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**Linitis Plastica of the bypassed stomach 7 years after Roux-en-Y gastric
bypass.**

A Case Report.

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Abstract

Laparoscopic Roux-en-Y gastric bypass (RYGB) is currently the preferred surgical procedure to treat morbid obesity. It has proven its effects on excess weight loss and its positive effect on comorbidities. One of the main issues, however, is the postoperative evaluation of the bypassed gastric remnant.

In literature, cancer of the excluded stomach after RYGB is rare. We describe the case of a 52-year-old woman with gastric linitis plastica in the bypassed stomach after Roux-en-Y gastric bypass, diagnosed by means of laparoscopy and Single-Balloon enteroscopy, and its clinical importance.

Linitis plastica of the excluded stomach after RYGB is a very rare entity. This case report shows the importance of long-term postoperative follow-up, and the importance of Single-Balloon enteroscopy for visualization of the bypassed stomach remnant, when other investigations remain without results. This case report is only the second report of a linitis plastica in the bypassed stomach after Roux-en-Y gastric bypass.

Linitis Plastica of the bypassed stomach 7 years after Roux-en-Y gastric bypass. A Case Report.

Introduction

Worldwide, gastric cancer is the second leading cause of death. Gastric linitis plastica (GLP) is a rare form of gastric cancer, with an incidence of 3-19% of gastric cancers cases (1). Gastric linitis plastica is a diffusely infiltrative subset of gastric cancer. It is associated with aggressive behavior, discovery in a late stage and metastatic disease (2, 3).

In addition, obesity is an increasing problem worldwide (4, 5). Surgical intervention is indicated in patients who remain obese after non-surgical interventions (5). Laparoscopic Roux-en-Y gastric bypass (RYGB) is currently the preferred surgical procedure. It has proven its effects on excess weight loss and its positive effect on comorbidities (6). One of the main issues, however, is the postoperative evaluation of the bypassed gastric remnant.

In literature, cancer of the excluded stomach after RYGB is rare, only a limited number of cases have been described, this being the tenth case describing a tumour in the bypassed stomach (2, 3, 7, 8). This case report is only the second report of a linitis plastica in the bypassed stomach after Roux-en-Y gastric bypass. Nau et al. describe the only other known case of linitis plastica of the bypassed stomach after RYGB (2).

Consent

Informed consent was obtained from the patient for publication of this case report.

Case report

A 52-year-old woman, with a medical history of a laparoscopic Roux-en-Y gastric bypass (LRYGB) and a laparoscopic cholecystectomy, was admitted with a history of abdominal cramps, vomiting and abdominal pain since four weeks.

The LRYGB was performed for the treatment of morbid obesity 7 years before. At that time she had a body mass index (BMI) of 40 kg/m².

Pre-operative evaluation included gastroscopy, which revealed *Helicobacter Pylori* upon anatomopathological analysis, successfully treated with triple eradication based on pantoprazole, amoxicillin and clarithromycin. The postoperative course was uneventful and during the 7 years follow-up no abnormalities were noted.

On admittance for her current medical problem, a computerized tomography revealed no abnormalities except for nonspecific wall thickening of the excluded stomach (Figure 1).

Blood analysis also revealed no abnormalities. Because of a suspicion of an internal herniation through Petersen, not noticeable on the abdominal computerized tomography, a laparoscopic exploration was performed.

When the abdominal cavity was entered, diffuse peritoneal metastasis was discovered. In addition, the excluded, bypassed stomach remnant was solid upon instrumental palpation, but no tumoral involvement of the surrounding structures, or serosal breakthrough was found. Biopsies were taken from the peritoneal masses and the procedure aborted.

Anatomopathological analysis of the peritoneal biopsies showed metastasis of an

adenocarcinoma without confirmation of the gastric origin.

Further work up included Positron Emission Tomography (PET), which showed a high Fludeoxyglucose (^{18}F) metabolism at the thickened, excluded, intraluminal gastric wall.

Next, a single-balloon enteroscopy was performed under general anesthesia at a tertiary center for inspection of the excluded gastric remnant. This procedure showed ulcers, thickened gastric folds, involvement of the pylorus and antrum (Figures 2,3). The esophagus, the gastric pouch and the jejunal loop were normal upon inspection. Biopsies were taken in the excluded stomach and in the gastric pouch.

Anatomopathological analysis showed the typical signet-ring form, confirming the diagnosis of gastric linitis plastica of the excluded gastric remnant, without signs of malignancy in the gastric pouch. Immunohistochemical analysis was only positive for Keratin 20, which showed a strong staining. Keratin 7, calretinin, thyroid transcription factor-1, and estrogen receptor were negative.

Further analysis showed no clear staining for HER-2/neu, with a negative FISH test, which showed no HER-2/neu amplification. The HER-2/neu ratio over chromosome 17 is 1.08 (<2) on average.

Tumor marker carcinoembryonic antigen (CEA) at admittance measured $0.80\ \mu\text{g/L}$, with a maximum of $0.97\ \mu\text{g/L}$ four months later, with a minimum of $0.58\ \mu\text{g/L}$ six months after diagnosis.

Discussion

Gastric linitis plastica is a rare form of gastric cancer (1). Gastric linitis plastica is a diffusely infiltrative subset of gastric cancer. It is associated with aggressive behavior, late discovery and metastatic disease (2, 3).

In literature, cancer of the excluded stomach after RYGB is rare, only a limited number of cases have been described (2, 3, 7). This case report is only the second report of a linitis plastica in the bypassed stomach after Roux-en-Y gastric bypass. Although a study by Inoue et al (9) using an experimental model of dietary-induced carcinogenesis concluded that RYGB reduces the risk of gastric cancer. They additionally suggested that RYGB might be a good option for weight loss, even in areas with high gastric cancer prevalence. Reasons for reduction of gastric cancer might be the lack of direct contact with carcinogens, lower bile reflux, and a lower bacteria concentration in the gastric content.

As suggested by Papadia et Scopinaro (10), pre-operative work-up aims to exclude patients that would develop a malignancy in the short term, but the difference between the expected and the reported gastric cancer cases after RYGB after long-term follow-up is difficult to explain. A decrease in gastric cancer after RYGB could be hypothesized (10).

The discovery of this case was mostly incidental, as most GLP present with dyspepsia, dysphagia, vomiting and weight loss. As mentioned by Jafferbhoy et al., the malignant cells infiltrate and reduce the stomach volume and interfere with peristalsis, resulting in easy regurgitation into the esophagus (3). In this case, as the GLP is only located in the excluded portion of the stomach, these symptoms will not easily arise. Moreover, weight loss and vomiting are not rare in post-operative RYGB

patients. Because of the initial suspicion of an intermittent internal hernia through Petersen a diagnostic laparoscopy was performed, showing peritoneal metastatic disease of an unknown primary malignancy. Confirmation of GLP was obtained by means of an antegrade Single-Balloon enteroscopy reaching the excluded stomach to prevail mucosal biopsies.

Nau et al. describe the only other known case of linitis plastica of the bypassed stomach after RYGB (2). Their case was treated with palliative chemotherapy. Our patient was proposed the same palliative chemotherapy, based upon the poor results of radical surgery in case of peritoneal metastatic disease despite the patient's young age.

The patient was put on a 3-weekly TPF chemotherapy regimen (Docetaxel, Cisplatin, 5-Fluorouracil). After two sessions 'stable disease' was acquired and after four sessions only poor response was achieved. After five cycles the chemotherapy regimen was ceased because of tumor progression and clinical intolerance.

Conclusion

Linitis plastica of the excluded stomach after RYGB is a very rare entity. This case report highlights a specific risk of RYGB and shows the importance of long-term postoperative follow-up.

Figures

Figure legend:

Figure 1: Computerized tomography revealing wall thickening of the excluded stomach.

Figure 2: Radiological view of the Single-Balloon enteroscope introduced into the excluded gastric remnant through the Roux-en-Y reconstruction. Note the tight lumen of the stomach and the biopsy forceps.

Figure 3. Endoscopic view of the excluded gastric remnant showing thickened folds with several small ulcers, suggesting linitis plastica.

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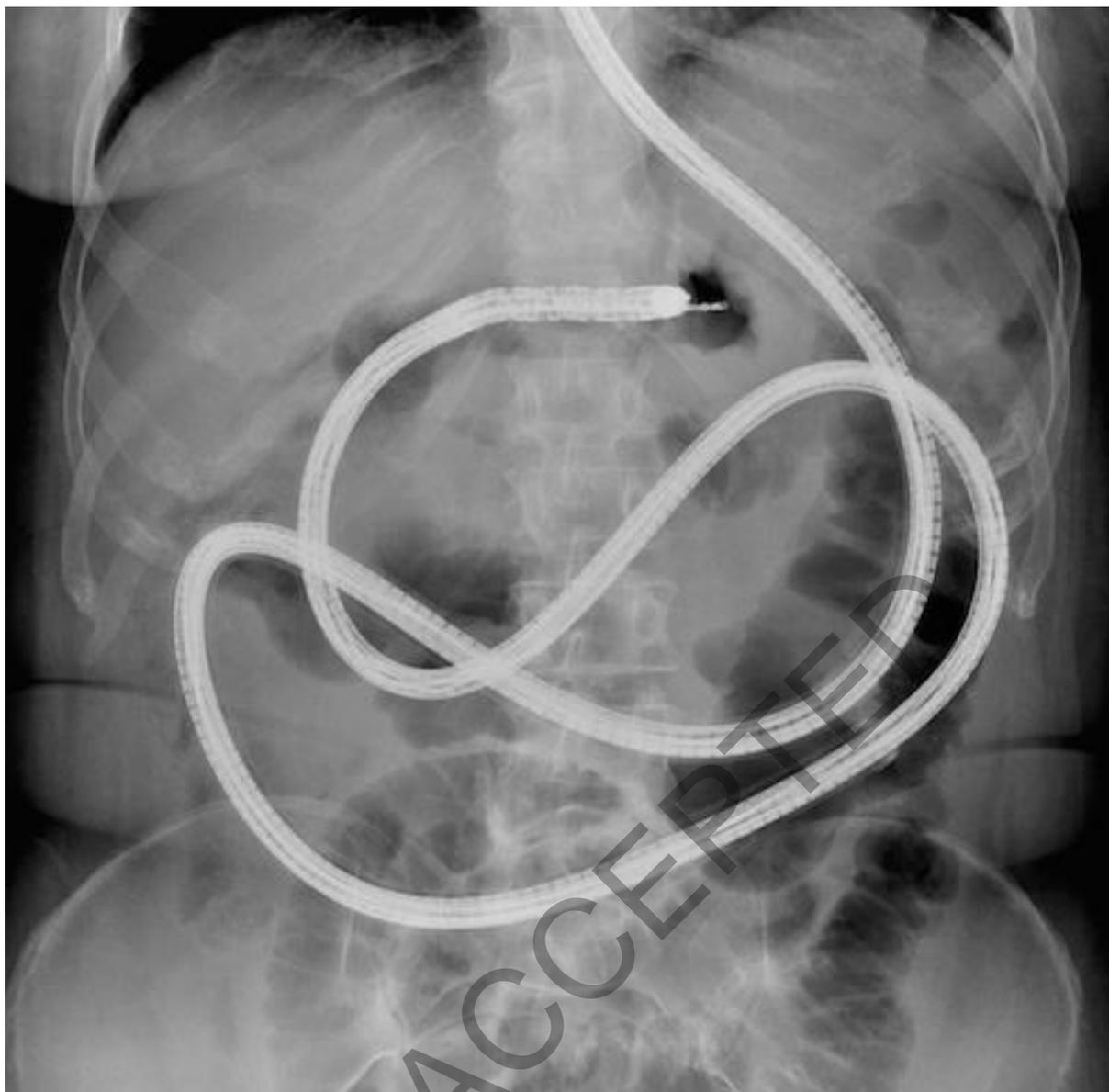
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