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Case Report Open Access

Gastric Duplication Complicated by Malignant Transformation in Adults: Report of Three Cases

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Abstract

Gastric duplication anomaly is an uncommon congenital disease, mostly reported in children. Malignant transformation of the duplication lesion is extremely rare, with only 11 cases reported in the English literature. Here we report three cases of early cancer found in gastric duplications or the adjacent gastric wall. Out of these three cases, one is an early cancer arising from the duplication lesion, one from the gastric wall and another form both. To the best of our knowledge, early cancer arising from both the duplication cyst and the adjacent wall is first reported. Once detected gastric duplication, surgical resection is recommended because of its potential for malignant transformation.

Keywords: Gastric duplication; Malignant transformation; Adenocarcinoma; Early cancer; Digestive system abnormalities

Introduction

Gastrointestinal duplications are rare congenital malformations, which may occur anywhere in the digestive tract and are common in the small intestine, while the gastric involvement is relatively rare. These duplication lesions usually attach to the mesenteric border of the gastrointestinal tract, with well-developed coat of smooth muscle outside and epithelial lining inside [1,2]. Malignant transformation of duplication lesion in adults is extremely rare, with only 11 cases having been reported so far in the English literature [3-21]. We encountered three cases of gastric duplication from 2005 to 2006 of which two had early cancer arising from the gastric duplication and the third showed early cancer in the adjacent gastric wall.

Case Report

Case 1

A 62-year-old Chinese man was admitted to the hospital because of intermittent epigastric pain. The patient's past medical history and family history were non-contributory. All the laboratory tests results, including tumor marker examination were within normal limits. An upper gastrointestinal endoscopy showed a hemisphere protruding lesion size about 4.0 × 3.5 cm located in the greater curvature of the stomach, with smooth mucosa surface (Figure 1). The biopsy showed chronic inflammation in the mucosae. Computed tomography revealed a 3.8 × 3.2 cm cystic lesion at greater curvature of the lower corpus, without signs of metastasis (Figure 1). Ultrasonography showed a well-defined mass in a heterogeneous low-echoic pattern arose from the submucosa of the gastric wall. Adenocarcinoma in duplication was found according to the intraoperative frozen section examination, thus a total gastrectomy was performed. The patient had an uneventful recovery.

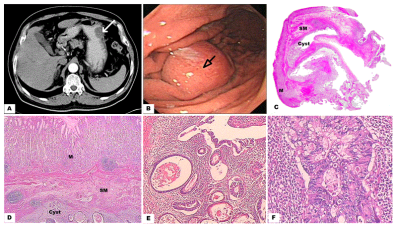

Figure 1: The cystic lesion of case 1. (A) Computed tomography showed a well defined lesion in low density, of 3.8 x 3.2 cm in diameter, located at the greater curvature of the stomach (white arrow). (B) The endoscopy showed a hemisphere protruding submucosa like lesion, size 4.0 × 3.5 cm located in the greater curvature of the stomach, with smooth mucosa surface (holly arrow). (C) Multiple cysts located in the submucosa of the gastric wall. (D) Microscopically, the cysts in the submucosa (sm) had a circumscribed smooth muscle. Epithelium can be seen inner the cysts. No signs of dysplasia or adenocarcinoma could be found in the gastric mucosa and submocosa (HE, ×40). (E) The adenocarcinoma of the gastric duplication cyst (HE, ×100). (F) The tumor cells lost of gland structure, with nuclear hyperchromatism and mitosis (HE, ×400).

The macroscopic finding showed a multilocular lesion of size 4.0 × 3.5 cm, with mucus in it, attached to the greater curvature of the lower part of the gastric body. There was no communication between the cystic lesion and gastric lumen.

Microscopically, multiple cysts in the submucosa had a well circumscribed smooth muscle layer that, shared with the stomach. The gastric glands inner lining were comprised of mitoses and hyperchromatism cells in an irregular structure, which indicated a well differentiated adenocarcinoma in the cystic lesion. The adenocarcinoma was localized in the submucosa of the cyst wall without muscularis mucosae invaded. Inflammation and helicobacter pylori were detected. No signs of dysplasia or adenocarcinoma change were found in the adjacent gastric wall (Figure 1).

Case 2

A 43-year-old Chinese man was admitted to the hospital because of intermittent abdominal pain and melena for 6 months. The patient's past medical history and family history were not remarkable. The fecal occult blood was positive and the other laboratory tests were within normal limits. The upper gastrointestinal endoscopy showed a 3.0 × 3.0 cm protruding lesion from the angular incisure to the antrum with erosive mucosa and stenosis (Figure 2). The biopsy showed chronic inflammation in the mucosae and moderate to high grade dysplasia of the epithelium with Hp detected. Computed tomography revealed a 3.0 × 2.8 cm multilocular cystic lesion at the greater curvature of the gastric antrum without lymphadenopathy in the abdomen (Figure 2). Ultrasonography showed focally thickened mucosa and submucosa in the gastric antrum. No adenocarcinoma in duplication was found according to the intraoperative frozen section examination. The surgeon performed a laparotomy and dissection the cyst. And the patient recovered uneventfully.

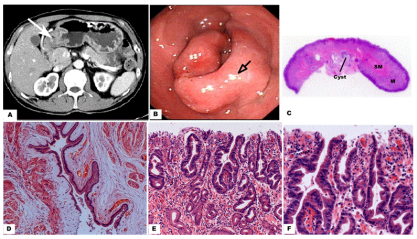

Figure 2: The cystic lesion of case 2. (A) Computed tomography revealed a well defined isodensity or slightly lower density mass of 3.0 in diameter, located at the greater curvature of the antrum, with uneven enhancement (white arrow). (B) The endoscopy showed a 3.0×3.0 protruding lesion (holly arrow) from the angular incisure to the antrum with erosive mucosa and stenosis. (C) Cysts located in the submucosa(sm) of the gastric wall. (D) The cyst has simple ciliated columnar epithelium lining inner, surrounded with smooth muscle. No sign of dysplasia or carcinoma in situ was investigated (HE, ×40). (E) Early adenocarcinoma in the gastric glands of the adjacent gastric wall can be seen (HE, ×100). (F) The epithelium of the gastric wall was characterized by pseudostratification, with depletion of mucin and nuclear hyperchromatism, which penetrated to the lamina propria, indicating high grade neoplasia lesion (HE, ×200).

At surgery, macroscopically, focally thickened gastric wall with multiple granular lesion on the surface were found in the antrum, 3.0 × 3.0 cm in dimension. Extensive smooth granular nodules can be seen inside.

Microscopically, multiple lesions with cystic structure located in the submucosa of the gastric wall, circumscribed with smooth muscle. In the cysts, mucus and Simple ciliated columnar epithelium can be detected without any dysplasia in the mucosae. In the adjacent gastric wall, high grade dysplasia originated from the epithelium, with penetrating to the lamina propria, and without muscularis mucosae invaded, indicated an early adenocarcinoma. Inflammation and helicobacter pylori were detected (Figure 2).

Case 3

A 72-year-old Chinese man was admitted to the hospital due to abdominal distention and intermittent regurgitation. The patient's past medical and family history were non-contributory. Laboratory tests results were within normal limits. An upper gastrointestinal endoscopy revealed a 2.0×1.5 cm protruding lesion with ulceration located in the posterior wall of antrum (Figure 3). Biopsy specimens confirmed this lesion a moderate differentiated adenocarcinoma.

A radical resection of gastric cancer was performed. The patient had a full postoperative recovery.

Gross feature of the specimen showed a 2.0 × 2.0 cm elevated lesion with ulceration in the posterior wall of antrum without serosa invaded.

Microscopically, the well differentiated adenocarcinoma invaded to the lamina propria of the gastric wall without muscularis mucosae involved. In the submucosa, multiple cystic lesions can be detected with well to moderate differentiated adenocarcinoma forming in the mucosae of the cystic wall. No signs of invasion were shown in the muscularis mucosae (Figure 3).

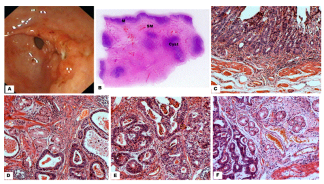

Figure 3: The cystic lesion of case 3. (A) The endoscopy revealed a 2.0×1.5 cm elevated lesion with ulceration located in the posterior wall of antrum (arrow). (B) Cysts located in the submucosa(sm) of the gastric wall. (C) The gastric glands arranged in irregular structure, with pseudostratification cells, nuclear hyperchromatism and lost of polarity. The change is limited to the mucosae, without muscularis mucosae involved, indicating early adenocarcinoma (HE, ×40). (D, E, F) Well to moderate differentiated adenocarcinoma forming in the part of the mucosae of the cystic wall. No signs of invasion were showed in the muscularis mucosae of the cyst.

Discussion

Duplication of the alimentary tract is an infrequent congenital abnormality which is most common in children or infants, and occurs rarely in adults [1]. The etiology of duplication is controversial, but has

been hypothesized to be due to split notochord etiology, abnormal recanalization during the bowel development and remaining diverticula [2]. That might be the reason that one third duplication cases are associated with other anomalies: esophageal atresia, diverticula, respiratory system abnormalities and vertebral abnormalities. The possible etiology could also explain the different mucosae lining the cysts: intestinal mucosa, gastric mucosa, pancreatic tissue and pseudostratified ciliated columnar epithelium. Gastric duplication accounts for 7%~8% of all gastrointestinal duplications [3] and is commonly located along the greater curvature or posterior wall of the stomach with tubular structures communicated with the stomach or with cystic ones which do not communicate with the stomach [4]. The common pathologic characteristics that are sued as criteria for the diagnosis of gastric duplication include: lesion is coated by smooth muscle, continued with the stomach, and inner lined with mucosae, which can be epithelium of any portion of the gastrointestinal tract. In addition, the lesion should be attached to the gastric wall [2]. In the present series of three cases, all these pathologic characteristics satisfied the criteria to confirm the diagnosis of gastric duplication.

Malignant transformation is a rare complication of gastric duplication. The three cases presented in this paper have three different scenarios: the first case presented, a well to moderate differentiated adenocarcinoma arose from the cystic lesion, limited to the submocosa of the lesion without the invasion of the gastric wall. The gastric wall remained normal. In the second case, high neoplasia involved with the epithelium of the adjacent gastric wall was noted while neither carcinoma in situ nor precancerous lesion was found in the cyst. The third case revealed the presence of early cancer arising from both the duplication cyst and the adjacent gastric wall. No evidence of invading adenocarcinoma was detected in the muscularis mucosae or the smooth muscle around the cystic lesions indicating that the two adenocarcinomas developed independent of each other. To the best of our knowledge, only 13 instances of malignant tumors arising from gastric duplications in adults have been reported since 1955, case 1 and case 3 in this paper included in Table 1 [5-14]. However, no predictor of the malignant change has been found, including the symptoms, size, location, tumor markers or macroscopical founding. The mechanism of malignant transformation is not clear.

Author	Age/Sex	Symptoms	Wrong Diagnosis	Gastric Duplication			Malignant Transformations			Follow Up
				Size (cm)	Location	Mucosa	Macroscopical	Microscopic	Invasion	
Mayo [6]	64/F	Weakness, weight loss	Gastric carcinoma	6.0	Antrum	Gastric mucosa	Polypl oid	Well differentiated adenocarcinoma	the gastric muscular wall	DFS at 12 months
Trieger [7]	50/M	Vomiting, weight loss	unknown	17.0	unknown	unknown	ulcerative	Infiltration epithelial carcinoma	the gastric muscular wall	unknown
Coit [8]	72/F	Abdominal pain, weight loss	Gastric carcinoma	4.0	antrum	Intestinal mucosa, gastric mucosa and pancreatic tissue	granular	Mucinous papillary adenocarcinoma	Submucosa of the stomach, peritonial nodules	DFS at 72 months
Ishikawa [3]	56/M	Vomiting, weight loss	Pancreatic Cyst	10.0	Between the fundus and the pancreatic tail	Cilliated columnar epithelium and pyloric glands	Supperficial depressed	Well differentiated adenocarcinoma	Mucosa of the cyst	DFS at 28 months
Mamiya [12]	71/F	Abdominal pain, poor appetite	unknown	8.0	unknown	unknown	Supperficial elevated	papillary adenocarcinoma	wall of the cyst	DFS at 1 month
Kuroaka [3]	40/M	Fewer, back pain	Splenic cyst	7.0	Anterior wall of fundus	Pseudostratified ciliated columnar epithelium	granular	Well differentiated adenocarcinoma	The whole gastric wall	Liver metastasis at 7 months
Horne [4]	40/M	Acute abdominal pain, poor appetite	GIST	12.0	Posterior wall of fundus	Pseudostratified ciliated columnar epithelium	protruded	Well differentiated neuroendocrine carcinoma	wall of the cyst	Peritonial metastasis at 14 months
Barussaud [5]	67/F	Abdominal pain, weight loss	Preatic carcinoma	18.0	antrum	Mixed adenocarcinoma and squamous cell carcinoma	unknown	Mixed adenocarcinoma and squamous cell carcinoma	Gastric wall and peritoneal nodules	Liver metastasis at 6 months

Jf. Zheng [13]	25/M	Asymptomatic (CEA elevation)	adenocarcinoma	8.0	Greater curvature of the body	Fundic type gastric mucosa and focally columnal epithelium	protruded	Infiltrative, moderatly differentiated tubular carcinoma	The serosa of the cyst wall and the gastric muscular wall	DFS at 13 months
Kang [20]	56/M	Asymptomatic (check up)	Submucosal tumor	5.5	Greater curvature of the body	Gastric foveolar epithelium	Thickened granular	adenocarcinoma	Muscle layer of the cyst	unknown
Lewitowicz [21]	73/M	Epigastric pain and gastrointestinal bleeding	tumor	4.0	subcrardial	Gastric foveolar epithelium	Growing arround	Gastro intestinal stromal tumor (lacking mitotic activity)	Around or from gastric duplicatin cyst	unknown
Case 1	62/M	Chronic abdominal pain	GIST	4.0	Greater curvature of the body	Gastric mucosa	granular	Well differentiated neuro endocrine carcinoma	Sub-mucosa of the cyst	DFS till now
Case 3	72/M	Regurgitation distention	Adenocarcinoma	2,0	Posterior wall of antrum	Gastric mucosa	Superficial flat	Well differentiated neuro endocrine carcinoma	Sub-mucosa of the cyst	Not followed

Table 1: Characteristic of malignant transformation of the gastric duplication cyst.

Based on the observations of the three cases reported here, it can be concluded that gastric adenocarcinoma can arise from the duplication cysts located in the submucosa or the adjacent gastric wall. The mechanisms of malignant transformation in those two layers might be different. Studies demonstrated a clear association between Hp infection and gastric adenocarcinoma [15,16-18]. Thus, Hp infection may play a role in malignant transformation of epithelium of gastric wall with gastric duplication [15,19]. The exits of cysts may draw some factors to the canceration of the adjacent gastric wall, such as cystic pressure and epithelium metabolism of the cysts. There are many possible explanations for the gastric duplication canceration. Gastric duplication has been reported with ectopic gastric or pancreatic mucosa that containing gastric acid and peptic enzymes, which may cause ulceration and perforation [18]. These persistent irritants together with events, such as increase of intracystic pressure and oxygen deficiency in the local microenvironment, may cause chronic inflammation, repeated apoptosis and regeneration of the epithelium that could ultimately lead to the malignant transformation process in the gastric duplication [20,21]. However, such a proposal needs further studies to confirm this assumption.

In conclusion, the gastric duplication is usually a benign lesion, but has the potential to turn malignant from either the duplication itself or the adjacent gastric wall. The mechanism of such malignant transformation process is poorly understood. In the event of presence of any suspicion of malignant transformation process in the gastric duplication, it is recommend surgical resection of the lesion once detected.

Acknowledgments

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