

Bariatric surgery and incidental gastrointestinal stromal tumors – a single-center study

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Abstract

Introduction: Gastrointestinal stromal tumors (GISTs), originating from Cajal cells, are most commonly located in the stomach; therefore they can be found in the specimens excised during bariatric operations. The global prevalence of GISTs is about 130 cases per million population. Morbidity differs depending on geographical latitude. Although surgery is the treatment of choice for GISTs, 40–50% of patients after radical surgical treatment will have a relapse or metastases.

Aim: To analyze the incidence of GISTs in patients undergoing bariatric surgery and to verify whether an operation performed according to the bariatric protocol is oncologically radical in case of GIST.

Material and methods: A single-center retrospective study. The study group comprised 1252 obese patients qualified for bariatric procedures, with no upper gastrointestinal tract neoplasms found during preoperative diagnostic examinations. In case of suspicious macroscopic pathologies ($n = 81$) present during the operation, tissue specimens underwent histopathological examination with further investigation performed if GISTs were found, including tumor size and localization, mitotic index and immunohistochemical analysis.

Results: Gastrointestinal stromal tumors were found in 16 cases, and benign tumors of various histological origin in 33 cases. All cases of GIST found came from stomach specimens, 7 from the gastric corpus vs. 9 from the fundus. Fourteen GISTs were found during laparoscopic sleeve gastrectomies (LSGs) vs. 2 during laparoscopic Roux-en-Y gastric bypasses (LRYGBs).

Conclusions: In case of incidental findings of GISTs during bariatric surgery, tumor resection with negative margins of incision may be considered as complete oncological treatment if there was very low/low risk stratification of GIST's recurrence after surgery.

Key words: obesity, bariatric surgery, gastrointestinal stromal tumor.

Introduction

Gastrointestinal stromal tumors (GISTs), mentioned for the first time in the 1980s, were classified as a separate group of tumors quite recently [1]. They probably originate from interstitial cells of Cajal [2], the pacemaker cells responsible for peristaltic

contractions. Gastrointestinal stromal tumors most commonly occur in the gastrointestinal tract: the stomach (50–60%) or small intestine (30–35%), and less frequently the colon (5%) or esophagus (1%) [3]. Extra-gastrointestinal tract tumors (E-GISTs) constitute less than 5% of GISTs [4]. E-GISTs may also be metastases of tumors of unknown primary

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location [3]. As Cajal cells are located mostly in the corpus and fundus of the stomach, these are also the most common locations of gastric GISTs [5]. The global prevalence of GISTs is about 130 cases per million population. Morbidity differs depending on geographical latitude, ranging from 7 new cases per million population a year in Europe and the United States to 16–22 cases in Asia [6]. Although surgery is the treatment of choice for GISTs, 40–50% of patients after radical surgical treatment will have a relapse or metastases [7].

Obesity has gradually become a common health problem, not only causing metabolic syndrome [8, 9], but also increasing the risk of developing neoplasms [10–12]. Bariatric surgery is the most effective way of treatment, exceeding in value diet or physical exercise or pharmacology [13–15].

More than 450 000 bariatric procedures were performed globally in 2013, and the number is constantly growing every year [16]. The same trend may also be observed in Poland, where according to Janik [17], about 1500 bariatric operations were performed in 2014.

Aim

The purpose of the study was to analyze the incidence of GISTs in patients undergoing bariatric surgery.

We also wanted to verify whether an operation performed according to the bariatric protocol is oncologically radical in case of GIST.

Material and methods

In this retrospective study, medical records of 1252 patients qualified for bariatric procedures from January 2013 to December 2016 in a single large bariatric centre were analyzed. The qualification criteria were chosen as follows, according to current recommendations [18]: body mass index (BMI) greater than or equal to 40 kg/m², or BMI greater than or equal to 35 kg/m² with at least one serious obesity-related comorbidity, such as heart disease, type 2 diabetes mellitus (T2DM), or severe obstructive sleep apnea (OSA). Pre-operative examinations included basic blood tests, endoscopy of the upper gastrointestinal tract and ultrasound examination of the abdominal cavity. According to patients' BMI, alimentary habits and co-morbidities, they were qualified for sleeve gastrectomy (SG), duodenal switch (DS) or

Roux-en-Y gastric bypass (RYGB). The operative protocols were standardized and performed by the same team of bariatric surgeons. In case of any abnormal macroscopic findings during the operation samples were taken and a decision was made whether or not to proceed with the bariatric operation.

Further analysis was performed if GIST was found during the histopathological examination.

The analysis included age, gender, BMI, type of bariatric procedure, length of hospital stay (LOS), tumor size and localization, mitotic index (MI) and results of immunohistochemical investigation.

Results

In the study 1252 obese patients were qualified for bariatric surgery, none of whom had upper gastrointestinal tract neoplasms found during preoperative diagnostic examinations.

Out of 81 (6.47%) patients from whom histopathological samples were collected, in 61% ($n = 49$) cases the results were positive and showed abnormalities. After histological and immunohistochemical evaluation of stomach tissue samples, GISTs were diagnosed in 16 (1.28%) patients, leiomyomas in 5 (0.40%) patients, lipomas in 3 (0.24%) patients, fibromas in 2 (0.16%) patients, Schwannomas in 2 (0.16%) patients and neurofibroma in 1 (0.08%) patient. In 7 cases the procedure was discontinued after diagnostic laparoscopy and surgical biopsy, without performing the bariatric procedure. The incidental macroscopic findings, which led to waiving the bariatric procedure, originated from the liver (one of each: non-alcoholic steatosis cirrhosis and bile duct adenoma), stomach (one fibroma and one leiomyoma) and perigastric tissue (one of each: sarcoidosis and simple cyst).

Out of 16 patients, 10 (62.5%) were male and 6 (37.5%) were female. The mean age was 55.5 ± 8.9 years (range: 39 to 68 years). The mean BMI was 48.9 ± 9.2 kg/m² (33.4–72.8 kg/m²). The mean length of stay in hospital was 4.7 ± 1.0 days (3 to 7 days). There were no severe complications or perioperative deaths.

All the cases of GIST found came from stomach specimens. Samples were taken during sleeve resection in 14 cases, and in 2 cases during Roux-en-Y gastric bypass.

All tumors were not larger than 20 mm in diameter. In 7 cases the tumors came from the gastric corpus, and 9 were found in the gastric fundus.

In 12 cases the tumors were of single location, in 4 cases of double location. The results are shown in Table I.

In all the cases additional immunohistochemical examinations were performed, the results of which are shown in Table II, together with the mitotic count.

Most of the evaluated tumors were excised with negative margins of more than 10 mm (14 out of 16 cases), in 1 case the margin was of 5 mm, and in 1 case the excision line was through the tumor. In the two latter cases the patients were invited to an oncological consultation, but they did not show up. No cases of local metastases to lymphatic nodes were found.

Discussion

All cases of GIST that were found in the study group were qualified as very low/low risk according

to Modified National Institute of Health (NIH) consensus criteria [19] and in the 1st group in the classification of the Armed Forces Institute of Pathology (AFIP) criteria [20], giving a 90–95% chance of 10 years recurrence-free survival [3].

Morbid obesity not only leads to development of various metabolic co-morbidities, such as heart disease, diabetes mellitus type 2 or obstructive sleep apnea, but also may be a risk factor for developing neoplasms.

Bariatric surgery has become the most successful method of obesity treatment, especially in patients with co-morbidities resulting from the obesity itself. In many cases surgical treatment is the only way of physical and social recovery. The value of bariatric surgery has been confirmed in numerous studies.

Depending on patient’s age and geographical latitude, global morbidity of GIST is 0.007–0.022 new cases per one thousand population a year, and in Europe about 0.01 new cases per one thousand population a year. These data come mostly from post mortem autopsies or incidental findings. In our study, we found 16 cases of GISTs in 1252 patients,

Table I. Characteristics of tumors

Case	Size [mm]	Type of operation	Localization
1	10 × 5	SLEEVE	Corpus
2	20 × 15 × 20	SLEEVE	Corpus
3	7	SLEEVE	Fundus
4	5 × 3	SLEEVE	Fundus
5	6	RYGB	Fundus
	5	RYGB	Fundus
6	4 × 3 × 3	RYGB	Fundus
7	4 × 3 × 3	SLEEVE	Corpus
8	7	SLEEVE	Fundus
	6	SLEEVE	Fundus
9	6 × 4 × 3	SLEEVE	Corpus
10	3	SLEEVE	Corpus
11	4	SLEEVE	Fundus
	4	SLEEVE	Fundus
12	7	SLEEVE	Fundus
13	5	SLEEVE	Fundus
14	5	SLEEVE	Fundus
15	6	SLEEVE	Corpus
	5	SLEEVE	Corpus
16	5	SLEEVE	Corpus

Table II. Immunohistochemical characteristics of tumors

Case	CD117	CD34	SMA	Desmin	S100	Ki67	HPF
1	+						0/50
2	+	+	-				1/50
3	+	+	-				0/50
4	+	+	-				0/50
5	+	+	-/+		-		1/50
6	+	+		-			0/50
7	+	+	-		-		0/50
8	+	+	+			+	3/50
9	-	+	-		-		0/50
10	+	+	-				0/50
11	+	+					0/50
12	+	+	+			+	1/50
13	+		-		-	+	5/50
14	+	+	-		-		1/50
15	+	+	-	-	-		0/50
16	+	+	-				0/50

during 47 months. Therefore the morbidity of GIST in our study is 12.8 new cases per 1 thousand population a year.

The results show that morbidity of GISTs found amongst patients undergoing bariatric surgery is 1280 times higher than in the general population. The results should be adjusted for the fact that most of the GISTs found during operations were small tumors (not larger than 20 mm), which might be asymptomatic during patients' lifespan, and therefore might not be diagnosed.

There are several research studies about findings during bariatric surgery. Most GISTs found were at very low risk stratification following modified NIH criteria: Chiappetta *et al.* [21] found 0.31% (8/2603) GISTs during RYGB and SG, Yuval *et al.* [22] reported 0.6% (5/827) GISTs during SG, Sanchez *et al.* [23] found 0.8% (4/517) GISTs during RYGB, and Crouthamel *et al.* [24] found 0.8% GISTs (12/1415) during SG, out of which only one was larger than 20 mm.

In the Japanese study by Kawanowa *et al.* [25], 100 stomachs resected because of gastric cancer during the period 1988–2003 were analyzed and microGISTs were found in 35% of cases, of 0.2–4 mm in diameter. The histopathological examination was performed in the whole specimen, analyzing tissue slices sectioned at 5 mm intervals.

Conclusions

In case of incidental findings of GISTs during bariatric surgery, tumor resection with negative margins of incision may be considered as complete oncological treatment if there was very low or low risk stratification of GIST's recurrence after surgery.

All patients after GIST resection should remain under long-term postoperative care.

There is an important question whether obesity is a risk factor of GISTs, and further analysis must be conducted to confirm the answer.

Conflict of interest

The authors declare no conflict of interest.

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