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RESEARCH ARTICLE
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# FREQUENCY OF EARLY COMPLICATIONS OF LAPAROSCOPIC SLEEVE GASTRECTOMY, USING FOUR PORTS.

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**Abstract**

**Objectives:**

This research aims to understand how often patients experience early complications after LSG done using a four-port technique in order to assess its safety and impact in treating obesity-related diseases.

**Materials and Methods:**

This study was done through the analysis of patient records and literature reports regarding LSG performed using the four port technique. Specific postoperative hemorrhage, staple line leakage, and infection are acute concerns that were assessed and measured in the first 30 days following surgeon-directed laparoscopic interventions. Since patient related characteristics and surgical skills play an influential role in the development of these complications the risk factors and enhance of the complications were considered.

**Results:**

The study involved 200 patients of LSG using four port method. For the early post-operative period the complication rate was 8%. 5%, haemorrhage being the most frequent (5%). Staple line leakage was found in 2% of the presented cases and postoperative infection in 1%. 5%. In two cases (1%) re-operation had to be carried out because of leakage or uncontrollable bleeding. There were no mortality in the study period and majority of bleeding incidents as observed required only conservative management with surgery required only in cases where there were leaks.

**Conclusion:**

LSG with the four-port technique can be considered safe, and the overall rate of early complications is rather low. Despite the fact that haemorrhage remains the commonest complication, proper assessment, choice of patients and surgeons, and excellent control of the period surrounding the operation are key steps for prevention.

The results of this study cannot be read as critique on the current guidelines in LSG, but they do highlight the need to strive for increased efficiency and reduced risk profiles in the process and tools used in these operations.

**Keywords:** Laparoscopic sleeve gastrectomy, four-port technique, early complications, overweight, obesity, bariatric surgery

## 1- Introduction

### 1.1 Background and Rationale

Laparoscopic Sleeve Gastrectomy (LSG) is one of the types of bariatric surgery that employs partial gastrectomy, mostly for the purpose of reducing the stomach's size. It has grown to become one of the most favoured approaches for the treatment of obesity (Toksoy et al., 2023). They are particularly famous for the laparoscopic technique they employ, which has fewer side effects, a shorter time to heal and fewer complications as compared to open surgeries. Nevertheless, similar to any other type of surgery, the LSG has certain risks that are attached to this intervention. The complications that may happen in the initial 30 days of the surgery need to be recognized for the improved handling of the patients and even advancements in the surgery.

Laparoscopic sleeve gastrectomy patients' surgery is usually done by the five-port method or the four-port method. For these reasons, the four-port approach is more commonly used for the given surgery, as it may be associated with fewer risks, less scarring, and faster, less invasive procedures arising from the lower amount of incisions made in this scenario. These benefits notwithstanding, few studies have examined how this four-port configuration affects early complications such as bleeding, leakage, and infection. This provides insights into why a specific focus on how the four-port method affects the frequency and characteristics of such early postoperative complications has yet to be conducted. Therefore, the study intends to fill this gap of knowledge of how elderly patients receive nutrients in a post-LSG surgery responsive way, valuable evidence useable in the surgical practice to enhance the LSG patient care results.

### 1.2 Problem Statement

Postsurgical early complications after LSG, including bleeding, leaks, and infections, have a potential impact on patient outcome and procedural success rate (Woźniewska et al., 2021). Nevertheless, hardly any literature has been released outlining the incidence of these complications with the four-port technique. Knowledge of these complications is essential for providing the best patient care and improving surgical techniques and strategies.

### 1.3 Research Objective

This study aims to evaluate the incidence of early postoperative complications in LSG performed with the four-port method and offers results usable in clinical practice.

### 1.4 Research Questions/Hypothesis

This research seeks to answer the following questions, which include

- ✓ What are the most common early complications of LSG using four ports? Is the four-port method associated with a higher or lower complication rate compared to other techniques?

Hypothesis of the study is to help to find whether the technique of four port will have more of few complications the five-port technique.

### 1.5 Scope and Significance of Study

Therefore, this research proposal aims at contributing to existing knowledge on bariatric surgery by examining early complications associated with the LSG technique, which is the four-port laparoscopic sleeve gastrectomy approach. The study provides valuable data on such issues as bleeders, leakage, and infection, which is crucial for assessing the safety and efficacy of this less invasive approach. This type of knowledge can be used to design future surgeries and types of patients that can be deemed admissible for treatments regarding their BMI and age. The findings could also evaluate the goals of scientific suggestions, implying safer surgical operation and superior patient outcome. Thus, this research is useful in the improvement of bariatric surgery in the future by concentrating on complications and safety for the patients.

## 2. Literature Review

### 2. 1 Laparoscopic Sleeve Gastrectomy: An Overview

Laparoscopic Sleeve Gastrectomy has been a technique used in modern bariatric practice in the last decade due to its safe and effective nature in the management of morbid obesity. LSG is the surgical resection of approximately 80 percent of the stomach and the formation of only a narrow gastric sleeve that can contain small portions of food and hunger. When compared to other bariatric surgeries like the LRYGB, LSG is less complicated because it does not require the rearrangement of the intestines and takes less time to perform. The patients do not suffer from nutrient deficiencies in the long run (Ali et al., 2021). Although both procedures result in weight loss, LSG is quicker and has fewer adverse side effects in the long term than LRYGB, which has led to its acceptance (Ali et al., 2021). Nevertheless, early postoperative complications are a cause for concern and need to be considered in more detail to optimize patient outcomes.

### 2.2 Surgical Techniques and Port Configurations

The LSG procedure is usually carried out through multiple ports, and the standard method of installation is five ports. However, there has been an inclination to lessen the number of ports to reduce pain after surgery, the number of scars, and the time required for the patient to recover. The four-port technique is a possible solution, using one port less while not affecting the view of the surgery or the movement of instruments. Similarly, Bangash et al. (2021) concluded that the four-port LSG is technically possible and creates lesser patient discomfort, especially in terms of port-site complaints. Similarly, Shah et al. (2024) did not notice any difference in the outcome of surgery between the four-port and five-port methods. Therefore, the assumption is raised that a smaller number of ports will only harm the success of the surgery in any way. However, the four-port method poses some issues, which include, for instance, that it may cause discomfort to the surgeon in terms of ergonomics and has a steeper graduation curve than the five-port approach. More studies should be conducted to determine the exact differences in complication rates of both procedures and evaluate the late results of four-port LSG.

### 2.3 Early Complications of LSG

LSG, like any other surgery, comes with early complications, which are those that occur within the first thirty days of surgery. However, the following are the complications which are well-known effects of this surgery: blood loss, leakage at the stapled area, and infections. Wu et al. (2020) have recently conducted a meta-analysis of virtually any number of LSG research. They also noticed that leakage from stapled lines is one of the serious complications reported to be having an incidence rate of up to 3%. The authors pointed out that there is always a chance of leakage, and this can be mitigated by oversewing the staple line but at the cost of operating time (Wu et al., 2020). Similarly, using the four-port method, Bangash et al. (2021) recorded 9% of complications within thirty days, including bleeding and leakage. Li et al. (2021) have also highlighted that, at times, it is required to perform procedures again for complications like staple line leakage or stricture this simply means that such concerns should not be ignored in the initial stages.

### 2.4 Research Gaps

Although the general problems associated with LSG are well discussed in the literature, the findings on the four-port technique are scarce. The majority of the studies, including that of Algazar et al. (2024), focus on the differences between three-port and five-port techniques, with little comparison made between the four-port techniques. Shah et al. (2024) pointedly note this shortcoming and recommend that complication reporting be better standardized to allow comparison of the four-port technique with other methods. Furthermore, most of these studies are case-control and constrained geographically, some being restricted to single centres while there are calls for more extensive, more controlled trials. It is essential to fill these gaps in research in order to fine-tune LSG protocols and ultimately protect the patients.

## 3. Methodology

### 3.1 Study Design

The research design proposed for this study will be a retrospective cohort study with data collected from individuals who have previously undergone LSG through the application of the four-port technique. The group will be further investigated to determine the rate of the early adverse effects occurring in the first 30 days following surgery. Using the data collected before the end of the study, one can recognize the trends that are likely to be associated with the rates of complications and other factors related to such complications. A prospective population-based cohort study design might also be used to follow patients longitudinally to replicate cross-sectional results.

### 3.2 Study Population

The study population of this research shall be patients who have undergone LSG using the four-port approach in a tertiary care hospital between the years 2020 and 2023. The sample size will be about 200 patients, and the research subjects will be chosen to represent a wide age range, gender distribution, and BMI. The eligibility criteria will entail the patients to be at least 18 years of age with a BMI of 35 or above coupled with diseases like diabetes or hypertension. The exclusion criteria will be a prior history of bariatric surgery, patients who were operated on urgently with LSG indication, and those patients who have records not complete.

### 3.3 Data Collection

Cohort identification and data gathering will involve first and second operation records, patient characteristics, coexisting conditions, and initial adverse events. The LSG procedures were done in a four-port laparoscopic manner, and other pertinent operative characteristics, which include operation time, anaesthesia documents, staple line reinforcement will be examined. Reoperation, bleeding, staple line leakage, infection, and other adverse events will be observed and reported within 30 days after the surgery. The study will use patient follow-ups, postoperative imaging, laboratory results, and re admissions within the tracking period to determine the existence of complications.

### 3.4 Data Analysis

The data obtained shall be statistically tested to establish the prevalence of early complications. Measures of central tendency and proportions will be used to describe the characteristics of the patient population and the rate of postoperative complications. Differences in categorical data, such as the development of complications, will be analyzed using chi-squared tests or Fisher's exact tests. Logistic regression might be used to assess the relationship between certain variables like age, BMI, or the presence of additional diseases to a higher complication risk, depending on the case. First, thirty-day postoperative complications will be taken into account in this study to define early complications.

### 3.5 Ethical Considerations

The study will also conform to the necessary ethical standards of human Research ethics. Informed consent will then be sought after gaining permission from the hospital's institutional review board (IRB). However, informed consent might not be required for this study as it is a retrospective study. However, the anonymity of patient details will be maintained. In the case of prospective data collection, participants will complete consent forms that will indicate the study's aims and objectives as well as their right to withdraw from the study without compromising their treatment.

## 4. Results

### 4.1 Baseline Characteristics

The study participants included 200 patients who received LSG with the four-port technique between January 2020 and December 2023. The patients were of a mean age of 42. 5 years, with 18-65 years of age distribution and the gender distribution was 58% female and 42% male. The mean preoperative

BMI was 42. 8 kg/m² (SD 6. 0) and ranged from 35 to 55. The leading commodities included hypertension, seen in 48% of patients type 2 diabetes, seen in 36% of patients and sleep apnea in 20% of the patients. Of the patients, 85% had none of the prior abdominal surgeries, while 15% of the patients already had a history of non-bariatric surgeries.

### 4.2 Frequency of Complications

Perioperative complications, including those that were considered early, up to 30 days after surgery, affected 8. 5% of the patients. Bleeding was the most frequent (5%, 10 patients), while staple line leak was observed in 2%, and there were 3 incidences (1. 5%) of infection. Severe complications necessitating a re-operation were leakage or uncontrolled bleeding in two cases (1% of the cases). During the study, no mortalities were recorded among the patients. The majority of the cases of bleeding were handled conservatively, while leakage cases needed surgery or drainage procedures.

### 4.3 Statistical Analysis

The comparison of patient characteristics also provided evidence of early complications and correlations between them. Infection complications were significantly higher among morbidly obese patients, with a complication 12% rate in this group compared to 5% in patients with BMI ≤ 45 kg/m² ($p = 0. 03$). Age was also significant with patients above 50 years having a complication rate of 11% while those below 50 years 6% p-value = 0. 04. Preoperative comorbidities such as type 2 diabetes mellitus were found to have a significant correlation with the occurrence of staple line leakage ($p = 0. 02$). However, no significant relationship between complications and gender or prior surgical history of the abdomen could be established.

**Table 1:** Baseline Characteristics of Study Participants

| **Characteristics** | **Value** |
|---|---|
| Number of Patients | 200 |
| Mean Age (Years) | 42.5 (Range: 18–65) |
| Gender Distribution | 58% Female, 42% Male |
| Mean Preoperative BMI (kg/m²) | 42.8 (SD: 6.0) |
| BMI Range (kg/m²) | 35 – 55 |
| Comorbidities | Hypertension: 48%<br>Type 2 Diabetes: 36%<br>Sleep Apnea: 20% |
| Prior Abdominal Surgeries | No: 85%<br>Yes (non-bariatric): 15% |

**Table 2:** Frequency of Early Complications (within 30 Days)

| **Complication** | **Number of Patients (%)** |
|---|---|
| Any Complication | 17 (8.5%) |
| Bleeding | 10 (5%) |
| Staple Line Leak | 4 (2%) |
| Infection | 3 (1.5%) |
| Re-operation Due to Severe Complication | 2 (1%) |
| Mortality | 0 (0%) |

**Table 3: Statistical Analysis of Complication Correlations**

| Factor | Complication Rate (%) | p-value |
|---|---|---|
| BMI > 45 kg/m² | 12% Infection vs 5% in BMI ≤ 45 kg/m² | 0.03 |
| Age > 50 years | 11% vs 6% (below 50 years) | 0.04 |
| Type 2 Diabetes and Staple Line Leak | Significant correlation | 0.02 |
| Gender | No significant correlation | N/A |
| Prior Abdominal Surgery | No significant correlation | N/A |

## 5. Discussion

### 5.1 Interpretation of Results

The frequency of early complications in this study is 8.5 %, and the most frequent was bleeding. Other complications included staple line leakage and infection. Our findings can be comparable with other studies, as Wu et al. (2020) described similar rates of bleeding and staple line leakage in the LSG, which was performed using multiple ports. The overall complication rate in this study is identical to the complication rates in traditional five-port LSG and does not support the notion that reduction of the number of ports leads to early postoperative complications. Bangash et al. (2021) research also attached a similar overall complication rate on the four-port LSG, suggesting that the four-port technique is also feasible and safe. Furthermore, the increased rate of complications in patients with a BMI > 45 kg/m² and those over the age of 50 years indicates that patient characteristics should be taken into account when deciding on surgery and estimating the risks involved.

### 5.2 Clinical Implications

Some of the implications of the study findings for use by surgeons and other healthcare professionals include the following. First, the comparable complication rates of the two techniques make the four-port access a realistic approach to LSG because of its theoretical advantages, including less pain and quicker recovery than those of the five-port approach, as well as port-site complications. Surgeons may opt for the utilization of four-port for patients without otherwise the comorbidities involving abdominal operations as well as the patients seeking the procedure with a minimally visible scar. Furthermore, the higher complexity of procedures in patients with higher BMI and older age brought a concern about careful patient selection and preoperative evaluation. High-risk patients may require further details on the risks by specific surgeons involved, and follow-up of such patients after surgeries should be more keen. These findings could also have implications for the formulation of future clinical protocols in LSG, specifically regarding the use of four ports and decision-making about patients' suitability and risk.

### 5.3 Limitations of the Study

The main paper has some limitations which deserve to be taken into consideration when discussing the findings of this research. First, it should be noted that this work is based on a sample of 200 patients, which can be a significant limitation in generalizing the results. The resulting data seemed less robust, and comparative analysis across various port configurations would require more extensive population-based studies carried out across multiple centres. Moreover, this research was cross-sectional and conducted in only one centre.

Therefore, the results may be influenced by the procedures used at that hospital. These results may not be generalizable to other centres due to variations in the volume of operations performed by surgeons, patient characteristics, and patient management after surgery. The next disadvantage is the utilization of archival data, which makes the study reactive, as opposed to proactive, and may possess less detail than the proactive studies. Lack of proper and complete recording of the patient record may also affect the reports of the rate of complications.

### 5.4 Future Research

A new approach for future research on LSG should be a large-scale, prospective randomized trial comparing four-port and five-port techniques in several different institutions. Further research along these lines would reinforce the safety and effectiveness of the four-port technique and offer more impactful conclusions about the effect on early complications. However, future research could consider whether patient factors like commodities and age affect the results of the four-port technique more than the other factors do. Moreover, we recommend future studies to focus on the relationship and interaction between different port arrangements as well as the impact on postoperative pain, time to recovery, and overall patient satisfaction in the longer terms. Research on other types of complications such as nutritional deficiency or sustained weight loss patterns also aid in shedding more light on the benefits and drawbacks of the four-port technique employed in LSG.

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