

Laparoscopic Sleeve Gastrectomy: One Institution's Experience with Omentopexy in the Prevention of Gastric Leaks (Retrospective Review)

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Abstract

Background: The omentum is associated with accelerated wound healing properties. This IRB-approved multi-surgeon single-center study is aimed to evaluate whether complications are reduced by omentopexy (OP) to the staple line after a laparoscopic sleeve gastrectomy.

Methods: Adults who have undergone a laparoscopic sleeve gastrectomy at St. Joseph's Regional Medical Center were reviewed. The group which had the OP performed was compared to the group which did not. Controls were matched for concurrent hiatal hernia repair, degree of obesity, and operating surgeon. OP was only performed by a single surgeon (Surgeon A), however several surgeons performed laparoscopic sleeve gastrectomies. Data extracted included demographics, indication, diagnostic investigations, treatments given, perioperative outcomes, findings, response to treatment given and survival. Complications were defined as a definitive leak or abscess seen on CT or upper GI study.

Results: A total of 181 patients underwent a laparoscopic sleeve gastrectomy, of which 75 patients (41%) also underwent OP. 18 patients (9.9%) had a concurrent hiatal hernia repair. Complications were found in 5 patients (2.76%). 4 of the 5 patients who had a complication had undergone OP. Complication rates between the group which had OP and the group which did not have OP showed an OR 6.0571, 95% CI 0.6631 to 55.3280, P 0.1105. No complications were observed in patients who had a concurrent hiatal hernia repair. An association was observed between Surgeon A and increased complications in patients who underwent OP (OR 5.0979, 95% CI 0.2676 to 97.1194, P 0.2787) as well as those who did not undergo OP (OR 1.8271, 95% CI 0.0727 to 45.9307, P 0.7141). An association was also seen between complications and patients who are super obese (OR 1.0833, 95% CI 0.1172 to 10.0126, P 0.9438) and severely obese (OR 2.2319, 95% CI 0.3378 to 14.5153, P 0.3603). No association was seen between complications and patients who are morbidly obese (OR 0.4950, 95% CI 0.0807 to 3.0371, P 0.4474).

Limitations: Small sample size, limited patient population, complication rates of a single surgeon performing the omentopexies, comorbidities, as well as limitations of retrospective analysis.

Conclusion: OP to the staple line is not associated with decreased overall complication rates. Concurrent hiatal hernia repair was not associated with complications. OP performed in patients who are super obese or severely obese had more complications as opposed to morbidly obese patients who had decreased complications. In addition, OP may be associated with decreased complications only in patients who are morbidly obese. In conclusion, one cannot, in good conscience, continue performing omentopexy given the significantly higher complication rate noted.

Keywords: Weight-loss surgery; Gastric sleeve; Sleeve gastrectomy; Omentopexy; Omentum; Obesity; Gastric leak

Introduction

Laparoscopic sleeve gastrectomy is becoming one of the most commonly used bariatric procedures. One of the concerning complications is a staple line leak. Staple line leaks occur in approximately 2.8% of cases, and can be due to a variety of reasons such as technique, poor vascularization and inflammation. The majority of leaks can be managed conservatively, but can cause significant morbidity and mortality in patients undergoing bariatric surgery. Numerous modalities are available to reinforce the staple line in an attempt to prevent post-operative staple line leaks. Some options

range from using bio-material strips to buttress the staple line, and using laparoscopic clips as reinforcement. Another option could be Omentopexy (OP). OP is a process by which the omentum is surgically attached to an ectopic site to provide its healing effects over the incision site. In addition, the ability of the omentum to adhere to inflamed tissue may help prevent leakage of luminal contents through small gaps in the incision. This study is aimed at evaluating the use of OP to promote healing and prevent leaks after a laparoscopic sleeve gastrectomy surgery.

The omentum is a complex fat-covered peritoneal fold, rich in lymphatics and blood vessels. It is classically known for its ability to adhere to and plug intraperitoneal sites of inflammation in order to prevent diffuse peritonitis during instances of intestinal gangrene or

perforation [1]. The omental lymphoid tissue contains lymphoreticular bodies, also known as “milk-spots,” which contain macrophages, lymphocytes and plasma cells. These fenestrated glomerular-like capillary structures are activated by inflammation which leads to the exchange of substances between the peritoneal cavity and the omental vasculature [2]. In addition to cells of the immune system, the omentum contains adipocytes that secrete biological agents such as cytokines, adipokines and growth factors, including vascular endothelial growth factor (VEGF) [3].

In response to inflammation several physiologic changes occur in the omentum. Inflammation inhibits the ability of peritoneal cells to perform fibrinolysis and causes activation of fibrinogen to adhere the omentum to inflamed or ischemic areas. This process of adherence results in sealing off of diseased areas, supplying healing factors to inflamed regions as well as applying pressure to control areas of hemorrhage. Hemorrhage is further controlled by the omentum's ability to speed the formation of a fibrin clot by activated prothrombin. Furthermore, angiogenic and neurotropic factors are released by the omentum, which result in new vessel formation between the omentum and inflamed tissue as well as re-innervation and pain modulation.

In addition to accelerating healing properties and preventing leakage of luminal contents, the omentum can have been proven to prevent adhesion and fistula formation between the surgical site and other organs or the abdominal wall [3]. Considering these remarkable properties, general surgeons mobilize the omentum to treat gastric [4], duodenal [5] or ileal [6] perforations as well as aorto-esophageal fistulae [7], with promising results. The ability of the omentum to produce progenitor cells has been studied with respect to heart repair after a myocardial infarct as the mesothelial cells have the ability to make blood vessels, smooth muscle and endothelium [8]. It was concluded that OP supported the survival of an autologous atrial tissue patch placed over the infarcted zone of the left ventricle [9]. Additionally, bronchial OP has been evaluated in lung transplant surgeries and has proven to not be essential for successful lung transplantation [10]. These findings, inevitably, have led us to identifying other scenarios in which the omentum may utilize.

We have conducted an IRB-approved multi-surgeon single-center study aimed at evaluating the use of OP in a laparoscopic sleeve gastrectomy. We will evaluate whether performing an OP to the staple line will promote healing and prevent complications such as leak and abscess formation.

Specific Aims

The purpose of this study is to assess outcomes of patients undergoing laparoscopic sleeve gastrectomy with and without OP to

reinforce the staple line and prevent gastric leaks. OP may prevent gastric leaks and abscesses. This will outline areas of improvement of quality measures associated with these procedures.

Methods

In this retrospective study, adults who underwent a laparoscopic sleeve gastrectomy at St. Joseph's Regional Medical Center were reviewed. Two groups were created, corresponding to whether or not OP was performed. Controls were matched for concurrent hiatal hernia repair, degree of obesity, and operating surgeon. OP was only performed by a single surgeon (Surgeon A), however several surgeons performed laparoscopic sleeve gastrectomies. The entire patient population came from the same general population and there was no obvious difference in morbidities noted between patients operated on by Surgeon A and those operated on by the other surgeons.

Data extracted included demographics, indication, diagnostic investigations, treatments given, perioperative outcomes, findings, response to treatment given and survival. Data collected was compared to current, accepted outcomes in recent studies from high volume, large centers. Complications were defined as a definitive leak or abscess seen on CT or upper GI study.

Criteria for Inclusion of Subjects

1. Patients treated at St. Joseph's Regional Medical Center.
2. Patients must be 18 years of age or greater.

Criteria for Exclusion of Subjects

1. Incomplete patient information
2. Incomplete chart information
3. Patients under the age of 18

Results

Of the 181 Laparoscopic Sleeve Gastrectomies performed at St. Joseph's Regional Medical Center, 75 were performed with Omentopexy (OP), 106 were performed without OP and 18 were performed with a concurrent hiatal hernia repair (Table 1).

Surgery	Number of patients
Laparoscopic Sleeve Gastrectomy	181
Laparoscopic Sleeve Gastrectomy with OP	75
Laparoscopic Sleeve Gastrectomy without OP	106
Laparoscopic Sleeve Gastrectomy with Hiatal Hernia Repair	18

Table 1: Number of surgeries performed.

The data was further analyzed and the 181 patients who had a laparoscopic sleeve gastrectomy were further divided in groups based on their respective degree of obesity (Table 2). Each patient's degree of obesity was evaluated by BMI and defined as follows:

- BMI 30-34.9 - Obesity
- BMI 35-39.9 - Severe Obesity
- BMI 40-49.9 - Morbid Obesity
- BMI>50 - Super Obesity

Obesity level	Number of surgeries
Super Obese (BMI>50)	34
Morbidly Obese (BMI 40-49.9)	103
Severely Obese (BMI 35-39.9)	41
Obese (BMI 30-34.9)	3

Table 2: Number of surgeries performed on patients of different categories of obesity.

Laparoscopic sleeve gastrectomy was performed on 34 super obese, 103 morbidly obese, 41 severely obese and 3 obese patients. It was observed that there was an increased incidence of complications in patients who are in the category of "super obesity" and "severe obesity" (Odds Ratio 1.0833 and 2.3419, respectively).

Moreover, the 181 gastrectomies were categorized by whether they were performed by the surgeon who performed the omentopexies (Surgeon A) or by the other surgeons. Surgeon A performed 141 laparoscopic sleeve gastrectomies (Table 3).

Surgeon	Number of surgeries
Surgeon A (who performed Omentopexies)	141
All other surgeons	40

Table 3: Number of surgeries performed by surgeon A.

Factor	Odds Ratio	95% C.I.	Z-Statistic	P
OP	6.0571	0.6631 to 55.3280	1.596	0.1105
Super Obesity	1.0833	0.1172 to 10.0126	0.071	0.9438
Morbid Obesity	0.4950	0.0807 to 3.0371	0.760	0.4474
Severe Obesity	2.3419	0.3378 to 14.5153	0.914	0.3603
Surgeon A	3.1484	0.1705 to 58.1487	0.771	0.4408
Surgeon A (in patients with OP)	5.0979	0.2676 to 97.1194	1.083	0.2787
Surgeon A (in patients without OP)	1.8271	0.0727 to 45.9307	0.336	0.7141

Table 5: Association between complications and other factors.

Of the 181 laparoscopic sleeve gastrectomies performed, 141 were done by Surgeon A. Of those, 75 were completed with OP and 66 were completed without OP. In the OP group, 4 patients had complications. In the group without OP, 1 patient had a complication. It was observed that there was an association between surgeon A and the

Of the 181 patients who underwent a laparoscopic sleeve gastrectomy, 5 had complications (abscess or a definitive leak seen on CT or upper GI study). Of the 5 patients with complications, 4 had an OP performed as part of their surgery (Odds Ratio 6.0571) and none had a hiatal hernia repair. This suggests an association between OP and incidence of a complication (Table 4).

Patient group	Number of patients
Total Number of Patients Who Had a complication (leak or abscess)	5
Had Laparoscopic Sleeve Gastrectomy with OP	4
Had Laparoscopic Sleeve Gastrectomy without OP	1
Had concurrent Hiatal Hernia Repair	0
Severely Obese	2
Morbidly Obese	2
Super Obese	1
Had procedure performed by Surgeon A	5
Had procedure performed by other surgeons	0

Table 4: Demographics of patients who had a complication.

Finally, the odds ratio, 95% confidence interval, z-statistic and p-value were calculated to evaluate the relationship between complications and OP, degree of obesity and surgeon A (Table 5). The odds ratio between OP and complications is 6.0571, representing a likely association. The data also suggests that complications are more likely to occur in Super Obese and Severely Obese groups (odds ratio 1.0833 and 2.3419) and least likely to occur in the morbidly obese group (odds ratio 0.4950).

incidence of complications in laparoscopic sleeves with and without omentopexies (Odds Ratio 5.0979 and 1.8271, respectively).

Conclusion

In this retrospective study 181 patients were evaluated, 75 of which had an OP performed. All omentopexies were performed by a single surgeon. Therefore, variability in results is not due to variability in technical skill of the surgeons. Of the 181 sleeve gastrectomies, 40 were performed by 5 other surgeons, none of whom perform OP procedures. In addition, 18 patients had a concurrent hiatal hernia repair along with the laparoscopic sleeve gastrectomy. The group which had the OP performed was selected at random. The patients operated on by Surgeon A as well as those operated on by the other surgeons came from the same general population and no obvious difference in morbidity was noted between the two.

The intrinsic healing properties of the omentum have led us to evaluate its use in decreasing the postoperative complications of laparoscopic sleeve gastrectomies. We believe performing OP to the staple line will decrease the rate of postoperative complications which are defined as either a definitive leak or an abscess, seen on CT scan or upper GI study.

Our hypothesis, that OP to the staple line is associated with a decreased rate of post-operative complications, was rejected (p-value 0.01105, 95% Confidence Interval 0.66 to 55.33). On the contrary, it was observed that there was an increased number of post-operative complications in the population that had an OP performed (Odds Ratio 6.0571). This is in contrast to the research done by Abdo A et al. which found that OP contributed to reduction in short and long-term morbidity [11]. Furthermore, research done by Afaneh C, et al. found that OP did not significantly decrease postoperative food intolerance or GI symptoms in morbidly obese patients undergoing laparoscopic sleeve gastrectomy [12]. Our findings lead us to conclude that it is not recommended to perform OP as it has not proven to decrease patient complications. On the contrary, it increases operative time under anesthesia which carries its own risks for the patient as well as increases the overall cost to the hospital. No change in complication rates was observed in patients with a concurrent hiatal hernia repair. An association is observed between patients in the categories of "super obesity" or "severe obesity" and complications however that association is not seen in patients who are morbidly obese. This may suggest that OP is useful in this group. In conclusion, given the significantly higher rate of complications in laparoscopic sleeve gastrectomies with OP compared to those without OP, one cannot, in good conscience, continue performing omentopexy.

Limitations of the research include the small sample size as well as limited patient population and comorbidities. Further limitations include complication rates of a single surgeon performing the omentopexies as well as the limitations of a retrospective analysis.

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