

**Review Article**

Gastric Cancer After Roux-en-Y Gastric Bypass: A Case Report and a Systematic Review

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Abstract: Background: Gastric carcinoma in the bypassed stomach after Roux en Y gastric bypass (RYGB) is rare, a few cases have been reported since 1991. The symptomatology associated is non-specific and the monitoring of a bypassed stomach is difficult. Case presentation: We present a case of a 57-year-old woman with an early cancer in the bypassed stomach 1 year after bariatric surgery. Method: PubMed, Web of Science and EMBASE databases were revised. Result: up to date, 17 case reports are founded in literature, among them 15 revealed gastric carcinoma, 1 GIST and 1 lymphoma. In our study were included 18 patients with gastric carcinoma. The interval between bypass surgery and the diagnosis of cancer ranged from 1 to 22 years. Mean patient age was 53.1 years (range: 38-71 years). The most frequent symptom was vague abdominal pain (50%), while only in one case was asymptomatic. In 7 patients (38,9%) the tumor was unresectable. Conclusion: Gastric carcinoma in the bypassed stomach after RYGB is rare and it is difficult to diagnose, and often disease's stage is advanced by the time of diagnosis. The associated symptomatology is non-specific, and so, it's important to maintain a high clinical suspicion to diagnose it early.

Keywords: Bariatric Surgery, Gastric Cancer, Roux-en-Y Gastric Bypass, Bypassed Stomach

1. Introduction

The bariatric surgery has increased extraordinarily in recent years, and the Roux-en-Y gastric bypass (RYGB) represents one of the most performed procedures.

Gastric carcinoma in the bypassed stomach after RYGBP is rare but is reported.

In English literature there are, up to date, less than 20 case reports. The interval between bypass surgery and the diagnosis of cancer ranged from 1 to 22 years. Because of a lack of effective tools to monitor the bypassed stomach, most cases were advanced gastric cancer. So, for the bariatric surgeon, it is important to know and to suspect this disease.

We present a case of a 57-year-old woman with an early adenocarcinoma in the bypassed stomach after 1 year of RYGBP for morbid obesity. Patient's previous: Obstructive

sleep apnea syndrome (OSAS), gastroesophageal reflux disease (GERD) treated by proton pump inhibitor (IPP), dislipidemia.

Preoperative upper endoscopy was performed, showing lots of polyps in the gastric body and the remnant of stomach was faultless. Biopsy showed the benignity of polyps. Moreover endoscopy showed a hiatal hernia. Due to the presence of multiple polipes, although milimetric, a two-months delayed endoscopie was judged to be necessary. A second upper endoscopy confirmed the results of the first one: fundic gland polyps, maybe related to use to IPP. A colonoscopy revealed any hyperplastic polyps.

Due to the presence of GERD, a multidisciplinary team decided to perform a RYGB. There were no contraindications related to the presence of benign polyps, due to their relationship to IPP use.

In November 2017 a laparoscopic RYGB was performed. She had an initial BMI of 39 Kg/m² (body weight 105 Kg and height 165 cm). After 1 year she lost 35 Kg (her BMI was reduced to 33 Kg/m²) and gastro-oesophageal reflux disease and obstructive sleep apnea syndrome (OSAS) disappeared.

In our institution, a postoperative abdominal ultrasound monitoring is scheduled for all patients who underwent bariatric surgery until 3 postoperative years. An ultrasonography performed in May 2018 showed only an asymptomatic cholelithiasis.

A second ultrasonography in November 2018 showed a gastric incidental thickening, although the patient was totally

asymptomatic. A computed tomography confirmed the report (*Figure 1*). These findings led to an exploratory laparoscopy in order to perform biopsies through a gastrostomy. Unfortunately, laparoscopy revealed a gastric cancer with unresectable peritoneal carcinosis (presence of tumor nodules in the left hemi diaphragm, triangular ligament, uterus and in the right lower abdomen). Pathologic reports of intraoperative biopsy showed a signet ring cell carcinoma of the stomach with HER2 negative.

A multidisciplinary team agreed upon EOX chemotherapy protocol.

The patient is even today asymptomatic.

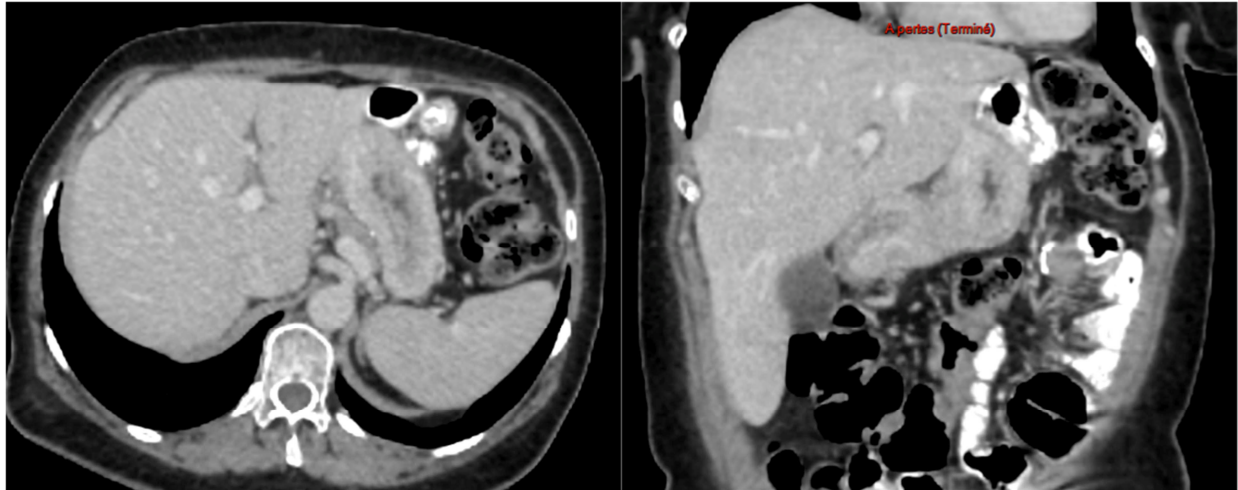


Figure 1. Gastric thickening in the axial (left) and coronal (right) plane.

2. Case Presentation

A 56-year-old woman underwent a laparoscopic RYGB for morbidity obesity. Previous: Obstructive sleep apnea syndrome (OSAS), gastroesophageal reflux disease (GERD) treated by proton pump inhibitor (IPP), dislipidemia.

Preoperative upper endoscopy was performed, showing lots of polyps in the gastric body and the remnant of stomach was faultless. Biopsy showed the benignity of polyps. Moreover endoscopy showed a hiatal hernia. Due to the presence of multiple polipes, although milimetric, a two-months delayed endoscopy was judged to be necessary. A second upper endoscopy confirmed the results of the first one: fundic gland polyps, maybe related to use to IPP. A colonoscopy revealed any hyperplastic polyps.

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3. Results

In English literature there are, up to date, about 17 case reports [1-15] (Table 1).

We have excluded 2 studies because of remnant gastric tumour after RYGB was a GIST [16] or a lymphoma [17]. A total of eighteen patients of 15 studies were included in the study.

Table 1. Summary of published case reports in the English literature to date.

STUDY	AGE	SEX	YEAR	TUMOR LOCATION	HYSTOLOGY	YEARS FROM SURGERY
Raijman et al	38	F	1991	Body	Adenocarcinoma	5
Lord et al	71	F	1997	Antrum	Adenocarcinoma	13
Kithin et al	57	F	2003	Antrum	Poorly differentiated adk	22
Escalona et al	51	F	2005	Antrum	Signet ring cells adk	8
Corsini et al	57	M	2006	Antrum	Poorly differentiated adk	4
Harper et al	45	F	2007	Antrum	Adenocarcinoma	1
Watkins et al	44	M	2007	Antrum	Adenocarcinoma	18
Swain et al	66	F	2010	Pylorus	E. gastric cancer	21
	69	F	2010	Pylorus	Adenocarcinoma	20
Chun-Chi Wu et al	41	F	2013	Antrum	Poorly differentiated adk	9
Menéndez et al	51	F	2013	Gastrojejunal anastomosis	Adenocarcinoma	3
Nau et al	55	F	2013	Linitis plastica	Poorly differentiated adk	4
Tinoco et al	56	F	2015	Antrum	Adenocarcinoma	10
D'Antonio et al	58	F	2017	Antrum	Early gastric cancer	4
Ali et al	40	F	2018	Antrum	Signet cell gastric carcinoma	13
	50	F	2018	Antrum	Poorly differentiated adk	6
Haenen et al	52	F	2018	Linitis plastica	Adenocarcinoma	7
Present study	56	F	2019	Linitis plastica	Signet cell gastric carcinoma	1

Table 1. Continued.

STUDY	SIGNS AND SIMPTOMS	STAGE	TREATMENT
Raijman et al	Epigastric pain, tarry stool	T4N-Mx	Explorative laparotomy
Lord et al	Anemia	T1N0M0	Distal gastrectomy
Kithin et al	Post-prandial discomfort, gastric outlet obstruction	T4N+M0	Distal gastrectomy
Escalona et al	Epigastric pain, gastric outlet obstruction	T4N3M0	Resection of the excluded stomach
Corsini et al	Abdominal pain, weight loss	Unresectable	Decompressive gastroenterostomy
Harper et al	Abdominal pain, distension	Unresectable	Decompressive gastrostomy
Watkins et al	Abdominal pain, emesis,	T3N0M0	Resection of the excluded stomach
Swain et al	Weight loss, ab. pain	TisN0M0	Resection of the excluded stomach
	Abdominal pain	T2N0M0	Resection of the excluded stomach
Chun-Chi Wu et al	Abdominal pain, fullness, tarry stool	T4N3M1	Resection of the excluded stomach
Menéndez et al	Dysphagia, syncope, vomiting	T4N2Mx	Total gastrectomy
Nau et al	Epigastric pain, vomiting	Unresectable	Explorative laparoscopy
Tinoco et al	Abdominal pain, distension, melenic stools, nausea	T1N3M0	Resection of the excluded stomach
D'Antonio et al	Anemia, abdominal pain and distension	TisN0M0	Laparoscopic trans gastric resection of the polyp
Ali et al	Epigastric pain, weight loss	Unresectable	Chemotherapy
	Epigastric pain, nausea, gastrointestinal bleeding	Unresectable	Explorative laparoscopy
Haenen et al	Abdominal pain, vomiting	Unresectable	Explorative laparoscopy
Present study	Asymptomatic	Unresectable	Explorative laparotomy

Mean patient age was 53.1 years (range: 38-71 years). The intervals between bypass surgery and the diagnosis of cancer ranged from 1 to 22 years (mean time 9.4 years). There were 15 females (83%) and 3 males (17%), according to gender's percentage undergoing to bariatric surgery. The symptoms and signs including: vague abdominal pain (50%) and fullness, were primarily caused by tumour obstruction, nausea and vomiting, post-prandial discomfort, gastric outlet obstruction, weight loss, abdominal distension, emesis, fullness, tarry stool (Table 2). Infrequently, the cancer of bypassed stomach is asymptomatic.

The most frequent location of the cancer was in the antrum (61%, 11 patients). In 7 patients (38,9%) the tumor was unresectable, and so in 5 cases (27.8%) only an explorative laparotomy/laparoscopic was performed. However, when feasible (61%, 11 patients), resection of the excluded stomach was the most frequently operation performed (6 cases).

Table 2. Patients' symptoms.

SYMPTOMS	CASES (%)
Abdominal pain	9 (50%)
Vomiting/nausea	6 (33.3%)
Epigastric pain	5 (27.8%)
Abdominal distension	3 (16.7%)
Weight loss	3 (16.7%)
Outlet obstruction	3 (16.7%)
Tarry stool	2 (11.1%)
Melenic stool	2 (11.1%)
Anemia	2 (11.1%)
Fulness	1 (5.6%)
Dysphagia	1 (5.6%)
Syncope	1 (5.6%)
Asymptomatic	1 (5.6%)

4. Discussion

Obesity is a growing epidemic worldwide. In 2014, more than 1.9 billion adults were overweight, 600 million of which were obese, representing 39% and 13% of the adult world population, respectively [18]. With the introduction of advanced laparoscopy, bariatric surgery became one of the leading weapons used in the treatment of obesity. Numerous procedures were developed over the years, each new procedure claiming advantaged over the others. Laparoscopic RYGB is one of the most commonly performed bariatric procedures and is an effective way for obese individuals to lose weight [19]. However, gastric cancer in the bypassed stomach following a RYGB and other bariatric operations remains a potential risk.

To date, in the English literature, there are a few articles: about twenty papers, 15 cases report of cancer in the excluded stomach, a total of 17 patients, and 2 cases of another tumor (1 GIST and 1 lymphoma).

The only case diagnosed within 1 year after gastric bypass was suspected of having a cancer at the time of bariatric surgery, because no preoperative endoscopic evaluation had been performed [6]. So our case is the second one with an interval of 1 year after surgery. In our case, two preoperative upper endoscopies and one colonoscopy were performed, showing the benignity of polyps. Hyperplastic polyps (HPs) and fundic gland polyps (FGPs) are the most common type of lesion among polypoid lesions of the stomach. HPs are considered to be relatively harmless in their natural course; the incidence rate of malignant change has been reported to be relatively low (2.1%) [20]. Certain authors have previously reported a few cases of the malignant transformation of gastric HPs [21-22]. FGPs are also benign lesion, associated to gastric acid suppression; FGPs can be sporadic, or they can be associated with an inherited polyposis syndrome such as FAP. Long term follow-up for sporadic FGPs is controversial, as these lesions were considered as benign without malignant potential [23]. There is a strong role for long term follow-up of FGPs in patients with an inherited polyposis syndrome due to the increased risk of dysplasia and cancer [24]. Malignant evolution risk rise when polyps are larger than 1 cm. In our case, polyps were millimetric and biopsy always revealed FGP. Most probably cause was IPP use, in patient with GERD.

In the 17 patients reported in the literature, the symptoms are non-specific. Abdominal pain (50%), especially in the epigastric region (27.8%), is the most common symptom. There aren't a pathognomonic signs. In three cases, the revealing sign was weight loss, and in one case was anemia. Weight loss is the aim of bariatric surgery, while anemia often is caused by iron or vitamin B12 malabsorption. So, these signs can be underestimated or misinterpreted in bariatric surgery patients.

Because of a lack of effective tools to monitor the bypassed stomach, most cases (38.9%) were advanced gastric cancer, and only a palliative chemotherapy was performed. If feasible, surgical resection of the by-passed stomach with lymphadenectomy is the treatment. Several exploration techniques have been proposed: endoscopic methods (long

retrograde endoscope or endoscopy through a jejuno-jejunal anastomosis or gastrostomy) or PET-TC [12]. However, these procedures are not routinely used because they require advanced techniques or invasive procedures. Therefore, the best procedure for diagnosis of cancer in the bypassed stomach after RYGB is to maintain a high clinical suspicion. Indeed, since the number of patients who undergo gastric bypass increases, more cases will likely be reported in the future.

5. Conclusions

The diagnosis of gastric carcinoma in the bypassed stomach after RYGB is difficult because the associated symptomatology is non-specific or even asymptomatic as seen in the previous case.

Nevertheless, it's important to maintain a high clinical suspicion, especially based on the increase of bariatric surgery procedures. Indeed the increasing number of bariatric operations may involve the surgeons to meet this disease. The new onset of epigastric pain, nausea/vomiting, abdominal distension, weight loss or outlet obstruction in a patient with RYGB can raise the suspicion of gastric carcinoma in the bypassed stomach.

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