

# ENDOSCOPIC AND ULTRASONOGRAPHIC EVALUATION BEFORE AND AFTER ROUX-EN-Y GASTRIC BYPASS FOR MORBID OBESITY

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**ABSTRACT – Background** - Esophagogastric abnormalities are recognized prior and after bariatric procedures, but frequency and severity are debated. Liver and biliary tract findings are also of clinical importance, especially gallstones and liver steatosis. **Aim** - To compare pre-operative findings of hepatobiliary ultrasound and upper digestive endoscopy with post-operative results in patients submitted to open Roux-en-Y gastric bypass for morbid obesity. **Methods** - A total of 80 patients were enrolled 16.8 ± 12.1 months after operation, all of them on routine follow-up program, and 8 were excluded. Retrospective analysis aimed at pre-operative clinical, endoscopic and ultrasonographic examinations and were prospectively repeated. **Results** - Pre-operative endoscopic report was available in 42 cases, and 52 examinations were performed post-operatively. Frequency of esophagitis changed from 16.7% (7/42) to 15.4% (8/52), and of gastritis from 45.2% (19/42) to 21.2% (11/52). Gastric or gastrojejunal ulcers were initially present in 4.8% (2/42) and increased to 9.6% (5/52). Post-operatively, an unusual abnormality was silastic band erosion: 7.7% (4/52). *Helicobacter pylori* was present in 50.0% (21/42) before and 3.5% (2/52) after operation. Ultrasonographic study had been done before intervention in 63 subjects, and 57 were executed on follow-up. Liver steatosis occurred previously in 58.7% (37/63) and in 43.9% (25/57) later on. Only 12.7% (8/63) of the patients had undergone cholecystectomy before bariatric operation, 29.1% (16/55) suffered simultaneous resection of gallbladder because of stones during Roux-en-Y gastric bypass, and an additional 26.8% (10/36) developed gallstones post-operatively. **Conclusions** - Liver steatosis did not statistically improve, nor did inflammatory conditions of the upper digestive tube, despite reduction of *H. pylori* infections; gallbladder stones requiring intervention were common.

**HEADINGS** – Gastric bypass. Obesity, morbid. Gallstones. Anastomosis, Roux-en-Y. Ultrasonics. Endoscopy, digestive system.

## INTRODUCTION

It is common knowledge that obesity is a risk factor for several diseases<sup>(18, 21)</sup>, mainly metabolic and cardiovascular<sup>(25, 29)</sup>, but also encompassing those of the gastrointestinal tract<sup>(12, 15, 30)</sup>, including malignancies<sup>(5, 10, 22)</sup>.

In 1992, the National Institutes of Health/USA considered bariatric surgery as a legitimate alternative for treatment of obesity<sup>(17)</sup>. Bariatric operations present the best answer not only to the main disease, but also to comorbidities. In other words, “a surgeon can perform one operation and cure the patient of four or five diseases”<sup>(34)</sup>.

On the other hand, bariatric surgery is not free of risk. It is possible, for didactic reasons, to divide as early and late the complications of anti-obesity procedures. The former should mention intra-operative accidents

and mortality, and peri-operative morbidity<sup>(19, 32)</sup> and mortality<sup>(9, 33)</sup>. The latter would focus inappropriate long-term weight loss, malnutrition<sup>(8)</sup> and many other derangements, including psychiatric illness on a few susceptible subjects – mainly those with prior psychiatric history<sup>(7, 24)</sup>.

Weight loss achieved by Roux-en-Y gastric bypass (RYGBP) induces major positive outcomes, such as hypertension and diabetes<sup>(3, 6, 23, 28, 35)</sup> amelioration, and possibly liver steatosis regression<sup>(15)</sup>. Potentially negative results should not be forgotten, such as gallbladder disease<sup>(20, 38)</sup> and changes in the functional gastric pouch as well as in adjacent organs (esophagus, jejunum).

Because of partial gastric exclusion from alimentary transit, concern has been directed to the excluded pouch, which is hardly accessible<sup>(31, 36)</sup>. For that reason,

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and because of the *H. pylori* contribution to various gastric morbidities<sup>(11, 16, 37)</sup>, it is considered mandatory to treat this infection before surgery, as well as to examine the patient afterwards, providing additional treatment should reinfection be demonstrated.

Given the relative scarcity of information regarding the impact on the listed troubles of anti-obesity intervention, a prospective study including retrospective information was designed with the objective of evaluating endoscopic and ultrasonographic findings before and after RYGPB.

## METHODS

**Population** - Interviews were conducted with 80 patients and, after 8 exclusions, 72 were enrolled in the protocol. Exclusion criteria were: critical illness, shock or coma after surgery, bariatric re-operation or conversion, operation not performed on our institution, liver cirrhosis, incomplete hospital chart or refusal to participate.

All patients underwent open RYGBP from 3 months to 4 years earlier ( $16.8 \pm 12.1$  months), and 87.5% were females. Age was  $42.0 \pm 10.4$  years (20-65). As a routine until 2006, in all patients a silastic ring (diameter = 2.3 cm) was placed around the new gastric pouch.

Pre-operative body mass index (BMI) was  $51.4 \pm 8.2$  kg/m<sup>2</sup> (36.4-79.1), maximum BMI was  $55.7 \pm 9.1$  kg/m<sup>2</sup> (40.1-87.7) and post-operative BMI was  $35.2 \pm 7.6$  kg/m<sup>2</sup> (20.1-56.7). Pre-operative BMI was defined as that immediately preceding bariatric surgery, maximum BMI was the largest preoperative weight the patient ever reported, and post-operative BMI was the result when the patient was first consulted during this investigation.

They were recruited in the outpatient obesity service, and informed consent was obtained. Brief history and physical examination was part of the protocol, as well as a concise questionnaire for comorbidities.

Pre-operative endoscopy and ultra-sonography was looked for at the medical chart, and repeat examination was scheduled. All patients were asymptomatic regarding hepato-biliary manifestations, however six (8.3%) already had an endoscopic assessment requested by their physician, on account of various complaints. They were not excluded because of interest in analyzing a representative sample where upper gastrointestinal symptoms are not entirely uncommon.

Retrospective chart revision encompassed description of surgical procedure and complications along with post-operative admissions, in the light of the exclusion criteria, especially for reoperations.

Relevant variables on ultrasonographic imaging were liver steatosis and gallbladder disease (including previous cholecystectomy). On endoscopy, *H. pylori* infection was evaluated, as well as esophagitis, gastritis, ulcers and other findings. Biopsy descriptions were also reviewed.

All control ultrasound and endoscopy examinations were done in the institution by radiologists and endoscopists aware

of the purposes of the protocol, and targeting the same variables of the retrospective part of the study.

For hepatic steatosis diagnosis, the radiologist (ASB, one of the authors) considered fatty infiltration as a diffuse increase in echogenicity of the liver as compared with that of the kidneys<sup>(1)</sup>. The ultrasound equipment used was Toshiba Sonolayer (Toshiba America, Tustin, CA, USA)

**Statistical analysis** – Results are shown as mean  $\pm$  SD. Comparison between pre and postoperative findings was done by paired *t* test and Chi square analysis, as appropriate, to a significance level of 5% ( $P < 0.05$ ).

## RESULTS

### Population

The following exclusions occurred: two subjects were reoperated, two were operated outside the institution, one had liver cirrhosis probably secondary to liver steatosis, one was diagnosed with gastric leiomyoma and underwent total gastrectomy with Roux-en-Y reconstruction, one was operated outside the time period and another refused to continue in the study. Additional exclusions occurred due to incomplete charts or failure to schedule the control examinations, therefore actual number of observations was smaller than initially projected.

### Ultrasonographic observations

#### Pre-operative

We could retrieve 64 ultrasonographic reports. Of those, one patient (BMI = 87.7) could not be classified because of severe signal attenuation by excessive body fat. Of the remaining cases, 8 patients (12.7%) had undergone previous cholecystectomy and 37 (57.8%) displayed signs of hepatic steatosis.

Gallbladder stones were found in 16 patients (29.1% of those still possessing a gallbladder). Cholecystectomy was performed in all of these during the gastroplasty procedure.

#### Post-operative

Fifty-seven examinations were performed (79.2% of total patients). History of cholecystectomy was registered in 33.3%, and of the remaining cases, 26.3% (10/36) presented gallbladder stones.

Signs of liver steatosis were disclosed in 25 patients (43.9%). No patient developed cirrhosis post-operatively.

Global changes can be followed in Table 1, together with changes on endoscopic examination. Stratification of findings by time after surgery is shown because it is clinically relevant, although different patients were examined once on different times. Consequently only the global post-operative percentage is truly representative and allows conclusions.

### Endoscopy observations

#### Pre-operative

Endoscopic evaluation was analyzed in 42 patients (58.3% of total). Biopsies were not routinely obtained, but urease test was systematically used to assess *H. pylori* infection.

**TABLE 1.** Total and percentual pre and post-operative findings. Chi-square test analysis of pre- and global post-operative values only

	Pre-operative percentage	3 to 12 months	13 to 24 months	25 to 36 months	37 to 48 months	Global post-operative percentage	P value
Esophagitis	16.7% n = (7/42)	10.5% n = (2/19)	15.0% n = (3/20)	22.2% n = (2/9)	25.0% n = (1/4)	15.4%	0.88
Gastritis	45.2% n = (19/42)	26.3% n = (5/19)	25.0% n = (5/20)	11.1% n = (1/9)	0% (n = 4)	21.2%	0.26
Ulcers	4.8% n = (2/42)	10.5% n = (2/19)	15.0% n = (3/20)	0% (n = 9)	0% (n = 4)	9.6%	0.40
Silastic ring complications	-	5.3% (n = 1/19)	5% (n = 1/20)	33.4% (n = 3/9)	25% (n = 1/4)	11.5%	-
H. pylori infection	50.0% n = (25/50)	0% (n_)	5.0% n = (1/20)	0% (n = 9)	25.0% n = (1/4)	5.6%	<0.001
Liver steatosis	57.8% n = (37/64)	25.0% n = (4/16)	50.0% n = (12/24)	44.4% n = (4/9)	62.5% n = (5/8)	43.9%	P = 0.125
Gallbladder stones	29.1% n = (16/55)	28.6% n = (2/7)	22.2% n = (4/18)	50.0% n = (2/4)	28.5% n = (2/7)	27.8%	P = 0.069
Previous cholecystectomy	12.7% n = (8/63)	-	-	-	-	-	-

**TABLE 2.** Silastic ring migration on digestive tube. Descriptions

Patient	Gender	Type of complication	Age	Pre-operative BMI	Post-operative BMI	Time after surgery (years)	Symptoms	Location of migration	Treatment
63	F	SRM	43	58.4	46.3	0.4	Asymptomatic	Esophagogastric transition	None
81	F	SRM	32	51.6	22.7	2.8	Excessive weight loss	Not identified	Exploratory laparotomy
3	F	E	54	48.3	35	3.4	Dysphagia		Endoscopic removal
34	F	E	49	50.8	32.9	2.9	Dysphagia		Endoscopic Removal
54	F	E	36	60.2	41.2	1.9	Asymptomatic		None
75	F	E	35	46.8	22	2.6	Dysphagia. Excessive weight loss		Endoscopic Removal

SRM = Silastic ring migration  
E = Erosion into the lumen

Esophagitis was seen in 16.7% (n = 7) of the patients, 45.2% (n = 19) exhibited gastritis, 4.8% (n = 2) had gastric ulcers. Out of 50 tested, 25 (50%) were positive for *H. pylori*.

#### Post-operative

Endoscopy was performed in 52 patients (72.2% of total). Routine biopsies were performed at first, but were discontinued after six cases of mild digestive bleeding. Esophagitis was identified in 15.4% (n = 8), 21.2% (n = 11) revealed gastritis, and 9.6% (n = 5) were affected by gastrojejunal ulcers. Two patients (3.8%) tested positive for *H. pylori*.

#### Other findings – silastic band

Six patients (11.5%) presented endoscopic findings related to the silastic band used in the procedure: In four of them it entered the gastric lumen and migration and gastric encroachment was noticed in two others.

Table 2 shows characteristics of the patients with silastic band findings.

Clinically, of the two that migrated, one was asymptomatic and the other produced clinical signs of stenosis and required laparotomy for removal. The intra-operative finding was jejunal stenosis. Of the four that invaded the lumen, three were symptomatic.

Treatment for those was endoscopic removal of the silastic band. The asymptomatic patients (migration and invasion of the lumen) are on conservative treatment.

Statistical analysis regarding pre-operative and post-operative comparison is demonstrated in Table 1. The same comments about global and time-stratified comparisons before mentioned are valid.

Other relevant endoscopic findings are shown in Table 3.

**TABLE 3.** Additional endoscopic findings

Other findings	Pre-operatively	Post-operatively
Erosive esophagitis "A" – SM	1/42(2.4%)	2/52(3.8%)
Erosive esophagitis "B" – SM	1/42(2.4%)	0
Non-erosive esophagitis	2/42(4.8%)	3/52(5.8%)
Barrett esophagus	0	1/52(1.9%)
Intestinal metaplasia	0	1/52(1.9%)
Hiatus hernia	4/42(9.5%)	3/52(5.8%)
Gastric polyps (no cancer at biopsy)	2/42(4.8%)	3/52(5.8%)
Silastic ring erosion	-	4/52(7.7%)
Silastic ring migration	-	2/52(3.8%)
Elevated eroded antral gastritis	5/42(11.9%)	Unreachable
Flat erosive gastritis	0	2/52(3.8%)
Erosive duodenitis	7/42(16.7%)	Unreachable
Duodenal inflammation	1/42(2.4%)	Unreachable

## DISCUSSION

Few studies compare pre-operative versus post-operative endoscopies findings in RYGBP patients, and impact of the operation is still debated. Some deal with chronic gastritis associated with *H. pylori* infection<sup>(26)</sup> which is reported in about 21% of patients pre-operatively. In one survey<sup>(27)</sup>, none of the nine patients submitted to the bariatric procedure (gastroplasty without malabsortive procedure) were infected with *H. pylori*.

Two Brazilian studies, one focusing only pre-operative endoscopy<sup>(4)</sup>, and another only post-operative<sup>(2)</sup>, indicated that before intervention (n = 110), *H. pylori* infected 29.1% of patients, 0.9% of them had gastric ulcer and 47.3% presented gastritis. These numbers are roughly comparable to the current protocol.

In another recent study<sup>(14)</sup>, focusing only endoscopy in symptomatic patients after RYGBP, none of the 23 patients were infected with *H. pylori*. The same study diagnosed ulcer disease in 52% (12/23) of patients. This unusual proportion of ulcers can only be explained by pre-selection of subjects displaying suspicious manifestations.

In the post-operative study (n = 168)<sup>(2)</sup>, every patient was treated for 2 months after surgery with proton pump inhibitors. Follow-up was 2 to 19 months. Just 4.7% of the patients were endoscopically diagnosed with ulcers and 6.5% presented visible erosions.

The only statistically significant change in the current protocol was reduction of *H. pylori* infection rates on follow-up control. All patients who tested positive pre-operatively were treated with antacids and antibiotics, and were only admitted to surgery if tested negative post-treatment. Therefore, all post-operative cases were reinfections. Of the two recurrences one was diagnosed with gastric ulcer, gastritis and intestinal metaplasia, and is being clinically treated. The other patient had normal endoscopy, with no visible lesions.

Gastritis and esophagitis, although less prevalent post-operatively, did not significantly disappear. For esophagitis this result can be considered as true and complete, since the whole esophagus was available for examination, but that is not the case for gastritis. Many of the lesions found pre-operatively involved the antrum, and this area is not reachable by ordinary endoscopy. Duodenal erosions, as well, could not be evaluated.

Silastic band problems, which unexpectedly occurred in relatively high numbers, were mostly managed by endoscopic removal which was easily feasible when there was erosion of the lumen. Migration presented different challenges: one patient was asymptomatic and is being just observed, but the other required surgery for removal, because it stenosed the jejunum (patient 81). Although it was not the aim of this study, we report characteristics of these patients on Table 2.

When ultrasonographic examination is addressed, the results are in broad agreement with others concerning pre-operative<sup>(30)</sup> cholecystectomy (14% of the population), as well as intra-operative gallbladder surgery (21.5% of patients with remaining gallbladder)<sup>(20, 30)</sup>. Only the rate of de novo calculi was rather high, and raises the possibility of prophylactic cholecystectomy if the observation is confirmed in future investigations. One Brazilian<sup>(20)</sup> (27.5%) and one American<sup>(30)</sup> publication (36%) already indicate comparable figures.

Changes in post-operative liver steatosis, although not statistically significant, also deserve some attention. Similarly to other centers a decrease tended to occur<sup>(20)</sup>, but it was less conspicuous, in spite of good weight response of the population. Ultrasound is not the gold standard for diagnosis of fatty liver accumulations, therefore such profile may not be entirely reliable, but it seems advisable to follow more closely the affected patients, and to employ liver biopsy in suspicious cases, especially if liver enzymes are deranged as well.

The global post-operative endoscopic and ultrasonographic profile of this basically asymptomatic population was encouraging, as few major complications were disclosed and most *H. pylori* infections were eliminated. Nevertheless, it was somewhat disappointing to discover that for most variables, little real progress was made.

It could be alleged that a mean follow-up period of 17 months is not ideal for such a protocol, as many patients will still lose weight until 2 or even 3 years after gastroplasty. Methodological constraints which prevented documentation of the full cohort of subjects are also a weak point in this model. Still it was rather striking to register that neither esophagogastric nor hepatobiliary abnormalities were appreciably corrected by operation, differently from what is known for diabetes, arterial hypertension and other comorbidities of advanced obesity<sup>(3, 6, 7, 19, 21, 28)</sup>.

Although publications regarding digestive derangements are indeed scarce, there are reasons to believe that they belong to a different category concerning comorbidities, one of the few that are not definitely improved by weight loss and normalization of body composition. The inevitable rearrangement of gastrointestinal anatomy imposed by RYGBP as well as by other bariatric interventions is necessary but not entirely physiological, and could thus be blamed for the outcome.

Gallbladder lithiasis was common after RYGBP, and cholecystectomy may be advisable during RYGBP in order to avoid another surgical procedure. Liver steatosis did not improve as much as expected, despite substantial weight loss, but more information is necessary in this area.

Endoscopic and ultrasonographic follow-up seems highly relevant for the bariatric population and should be recommended in the long term. The findings in those asymptomatic patients lend credence to the hypothesis that early intervention based on these observations could prevent more significant morbidity later on.

## CONCLUSIONS

Liver steatosis did not statistically improve, nor did inflammatory conditions of the upper digestive tube, despite reduction of *H. pylori* infections.

Gallbladder stones requiring intervention were common.

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Teivelis MP, Faintuch J, Ishida R, Sakai P, Bresser A, Gama-Rodrigues J. Avaliação endoscópica e ultra-sonográfica antes e depois de gastroplastia com derivação intestinal em Y-de-roux para obesidade mórbida. *Arq Gastroenterol.* 2007;44(1):8-13.

**RESUMO – Racional** - Anormalidades esôfago-gástricas são reconhecidas anteriormente e após procedimentos bariátricos e suas freqüências são alvo de discussão. Achados hepáticos e biliares são também de importância clínica, especialmente litíase biliar e esteatose hepática. **Objetivo** - Comparar achados pré-operatórios de ultra-sonografia hepática e vias biliares e de endoscopias digestivas altas com resultados pós-operatórios dos mesmos em pacientes submetidos a cirurgia bariátrica aberta com derivação intestinal. **Métodos** - Oitenta pacientes foram incluídos na pesquisa 16.8 ± 12.1 meses após a operação, todos no seguimento ambulatorial de rotina, tendo oito sido excluídos. Análise retrospectiva foi feita com enfoque nos dados pré-operatórios, em exames ultra-sonográficos e endoscópicos dos pacientes e estes foram, prospectivamente, realizados para este estudo. **Resultados** - A endoscopia pré-operatória foi realizada em 42 casos e 52 exames foram realizados no pós-operatório. A freqüência de esofagite mudou de 16,7% (7/42) para 15,4% (8/52) e de gastrite de 45,2% (19/42) para 21,2% (11/52). Úlceras gástricas ou gastrojejunais estavam inicialmente presentes em 4,8% (2/42) e aumentaram para 9,6% (5/52). No pós-operatório uma anormalidade incomum encontrada foi a erosão da banda de silastic 7,7% (4/52). *H. pylori* estava presente em 50,0% (21/42) no período pré-operatório e em 3,5% (2/52) no seguimento pós-operatório. A análise ultra-sonográfica foi feita no período pré-operatório em 63 pacientes e 57 foram realizadas no pós-operatório. Esteatose hepática estava presente em 58,7% (37/63) e em 43,9% (25/57), posteriormente. Apenas 12,7% (8/63) dos pacientes tinham colecistectomia prévia, 29,1% (16/55) sofreram colecistectomia durante o procedimento bariátrico e mais 26,8% (10/36) desenvolveram litíase biliar no seguimento pós-operatório. **Conclusões** - Esteatose hepática não melhorou de forma estatisticamente significativa, nem as doenças inflamatórias do tubo digestivo superior, apesar da redução da infecção pelo *H. pylori*. Litíase biliar requerendo intervenção foi comum.

**DESCRITORES** – Derivação gástrica. Obesidade mórbida. Cálculos biliares. Anastomose em Y-de-Roux. Ultra-som. Endoscopia do sistema digestório.

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