

Our Early Experience with Laparoscopic Sleeve Gastrectomy in Adolescents

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Background: Laparoscopic sleeve gastrectomy (LSG) is a very effective bariatric procedure indicated in the treatment of morbid obesity.

Methods: Between July 2015 to November 2017, 58 adolescents with morbid obesity (42 female and 16 male) underwent LSG. The mean preoperative weight was 126.4 ± 26.7 (range 90-210) Kg. The mean body mass index (BMI) was 45.1 ± 7.9 (range 36.2-59.5) Kg/m².

Results: The mean operative time was 35 (range 33-68) minutes. The mean length of hospital stay was 1.2 (range 1-3) days. There were no intraoperative complications. The %EWL (excess body weight loss) was $50.2\% \pm 19.3\%$ and $73.3\% \pm 20.1\%$ at six months and 1 year respectively. The mean postoperative BMI was 33.8 ± 6.8 Kg/m² and 27.6 ± 5.1 Kg/m² at six months and 1 year respectively. The overall complication rate was 10.3% (6 patients). Two patients (3.4%) had postoperative bleeding and managed conservatively. Three patients (5.2%) suffered from port site infection. One of them had persistent vomiting and upper abdominal pain for 3 days after operation. Vomiting and pain improved after drainage of an abscess at the site of the 15 mm trocar. The other two improved with antibiotics. Finally, one patient was readmitted 4 days after surgery for persistent severe nausea, vomiting, and dehydration. This patient resolved with inpatient medical treatment. There were no postoperative mortalities.

Conclusion: LSG can be regarded as a simple, safe, effective bariatric procedure in adolescents.

Key words: Bariatric surgery; morbid obesity; adolescent; type 2 diabetes; weight loss surgery; adolescent obesity.

Introduction

Morbid obesity is a major social and medical problem in developed and developing countries today, even among adolescents.^{1,2}

Obesity associated diseases like diabetes mellitus type 2 (T2DM), are now diagnosed in adolescents more than before.³ Most adolescents with obesity will carry the disease to adulthood.⁴ So there has been increasing concern in bariatric surgery for adolescent patients with morbid obesity.⁵

Nowadays, sleeve gastrectomy (SG) is the most widespread bariatric surgery worldwide providing effective weight loss with remission of comorbidities and restricted morbidity.⁶

Patients and methods

This study includes 58 adolescents (42 female and 16 male) with morbid obesity. These patients underwent LSG from July 2015 to November 2017. They had completed their 12 months follow-up visits. Inclusion criteria were previous failed attempts at losing weight, body mass index (BMI) for age and gender ≥ 99 percentile (using the center for disease control and prevention age and gender matched growth charts) and age between 13 and 19 years old. Patients with severe organ dysfunction

or major psychiatric or mental disease were excluded. Ideal body weight (IBW) is defined as the weight corresponding to the 85th percentile of BMI for the patient's gender, age and height. The %EWL (excess body weight loss) was calculated using the formula
$$\frac{100\% \times (\text{initial weight} - \text{Follow_up weight})}{(\text{Initial weight} - \text{IBW})}$$
.

All patients and parents were informed in details about the benefits and the risk of the surgery, and a written consent was obtained from parents with approval from the patient if he or she was <18 years of age, or directly from the patient for those ≥ 18 years of age. We insist on careful evaluation of the patient compliance with pre and postoperative instructions. Preoperative investigations including upper GI endoscopy, kidney function tests, liver function tests, complete blood count, prothrombin time, fasting blood sugar and Abdominal ultrasound were done. Prophylactic dose of low molecular weight heparin were used 12 hours preoperative.

As regard obesity related comorbidities, six patients (18.8%) had type 2 DM, eight patients (25%) had sleep apnea, eleven patients (34.4%) had HTN, eleven patients (34.4%) had degenerative osteoarthritis and three patients (9.4%) had ischemic heart disease.

Surgical technique

General anesthesia was given. The patient was positioned in 30 anti-Trendelenburg position with legs abducted. The lower extremities were supported and secured with a belt and tape. Nasogastric tube was inserted. Foley's catheter was not used. Compression stockings were applied.

Three or four trocars were used. Optical port (10 mm) was introduced one hand breadth and half below xyphoid just to the left of midline. 5 mm port was introduced just below xyphoid and to the left. 5 mm port was inserted at left midclavicular line 2 cm below the costal margin. Trocar 15 mm was inserted at right midclavicular line 2 cm above the level of optical port.

The division of the vascular supply of the greater curvature of the stomach started at 2 cm from the pylorus and progressed to the angle of His and the upper part of the fundus was mobilized completely from the left crus of the diaphragm.

We divided the stomach parallel to the gastric calibration tube (a 36 French size gastric calibration tube) along the lesser curvature. Using laparoscopic linear staplers (EndoGIA®, Tyco) the stomach was divided parallel to the gastric calibration tube along the lesser curvature. First cartridge is 6 cm long green (4.8 mm) and the latter are 6 cm long blue (3.5 mm) cartridges.

A methylene blue test was then carried out. Gastric calibration tube was removed. The resected stomach was removed through the right midclavicular port wound. A drain was placed at the left subdiaphragmatic space under vision.

Postoperative care

A gastrograffin study was performed only if there was suspicion of leakage. On the first postoperative day, the patients received a clear liquid diet, drains were removed and patients were then discharged. Patients received full liquid diet for 14 days. The patients were then progressed to a soft diet for the next 3 weeks.

The patients were seen on day 10 and at 1, 3, 6 and 12 months postoperatively. Proton pump inhibitors were used in all patients for the first two months postoperatively. Patients were encouraged to have high protein diet.

Results

Between July 2015 to November 2017, 58 patients

underwent LSG. The mean preoperative weight was 126.4 ± 26.7 (range 90-210) Kg. The mean BMI was 45.1 ± 7.9 (range 36.2-59.5) Kg/m².

The mean operative time was 35 (range 33-68) minutes. The mean length of hospital stay was 1.2 (range 1-3) days. There were no intraoperative complications. None of the patients required conversion to open surgery. For three patients with asymptomatic gall bladder stones, laparoscopic cholecystectomy was done at the same session.

Gastroesophageal reflux disease was diagnosed preoperative in two patients using UGI Endoscopy, esophageal manometry, Gastrograffin meal & 24 hours ph. monitoring. Crural repair after reduction of sliding hiatus hernia was done for both of them. Postoperative, symptoms disappeared completely.

The overall complication rate was 10.3% (6 patients). Two patients (3.4%) had postoperative bleeding and managed conservatively with packed red blood cells and fresh frozen plasma. Three patients (5.2%) suffered from port site infection. One of them had persistent vomiting and upper abdominal pain for 3 days after operation. Vomiting and pain improved after drainage of an abscess at the site of the 15 mm trocar (in right midclavicular line), where the stomach was extracted. The other two improved with antibiotics. Finally, one patient was readmitted 4 days after surgery for persistent severe nausea, vomiting, and dehydration, but his Gastrograffin study was acceptable. This patient resolved with inpatient medical treatment for 4 days. There were no postoperative mortalities.

The %EWL was $50.2\% \pm 19.3\%$ and $73.3\% \pm 20.1\%$ at six months and 1 year respectively. The mean postoperative BMI was 33.8 ± 6.8 Kg/m² and 27.6 ± 5.1 Kg/m² at six months and 1 year respectively (**Figure 1**).

Patients of the current study showed some of the obesity related comorbidities in the form of type 2 DM (four patients, 6.9 %), sleep apnea (two patients, 25%), and HTN (five patients, 8.6%). Diabetic patients showed reduction of fasting blood sugar and HbA1c from 129.7 mg/dl and 7.5% to 92 mg/dl and 5.6 % respectively at 12 months postoperative. Complete cessation of medical treatment with normal fasting blood sugar and HbA1c was achieved in three patients (75%). All patients with preoperative HTN achieved complete resolution by 12 months postoperatively with complete discontinuation of medications. The mean

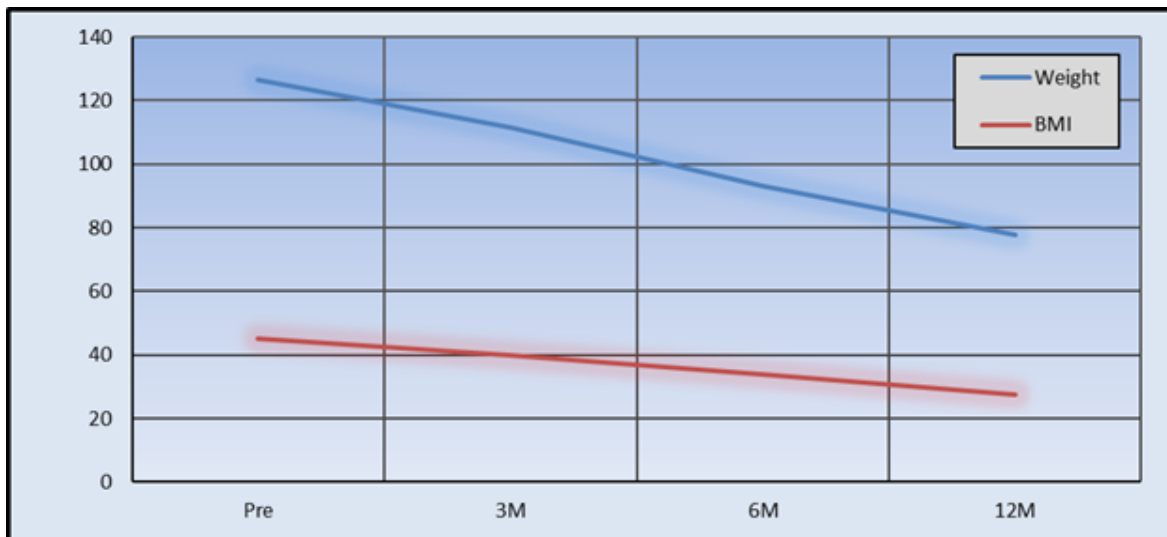


Fig 1: Graph shows BMI and %EWL at 3, 6 and 12 months after LSG.

blood pressure decreased from 145 mmHg preoperative to 116 mmHg 12 months postoperative. There was 100% resolution of sleep apnea.

Discussion

Obesity at children and adolescents is associated with multiple diseases. It is a risk factor for T2DM, cardiovascular diseases as hypertension, liver disease as steatohepatitis, obstructive sleep apnea and severe psychosocial problems like depression.⁷

There are multiple concerns regarding nutritional deficiencies after bariatric surgery in adolescents. Safety and efficacy of bariatric surgery in this age group is also an important issue.

Adolescents with severe obesity commonly suffer nutritional deficiencies before bariatric surgery and often persist in the postoperative period.⁸ Bone mineral density and also bone mineral content are reduced within a year after laparoscopic roux-en-Y gastric bypass (RYGB) surgery and prophylaxis regimen is needed, especially in adolescents.⁹

LRYGB is one of the most popular bariatric surgeries

in adults but we do not prefer it for adolescents due to increased nutritional concerns and poor compliance regarding regularity in vitamins and minerals intake after operation in this age group.

Laparoscopic sleeve gastrectomy has better results than the lap-band and the gastric balloon.^{10,11} The decrease in ghrelin production has a significant role in the Laparoscopic sleeve gastrectomy good results.¹²

Maffazioli et al. issued that both roux-en-Y gastric bypass and sleeve gastrectomy are effective treatment for morbid obesity in adolescents. However, EBWL results at 7–18 months following roux-en-Y gastric bypass are better than that following SG. Although length of hospital stay and operative time were greater in the RYGB group, the incidence of complications did not significantly differ between RYGB group and SG group.¹³

Sleeve gastrectomy is a safe and effective treatment for adolescents with morbid obesity. Our results as regard EWL after sleeve gastrectomy are in line with those declared in the literature (**Table 1**).

Table 1: %EWL after sleeve gastrectomy in adolescents

	EWL after 6 months	EWL after 1 year	EWL after 2 years	EWL after 3 years
Alqahtani et al, ¹⁴	48.1%	61.3%	62.3%	NA
Nadler et al, ⁵	38 ± 14%	40 ± 19%	NA	NA
Park et al. ¹⁶	52.6%	74.2%	82.7%	75.6%
Dakouraridi et al ¹⁷	NA	90.1% ± 28.6%	89.9% ± 32.0%	82.2% ± 38.6%
Boza et al ¹⁸	94.6%	96.2%	92.9%	NA
Nocca et al ¹⁹	48%	66.7%	78.4%	NA
Pourcher et al ²⁰	NA	70.61%	NA	NA
Alqahtani and Elahmed ²¹	NA	56.6%	69.8%	75.1%
Al-Sabah et al ²²	54.9 %	75.2 %	78.6 %	NA
Our study	50.2% ± 19.3%	73.3% ± 20.1%	NA	NA

Jen et al. reviewed the results of 409 adolescents with morbid obesity who underwent RYGB. The rates of inpatient reoperation, readmission and morbidity to be 2.9%, 5.9% and 11.5%, respectively.²³

Inge et al. had major and minor complication of 26.1% and 16.4% after RYGB and sleeve gastrectomy in adolescents.²⁴

The study performed by Aridi et al. on 121 adolescents who underwent sleeve gastrectomy have showed some short-term complications (>30 days). One of their patients (0.8%) had portal vein thrombosis that was treated with low molecular weight heparin. Another one (0.8%) suffered from wound infection, and one of them suffered from dehydration (0.8%). Long-term complications (>30 days) included worsening depression (2 patients, 1.7%), dehydration (2 patients, 1.7%), symptomatic gallstones (12 patients, 10.1%) necessitating laparoscopic cholecystectomy at a mean follow-up of 11.9–3.6 months, and one case developed thiamine deficiency after sleeve gastrectomy and was treated without any sequelae.¹⁷

Although the literature stresses on the importance of weight loss after bariatric surgeries, the remission of the obesity-related comorbidities is an important measure by which the success of bariatric surgery is evaluated.

Inge et al, reported remission of diabetes in 95% of adolescents who had T2DM and normalization of elevated blood pressure in nearly 80% of them after weight loss surgeries, leads us to hypothesize that adolescents may have a greater potential than adults for reversal of the cardiometabolic consequences of obesity.²⁴

Conclusion

Sleeve gastrectomy is a safe and effective treatment for adolescents with morbid obesity and therefore should be considered adolescents when meet surgical criteria. We observed a favorable short-term complication profile, supporting the early postoperative safety of LSG in adolescents. Further studies to evaluate the longer-term durability of weight loss may provide a better understanding of the role of sleeve gastrectomy in the treatment of adolescents with morbid obesity.

Conflict of Interest

The authors declare that they have no conflict of interest.

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