Staple-line Reinforcement after Laparoscopic Sleeve Gastrectomy: Personal Experience at a Single Center

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Purpose: The usefulness of reinforcement of staple-line during laparoscopic sleeve gastrectomy (LSG) is still controversial. We review our experience of LSG to check it. Materials and Methods: Eighty one patients who were performed LSG between April 2009 and August 2010 enrolled in this study. The patients were divided into two groups; nonreinforcement of staple-line group and reinforcement of staple-line group. We started reinforcement of staple-line from 31st patients because we experienced three cases of staple-line related complications. Results: The demographics of each group had no difference. There were three staple-line related complication (one case of leak and 2 cases of kinking) in nonreinforcement group, but no staple-line related complication in reinforcement group (P=0.048). There was no bleeding and no stenosis in both group. The operation time was longer in nonreinforcement group than reinforcement group (129 min. vs 103 min., P=0.027). Also, the number of patients who needed medication for reflux symptom were 6 (20%) in nonreinforcement group and 2 (3.9%) in reinforcement group (P=0.019). Conclusion: Routine reinforcement of the staple-line may decrease the staple-line related complications. A well-designed prospective study with longer follow up would be necessary to elucidate the efficacy and usefulness of the staple-line reinforcement during LSG.

Key Words: Sleeve gastrectomy, Morbid obesity, Reinforcement

INTRODUCTION

Obesity is associated with many chronic disease, consequently increased morbidity, and decreased quality of life and life expectancy [1,2]. Bariatric surgery has been considered as the most effective treatment for sustained weight loss in morbid obesity patients [3,4]. As surgical technique and equipment has been improved, perioperative morbidity was significantly decreased, so, the attention have been increased in the surgical treatment of morbid obesity [5,6].

Laparoscopic sleeve gastrectomy (LSG) is originally considered as a bridge procedure for biliopancreatic diversion bypass (BPD) or duodenal switch (DS). Because early results [7,8] and even long term results [9] were acceptably good in weight loss for morbid obesity, and it is an easier and safer technique with a shorter learning curve compare to gastric bypass surgery, LSG become increasingly favored as a stand alone bariatric procedure.

Since long staple-line retained after LSG and the high internal pressure created with vertical tubulization of the stomach [10], leak sometimes happened after LSG. Reinforcement could be an option to decrease staple-line related complications such as leak and kinking, however,
its effective value is still controversial. Some authors reported it did not decrease the rate of leaks [11], another authors reported buttressing the stapler line reduced the blood loss but did not decrease the leak [12], and the other authors staple-line reinforcement was important for preventing leak [13]. We review our experience of LSG for morbid obesity patients to check about it.

MATERIALS AND METHODS

1. Patients

This study was approved by the Institutional Review Board for human investigation of Soonchunhyang University Hospital (SCHUH 2014-04-021). Retrospective review of medical records of patients who were performed LSG for morbid obesity from April 2009 to August 2010 was performed. There were 81 patients (21 male patients and 60 female patients) with a mean age of 34 years (20-57 years). Indication for LSG followed guide line of 2005 Asian-Pacific Bariatric Surgery Group (APBSG) consensus meeting: 1) obese patients with their BMI >37, 2) obese patients with their BMI >32 in the presence of diabetes or two significant obesity related co-morbidities, 3) have been unable to lose or maintain weight loss by dietary or medical measures, 4) age of patient >18 years and <65 years. Before operation, all patients had consultant to dietitian and experienced two weeks of high protein diet. The patients divided into two groups: reinforcement of staple-line group and nonreinforcement of staple-line group. We started reinforcement of staple-line from April 2010, 31st patients, because we experienced one case of leak and two cases of kinking.

2. Operative procedure

Low weight molecular heparin was used to prevent deep vein thrombosis twelve hours before operation routinely. In general anesthesia, the patient positioned to reverse-Trendelenberg position. LSG was performed using five ports: one 12 mm trocar, two 11 mm trocar, and two 5 mm trocar (ENDOPATH, XCEL™, Bladeless Trocar, Ethicon Endo-Surgery, Cincinnati, OH, USA). The great omentum was divided using Harmonic scalpel (Ethicon Endo-Surgery, Cincinnati, OH, USA) from 4 cm above pyloric ring to esophago-gastric junction (EGJ). To divided posterior wall of the stomach, dissection was performed until identify the left crus of diaphragm muscle. 34 Fr of bougie was inserted till duodenum to guide the plane; the stomach was resected from greater curvature to EGJ using endoscopic stapler (ECHELON ENDOPATH™ Staplers 45 mm, Ethicon Endo-Surgery, Cincinnati, OH, USA). No reinforcement of the staple-line was implemented in initial 30 patients, and reinforcement of the staple-line (continuous oversewing with absorbable monofilament) was performed with the absorbable clip made of a biocompatible polydioxanone polymer (Lapra-Ty; Ethicon Endosurgery, Cincinnati, OH, USA) in subsequent patients. All patients underwent routine intraoperative leak test using methylene blue and air.

RESULTS

Table 1 showed the obesity related comorbidities of both group. There was 9 patients (30%) who had diabetes in nonreinforcement group, and 14 patients (27%) in reinforcement group. Also, hypertension (37% vs 20%, P=0.093), hyperlipidemia (47% vs 37%, P=0.405), sleep apnea (7% vs 16%, P=0.233), and arthritis (33% vs 18%, P=0.108) showed no statistical difference between two group.

As Table 2 showed, the mean age of each group was similar (34.6 years in nonreinforcement group and 34.3 years in reinforcement group), and the ratio of sex had no difference in both group (11 male 19 female patients in each group).
Table 2. Demographic features of both group

<table>
<thead>
<tr>
<th>Reinforcement</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n=30)</td>
</tr>
<tr>
<td>Duration</td>
<td>2009.4-2010.3</td>
</tr>
<tr>
<td>Mean age, years±SD</td>
<td>34.6±9.7</td>
</tr>
<tr>
<td>Male : Female</td>
<td>11 : 19</td>
</tr>
<tr>
<td>Mean weight, kg±SD</td>
<td>110±21.6</td>
</tr>
<tr>
<td>Mean BMI, kg/m²±SD</td>
<td>38.9±5.2</td>
</tr>
</tbody>
</table>

Table 3. Postoperative outcomes of each group

<table>
<thead>
<tr>
<th>Reinforcement</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No (n=30)</td>
</tr>
<tr>
<td>Operation time, min.±SD</td>
<td>129±59</td>
</tr>
<tr>
<td>Hospital stay, days±SD</td>
<td>5.4±14.5</td>
</tr>
<tr>
<td>Complication</td>
<td>9 (30%)</td>
</tr>
<tr>
<td>Staple-line complication</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>Bleeding</td>
<td>0</td>
</tr>
<tr>
<td>Wound complication</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Reflux</td>
<td>6 (20%)</td>
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</table>

DISCUSSION

LSG have received attention as a stand alone bariatric procedure because of its safety and effectiveness [14]. The mechanism of weight loss after LSG is known as followings: 1) restrict the gastric capacity and passage of food through the stomach, 2) reduce the appetite-inducing peptide hormone, ghrelin, which was mainly deriving from the gastric fundus resected after LSG.

The leakage is one of the most common and unwanted complication after LSG. The incidence of leak after LSG have been reported 0.8-7% [11,15-17]. The etiologies of the leaks have been divided into mechanical and ischemic causes. In general, ischemic leaks are known to occur 5-7 days after operation, so if the leaks occurred within 48 hrs after operation, it may be mechanical leaks which are results of intraluminal pressure exceeds the strength of the tissue and the staple line [11]. The staple-line could be vulnerable because it had long staple-line and the high internal pressure created with vertical tubulization of the stomach after LSG [10].

Numerous studies have reported buttressed staple-lines using commercial products such as bovine pericardial strips or absorbable polymer membranes were helpful to prevent leak or hemorrhage [18-20], however, it was also known that such materials were expensive [21-23].

Kinking, the anatomical changes in the angle of His and EGJ area is one of the staple-line related complications after LSG. Kinking might be associated with retention of the fundus, and it may play an important role in the postoperative sleeve emptying [24]. In our series, there were two cases of kinking: 1) a 48-year-old man was suffered from nausea and vomiting just after LSG. Upper GI series (Fig. 1A) showed that the anatomical angle was changed. Fortunately, after several days of conservative treatment, the symptom was gradually improved but the diet advancement was slow compared to other patients. 2) A 26- years-old male was also suffered from nausea and vomiting after surgery and in upper GI series, there was kinking (Fig. 1B). He discharged at POD #4, however he readmitted at POD # 7 and needed another 1 week of admission for conservative treatment. The two patients did
not need any intervention or medication after they overcame the initial symptom. In our study, there was no staple-line bleeding or postoperative bleeding, so we couldn’t identify that reinforcement of the staple-line have an advantage for decrease bleeding. However there was one leak and 2 cases of kinking without bleeding in nonreinforcement group, and it had statistical significance (P=0.048). So reinforcement with continuous oversewing of staple-line had an advantage in the aspect of decrease the staple-line related complications.

Reflux also has been one of the most common complication after LSG, so some authors have suggested that other procedure may be better than LSG to patient who already have esophageal reflux in endoscopy before operation [25]. Sometimes severe reflux may need remedial reversed operation such as mini-gastric bypass [26] or re-sleeve gastrectomy with hiatal hernia repair [27]. The reflux after LSG increased during the first postoperative year, but disappeared thereafter [28]. However, the cause of reflux complication after LSG is still not clear. Keidar et al. [24] have reported the reflux might be occurred because of not only the degree of fundal dilatation, but the presence of a relative narrowing distal to it, also, the size of gastric tube and oversewing the staple line did not seem to affect the rate of reflux.

According to our data, the patients who needed medication (proton pump inhibitors) for reflux symptom were more frequently observed in nonreinforcement group than reinforcement group (P=0.019). We can’t explain this outcome exactly because there was no definite narrowing or stasis in upper GI series, however, the reflux symptom seemed have some relationship to reinforcement or learning curve. To identify a link between reflux and its causes, well designed study with large number of case will be needed.

The operative time and hospital stay was longer in nonreinforcement group. There was one case of leak in nonreinforcement group: he discharged at POD#82, so it affected long hospital stay. Except that leak case, mean hospital stay was 2.76 days. In operation time, the learning curve might be related longer operation time in nonreinforcement group. Also the first case of LSG took 300 minutes, and in one patient who was performed combined operation for uterine myoma, the operation time took 340 minutes. Except that two cases, the mean operation time was 115.71 minutes. In our experience, the reinforcement with continuous oversewing using the Lapra-Ty clip needed only additional 10 minutes. So, reinforcement of staple-line is not time consuming procedure.

CONCLUSION

We recommend to perform reinforcement of the staple-line routinely during LSG because it had some advantages of reducing staple-line related complications. However, a well-designed prospective study with long term follow up
is needed to confirm its effectiveness.

ACKNOWLEDGMENTS

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REFERENCES