

## Histopathological findings in laparoscopic sleeve gastrectomy specimens: Are pathological examinations necessary?

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### Abstract

**Objective:** The objective of this study is to determine the prevalence of gastric histopathological findings in patients who underwent laparoscopic sleeve gastrectomy (LSG) in our hospital and to add more data to the published literature on the characteristics of the resected LSG samples.

**Material and Methods:** The pathology reports of the patients were retrospectively analyzed to identify all patients with consecutive morbidly obesity who underwent LSG from January 2015 to December 2019. All patients underwent gastroscopy in the preoperative period.

**Results:** The study analyzed 800 patient reports. No specific pathological finding was observed in 230/800 (28.75%) of the patients, which was reported as normal. Specific pathological findings were present in 570 (71.25%) patients. Cases of chronic inactive gastritis (400 patients [50%]), chronic active gastritis (134 patients [16.7%]), intestinal metaplasia (2 patients [0.2%]), low-grade dysplasia (1 patient [0.12%]), stromal tumor (7 patients [0.87%]), Neuroendocrine (NE) cell hyperplasia (7 patients [0.87%]), fundic gland polyps (3 patients [0.37%]), granulomatous gastritis (1 patient [0.12%]), acute gastritis (1 patient [0.12%]) and ectopic pancreas (1 patient [0.12%]) were recorded.

**Conclusion:** Surgeons should be aware of the high unexpected histopathological prevalence in bariatric patients. Although our study did not find any malignant pathological result, we believe that routine postoperative pathological examination and preoperative endoscopy are necessary for medicolegal reasons.

**Keywords:** Obesity; Histopathology; Laparoscopic sleeve gastrectomy; Bariatric surgery

### 1. Introduction

Obesity has become a global health problem and normal diets and exercise regimens have failed to control this disease [1,2]. Bariatric surgery has become the preferred treatment and laparoscopic sleeve gastrectomy (LSG) is one of the most effective surgical procedures to get it under control [3]. Histopathological samples taken after surgery are usually normal; however, in rare cases, pathological findings will lead us to change our entire treatment plan [1,4]. LSG is the only surgical procedure that provides samples for histopathological examination [2,3]. Abnormal histopathological findings include a broad range from chronic inactive gastritis to gastrointestinal stromal tumor. However, it has been

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reported that the rate of no specific pathological finding in the histopathological examination of the specimen in laparoscopic sleeve gastrectomy ranges from 0 to 80.2% [5,6].

The objective of this study is to determine the prevalence of gastric histopathological findings of the patients who underwent LSG in our hospital and to add more data to the published literature on the characteristics of the resected LSG samples. Also, more information about the main histopathological characteristics of LSG materials may help determine what is required prior to the surgical procedure. Another objective of this study is to evaluate the histopathological changes that may be incidentally detected in these morbidly obese patients and these data may help to define the prevalence of different histopathological findings in morbidly obese patients. Based on these results, they may also help to determine the requirement and practicability of preoperative endoscopy to evaluate the gastric mucosa with biopsies.

## 2. Material and methods

The pathology reports of the patients were retrospectively analyzed to identify all patients with consecutive morbidly obesity who underwent LSG from January 2015 to December 2019. Patients who met the following criteria were considered eligible for LSG; those with Body Mass Index (BMI)  $\geq 40$  kg/m<sup>2</sup> or BMI  $>35$  kg/m<sup>2</sup> and accompanying comorbidities or BMI between 30 and 35 kg/m<sup>2</sup> and accompanying Type 2 Diabetes Mellitus (T2DM) or metabolic syndrome were operated. Patients who did not meet these criteria were not operated. Patients who had revision surgery and underwent different bariatric procedures were not included in the study. Preoperative informed consent was obtained from all patients to examine the resected samples and use them appropriately in the study. All patients had blood tests and chest X-rays; abdominal ultrasonography (abdominal pain and/or history of suspected cholecystitis) and gastroscopy were also performed. Upon the obesity council's decision, consent for anesthesia was obtained. All surgical operations were performed by the same bariatric surgical team. It was decided whether to continue the bariatric surgery in the absence of any abnormal macroscopic finding during the surgical operation samples.

### 2.1. Statistical analysis

IBM SPSS (Statistical Package for the Social Sciences) Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. was used for statistical analysis of all data. The mean and standard deviation values were calculated in the descriptive statistics of the data.

## 3. Results

The study analyzed 800 patient reports. 560 (70%) of the patients included in the study were females and 240 (30%) were males. Their age ranged from 18 to 60 and the mean age was 34.75 (standard deviation  $\pm 10.3$ ). The mean age was  $34.25 \pm 9.6$  in males, but it was  $34.95 \pm 10.2$  in females. BMI was  $44.9 \pm 5.1$  kg/m<sup>2</sup> in the whole group. BMI was  $45.7 \pm 5.2$  in males and  $44.2 \pm 5.1$  in females. (Table 1) No specific pathological finding was observed in 230/800 (28.75%) of the patients, which was reported as normal. Specific pathological findings were present in 570 (71.25%) patients. *Helicobacter pylori* was found with Giemsa stain in 300 (37.75%) patients. 100/134 (74.6%) of these patients had chronic active gastritis and 200/400 (50%) had chronic inactive gastritis. Cases of chronic inactive gastritis (400 patients [50%]), chronic active gastritis (134 patients [16.7%]), intestinal metaplasia (2 patients [0.2%]), low-grade dysplasia (1 patient [0.12%]), stromal tumor (7 patients [0.87%]), Neuroendocrine (NE) cell hyperplasia (7 patients [0.87%]), fundic gland polyps (3 patients [0.37%]), granulomatous gastritis (1 patient [0.12%]), acute gastritis (1 patient [0.12%]) and ectopic pancreas (1 patient [0.12%]) were recorded (Table 2).

**Table 1** Characteristics of 800 sleeve gastrectomy patients

| Gender | Number (%) | Age(mean $\pm$ SD) | BMI(mean $\pm$ SD) |
|--------|------------|--------------------|--------------------|
| Male   | 240 (30)   | 34.25 $\pm$ 9.6    | 45.7 $\pm$ 5.2     |
| Female | 560 (70)   | 34.95 $\pm$ 10.2   | 44.2 $\pm$ 5.1     |

**Table 2** The histopathological diagnosis of laparoscopic sleeve gastrectomy

| Histopathology                                     | Cases | Percentage |
|--|-------|------------|
| No pathology                                       | 230   | 28.75      |
| Abnormal (specific histopathologic change evident) | 570   | 69.6       |
| Chronic inactive gastritis                         | 400   | 50         |
| <i>Helicobacter pylori</i>                         | 300   | 37.75      |
| In chronic active gastritis                        | 200   | 50         |
| In chronic inactive gastritis                      | 100   | 74.6       |
| Chronic active gastritis                           | 134   | 16.7       |
| Intestinal metaplasia                              | 2     | 0.2        |
| Low grade dysplasia                                | 1     | 0.12       |
| Stromal tümör                                      | 7     | 0.87       |
| Fundic gland polyps                                | 16    | 2          |
| Neuroendocrine (NE) cell hyperplasia               | 7     | 0.87       |
| Granulomatous gastritis                            | 1     | 0.12       |
| Acute gastritis                                    | 1     | 0.12       |
| Ectopic pancreas                                   | 1     | 0.12       |

(Low grade dysplasia were accompanied by intestinal metaplasia.)

#### 4. Discussion

Bariatric surgery is the most effective technique for improving weight loss and obesity-related comorbidities [7]. Today, laparoscopic sleeve gastrectomy (LSG) is the most frequently performed bariatric surgery for obesity and associated comorbidities in the United States and Asia-Pacific region due to its relative ease of application and excellent results [8,9]. Unlike Roux-en-Y gastric bypass, a sample is removed, which can be pathologically examined and may exhibit unexpected pathological results.

One of the most common conditions is gastritis [10]. There are two types of chronic gastritis, active and inactive. Upon the histopathological examination of laparoscopic sleeve gastrectomy specimens, the rates of chronic active and inactive gastritis were reported as 1.6-35% and 12.1-74.5% respectively [3,5,11,12]. Histopathological findings of all patients who underwent laparoscopic sleeve gastrectomy at King Khalid University Hospital from 2010 to 2015 were retrospectively analyzed. Most of 602 cases examined (83.4% [n = 502] ) exhibited chronic gastritis, 22.3% (n = 134) had *Helicobacter pylori* (HP) infections with active gastritis, 1% (n = 6) had intestinal metaplasia and one case (0.17%) was detected as gastric adenocarcinoma [10]. *H. pylori* infection is two to three times more common in obese patients than in normal patients [13]. In large series, the prevalence of *H. pylori* positivity in patients with LSG was found to be between 7.3 and 33.3% [5,14,15]. Our series had a 37.75% prevalence of *H. pylori*. It has been showed that the elimination of HP may reduce the long-term risk of malignancy, but it is still a controversial issue [16]. Carabotti et al. found that postoperative complications were more common in obese patients with *H. pylori* infection [17]. However, Almazeedi et al. identified 7.8% *helicobacter pylori* infection from 680 LSG materials in 2014, and they could not find a significant relationship between the presence of *H. pylori* and postoperative complications, which was similar to our study [15]. During sleeve gastrectomy (SG), ~85% of the greater curvature of the stomach is removed. This includes the majority of tissue potentially colonized or infected with bacteria. In addition, most acid-producing cells are resected, thereby minimizing the risk of peptic ulcer disease.

Therefore, some groups have stopped treating patients found to be infected with *H. pylori* if they have had LSG [18]. We did not perform routine eradication in our clinic from patients with HP infection to those without clinical complaints.

The study by Miller and colleagues [6] included a retrospective review of 1463 consecutive sleeve gastrectomy samples collected. No pathological changes were observed in most cases (80.2%) The most common changes were non-specific, non-Helicobacter-associated chronic gastritis (7.2%), Helicobacter-associated gastritis (6.8%) and benign fundic gland polyps (4.0%). On the other hand, less frequent changes were lymphocytic gastritis, autoimmune atrophic gastritis, chronic gastritis with intestinal metaplasia, hyperplastic polyps, pancreatic heterotopia, gastrointestinal stromal tumors (GISTs) and a leiomyoma.

Ohanessian et al.'s [11] study on 310 patients included the histopathological findings as follows: There were no pathological changes in 214 patients (69.0%), but chronic inactive gastritis in 41 patients (13.2%), and fundic gland polyps in 17 patients (5.5%). Effect of proton pump inhibitor therapy in 12 patients (3.9%), H. pylori-associated chronic active gastritis in 10 patients (3.2%), chronic active gastritis (H. pylori-negative) in 5 patients (1.6%), chronic gastritis with intestinal metaplasia in 4 patients (1.0%), gastrointestinal stromal tumor (GIST) in 3 patients (1.0%), hyperplastic polyps in 1 patient (0.3%), granulomatous inflammation in 1 patient (0.3%), xanthogranulomatous inflammation in 1 patient (0.3%) and mucosal ulceration in 1 patient (0.3%).

Gastric polyps are defined as lesions that protrude from the gastric mucosal surface into the lumen. The term “polypoid lesion” is often used. In general, it is incidentally detected in 2-6% of all patients undergoing upper gastrointestinal endoscopy [19,20]. The rate of polyp detection in the patients in this study was within the rates specified in the literature [22]. Hyperplastic and fundic gland polyps are considered the most common polypoid lesions [20-22].

Upon the histopathological examination of laparoscopic sleeve gastrectomy specimens, dysplasia can be seen at a rate of 0.06-0.2% [23,24]. These patients should be closely followed. Intestinal metaplasia can be detected at a rate of 0.2-5%, and atrophic gastritis at a rate of 0.2-1.8% [5,23]. Low-grade dysplasia was observed in 1 (0.12%) patient, and intestinal metaplasia in 2 (0.2%) patients in our series.

Neoplasia was a rare finding both in our study and in previous studies. The frequency of GIST ranged from 0 to 1.2% in the literature, but we found it to be 0.87% in our series [3,5,10,12,24-26]. We identified all of these patients during the surgery and there was no need to change the treatment and follow-up protocol, whether in the surgical technique or in the postoperative period. All of them were early stage stromal tumors with low mitotic rate and low ki67 index. All major case series yielded <1% of the prevalence of GIST. The possibility of GIST in laparoscopic sleeve gastrectomy specimens should be kept in mind and macroscopic pathological examination of the resected samples should be performed very carefully. Heterotopic pancreas (HP) is the second most common submucosal lesion in the stomach after gastrointestinal stromal tumor [27]. Ectopic pancreas can be found in any part of the gastrointestinal system from the esophagus to the colon, and is often localized in the gastric antrum, duodenum and proximal jejunum [28]. It can also be localized on the anterior or posterior wall of the stomach. It is often located on the greater curvature [29]. There were significant differences in the prevalence of Neuroendocrine (NE) cell hyperplasia detected histopathologically in LSG samples in 1 case of ectopic pancreas (0.12%) in our series and the prevalence rate ranged from 0 to 39.4% [3,5,14,15,26,30-32]. Raess et al. found the rate of NE cell hyperplasia in LSG samples to be 0.8% (7/800), which was similar to our study [3].

The Society of American Gastrointestinal and Endoscopic Surgeons and the American Society for Gastrointestinal Endoscopy recommend preoperative endoscopy in patients with gastrointestinal symptoms, and it should be routinely performed in all patients undergoing Roux-en-Y gastric bypass, since it is difficult to reach the remaining gastric tissue after surgery [9]. Similarly, the American Society for Metabolic and Bariatric Surgery (ASMBS) also suggests gastroscopy in the preoperative period only if clinically necessary [33]. Preoperative endoscopy and removal of premalignant lesions (if any) are advised [35]. Endoscopic removal of premalignant lesions after surgery is not possible due to the narrow area. However, there are centers in the literature that perform preoperative routine endoscopy as well as selective endoscopy [34-36]. Preoperative endoscopic evaluation is sufficient for LSG only in selected cases, since it does not cause too much change in the decision of surgery type or postoperative follow-up. Nevertheless, we perform routine preoperative endoscopy in our clinic.

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## 5. Conclusion

Laparoscopic sleeve gastrectomy can be performed with increasing frequency and safety. Routine preoperative endoscopy prior to these surgical operations is still a controversial issue. Surgeons should be aware of the high unexpected histopathological prevalence in bariatric patients. Although our study did not find any malignant pathological result, we believe that routine postoperative pathological examination and preoperative endoscopy are necessary for medicolegal reasons.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The authors agree no conflict of interest.

### *Author contributions*

Concept -, Design-, Supervision -, Resource -, Materials -, Data Collection and/or Processing - Selim Sözen; Analysis and/or Interpretation -, Literature Search -, Writing -, Critical Reviews – Seyfi Emir, Selim Sözen , Muhammed Said Dalkılıç, Mehmet Gençtürk, Abdullah Şişik and Hasan Erdem.

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