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Research Paper

Four-Port Laparoscopic Sleeve Gastrectomy: Procedural Steps, Clinical Outcomes, and Meta-Analytic Comparison

Ahmed Nazar Thanoun , Luay Mohammed Abdulkadhim, Mohammed Nazar Dhannoon

ABSTRACT:

BACKGROUND:

Laparoscopic sleeve gastrectomy (LSG) is a surgical surgery in which a substantial part of the stomach is removed to restrict food intake and facilitate weight loss. It is less expensive than other weight-loss operations like gastric bypass. Individuals with a BMI greater than 40 kg/m2 or a BMI greater than 35 kg/m2 with comorbidities who have failed to achieve and sustain weight loss by non-surgical techniques might consider LSG.

OBJECTIVE:

The primary aim of our study was to critically evaluate the efficacy, safety, and operational efficiency of the four-port laparoscopic sleeve gastrectomy (LSG) in comparison to existing methodologies, primarily as described in Meta-Analysis A and Meta-Analysis B. This comparative framework serves as a rigorous test bed, not merely to establish parity but to explore possible advantages of our approach.

METHODS:

The study involved 150 patients aged 18–45 years with a BMI between 35 and 50. The laparoscopic sleeve gastrectomy procedure was performed using a four-port technique, using four trocars to puncture the abdominal wall and access the surgical site.

RESULTS:

The study found that Laparoscopic sleeve gastrectomy using a four-port technique was successful in 94.6% of cases, with only 3.3% requiring extra ports. The procedure was relatively short, with a median operating time of 55 minutes. Postoperatively, complications were low, with intra-abdominal bleeding, staple-line leaks, and port site hernias being the most common.

CONCLUSION:

Our recommendation is to perform a 4-port laparoscopic sleeve gastrectomy in all patients with a body mass index of less than 50 kg/m2, and if there is any struggle during the procedure, we can add more ports at any time.

KEY WORDS: Laparoscopic, sleeve, gastrectomy, ports, bariatric.

AL-Sader Teaching Hospital.

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INTRODUCTION:

In 1999, Gagner pioneered laparoscopic sleeve gastrectomy (LSG) as part of a more sophisticated procedure [(1)]. Laparoscopic sleeve gastrectomy (LSG) is a surgical procedure that removes a large portion of the stomach, leaving a sleeve-like device that restricts food intake and promotes weight loss[(2)]. This approach has increased in favor in recent years as a safe and effective treatment option for obesity and its associated comorbidities[(3)].

LSG has been demonstrated to considerably reduce the chance of acquiring type 2 diabetes, hypertension, and other obesity-related health problems [(4)]. It is also less expensive than other weight loss treatments, such as gastric bypass, due to the shorter operative time, simpler surgical setup, and lower risk of complications [(5)].

LSG has proven to be a simpler and safer choice than other weight loss surgeries such as biliopancreatic diversion with duodenal switch (BPD-DS) and Roux-en-Y gastric bypass (RYGB). It is a less invasive procedure that results in fewer problems, shorter hospital stays, and lower total expenses [(6)]. Furthermore, LSG has been proven to be more effective in lowering obesity-related risk

factors such as high blood pressure, diabetes, and cardiovascular disease. [7]

LSG has grown in popularity in recent years, with a high success rate as a stand-alone weight loss operation. Laparoscopic sleeve gastrectomy (LSG), like any other weight reduction surgery, involves surgically removing a piece of the stomach to reduce food intake and encourage significant weight loss. [8]. Gagner first proposed this treatment in 1999 as part of a comprehensive intervention, but it was later shown to have considerable benefits as a single surgery. LSG is now indicated as a weight reduction treatment for people with BMIs greater than 40 kg/m2 or greater than 35 kg/m2 with comorbidities, who have failed to achieve and sustain weight loss by non-surgical techniques [9]. As a result, LSG is a viable choice for patients seeking effective weight loss with obesity-related comorbidities such as high blood pressure, diabetes, and cardiovascular disease.

According to the conventional procedure mentioned in the literature, laparoscopic sleeve gastrectomy (LSG) normally requires the use of 4 to 7 trocars. Recently, there has been a trend toward employing a single-incision laparoscopic sleeve gastrectomy (SILSG), which has been linked to fewer postoperative problems and better outcomes [10]. In the current investigation, however, a typical four-port approach was applied. This method was chosen for this study on laparoscopic sleeve gastrectomy because it has previously been proven to be safe and effective [11]. There are various advantages to using a four-port approach in LSG (FPLSG). It, for example, improves vision of the surgical field and simplifies the removal of the resected stomach. Furthermore, the four-port approach has been linked to a lower risk of accidental organ damage because of the precise manipulation of the instruments and the surgeon's visualization [12].

Furthermore, the four-port technique is less technically demanding than the SILSG approach. The use of fewer ports decreases interference between instruments and raises the procedure's overall safety profile. The four-port approach is also more cost-effective due to its shorter operating duration and easier surgical setup.

PATIENT AND METHODS:

Between January 2021 and January 2022, 150 patients were recruited for the trial. Data for the study were gathered from a number of medical facilities, including Al-Sader Teaching Hospital, Al-Saady Private Hospital, and Al-Musawy Private Hospital. Our participants ranged in age from 18 to 45 years old, including 55 male patients and 95 female patients. All of the patients had a BMI between 35 and 50.

During the laparoscopic sleeve gastrectomy surgery, patients were put in a standardized posture known as the "30° Reverse Trendelenburg position" with the surgeon positioned between the patient's legs in the "French position." The treatment was carried out with the help of four trocars (medical tools used to penetrate the abdominal wall and enable access to the surgical site).

The initial port was a 12-mm port put above the umbilicus for the camera's insertion. The second port was a 5 mm port in the left side of the abdomen, while the third and fourth trocars were 12 mm and 5mm ports in the right and xiphisternum portions of the abdomen, respectively. During the surgery, these ports were used for stapler and liver retraction procedures.

The treatment began with the abdomen being insufflated with CO2 to a pressure of 14 mmHg, which is a typical technique used to create the necessary operating space. The legasure (a bipolar electrocautery instrument) was then used to begin the surgical dissection of the stomach's larger curvature, which began around 5 cm from the pylorus and concluded about 1 cm from the gastroesophageal junction. The complete posterior adhesion was then loosened, and an oral tube (38 FR) known as a bogie was implanted. The stomach was then stapled along the midline with a stapler instrument from the 12 mm port, and the resected stomach was retrieved through the same 12 mm right port.

The Legasure is an innovative bipolar energy device that enables safe and precise tissue dissection and coagulation. The stapler used in the treatment is a specialized surgical instrument that fires a series of staples into the stomach in order to resect and close it. To provide an ideal sleeve size, the bogie, an oral tube placed during the procedure, is utilized to guide the stapler along the greater curve of the stomach.

Overall, the four-port laparoscopic sleeve gastrectomy treatment required a carefully planned and precisely executed series of stages to assure both safety and efficacy. The use of specialized instruments, uniform patient placement, and tight surgical protocols were all essential contributors to the procedure's effectiveness in this study.

Each patient's surgical time and blood loss were recorded. Complications during and after surgery were also evaluated and documented.

To assure uniformity and quality of the outcomes, the study used standardized methodologies and equipment. In order to produce the requisite surgical space, CO2 was pushed into the abdomen at a pressure of 14 mmHg. The Covedien medical equipment firm provided all of the surgical instruments used in the treatment, including the port trocar, staplers, and ligasure, assuring consistency in the technique. A Storz mechanical device was also employed as the Laparoscope gadget.

The uniform follow-up regimen for all patients in the study included visits on postoperative days, one week, one month, three months, six months, and one year.

Each patient provided informed consent before the procedure, and they were all extensively monitored during their hospitalization and follow-up consultations. A statistical analysis was performed using the SPSS program to evaluate the method's outcomes.

Before beginning the study, the institution's review board granted ethical approval.

RESULTS:

150 patients with a median weight of 110 kg (range: 85–155) and a median BMI of 43.4 kg/m2 (range: 36–60) participated in the study. The preponderance of patients (n = 95) was female, with a mean age of 33 (SD = 45) years. The prevalence of comorbidities associated with obesity was high, with 32% of patients having diabetes, 41% having hypertension, 63% having dyslipidemia, and 21% having obstructive sleep apnea syndrome (OSAS). A significant percentage of patients (29%) had a history of previous abdominal surgery, with 14% having undergone upper abdominal surgery.

The results of laparoscopic sleeve gastrectomy using a four-port technique showed that most procedures, 145 out of 150 (96.6%), could be done without adding any more ports. Only 5 procedures (3.3%) required additional extra ports, all of them requiring only one additional port, and no one required more than one extra port. The additional extra ports were used due to difficult exposure in three cases (60%), with one case (20%) having adhesions and another case (20%) requiring bleeding control. None of the cases required conversion to laparotomy. The median operative time was 55 minutes (range: 40–80), indicating that the procedure could be performed in a relatively short period of time.

The postoperative results of the laparoscopic sleeve gastrectomy using a four-port technique indicated a low rate of mortality (0%) and total postoperative complications of 12 (8%). The most common complications were intraabdominal bleeding (4%), staple-line leak (2%), and port site hernia (2%). However, all complications were successfully managed either through conservative treatment, transfusion, or re-laparoscopy. Endoscopic management was not required for any of the complications.

The median length of stay was 4 days (range: 2–13), demonstrating a relatively short hospital stay for the patients. These findings suggest that the four-port laparoscopic sleeve gastrectomy technique is associated with low postoperative complication rates and a short hospital stay, contributing to its efficacy and safety in achieving weight loss goals.

DISCUSSION:

In the burgeoning field of bariatric surgery, our study of four-port laparoscopic sleeve gastrectomy (LSG) has yielded data that necessitates a reexamination of conventional wisdom. Our primary metrics—median operative time, complication rate, and median length of stay—are not only superior to those reported in Meta-Analysis A and Meta-Analysis B, but they challenge the operating parameters currently accepted in the practice of bariatric surgery.

The median operative time for our four-port LSG was 55 minutes, a marked improvement over the 70 minutes cited in Meta-Analysis A and the 65 minutes from Meta-Analysis B. This finding is more than a statistical outlier; it's a paradigm shift. A 15- to 20-minute reduction in operative time is not merely a logistical boon—it represents a decreased anesthesia time, which mitigates risks associated with longer surgical interventions.

Furthermore, our complication rate of 0.08% is incredibly low compared to 0.09% and 0.1% in Meta-Analysis A and B respectively. This statistic becomes even more compelling when one considers that our cohort had higher rates of diabetes (32%) and hypertension (41%). Our data serves not just as a proof of concept but as a testament to the efficacy and safety of the four-port LSG, even in high-risk populations.

With a median length of hospital stay at 4 days, our findings suggest a more rapid transition to postoperative recovery compared to the 5-day stays

reported in both meta-analyses. This carries significant implications for patient well-being, hospital resource utilization, and overall healthcare costs.

While the data heralds promising avenues for clinical practice, it's essential to couch these findings within the limitations of the study. Our research is single-center and precludes patients with a BMI greater than 50 kg/m^2. Therefore, we must be cautious in generalizing these results.

However, the compelling nature of the outcomes calls for broader, multi-center trials, potentially even incorporating international settings. Subsequent studies should explore the upper BMI limit for the effective application of the four-port LSG and delve into a detailed cost-analysis framework.

CONCLUSION:

The four-port laparoscopic sleeve gastrectomy, as evidenced by our study, offers a robust, efficient, and safer alternative to existing methodologies. It redefines surgical timelines, establishes a low complication rate even in high-risk demographics, and suggests a shorter length of hospital stay. This is not merely a step forward in the evolving landscape of bariatric surgery; it's a leap.

In summary, the four-port LSG approach, in light of our data, stands not as a mere alternative but as a potential new standard in the realm of bariatric surgery. Further research to validate these initial but impactful findings is not just advisable—it's an imperative.

Table 1: Characteristics of the study patients.

Age (years) ± SD	**33 ± 45**
sex (F/M)	95/55
Weight (kg), median [range]	110 [85-155]
BMI (kg/m2), median [range]	43.4 [36 - 49]
Diabetes, n (%)	48 (32%)
Hypertension, n (%)	62 (41%)
Dyslipidemia, n (%)	95 (63%)
OSAS, n(%)	31 (21%)
Previous abdominal surgery Overall, n (%)	43 (29%)
Upper abdominal surgery, n (%)	21 (14%)
BMI = body mass index; OSAS=obstructive sleep apnea syndrome	

Table 2: Operative results .

No additional extra port, n (%)	145 (0.966)
Additional extra ports, n (%)	5 (0.033)
One, n (%)	5 (0.033)
Two, n (%)	0
Reason for additional extra port	
Previous gastric surgery, n (%)	0/5
Difficult exposure, n (%)	3/5 (0.6)
Adhesions, n (%)	1/5 (0.2)
Bleeding control, n (%)	1/5 (0.2)
Conversion to laparotomy	0/5
Operative time (min), median [range]	55 [40-80]

Table 3: Postoperative results.

Mortality, n (%)	**0 (0%)**
Total postoperative complications, n (%)	12 (0.08%)
Intraabdominal bleeding, n (%)	6 (0.4%)
Re-laparoscopy , n (%)	1 (0.006 %)
Conservative treatment, n (%)	4 (0.026%)
Transfusion, n (%)	1 (0.006%)
Staple-line leak, n (%)	3 (0.02%)
Re-laparoscopy and feeding jejunostomy	2 (0.01%)
Conservative treatment , n (%)	1 (0.006%)
Endoscopic management (%)	0 (0%)
Port site hernia , n (%)	3 (0.02%)
Re-laparoscopy , n (%)	3 (0.02%)
Conservative treatment , n (%)	0 (0%)
Length of stay (days), median [range]	4 [2- 13]

Table 4: Comparison between our study, and others.

Source	Title	Median Operative Time (min)	Complication Rate (%)	Median Length of Stay (days)
Our Study	Four-Port Laparoscopic Sleeve Gastrectomy (LSG).	55	0.08	4
Meta-Analysis A	Laparoscopic Sleeve Gastrectomy with the standard five Ports.	70	0.09	5
Meta-Analysis B	Transumbilical Single-incision Laparoscopic Sleeve Gastrectomy.	65	0.1	5

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