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Routine careful histopathological examination should be performed in sleeve gastrectomy specimens

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ABSTRACT

Introduction: The presence of increased ratio of obesity caused a rapid increase of bariatric surgery practice. In this study, our purpose is to clarify the histopathologic findings of the patients who have experienced this type of bariatric surgery and to learn more about the distinguishable features of laparoscopic sleeve gastrectomy (LSG) specimens and to contribute to the related literature.

Methods: A retrospective study was designed with the histopathologic findings from pathology specimens of 109 patients who experienced LSG between April 2014 and May 2016. To essential data, we used the database system of our institution that contains all of the selected patients for our study.

Results: Overall, the average age was collect 36.2 years, and 85 were female while 24 were male. The principal histopathologic features were active chronic gastritis in 9, chronic gastritis in 68, atrophy in 5, and intestinal metaplasia in 8 patients. In two patients, gastrointestinal stromal tumor was found and in another patient, neuroendocrine cell hyperplasia was found. In addition to the dominant histopathologic features including chronic and active chronic gastritis, a small percent of patients had clinically significant pathologic findings in the sleeve gastrectomy specimens and this may have an effect on postoperative management and morbidity.

Conclusion: Considering these results, having histopathologic examination of the sleeve gastrectomy specimens as a standard procedure is strongly recommended.

Keywords: Gastric sleeve; histopathology; gastrointestinal stromal tumor; bariatric surgery

INTRODUCTION

After developed major agricultural advancement, scarcity of food is no longer the basic concern and significant increasing of the ratio of obesity in developed countries especially. Nowadays, overweight–obesity

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and non-active lifestyle are responsible in 10% of preventable premature deaths in the USA (1). The World Health Organization (WHO) accepts an individual with a body mass index (BMI) between 25.0 and 29.9 kg/m^2 as "overweight" and the person with BMI more than 30.0 kg/m^2 as "obese." The WHO reports that approximately one billion people in the worldwide are overweight (BMI ≥25) and near 300 million are obese (BMI ≥30), and it is considered a worldwide epidemic (2). National Health and Nutrition Examination Survey estimates that approximately 90% of all adults in the USA will be overweight or obese after two decades, and of these, more than 50% will be obese category (1-4).

There are different ways of dealing with obesity, and one of these reliable options is bariatric surgical procedure. There are different surgical procedures in bariatric surgery such as laparoscopic sleeve gastrectomy (LSG), gastric bypass, adjustable gastric band, and pancreatobiliary diversion with duodenal switch. Now, LSG is the most common bariatric surgical operation and remarkable part of the stomach has been resected in this surgery and there is a lack of published data about histopathologic changes in the LSG specimens of morbidly obese patients. These types of surgeries are considered pretty routine now, and most of clinicians think of bariatric surgical resection as just removing normal tissue component and we almost always do not expect to find histopathological abnormal finding in such a routine resection specimen. However, even in these routine cases including only excision normal tissue, the pathologist found gastric abnormal histopathologic findings that sometimes may be required serious treatment and follow-up. The aim of this study was to identify the prevalence gastric histopathologic findings of the patients undergoing LSG at our hospital and also to add more data about the characteristics of the resected LSG specimens to the published literature. Furthermore, there is uncertainty about how to fix presurgery workup and more data including the main histopathologic features of LSG materials may be helpful to figure what is necessary before the surgical procedure. Additional objective of the current study is to evaluate the histopathological alterations that may be detected incidentally in these morbid obese patients, and these data may also be helpful to describe the prevalence of different histopathological findings in morbid obese patients and based on these results may be helpful to determine the requirement and practicality of preoperative endoscopy for assessing the gastric mucosa with biopsies.

METHODS

We studied the specimens from 109 bariatric gastric sleeve surgery cases performed at our hospital from April 2014 to May 2016. We conducted a retrospective study using our prospectively collected data of our medical center's metabolic and bariatric registry approved by the Institutional Ethical Committee (IEC, Helsinki Committee). Preoperative endoscopy was not generally performed in asymptomatic patient. A retrospectively maintained database was used to collect our data. We identified patients that underwent LSG in whom data were found in the resected pathological specimen. Patient characteristics such as age, sex, and initial BMI were examined and noted. For this retrospective study, the guidelines of the 1975 Declaration of Helsinki and national laws were followed. All the patients and healthy subjects gave informed consent. LSG surgical materials were fixed immediately with 10% buffered neutral formalin at least 24 hours. After the fixation, a total of six samples from the same locations (three from the proximal part and three from the distal part of the resection material) were taken from LSG material in each resection material of the case. Four microns sections were taken from the specimens obtained from resections after the routine tissue processing procedure and embedding. These sections stained with hematoxylin and eosin (H and E) for orthodox light microscopic examination. The gastric mucosa status of *Helicobacter pylori* was evaluated in detail in the one proximal and one distal samples section stained with special stain. Lymphoid follicular hyperplasia in lamina propria was noted if present. We essentially focused on the five basic parameters in the lamina propria of sleeve gastrectomy materials: The presence of inflammatory cells, activity consisted with polymorphonuclear leukocyte and eosinophil leukocytes, gastric glandular atrophy, intestinal metaplasia, and *H. pylori*-like organism. All of these five parameters were graded according to visual analog system semiquantitatively between 0 and 3 as (0) absent

(within normal range), (1) mild, (2) moderate, and (3) severe related with degree of mucosal involvement. We also examined HE-stained slides for the additional pathological findings such as the presence of epithelial nuclear abnormality (such as reactive regenerative atypia and dysplasia), neuroendocrine (NE) cell hyperplasia, mesenchymal neoplasm, lymphoid aggregate, and erosion/ulceration in the mucosal surface epithelium. Two additional sections of the tissue were taken at random, and the presence of *H. pylori* was detected in slides stained with H and E if possible or modified in slides stained with toluidine blue, in classic light microscope. All the data were analyzed using SPSS version 13 for Windows (SPSS Inc.; Chicago, IL, USA).

RESULTS

Our institutional laboratory information system was searched to retrospectively identify all primary LSG specimens performed from April 2014 to May 2016. Between these months, 181 gastric resection specimens were identified and reported as "Gastric resection, non-tumor." Clinical information provided with the specimen was reviewed to detect LSG performed for morbid obesity; total 109 cases were identified. Demographic findings are given in Table 1.

Women comprised 77.9% (85 patients) of the study population. The mean age of patients undergoing the procedure was 36.2 ± 9.2 years, with the youngest patient being 18-year-old and the eldest being 63-year-old. The average and median number of tissue blocks submitted for microscopic analysis per specimen were six. From a histopathological point of view, 77 (71%) patients had an evidence of chronic gastritis, with an additional 9 (8.2%) showing active components and 4 (3.6%) cases with atrophy. Furthermore, 19 (17.3%) of patients had *Helicobacter*-like microorganisms, with an additional 8 (7.3%) having intestinal metaplasia consisted with brush border in luminal surface of the epithelium, Paneth cells, and goblet cells. In addition, one patient (0.9%) had NE cell hyperplasia positive stained with NE antibodies such as synaptophysin (Figure 1), chromogranin, CD56, and CD57. Moreover, finally, in two different patients was found to have mesenchymal spindle cell tumor (1.4 cm and 0.5 cm largest size) in classical light microscopy (Figure 2). Gastrointestinal stromal tumor (GIST) diagnosis had been made due to the positive staining of this tumor with CD34, CD117, and DOG1 antibodies. S100, smooth muscle actin, muscle-specific actin, desmin, synaptophysin, and chromogranin antibodies were negative. There was no necrosis in sections of spindle cell tumor and only few mitotic figures were seen in microscopic examination in 50 high-power field areas.

TABLE 1. Demographic and clinicopathological features of LSG patients

Demographic characteristics	N (%)
Obese patients number	
Male	14 (20.3%)
Female	55 (79.7%)
Age (median±SD)	36.4±9.3 years
Pathological findings *N* (%)	
Chronic gastritis	49 (71%)
Chronic active gastritis	6 (8.6%)
Atrophy	3 (4.3%)
Intestinal metaplasia	6 (8.7%)
Helicobacter-like organisms	12 (17.4%)
GIST	1 (1.4%)
NE cell hyperplasia	1 (1.4%)

LSG: Laparoscopic sleeve gastrectomy; GIST: Gastrointestinal stromal tumor, NE: Neuroendocrine

DISCUSSION

Human obesity is described as the BMI over 30 kg/m^2 (5,6). Obesity has become widespread, especially in developed countries along with a predominant increase in the frequency of type II diabetes. The presence of insulin resistance usually is initial pathophysiological event which involves a genetic component that is induced by overweight and a sedentary lifestyle. Strong association also has been observed between obesity and insulin resistance in nondiabetic subjects (2,7).

Bariatric surgery has been emerged as one of the first choices in the treatment of morbid obese patients in the last two decades with the significant result of a reduction of excess weight and BMI, improvement of life conditions, and abatement of the comorbidities that affect these morbid obese individuals (8,9).

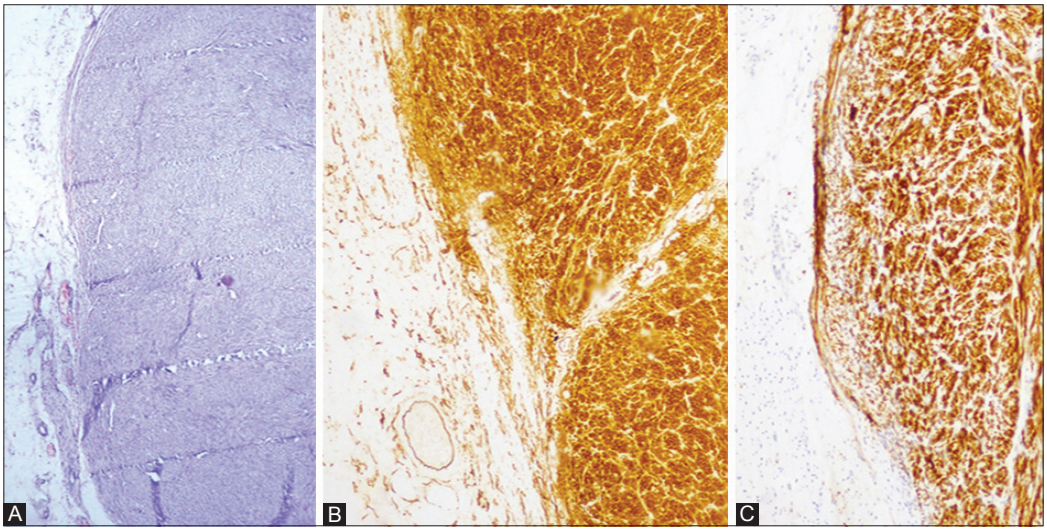

FIGURE 1. Well-delineated spindle cell tumor was seen in hematoxylin-eosin-stained sections (A), immunohistochemically CD 34 positivity (B) and DOG-1 positivity (C) were also seen in the case having larger tumor (×20).

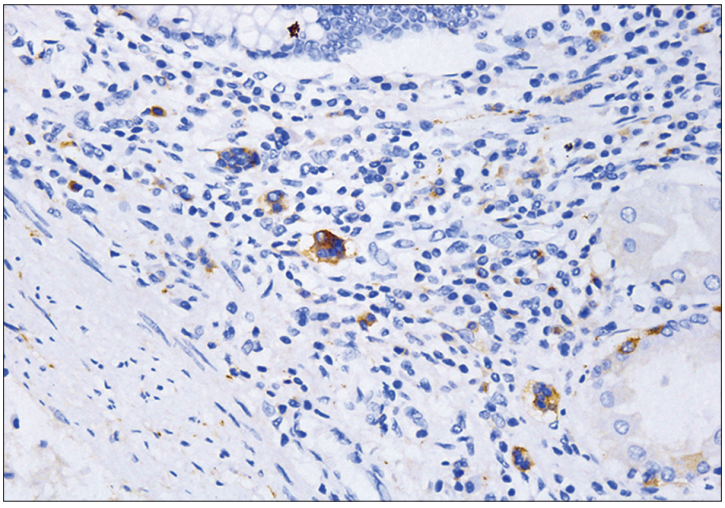

FIGURE 2. Micronodular neuroendocrine cell hyperplasia was seen in deep part of the lamina propria (Synaptophysin, ×200)

When comparing some characteristics of the patients in this study, female/male ratio was 3.54/1, and the mean age was 36.2 years, which is similar to the category of middle-aged women reported in published studies previously (10). Actually, the majority of our cases were females (77.9%), which as noted in previous studies, could be due to the female strong preference for reaching in body shape which has been accepted in traditional fashion and sociologically in most of the countries (11).

Retrospective review of histopathologic findings in 109 consecutive LSG specimens performed for morbid obesity indicated a relatively high prevalence of histopathologic findings in the mucosa and submucosa of stomach. Unexpected findings warranting clinical follow-up were identified in 80.6% of cases and included cases of *H. pylori* gastritis, active chronic gastritis, cases with NE cell hyperplasia formation, GIST, and intestinal metaplasia. The most common histologic findings included identification

of gastritis and chronic inflammation. Furthermore, benign lymphoid aggregates that may be related with *H. pylori* in the lamina propria were seen in 34 cases (31.2%). No statistically significant difference was found between the two genders in terms of the histopathological findings in our study.

Few studies report the histopathological findings in sleeve gastrectomy specimens present in literature related with bariatric surgery. In large series, the prevalence of *H. pylori* positivity was found between 7.3% and 33.3% in patients with LSG (12-14). In our series, *H. pylori* prevalence was 17.3% (19 of 109 cases) and correlated with the ratio of *H. pylori* positivity in these large LSG patient series. To our knowledge, there are several publications that small case series or case reports reporting GISTs associated with LSG (12,15-18).

Although GIST represents the most common mesenchymal malignancy of the alimentary tract, it is rare and accounts for <1% of all gastrointestinal tumors (19,20). Yuval et al. presented a large series (827 cases) and they found in only 5 (0.6%) GIST histopathologically in patients with sleeve gastrectomy (21). In addition, in Almazeedi et al. study, GIST were found incidentally in one of the 656 patients, and in Gordezky et al. study, two GIST cases were detected incidentally in 343 patients (12). On the other hand, no GIST was found in meta-analysis of six large series having patients between 20 patients and 682 patients (13,14,22-25). In our case series, we have found GIST in two patients (1.8%), and our prevalence look higher than 1% which given in the literature. All of the large case series have given the ratio for GIST prevalence <1%. The probability of the presence of GIST in sleeve gastrectomy specimens should be keep in mind and in gross examination of resection specimens should be perform very carefully.

There were significant differences in the prevalence of histopathologically detected NE cell hyperplasia in LSG specimens and the prevalence ratio was from 0% up to 39.4% (12-14,21-25). In Gündoğan et al.'s study, they found this high ratio for the presence of NE cell hyperplasia in LSG specimens. Possibly, due to the staining of chromogranin-A antibody to all cases in addition to ghrelin antibody, they found this high prevalence for NE cell hyperplasia (25). Raess et al. found 0.8% (2/248) for the ratio of NE cell hyperplasia in LSG specimens similar to our study (22). No NE cell hyperplasia was detected in the other studies that performed to evaluate the distribution of various histopathological findings (12-14,21,23,24). The prevalence of NE cell hyperplasia in LSG specimens was very different from 0% to 39.4% and needs larger series and meticulous histopathological examination of LSG specimens.

CONCLUSION

The overall rate of abnormal histopathologic findings varies among studies describing sleeve gastrectomy specimen pathologic findings but is generally high. The incidence of GIST found in this cohort is significantly higher than previously reported. This may be due to an association between these tumors and obesity. Alternatively, it is possible to think that asymptomatic GISTs are underdiagnosed in the general population and large resection of stomach compartment revealed the unexpected presence of GIST, NE cell hyperplasia, and additional histopathological findings. GIST is particularly common in older patients and special attention must be given when performing LSG on this subpopulation. LSG specimens deserve meticulous gross examination and careful histopathological examination due to the presence of unexpected lesions that may be possible dangerous for human health.

CONFLICT OF INTERESTS

Authors declare no conflict of interest.

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