Bile Gastritis Following Laparoscopic Single Anastomosis Gastric Bypass: Pilot Study to Assess Significance of Bilirubin Level in Gastric Aspirate

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ORIGINAL CONTRIBUTIONS

Bile Gastritis Following Laparoscopic Single Anastomosis Gastric Bypass: Pilot Study to Assess Significance of Bilirubin Level in Gastric Aspirate

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Abstract

Introduction Laparoscopic single anastomosis gastric bypass (SAGB) is increasingly performed for morbidly obese patients.

Aim of Work This pilot study aims primarily at evaluating the incidence of bile gastritis after SAGB. The occurrence of reflux oesophagitis and reflux symptoms were also assessed.

Patients and Methods This study included 20 patients having no reflux symptoms. All patients underwent a SAGB as a primary bariatric procedure by a single surgeon. Patients included consented to have an upper GI endoscopy done at 6 months postoperatively. Gastric aspirate was sent for bilirubin level assessment. Gastric and esophageal biopsies were submitted for histopathology and campylobacter-like organism (CLO) test.

Results In our study, the rate of bile gastritis was 30%. In 18 patients, the level of bilirubin in gastric aspirate seems to be related to the degree of mucosal inflammation. The remaining two patients had microscopic moderate to severe gastritis with normal aspirate bilirubin level. Two patients with bilirubin level in aspirate more than 20 mg/dl had severe oesophagitis, gastritis with erosions, and metaplasia. Relationship between bilirubin level and histopathological findings of gastric biopsy examination was statistically significant with a P value of 0.001.

Conclusion The incidence of bile gastritis in this cohort is higher than reported in the literature, and this may be worrying. The correlation between endoscopic findings and patients' symptoms is poor. Bilirubin level and pH in aspirate might be useful tools to confirm alkaline reflux. Its level might help to choose candidates for revision surgery after SAGB. This needs further validation with larger sample size.

Keywords Single anastomosis gastric bypass · Bile gastritis · Bilirubin level

Introduction

Morbid obesity is expanding worldwide [1], and increasing levels of obesity are associated with increasing risk of comorbidities and of death [2]. Obesity is associated with an increased mortality risk [3], as well as increased health costs. A BMI ≥ 35 kg/m^2 is associated with a 200% increase in health care costs compared to the normal weight range [4]. Long-term studies show that bariatric procedures cause significant long-term loss of weight, recovery from diabetes, improvement in cardiovascular risk factors, and a reduction in mortality of 23% from 40%.

Laparoscopic single anastomosis gastric bypass (SAGB) first reported by Rutledge [5] is increasingly performed for morbidly obese patients. Safety and satisfactory short- and long-term outcomes have been reported in large series [6]. Centers have published their 10-year experience with the procedure [7]. A randomized controlled trial comparing

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Table 1 Patients' demographics—pre and post operative endoscopy results

	Age	Sex	Height	Weight	BMI	Comorbidities	Weight (6 m)	%EBWL	OGD preop	OGD postop	Bil. (mg/dl)
1	44	1	179	136	42.3	DM, HTN	99	66.1	Normal	Normal	0
2	56	2	169	160	56.02	No	96	77.87	Normal	MG	10.4
3	32	2	150	110	48.8	No	75	65.11	Normal	MG	10.6
4	31	2	160	125	48.8	No	75	81.96	Normal	SG/O	27.7
5	33	1	178	186	58.7	No	102	83.34	Normal	Normal	1
6	43	2	183	204	60.91	No	132	59.86	Normal	Normal	0.1
7	26	2	167	123	44.1	No	89	63.81	MG	Normal	0.2
8	19	2	166	125	45.36	No	83	74.85	Normal	Normal	0.8
9	31	2	162	118	44.9	No	76	80.16	Normal	Normal	0.3
10	35	2	150	110	48.88	DM	69	76.27	MG	MG	0.4
11	42	1	172	112	37.8	DM, HTN	80	84.12	MG	MG	0.5
12	40	2	177	137	43.7	DM	92	76.69	Normal	Normal	0.4
13	23	2	167	124	45.5	No	85	71.84	Normal	MG	0.7
14	18	2	171	121	41.38	No	83	79.33	MGl	Normal	0.8
15	35	2	158	124	49.67	DM	85	63.32	Normal	MG	0.4
16	31	2	171	133	45.48	No	86	78.46	Normal	SG/O	22.5
17	43	1	173	115	38.4	DM	82	82.13	Normal	MG	0.4
18	29	2	152	112	48.47	No	77	64.52	Normal	MG	11.6
19	30	2	163	119	44.7	No	78	77.97	Normal	Normal	0.2
20	53	2	173	141	47.1	DM, HTN	92	74.04	Normal	MG	9.6

DM diabetes, HTN hypertension, MG mild-moderate gastritis, SG/O severe gastritis/Oesophagitiss, Bil. bilirubin level in gastric aspirate

laparoscopic Roux–en-Y gastric bypass (RYGB) versus SAGB concluded that both procedures were effective for morbid obesity with similar results for resolution of metabolic syndrome and improvement of quality of life. SAGB is a simpler and safer procedure that has no disadvantage compared with RYGB at 2 years of follow-up [8].

McCarthy et al. reported the incidence of macroscopic and microscopic gastritis with different ways of restoration of gastrointestinal continuity after gastric bypass. According to his study, Roux-en-Y reconstruction was associated with least incidence of macroscopic gastritis (13%) compared to loop bypass (71%) even with the addition of Braun anastomosis (45%) [9].

In other studies, the incidence of symptomatic bile gastritis after SAGB was 0.05% according to Rutledge et al. These patients required revisional surgery and addition of Braun anastomosis [5]. Musella et al. reported an incidence of 0.9%. None of these patients required surgery [6].

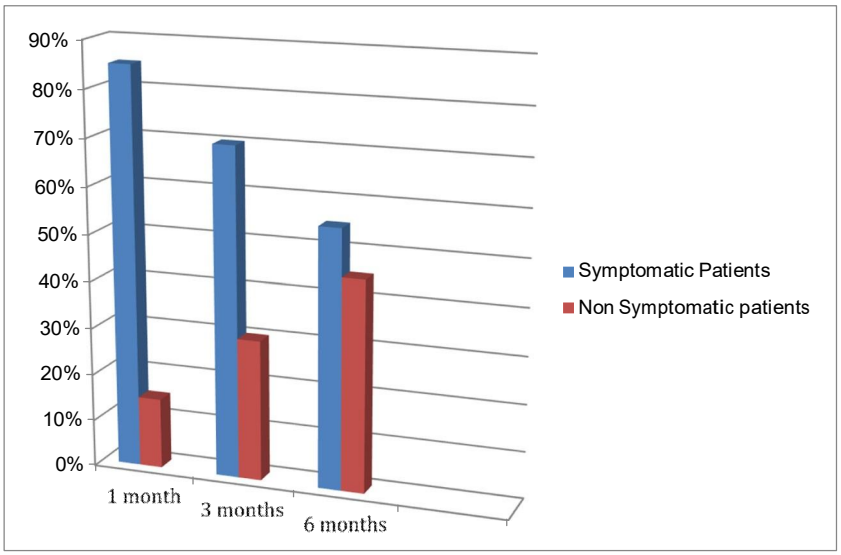

Fig. 1 Dyspeptic symptoms 1, 3, and 6 months post operatively

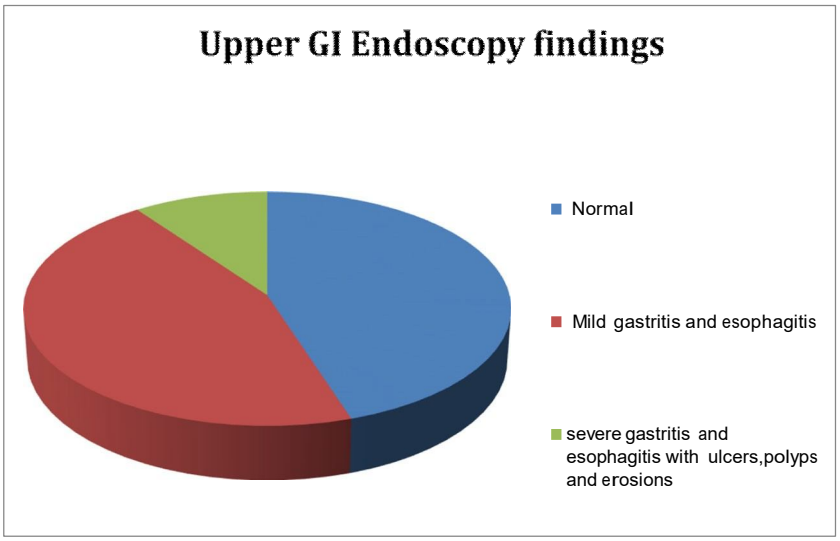

Fig. 2 Upper GI endoscopy findings 6 months post operative

The clinical importance of this gastritis is not clear because of the lack of follow-up data. However, similarity in reconstruction between SAGB and Billroth II is not in favor that SAGB patients are more at risk of developing gastric cancer. The only reported case of gastric cancer post SAGB was in the excluded stomach and hence not related to bile reflux [10].

This study aims primarily at evaluating the incidence of bile gastritis after SAGB for 20 morbidly obese patients of the Egyptian population. The occurrence of reflux oesophagitis and symptoms of reflux following SAGB were also assessed throughout the study.

Patients and Methods

This pilot study included 20 consecutive patients over 3 months' period. All patients underwent a SAGB as a primary one-stage bariatric procedure by single surgeon using the same surgical technique in Cairo University Hospitals.

Preoperative evaluation followed the same standard protocol and included thorough history, complete endocrinal work-up, psychological evaluation, and counseling by a dietician. All patients underwent upper abdominal ultrasonography to look specifically for gallstones. Upper GI endoscopy (OGD) was routinely performed for all patients.

Table 2 Histopathology of gastric biopsy 6 months post operative

istopathology of gastric biopsy	Number	Percent
Normal mucosa/mild gastritis	12	60
Moderate to severe gastritis	6	30
Severe gastritis with erosions and metaplasia	2	10
Total	20	100

The subjects were considered appropriate candidates for the present study if they were aged between 18 and 65 years, with BMIs of ≥ 40kg/m^2, or between 35 and 40 kg/m^2 with obesity-related disease. Moreover, they had to be compliant with long-term follow-up.

Patients with type II diabetes—sweet eaters were advised to have SAGB. Only Patients with reflux symptoms or with evidence of severe reflux on OGD were advised to have Roux–en-Y gastric bypass. All patients included in this study had no/minimal reflux symptoms/dyspepsia prior to surgery. Sleeve gastrectomy remains the most commonly performed procedure in our department.

Informed written consent was obtained from all patients. Patients willing to participate in our study consented to have an upper GI endoscopy done at 6 months postoperatively.

Thromboembolic prophylaxis with subcutaneous low molecular weight heparin was routinely prescribed to all patients during their hospital stay and continued at home for 2 weeks.

Surgical Procedure

All procedures were performed under general anesthesia with the patient in supine position and the surgeon positioned between the legs of the patient (French position) after applying compression stockings on the patient's lower legs. The patients were firmly secured to the operating table to allow for placement in the anti-Trendelenburg position as required.

We use a five-port technique. A gastric pouch is created over a 36 Fr. bougie starting at the level of incisura angularis. Pouch length is usually 18 cm or slightly more. We perform an antecolic end-to-side gastrojejunostomy using a 30-mm stapler at 200 cm from duodenoejunal flexure. Remaining enterotomy is closed in two layers with a running suture. We routinely use an anchoring stitch between the afferent loop and the gastric pouch in an attempt to decrease chances of biliary reflux.

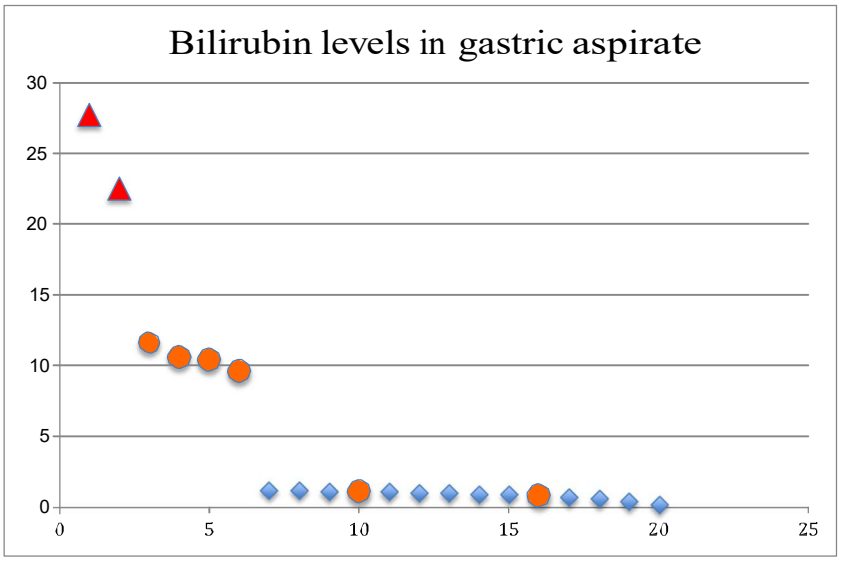

Fig. 3 Bilirubin levels in gastric aspirate in mg/dl. (Red triangles correspond to findings of severe oesophagitis, gastritis with ulcers, polyps, and erosions on OGD. Amber dots correspond to microscopic findings of moderately to severely inflamed gastric mucosa)

Any bleeding from staple lines is controlled by liga clips. We perform a routine methylene blue test to check integrity of anastomosis. Patients have a gastrografin meal on post operative day 1 before they are allowed oral intake. They get discharged either at the end of post operative days 1 or 2 on proton pump inhibitors with written instructions regarding diet and supplements.

Post Operative Follow-Up

The weight loss assessments included the absolute change in weight, the change in BMI, and the percentage of excess body weight loss (%EBWL). The weight was measured at the initial screening visit, 1, 3, and 6 months after surgery. Preoperative comorbidities were followed up postoperatively at 1, 3, and 6 months after surgery.

In addition to routine assessment at these visits, patients were asked to fill questionnaire to assess reflux symptoms (GORD Symptom Frequency Questionnaire (GSFQ score) [11].

All 20 patients had an upper GI endoscopy done at 6 months by a single endoscopist. Gastric aspirate was sent for bilirubin level assessment. Gastric and esophageal biopsies were taken and submitted for histopathology and CLO test. CLO test was done selectively on preoperative endoscopy for patients with positive endoscopic findings.

SPSS (Statistical Package for Social Science) software v 15.0 for windows was used for statistical analysis (SPSS Ione, IL, VSA). Fisher's exact test was used to assess statistical significance due to small sample size. P value less or equal to 0.05 is considered statistically significant whereas a P value less or equal to 0.01 is considered highly significant.

Results

Twenty patients (16 females and 4 males) with a mean age of 34 ± 1.5 years (18–65 years) and a median BMI of 47 (38–61 kg/m^2) had uneventful SAGB. All patients were discharged maximum 48 h postoperatively. They were all

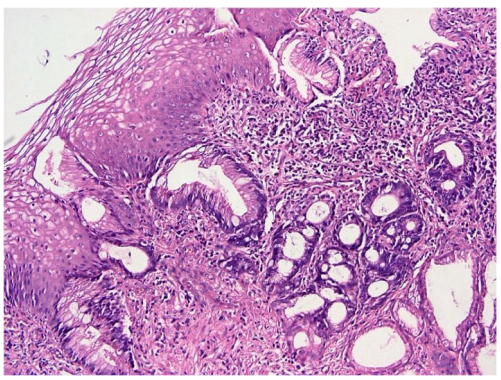

Fig. 4 Barrett's esophagus, squamous mucosa alternating with glandular mucosa showing intestinal metaplasia with evident Goblet cells (×200 H&E)

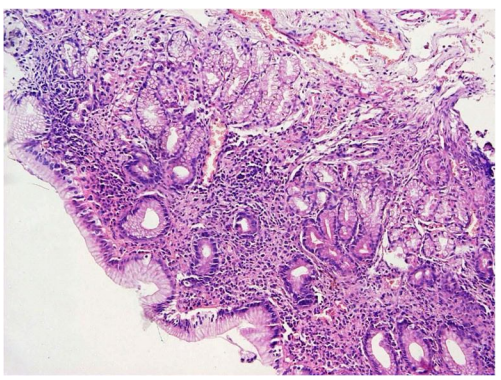

Fig. 5 Gastric mucosa showing moderate infiltration by plasma cells and lymphocytes with few neutrophils (×200 H&E)

Table 3 Relation of bilirubin levels to gastric biopsies

			Gastric biopsy	
			Normal + mild gastritis	Moderate to severe gastritis
Bilirubin level in aspirate	Normal	Count	12	2
		%within bil. level in aspirate	85.7%	14.3%
		%within gastric biopsy	100%	25%
	High	Count	0	6
		%within bil. level in aspirate	0%	100%
		%within gastric biopsy	0%	75%
Total		Count	12	8
		%within bil. level in aspirate	60%	40%
		%within gastric biopsy	100%	100%

reviewed in outpatient clinic 1-week post discharge. One patient experienced calf DVT 15 days postoperatively and was treated at home by therapeutic dose of anticoagulant.

Seven out 20 patients had type II diabetes and three of them were hypertensive as well. All of them stopped their medical treatment by the time of OGD.

Among 20 patients, the average EBWL 6 months postoperatively is 74% with a minimum of 60% and a maximum of 84%. (Table 1)

At 1 month, 17 patients had dyspeptic symptoms with an average GSFQ score of 18 out of 22. At 3 months, 14 patients were symptomatic with an average score of 14. At 6 months, 11 patients had still symptoms with an average score of 14. (Fig. 1)

Endoscopy Findings Nine patients had normal gastric and oesophageal mucosa. Mild gastritis and oesophagitis were evident in nine patients. Severe oesophagitis, gastritis with ulcers, polyps, and erosions appeared in two patients. (Fig. 2)

Gastric biopsy was taken by upper GI endoscopy for all patients and sent for histopathological examination. It confirmed endoscopic findings in 12 patients who had normal mucosa or evidence of mild gastritis. Eight patients had moderate to severe gastritis (two of them had erosions and metaplasia on top). (Table 2)

CLO test was positive in 14 patients. Four of these patients had mild gastritis on preoperative endoscopy with a positive urease test and received H. pylori eradication treatment for 2 weeks.

Bilirubin level in gastric aspirate was within normal serum range in 14 patients (< 1.3 mg/dl). It ranged from 9.6 to 27.7 mg/dl (mean 15.4 mg/dl) in the remaining six patients. (Fig. 3) Mean normal bilirubin levels in gastric aspirate were found to be 1.28 mg/dl [12]

Twelve out of 14 patients, with normal bilirubin level in gastric aspirate, had normal or mildly inflamed gastric mucosa on histopathological examination of gastric biopsy. The remaining two patients had microscopic moderate to severe gastritis.

In the remaining six patients, the level of bilirubin in gastric aspirate seems to be related to the degree of mucosal inflammation. Two out of the six patients with bilirubin level in gastric aspirate more than 20 mg/dl had severe oesophagitis, gastritis with erosions, and metaplasia. (Figs. 4 and 5)

In our study, there was relationship between bilirubin level in gastric aspirate and histopathological findings of gastric biopsy examination of statistical significance with a P value of 0.001. (Table 3)

Discussion

Mini gastric bypass is gaining popularity in some parts of the world especially after the encouraging results published [7]. A RCT comparing SAGB versus RYGB concluded that both procedures had comparable results for resolution of metabolic syndrome and improvement of quality of life [8]. SAGB is a simpler and shorter procedure compared to RYGB. It also has the advantages of less incidence of internal hernia (1 reported case in SAGB versus 0.9–4.5% in RYGB) and the ease of reversibility [13].

Musella M. et al. reported in a multicenter review that bile reflux gastritis was symptomatic, with endoscopic findings in 0.9% and acid peptic ulcers for 1.7%. Patient is required revision surgery due to bile gastritis [6].

In a 5-year follow-up study of 175 patients, Bruzzi M, et al. reported that incapacitating bile reflux developed in 2 (1.6%) who required conversion into RYGB [14]. In other study, Chakhtoura G. et al., reported that out of 100 patients who underwent SAGB, two patients (2%) complained of bile reflux [15].

In our study, the rate of bile gastritis was 30% (6 out of 20 patients). This was proven by upper GI endoscopy and bilirubin level in gastric aspirate and histopathological examination

of gastric and oesophageal biopsies. This rate is higher than that reported in literature. This may be because of the timing of endoscopy, inclusion of asymptomatic patients, and small sample size of our study, but may also be affected by underreporting in other studies, which depended merely on upper GI endoscopy findings.

Hospital stay, morbidity, and absence of mortality in our study are comparable to reported international figures. Average EBWL in this study was 74% at 6 month. This is again comparable to the results of Rutledge et al. He reported in 1054 mini-gastric bypasses patients an EBWL% of 84 and 91% in the first and second years, respectively [16].

As regards to symptoms, at 6 months, 11 patients had GORD symptoms with an average GSFQ score of 14. However, four out these 11 patients did not have endoscopic findings to explain their symptoms. At the same time, four out of nine asymptomatic patients had endoscopic evidence of oesophagitis and gastritis with only one of them having microscopic evidence of severe inflammation. The study shows no significant relationship between patients' symptoms and endoscopy findings at 6 month. However, histological findings were more in line with patients' symptoms. This may be due to the fact that pathologists were blinded of patients' symptoms and endoscopy findings.

Despite the fact that one out nine asymptomatic patients had microscopic evidence of severe gastritis and oesophagitis, we cannot recommend, based on this data, routine endoscopy at 6 month postoperatively. Sample size is too small to make such a recommendation, which is not a routine practice internationally.

Meanwhile, there was a significant relationship between bilirubin level in gastric aspirate and histological findings. Level of bilirubin in aspirate was higher in patients with more significant inflammation. Two patients with bilirubin level in aspirate > 20 mg/dl had severe gastritis with erosions and metaplasia. Bilirubin level was also found to be significantly related to endoscopy findings. Level of bilirubin in gastric aspirate in cases with significant mucosal damage on endoscopy might be a useful tool to select patients likely to need surgery (e.g., Braun anastomosis/conversion to Roux-en-Y) rather than medical treatment. Size of sample and duration of follow-up do not allow us to make such a recommendation.

In this study, 14 out of 20 patients were H. pylori positive. This might be due to a change in pH after SAGB. However, preoperative infection cannot be excluded as only patients with endoscopic evidence of gastritis were tested for H. pylori preoperatively. Success of H. pylori eradication was not checked for those who received treatment. H. pylori prevalence among preoperative patients, therefore, needs to be further evaluated.

One would expect change in gastric pH after SAGB especially with the routine use of PPI postoperatively.

In our study, we managed to standardize the techniques through having single surgeon supervision and a single endoscopist, along with 100% patients' compliance. Nevertheless, the small sample size, selection bias, different pathologists, and short follow-up period, are all obvious drawbacks.

This study highlighted the safety of SAGB in our hospital setting—no mortality and low morbidity with quick post operative recovery. Incidence of bile gastritis was 6/20 (30%), with only two patients (10%) having severe microscopic inflammation with elevated levels of serum bilirubin in gastric aspirate.

Conclusion

The incidence of bile gastritis in this cohort is higher than reported in the literature, and this may be worrying. The correlation between endoscopic findings and patients' symptoms is poor. Bilirubin level and pH in aspirate might be useful tools to confirm alkaline reflux. Its level might help to choose candidates for revision surgery after SAGB. This needs further validation with larger sample size.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval Statement The pilot study BBile Gastritis following laparoscopic single anastomosis gastric bypass^ has obtained ethical committee approval in March 2015 before starting to recruit patients. Ethical committee approval is a must before the start of any research project in Cairo University Hospitals.

Statement of Informed Consent Informed consent was obtained from all individual participants included in the study.

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