Pre-pyloric site gastric cancer after pylorus-preserving gastrectomy (PPG): A case report

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Abstract

Pylorus-preserving gastrectomy (PPG) is a function-preserving surgical procedure which is now applied to treat early gastric cancer in the mid-portion of the stomach. We report a patient who developed a pre-pyloric site gastric cancer after PPG. To our knowledge, this is the first report on the development of pre-pyloric site gastric cancer after PPG in the English literature using PubMed.

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Introduction

Pylorus-preserving gastrectomy (PPG) was first reported as a new operative procedure for benign gastric disease by Maki et al. in 1967.¹ This technique has the advantages of reducing postoperative complaints such as Dumping syndrome or reflux remnant gastritis. Kodama et al.² reviewed 154 patients with early gastric cancer occurring in the mid-portion of the stomach, and concluded that no suprapyloric lymph node metastasis was observed. Thus, they applied this surgical technique to treat early gastric cancer located in the mid-portion of the stomach. A postoperative evaluation study on the function of the remnant stomach and nutritional status showed better outcomes in PPG than conventional distal gastrectomy (CDG).³ We herein report a case with newly developed gastric cancer in a pre-pyloric portion of remnant stomach after PPG.

Case report

A 64-year-old male had undergone PPG for early gastric cancer on August 4, 1999. A pyloric lesion 2.5 cm in length was preserved and anastomosed with proximal remnant stomach (Fig. 1). Lymphadectomy including Nos. 1, 3, 4sb, 4d, 6 and 7 was undertaken according to the general rules of the Japanese Gastric Cancer Association. Pathological diagnosis was well-differentiated adenocarcinoma with no lymphatic or vessel invasion, and the surgical margins were negative for cancer cells (Fig. 2). The final stage was f-IA (pT1(M),pN0,H0,P0,CYX, defined by the general rules of the Japanese Gastric Cancer Association). The patient was doing well without evidence of recurrence at 6 months follow-up.
of the Japanese Gastric Cancer Association). Postoperative follow-up included chest radiography, bolus-contrasted computed tomography and ultrasonography, as well as laboratory tests including carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA19-9) every 4 months and upper gastrointestinal endoscopy annually. Four years after surgery, he came to our clinic complaining of abdominal distension. The physical examination exhibited no remarkable findings, and the serum levels of tumor markers were within normal limits. However, upper gastrointestinal endoscopy indicated IIc-type lesion in the pre-pyloric portion (Fig. 3b). Pathological examination of the biopsy specimens revealed signet ring cell carcinoma. The newly detected pre-pyloric gastric cancer was judged to be a residual cancer in the remnant stomach, but not a recurrence. We then proceeded with total gastrectomy with D2 lymphadenectomy and splenectomy on July 30, 2003. We finally decided to perform this procedure because the tumor seemed to invade the muscular propia or deeper, judged intraoperatively, and the preoperative pathological diagnosis was signet ring cell carcinoma, which usually tends to spread into the gastric wall. Furthermore, we performed sentinel node navigation surgery with the technique of infrared ray electronic endoscopy combined with indocyanine green injection in the submucosal layer around the tumor by using intraoperative gastric endoscopy. The sentinel node indicated by lymphatic flow was No. 11, the lymph node located around the splenic artery. The pathological finding was poorly differentiated adenocarcinoma with signet ring cell carcinoma in greater curvature of the pre-pyloric region, which was limited to the mucosal layer (Figs. 4, 5). There was no lymphatic or vessel invasion and surgical margins were negative for cancer cells. The final stage was T1a (M), pN0, pT0, pC0, pX. His postoperative recovery was uneventful, and the patient remains recurrence-free after 35 months.

Discussion

The definition of remnant gastric cancer remains obscure. In the past, remnant gastric cancer was a cancer which arose in the remnant stomach 10 or 20 years after surgery for benign gastric diseases. Recently Kaminishi et al. proposed to define and classify remnant gastric cancer into three types: (1) a primary remnant gastric cancer more than 10 years after surgery regardless of the previous gastric disease; (2) a residual cancer in the remnant stomach within 10 years after surgery, regardless of whether the previous disease was benign or cancerous, with cancer-free resection margin; (3) a recurrent cancer found at the anastomosis or resection margin in the remnant stomach within 10 years after surgery for malignancy, or the previous surgery was a non-curative operation. We finally judged this case as a residual cancer in the remnant stomach in accordance with Kaminishi’s criteria for the following reasons: (1) upper gastrointestinal endoscopy carried out prior to the first operation indicated no abnormal lesion in the pre-pyloric portion (Fig. 3a); (2) histological differences in the resected specimens between the first and second operations (Figs. 2, 5); (3) remnant gastric cancer developed within 4 years after surgery; (4) the surgical margins of the first operation were free of cancer cells. The pathological finding of the first operation indicated gastric incomplete-type intestinal metaplasia in the surrounding mucosa of the cancer area with mild atrophic gastritis and fibrosed submucosa. Likewise, the second cancer was surrounded by incomplete-type intestinal metaplasia with severe atrophic gastritis. Jass and Filipe et al. reported that incomplete-type intestinal metaplasia was frequently observed around gastric carcinoma and they suggested that this status has a high malignant potential and may be a pre-neoplastic condition. Several authors have
also reported that there is a pronounced tendency for the carcinomas to occur in the gastric mucosa with incomplete-type intestinal metaplasia in patients with multiple early gastric carcinomas.\textsuperscript{9,10} Isozaki et al. reported frequent coexistence of severe dysplastic lesions and mutant p53 protein expression in the background mucosa of multiple gastric carcinomas.\textsuperscript{11} These reports and our experience suggest that coexistence of incomplete-type intestinal metaplasia around the cancer area will be a risk factor of residual cancer in the remnant stomach. Therefore we should refer to the histological condition of the surrounding mucosa of cancer tissue in deciding on the operative procedure, PPG or CDG.

It is of note that lymph nodes around the splenic artery were detected as sentinel nodes using infrared ray electronic endoscopy combined with indocyanine green injection. Although it was unexpected, we decided to perform a total gastrectomy and splenectomy with D2 lymph node dissection from this information. In consequence, the cancer was confined within the muscular layer and there was no lymph node metastasis. However, this result led to some problems in managing remnant gastric cancer. Perigastric lymph nodes are usually dissected at the time of PPG, therefore the cancer possibly metastasizes to other lymph nodes directly through the network of the lymphatic system in cases of remnant gastric cancer. Under conditions where remnant gastric cancer in the pre-pyloric site following PPG seems to invade deeper than the submucosal layer, it may be reasonable to proceed to total gastrectomy with D2 lymph node dissection.

In conclusion, PPG has advantages over CDG in terms of gallbladder function, the condition of the remnant stomach, and gastric emptying\textsuperscript{3} and the dumping scores were

![Figure 3](image1.png)  
**Figure 3** Upper gastrointestinal endoscopy view of the pre-pylorus: (A) at the first operation; (B) at the second operation.

![Figure 4](image2.png)  
**Figure 4** Macroscopic view of the remnant stomach. The white arrow indicates the secondary primary gastric cancer, and the broken line shows the suture line of PPG.

![Figure 5](image3.png)  
**Figure 5** Pathomicroscopic view of the remnant gastric cancer which demonstrates signet ring cell carcinoma (H&E stain ×200).
significantly lower in the PPG group compared with the CDG group. On the other hand, PPG should be applied carefully for patients with incomplete-type intestinal metaplasia at the pre-pyloric site.

References