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RESEARCH ARTICLE

SAFETY AND FEASIBILITY OF THE THREE PORT TECHNIQUE FOR CONCOMITANT CHOLECYSTECTOMY DURING SLEEVE GASTRECTOMY: A COMPREHENSIVE ANALYSIS AND CLINICAL IMPLICATIONS

Owaid M. Almalki^{1,2}

1. Department of Surgery, College of Medicine, Taif University, Taif, Saudi Arabia.
2. Department of Surgery, Alhada Military Hospital, Taif, Saudi Arabia.

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Abstract

Introduction: Obesity, a prevalent global health issue, has led to an increased demand for bariatric surgeries, with laparoscopic sleeve gastrectomy (LSG) being a preferred option due to its efficacy and minimal invasiveness. Concomitant cholecystectomy (CC) during LSG has gained traction among patients with obesity and gallstones. While various techniques have been explored, concerns persist regarding safety and efficacy. Our study aims to evaluate the feasibility and outcomes of a three-port laparoscopic technique for this combined procedure.

Methodology: A high-volume bariatric center in Saudi Arabia conducted a retrospective cohort study involving patients who underwent three-port sleeve gastrectomy (3PSG) with CC between January 2022 and January 2024. We collected and analyzed data on demographics, preoperative evaluation, intraoperative details, and postoperative outcomes using descriptive statistics.

Results: Out of 360 LSG patients, 76 underwent CC with the three-port technique. The mean age was 42.18 years, with a female predominance (71.0%) and a mean BMI of 44.67 kg/m². Intraoperatively, the mean operative time was 109.8 minutes, with minimal blood loss and no complications or conversions to open surgery. The average hospital stay was 2.1 days. Postoperatively, the complication rate was 4%, primarily consisting of early bleeding, port-site infection, and atelectasis, all of which were managed conservatively. No severe complications, mortalities, or thrombotic events occurred during the 3-month follow-up.

Conclusion: The three-port laparoscopic technique for concomitant cholecystectomy during sleeve gastrectomy appears safe and feasible, offering favorable outcomes in terms of operative time, blood loss, and postoperative complications. This approach presents a promising option for minimizing surgical trauma and enhancing recovery in obese patients who require both procedures.

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Corresponding Author:- Owaid M. Almalki

Address:- Department of Surgery, College of Medicine, Taif University, Taif, Saudi Arabia.

Introduction:-

Obesity is an escalating worldwide health issue, affecting millions of people and leading to various health complications such as type 2 diabetes, hypertension, and sleep apnea. Bariatric surgery has become a potent method for achieving long-term weight loss and enhancing the circumstances related to it [1, 2].

Bariatric surgery (BS) is increasingly acknowledged as an effective approach, with laparoscopic sleeve gastrectomy (LSG) being preferred because to its relative ease and positive results in comparison to more intricate procedures [3]. The minimally invasive method has several advantages, including less blood loss, low rates of complications, and shorter hospital stays [4].

LSG, which was traditionally performed with several access points (ports), usually four to six ports, has seen advancements aimed at minimizing surgical trauma and improving patient comfort. One such innovation is the single-port approach, utilizing fewer instruments for a potentially smoother recovery and better cosmetic results [5]. However, some concerns remain regarding its feasibility, safety, and effectiveness compared to the standard technique [6, 7].

In addition to obesity, gallstone prevalence is heightened, particularly among individuals with obesity [8]. Laparoscopic cholecystectomy (LC) stands as the gold standard treatment for symptomatic gallstones [9].

Due to the minimally invasive nature of both LSG and LC, there has been a growing interest in doing both jointly in a single surgery [10]. There is no proof that performing concomitant cholecystectomy (CC) during LSG leads to an increase in complications in severely obese patients with other health conditions and symptomatic gallstones. This indicates that it is a secure and efficient surgery for high-risk severely obese individuals [8].

Although numerous reports demonstrate the safe performance of the combined procedure, it is not devoid of complications. Reports indicate the need for additional ports, an increase in surgical time and hospital stay duration, and the occurrence of certain adverse events, such as gastrointestinal leaks, wound infections, renal failure, and pneumonia [11, 12].

Barakat et al. and Hsu et al. recently published studies on a four-port laparoscopic technique that suggests it might be able to reduce the number and size of trocars, leading to better cosmetic results and less pain after surgery [13, 14].

Building on these advancements, the current study aims to investigate the safety and efficacy of a three-port laparoscopic technique for this combined procedure. We believe this approach holds promise for further reducing surgical trauma and enhancing recovery outcomes.

Methodology:-

Study Design:

We conducted a retrospective cohort study from our prospective database between January 2022 and January 2024 to investigate the safety and efficacy of combined three-port sleeve gastrectomy (3PSG) and concomitant cholecystectomy (CC).

Study Setting:

The study was conducted in a high-volume bariatric center at Alhada Military Hospital, Taif, Saudi Arabia. One experienced bariatric surgeon with expertise in laparoscopic techniques performed the surgical procedures.

Participants:

The study included patients who fulfilled the following criteria: We performed a combination 3PSG and CC procedure at our facility. The study included participants who were 18 years of age or older and had complete medical records throughout the whole study period. We specifically excluded individuals who had undergone gastric or biliary surgery in the past, as well as those whose medical records were insufficient.

Data Collection:

We collected data from electronic medical records and operative reports. The data collection period spanned from the procedure's initiation until the last follow-up appointment or documented encounter.

Ethical Considerations:

This study was approved by the Research Ethics Committee of Alhada Military Hospital, Taif, Saudi Arabia. Informed consent was waived due to the retrospective nature of the study, and patient confidentiality was ensured through anonymization and de-identification of all data.

Demographic Characteristics:

Demographic data, including age, gender, body mass index (BMI) at the time of surgery, and comorbidities were collected.

Preoperative Evaluation:

Preoperative evaluation details were extracted from the medical records, including laboratory investigations (e.g., complete blood count, liver function tests); Endoscopic findings (if available); Imaging studies (e.g., upper GI contrast, abdominal ultrasound); nutritional assessment.

Conversion to open surgery criteria:

Conversion to open surgery during combined laparoscopic sleeve gastrectomy and cholecystectomy may occur due to intraoperative complications, technical challenges, poor visualization, hemodynamic instability, or surgeon's judgment based on case complexity.

Intraoperative Data:

Intraoperative data will include operative times for LSG and cholecystectomy, estimated blood loss, any intraoperative complications and any conversion to open surgery.

Postoperative Data:

Postoperative data will encompass length of hospital stay, development of complications (e.g., bleeding, infection, leak and bile duct injury), need for additional interventions, and readmission rates within 30 days.

Statistical Analysis:

Descriptive statistics were employed to summarize demographic and clinical characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means with standard deviations or medians with interquartile ranges, depending on the distribution. IBM SPSS Statistics software (version 25; IBM Corp., Armonk, NY, USA) was used for conducting statistical analysis.

Results:-

Among the 360 patients who underwent laparoscopic sleeve gastrectomy (LSG) over a two-year period, 76 presented with cholelithiasis and underwent concomitant cholecystectomy (CC) with three-port technique.

The mean age of patients undergoing 3PSG with CC was 42.18 years and gender distribution showed a female predominance (71.0%). Mean BMI was 44.67 kg/m².

Sixty-eight patients (80.5%) had type 2 diabetes mellitus (T2DM), thirty two patients (30.2%) had hypertension and hyperlipidemia and five patients had moderate to severe obstructive sleep apnea (6.5%). (Table 1).

Table 1:- Demographic characteristics of the study patients.

Patient characteristic		Total (n = 76)
Age (y)	mean ± SD	42.18 ± 9.44
Gender	Male	22 (28.9%)
	Female	54 (71.0%)
BMI (kg/m ²),	mean ± SD	44.67 ± 4.472
Gall bladder stones	Multiple	66 (86.9%)
	Single	10 (13.1%)
Comorbidities	Diabetes T2DM	68 (80.5%)

	Hypertension	23 (30.2%)
	Hyperlipidemia	23 (30.2%)
	Obstructive sleep apnea	5 (6.5%)

In our study, the mean operation times were 109.8 minutes for 3PSG with CC, with minimal blood loss (12 mL) and no intraoperative complications or conversions to open surgery observed. The mean hospital length of stay was 2.1 days, reflecting a favourable perioperative course (Table 2).

Table (2):- Operative details in the studied groups.

Variable		Total (n = 76)
Operative time (min)	mean \pm SD	109.8 \pm 7.35
Intraoperative complication	Blood loss (mL), mean \pm SD	12 \pm 13.61
	Gall bladder bed bleeding	0 (0%)
	Gall stone spillage	0 (0%)
Conversions to open surgery		0 (0%)
Length of stay (d),	mean \pm SD	2.1 \pm 2.32

During the 30-day follow-up period, the total postoperative complication rate was 4% (3/76 patients). One patient experienced early post-operative bleeding within the first 24 hours post-operatively, managed conservatively with a blood transfusion, and discharged on day four post-operatively. Another patient developed a port-site infection with abscess formation at the first week post-operative visit, and we treated it with drainage and antibiotics. We removed the patient's gall bladder using an endobag but did not remove the stomach specimen. Later, we adopted the method of extracting both specimens using an endobag. The third patient developed atelectasis on postoperative day two; he was a smoker, not adherent to incentive spirometry, and treated conservatively with aggressive chest physiotherapy.

On the other hand, we registered no postoperative complications such as staple leakage, bile leakage, post-operative paralytic ileus, or post-operative pelvic collection, indicating a favorable postoperative course. Additionally, there were no reported mortalities or occurrences of post-operative venous thrombosis in the 3-month follow-up period, underscoring the safety and efficacy of the procedures. (Table 3).

Table 3:- Postoperative complications.

Complication	Patient (3=76)
Post-operative bleeding	1 (1.3%)
staple leakage	0 (0%)
bile leakage	0 (0%)
Post-operative atelectasis	1(1.3%)
Post-operative wound complications	1 (1.3%)
Post-operative paralytic ileus	0 (0%)
Post-operative pelvic collection	0 (0%)
Post-operative venous thrombosis	0 (0%)
Post-operative at 30 days mortality	0 (0%)

Discussion:-

Recent studies show that cholelithiasis is very common in individuals with obesity, affecting anywhere from 19% to 45% [15]. Therefore, knowing how to treat these patients surgically is very important.

The literature on the feasibility of CC during LSG currently exhibits notable disparities. While some authors advocate for the safety of concurrent procedures based on research findings [16], others highlight heightened postoperative complications and prolonged hospital stays [17].

A more widely accepted and selective approach involves exclusively performing CC during LSG for morbidly obese individuals with confirmed gallbladder pathology on preoperative imaging. In line with this approach, our study protocol mandated CC for all patients with documented gallbladder disease on imaging, regardless of symptomatology, mirroring the protocol employed in a study by [13].

In our evaluation of the feasibility of the Three-Port Sleeve Gastrectomy (3PSG) with concomitant cholecystectomy (CC) technique, we found favorable perioperative outcomes. Crucially, there were few or non-existent postoperative complications observed throughout the 30-day follow-up, underscoring the safety of these treatments.

Furthermore, using a single approach for both surgeries simplifies the process, enhances operative efficiency, and improves the patient's experience.

Simultaneous procedures in laparoscopic surgery may need the use of extra ports. Typically, simultaneous laparoscopic procedures necessitate the use of 6 to 7 ports, consisting of three 12-mm trocars and three or more 5-mm trocars [18, 19]. Ohta et al. introduced a method for sharing ports in laparoscopic sleeve gastrectomy (LSG) that used a total of 7 trocars, with 3 of them having a diameter more than 10 mm [20].

The Fang-Chin research determined that using four trocars was sufficient for performing CC during LSG. There are only two trocars that are 10 mm or greater in size. These include the umbilical trocar, which is 12 mm, and the left abdominal trocar, which is 10 mm. The use of these trocars offers several benefits, such as the ability to change the trocar sites, resulting in improved esthetic outcomes and a more extensive surgical field [21].

In our protocol, the integration of a three-port approach presents several potential benefits. By reducing the number of ports and instruments utilized, this technique reduces surgical trauma, improves cosmetic outcomes, and potentially accelerates recovery times.

Our center protocol for performing the 3PSG with CC included a three-port laparoscopic sleeve gastrectomy, followed by a cholecystectomy using the same three-port laparoscopic approach. We performed all procedures under general anesthesia. We administered prophylactic antibiotics during the induction of anesthesia. In reverse Trendelenburg, patients lie supine with adducted legs. We set up the laparoscopic equipment to the left of the patient's head. During the sleeve gastrectomy, the surgeon positioned himself on the right side of the patient, then shifted to the left side to perform the cholecystectomy.

To get into the abdomen, a 5-mm optical view trocar (ENDOPATH XCEL™) is placed 1 hand's breath below the left costal margin in the midclavicular line in the left upper quadrant. The next step involves insufflating the abdomen and creating a pneumoperitoneum. Next, insert a 45-degree 5-mm camera, and place two additional ports under direct vision. A 5-mm trocar (ENDOPATH XCEL™) is placed 15 cm below the xiphoid process. Place the third 12-mm port (Versaport Bladeless; Covidien, Mansfield, MA) in the right upper quadrant, just below the right costal margin in the anterior axillary line. Dissection is performed through the right and left upper quadrant ports, and the field view is maintained with a 5-mm, 45-degree camera through the supraumbilical 5-mm port.

We devascularized the great curve up to the left crus using a sealing device to perform the sleeve procedure. An endoscopic stapler through the right port transected the stomach after calibration with a 36-Fr orogastric suction bougie. After sleeve construction, we routinely fixed the remnant stomach to the prepancreatic fascia using interrupted 2-0 vicryl sutures to prevent axial twisting.

CC started by shifting the surgeon's position to the patient's left side. Using the same two working ports, the left hand will retract the gall bladder cephalic at the Hartman pouch, while the right hand's sealing device will dissect the cystic triangle to reach the critical view for safety, after which the cystic artery will be sealed, and the duct clipped.

Both specimens were retrieved using endo-bag. We usually did not place abdominal drains after surgery. In all cases, port 12-mm fascia closure was routinely performed. Our findings suggest that this approach is a promising option with several potential benefits.

Our study observed a mean operative time of 109.8 minutes, extending the duration by approximately 12–40 minutes compared to LSG performed alone. Previous literature reports have indicated varying degrees of operative time extension when performing CC with obesity surgery, ranging from 18–49 minutes [22, 23] to up to 15–110 minutes [22]. Another study found this extension to be within the range of 15–45 minutes [13].

We used harmonic shears to dissect the Calot triangle and cauterize the cystic artery, which resulted in a comparatively shorter operative time for CC in our study. Unlike in other studies, we conducted CC through the

same three ports used for LSG without requiring additional trocar insertion for either procedure. We attribute this efficiency to our experience with the three-port LSG technique.

Our research found no substantial difference in the duration of hospitalization between patients who had CC during LSG and those who underwent LSG alone at our facility. The short duration of hospitalization, typically lasting 2.1 days, suggests rapid recuperation, irrespective of the particular medical intervention. This conclusion aligns with the observations made by Aridi et al. and Wood et al., who also reported no substantial increase in the duration of hospital stays [24, 25]. On the other hand, Habeeb et al. found in their study that the duration of hospitalization after surgery was extended for the 222 patients who received CC [26].

The current study reported a single incidence of post-operative bleeding (1.3%), which necessitated hospitalization in the intensive care unit (ICU) and a blood transfusion. The patient was hospitalized for a duration of 4 days and was discharged without encountering any complication.

In the current study, intraoperative cholecystectomy complications were notably absent, with no instances of gallbladder bed bleeding or gallstone spillage observed. This contrasts with findings from a study by Gamal Osman et al., where 2 (11.1%) patients experienced gallstone spillage, and another 2 (11.1%) individuals encountered complications related to gallbladder bed bleeding [27].

We successfully performed all procedures in our study laparoscopically, without any instances requiring conversion to open surgery. These results are consistent with prior research [27, 28]. Another study, on the other hand, found two cases of open conversion during gallbladder removal. One was needed because of uncontrolled bile leakage caused by a partial tear in the common bile duct that had to be fixed with simple interrupted sutures using Vicryl 4/0 sutures, and the other was needed because of extensive adhesions that required an open partial cholecystectomy [26].

A subsequent study reaffirmed that CC during LSG increased the risk of surgical site infection by 0.6% [29]. Our findings indicated a higher incidence, with wound infection complications reaching 1.3%.

Limitations:

The study has some limitations. It was retrospective, which makes it harder to prove cause and effect and account for possible confounding factors. Additionally, the sample size was relatively small ($n = 76$), which limits the generalizability of the results. Finally, the follow-up period was only three months, which makes it hard to see if there were any long-term complications.

Although our study did not document any intraoperative complications or instances requiring conversion to open surgery, it's imperative to maintain vigilance for such occurrences, especially in patients with complex anatomical considerations or comorbidities.

Conclusion:-

Our study suggests that the 3PSG with CC is a safe and effective approach for patients with cholelithiasis who are undergoing LSG. This minimally invasive technique offers potential benefits, including reduced surgical trauma, favorable perioperative outcomes, and potentially lower healthcare costs.

This study offers crucial information on the safety and effectiveness of combining 3PSG with CC in individuals with cholelithiasis. The favorable perioperative outcomes observed underscore the feasibility of this approach in appropriately selected patients.

It is necessary to persist in research endeavors to improve surgical procedures, enhance patient selection criteria, and further elucidate the long-term benefits and risks associated with combined bariatric and gallbladder surgeries.

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