**Fig. 4.** **a** Photomicrograph of a cyst wall composed of gastric foveolar epithelium, gastric glands, and subjacent bundles of smooth muscle. **b** Photomicrograph of a cyst wall composed of ciliated pseudostratified columnar epithelium with focal squamous metaplasia and subjacent bundles of smooth muscle. **c** Photomicrograph of a cyst wall with ulceration and inflammation

Gastric duplication cysts are difficult to diagnose preoperatively. In general, cystic lesions of the stomach are classified according to their etiology into (1) developmental anomaly (duplication cyst), (2) infection (*Echinococcus*), (3) trauma, (4) retention cyst, or (5) neoplasm. Palmer reviewed 91 cases of gastric cysts reported previously, of which 48 cases (52%) were duplication cysts.<sup>3</sup> Most had been diagnosed after the operation. Though transabdominal ultrasonography and CT have been used for characterizing cystic lesions in the abdomen, they have some limitations. Recently EUS has become a popular method for examining submucosal tumors of the stomach. Several reports have described the EUS images of gastric duplication cysts.<sup>7-9</sup> EUS is useful for demonstrating the relationship between the cyst and the gastric wall. Furthermore, a small tumor inside the cyst was able to be detected by EUS in one case.<sup>8</sup> In our case the EUS findings were extremely useful for distinction of this cyst from other lesions such as pancreatic cyst, cyst of retroperitoneal origin, retention cyst, and abscess. The heterogeneous low-echoic pattern inside the cyst suggested that the

fluid in the cyst might not be homogeneous. T<sub>1</sub>-weighted MRI clearly demonstrated the level produced by two layers of fluid in contrast to the homogeneous density observed by CT. The low signal-intensity upper layer appeared to be serous in character, whereas the high signal-intensity lower layer was suggested to consist of hemorrhagic or mucoid material. To obtain further information on the cyst, endoscopic needle aspiration would have been required.<sup>9</sup> The combination of EUS and MRI was very helpful in characterizing the contents of the cyst as well as defining the anatomical relationship of the cyst to adjacent organs. To our knowledge, no other report on gastric duplication has shown findings obtained by EUS and MRI that are as characteristic as ours.

Our case exhibited a unique histological finding of ciliated pseudostratified columnar epithelium which was characteristic to mediastinal enteric cysts. The first case of a gastric cyst lined with ciliated columnar epithelium was reported by Gensler et al. in 1966.<sup>13</sup> It has been suggested that the histogenesis of this type of cyst was derived from the anomalous laryngotracheal

outgrowth which remained attached to the portion of the primitive foregut embryologically destined to become the stomach.

Though gastric duplication cysts in adults are usually revealed by incidental findings of the upper GI series, some of them are symptomatic. Since gastric duplication cyst is lined with a variety of gastrointestinal mucosa which may include active glands secreting digestive fluid, there are some reports describing ulceration and rupture of the cysts.<sup>14</sup> Though an ulceration was found in our case, the secretion retained in the cyst was not very acidic. Other digestive enzymes secreted from gastric glands may have destroyed a region lined with ciliated columnar epithelium.

Taking into consideration that some gastric cysts have been accompanied by bleeding, perforation, or neoplasm,<sup>10,11,14</sup> even an asymptomatic gastric duplication cyst should be removed once it is diagnosed. Surgical treatment of the cyst should be individualized and varies from simple excision with or without partial gastrectomy to total gastrectomy.

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