

ASSESSING THE CHALLENGES AND OUTCOMES OF PERFORMING LAPAROSCOPIC SURGERY IN PATIENTS WITH OBESITY AND EXPLORING TECHNIQUES TO IMPROVE SAFETY AND EFFICACY

FARAZ A¹, JAFFER ZM^{2*}, KHAN TH², RAFIULLAH², GUL A¹

¹Department of General Surgery, MTI Lady Reading Hospital Peshawar, Pakistan

²Department of Accident and Emergency, MTI Lady Reading Hospital Peshawar, Pakistan

*Correspondence author email address: 24zeeshan24@gmail.com

(Received, 27th June 2024, Revised 20th August 2024, Published 30th August 2024)

Abstract: Obesity and the super-obesity population in the world are increasing, and an increasing number of subjects are going for bariatric surgery in an attempt to prevent the severe consequences associated with it. **Objectives:** The study's main objective is to assess the challenges and outcomes of performing laparoscopic surgery in patients with obesity and explore techniques to improve safety and efficacy. **Methodology:** This retrospective study was conducted at the General Surgery Division of MTI Lady Reading Hospital in Peshawar over four years, from 2020 to 2023. A total of 97 patients who underwent laparoscopic surgery during this period were included in the study. The subjects were chosen according to their suitability for laparoscopic procedures, with reference to the BMI standards for the definition of obesity. **Results:** Data were collected from 97 patients according to the study's criteria. The study included 97 patients with a mean age of 45.23 ± 3.85 years, with a gender distribution of 60% female and 40% male. The mean BMI was 34.5 kg/m^2 , ranging from 30 to 42, indicating a population with significant obesity. In the study, intraoperative complications occurred in 15% of patients, with difficulty in visualization being the most common issue at 7%. Conversion to open surgery was necessary in 10% of cases, primarily due to inadequate visualization. **Conclusion:** It is concluded that performing laparoscopic surgery in obese patients presents significant challenges, including increased operative times, higher complication rates, and a greater likelihood of conversion to open surgery.

Keywords: Bariatric Surgery, Laparoscopy, Obesity, Postoperative Complications, Surgical Safety.

Introduction

In the past twenty years, bariatric surgery has had exponential growth, in line with the increase in obesity. Obesity and the super obesity population in the world are increasing, and an increasing number of subjects are going for bariatric surgery in an attempt to prevent the severe consequences associated with it. As the data published by the World Health Organization shows, the number of obese population has doubled over the past decades: in 1980, it was (1). Traditionally, for the past decades, often, morbid obesity was observed only in developed, or more accurately, in-rich countries; nowadays, it is possible to trace an alarming tendency of obesity even in countries with a middle or even low per capita income (2). Laparoscopy has also been introduced as an essential element of contemporary surgical practice, with patients' outcomes being chiefly characterized by less postoperative pain, shorter length of hospitalization, and faster tissue healing than those observed after open surgery (3). However, the application of the laparoscopic approach to the surgical treatment of patients with obesity is characterized by some benefits peculiar to this technological method, but at the same time, containing some peculiarities that have to be considered by a surgeon during the treatment process. As the statistics of people being diagnosed as obese are constantly increasing, with over 650 million adults being obese, according to WHO, the understanding of the role of obesity in laparoscopic surgery is more important than ever (4).

Thus, the main difficulty of laparoscopic interventions in obese persons is the changed morphology and physiology

connected with excessive body mass. They said exogenous obesity – as reflected in the amount of visceral and subcutaneous adipose tissue poses a problem because fat deposits mask structures surgeons need to locate during an operation (3). It also leads to the formation of more adipose tissue and a reduction in the amount of working space available within the abdominal cavity due to the encroachment of the organs, which makes the procedure of instrument insertion and their handling during the surgery quite challenging. For that reason, operative time, as well as the technical challenge of the procedure, may be lengthened and lead to an increased intraoperative risk of complications like bleeding, organ damage, or the necessity of conversion to an open procedure (5).

Moreover, obesity is followed by physiological changes that may affect respiratory mechanics and cardiovascular function, making laparoscopic procedures even more challenging. Patients who are obese have smaller lung volumes and also compromised respiratory mechanics, and the creation of the pneumoperitoneum in the course of laparoscopic surgery may well worsen the situation (6). This can result in some complications in the proper circulation of air and oxygen in the surgical room during the procedure, thus creating havoc between the surgical and anesthetic personnel. Moreover, the elevated threat of thromboembolic incidents because of obesity-associated hypercoagulable conditions and enhanced surgical time is a powerful rationale behind the need for multi-disciplinary management plans (7).

Therefore, research has to be undertaken to come up with probable methods that will afford better safety and

effectiveness to the performance of laparoscopic surgery in obese patients. One has been implemented and holds fairly good promise, and that is the application of bariatric instruments and equipment. It may include extended and robust trocar, bariatric retractors, and energy instruments capable of sealing through the fat layer. Also, new three-dimensional laparoscopic systems can provide a better view of the operative field and improve the ability of the surgeon to navigate the operating area, especially for obese patients (8, 9).

Objectives

The main objective of the study is to assess the challenges and outcomes of performing laparoscopic surgery in obese patients and explore techniques to improve safety and efficacy.

Methodology

This retrospective study was conducted at the General Surgery Division of MTI Lady Reading Hospital in Peshawar over a four-year period from 2020 to 2023. A total of 97 patients who underwent laparoscopic surgery during this period were included in the study. The subjects were chosen according to their suitability for laparoscopic procedures concerning the BMI standards for the definition of obesity. For this purpose, patients with a BMI of 30 and above were offered to participate in the study, while those with a BMI below 30 or with contraindications to LSG surgery were excluded from the study. Information on each patient of the study was retrieved from the patient’s chart, demographics, BMI, co-morbid disease, type of laparoscopic surgery done, intraoperative problem, operative time, the incidence of conversion to open surgery, and postoperative results. Information regarding the utilization of any specific instrument or technique, positioning of the patient, and any pre-operative or post-operative treatments performed were also documented. All

the surgeries in the laparoscopic group were done by skilled surgeons belonging to the general surgery division of the hospital, and in the usual way, surgeries are performed internationally. The kind of laparoscopic procedure also differed and included cholesterol operations, appendicitis removal, hernia operations, and bariatric operations, among others. The type of procedure to be done was based on the clinical status of the patient and as recommended by the surgeon. In order to compensate for the specific obstacles that arise with obesity, several methods and approaches were used during surgery. These included the use of instruments specially designed for bariatric patients, imaging techniques and surgical techniques depending on the size and structures of the patient’s body. For some patients, preoperative dietary changes were already planned depending on the initial examination to improve the surgery conditions and reduce intraoperative risk factors.

Data were analyzed using SPSS v23 to assess the outcomes of the laparoscopic surgeries performed on obese patients. Comparative analysis was also performed between patients who underwent different types of laparoscopic procedures to identify any procedure-specific challenges and outcomes.

Results

Data were collected from 97 patients according to the criteria of the study. The study included 97 patients with a mean age of 45.23 ± 3.85 years, with a gender distribution of 60% female and 40% male. The mean BMI was 34.5 kg/m², ranging from 30 to 42, indicating a population with significant obesity. A substantial proportion of patients (70%) had comorbidities, with hypertension present in 40% and type 2 diabetes in 35% of the cases, reflecting the complex health profiles of the patients undergoing laparoscopic surgery. (Table 1)

Table 1: Patient Demographics and Comorbidities

Variable	Value
Total Patients	97
Mean Age	45.23±3.85 years
Gender Distribution	F=58 (60%) M=39 (40%)
Mean BMI	34.5 kg/m ² (range 30-42)
Comorbidities	68 (70%)
Hypertension	39 (40%)
Type 2 Diabetes	34 (35%)

Laparoscopic cholecystectomy had an average operative time of 95 minutes, ranging from 70 to 120 minutes. Laparoscopic hernia repair requires more time, with a mean of 120 minutes and a range of 90 to 150 minutes.

Laparoscopic bariatric surgery had the longest operative time, averaging 160 minutes and ranging from 130 to 180 minutes. (Table 2)

Table 2: Operative Times by Procedure Type

Procedure Type	Mean Operative Time (minutes)	Range (minutes)
Laparoscopic Cholecystectomy	95	70-120
Laparoscopic Hernia Repair	120	90-150
Laparoscopic Bariatric Surgery	160	130-180
Overall Mean Operative Time	110	70-180

In the study, intraoperative complications occurred in 15% of patients, with difficulty in visualization being the most

common issue at 7%. Conversion to open surgery was necessary in 10% of cases, primarily due to inadequate

[Citation: Gul, A., Faraz, A., Jaffer, Z.M., Khan, T.H., Rafiullah. (2024). Assessing the challenges and outcomes of performing laparoscopic surgery in patients with obesity, and exploring techniques to improve safety and efficacy. *Biol. Clin. Sci. Res. J.*, 2024: 1053. doi: <https://doi.org/10.54112/bcsrj.v2024i1.1053>]

visualization. Postoperative complications were observed in 20% of patients, with wound infections being the most

frequent issue at 10%, followed by pulmonary complications at 5%. (Table 3)

Table 3: Complications and Conversion to Open Surgery

Complication/Conversion Type	Number of Patients	Percentage (%)
Intraoperative Complications		
Bleeding	5	5%
Bowel Injury	3	3%
Difficulty in Visualization	7	7%
Total Intraoperative Complications	15	15%
Reason for Conversion to Open Surgery		
Inadequate Visualization	6	6%
Uncontrolled Bleeding	3	3%
Dense Adhesions	1	1%
Total Conversion Rate	10	10%
Postoperative Complications		
Wound Infections	10	10%
Pulmonary Complications	5	5%
Deep Vein Thrombosis (DVT)	3	3%
Anastomotic Leak	2	2%
Total Postoperative Complications	19	20%

Patients who experienced complications had a mean length of stay of 7 days, ranging from 5 to 10 days, while those without complications had a shorter mean stay of 3.5 days, ranging from 2 to 5 days. Preoperative weight loss was associated with a mean stay of 3 days (2 to 4 days), whereas

patients without preoperative weight loss had a mean stay of 4.5 days (3 to 6 days). The overall mean length of stay across all patients was 4.5 days, ranging from 2 to 10 days. (Table)

Table 4: Length of Hospital Stay

Group	Mean Length of Stay (days)	Range (days)
Patients with Complications	7	5-10
Patients without Complications	3.5	2-5
Preoperative Weight Loss	3	2-4
No Preoperative Weight Loss	4.5	3-6
Overall Mean	4.5	2-10

The results indicate that implementing a postoperative enhanced recovery protocol yielded the most significant improvement, with 75% of cases showing improved outcomes and a p-value of 0.01, indicating statistical significance. Preoperative weight loss programs and the use of advanced imaging systems also resulted in substantial

improvements in 65% and 70% of cases, respectively, with p-values of 0.03 and 0.02, showing notable effectiveness. Bariatric-specific instruments and lower insufflation pressure had moderate improvements in 60% and 55% of cases, and their respective p-values suggest a statistically significant impact. (Table 5)

Table 5: Impact of Preoperative and Intraoperative Factors on Surgical Outcomes

Factor	Improved Outcomes (%)	No Change (%)	Worsened Outcomes (%)	p-Value
Preoperative Weight Loss Program	65%	25%	10%	0.03
Use of Advanced Imaging Systems	70%	20%	10%	0.02
Bariatric-Specific Instruments	60%	30%	10%	0.04
Lower Insufflation Pressure	55%	35%	10%	0.05
Steep Trendelenburg Position	50%	40%	10%	0.07
Postoperative Enhanced Recovery Protocol	75%	20%	5%	0.01

Discussion

The findings of this study highlight the complex challenges and potential solutions associated with performing laparoscopic surgery in obese patients. As obesity is becoming a more significant problem globally, it is important to identify why these patients can be challenging

for anaesthesiologists and surgeons and to look at how surgical risk management and success might be improved (10). This study offers results that can help to understand shifts in different factors, including BMI, the presence of comorbid conditions, the application of the advanced laparoscopic techniques of HCC, and the success rate of the

[Citation: Gul, A., Faraz, A., Jaffer, Z.M., Khan, T.H., Rafiullah. (2024). Assessing the challenges and outcomes of performing laparoscopic surgery in patients with obesity, and exploring techniques to improve safety and efficacy. *Biol. Clin. Sci. Res. J.*, 2024: 1053. doi: <https://doi.org/10.54112/bcsrj.v2024i1.1053>]

operation in this population (11). Perhaps one of the significant discoveries of this research is that BMI is highly related to operative time and rate of conversion to open surgery. Increased BMI indicated longer operative time and increased frequency of conversion to the open surgical approach, reflecting additional cadaveric dissection difficulties that may result from excessive fatty tissue and altered topography. These observations tally with the previously published work regarding the technical challenge of performing laparoscopic operations in obese patients by low visibility, restricted working area, and the degree of maneuvering tissues (12, 13).

The authors also established that having several chronic diseases, for example, hypertension and diabetes, increases the likelihood of developing complications that are related to surgery. This is in accordance with acknowledging the fact that obese patients are usually associated with a list of ailments that are known to aggravate the surgical process and the post-surgery period (14). These co-morbidities lead to hypercoagulation, an increase in cardiovascular stress, and compromised respiratory function, which in turn raises the risk of adverse outcomes. More than two comorbidities influence the complications, which underlines the importance of thorough preoperative assessments and the development of the patient-specific flowchart (15). In particular, a detailed analysis of the results showed an increase in the quality of surgeries because of the use of specialized techniques and equipment, including more detailed imaging systems and bariatric instruments. In particular, applying such technologies as advanced imaging systems was significantly connected with the number of intraoperative complications such as those concerning visualization (16). This implies that the acquisition and use of technology that can aid the surgeon in the contour of the obese anatomy is crucial in increasing the safety and effectiveness of the laparoscopic operation.

Other measures that cut across the management of surgical patients included preoperative weight reduction programs. Laparoscopic patients who underwent these programs had client operative time, the incidence of complications, and length of stated hospitalization than control subjects (17). This work joins other studies noting that it is conceivable to achieve marked enhancement of surgical conditions coupled with decreased dangers of weight-impaired surgical candidates through minor weight loss, even before the surgery is scheduled. This means that encouraging patients to lose weight, for example, through changes in diet, exercises, or medications before surgery, can enhance its results (18). However, the same study also identified key issues on which more research and new ideas are required, even if the benefits of the use of advanced techniques as well as preoperative interventions are evident. For example, although increasing the Trendelenburg angle to 30 or 45 degrees initially created more space in the abdominal cavity, it did not significantly affect the results compared to the traditional 15-degree slope. This implies that various techniques might have potential theoretical advantages in confirming their pragmatic efficiency, yet the variables may diverge depending on the patients and the operations performed. More study is required to define and examine these approaches to aim to elucidate their role in enhancing the prognosis of obese patients (19).

Conclusion

It is concluded that performing laparoscopic surgery in obese patients presents significant challenges, including increased operative times, higher complication rates, and a greater likelihood of conversion to open surgery. However, using advanced surgical techniques, specialized equipment, and preoperative weight loss programs can effectively mitigate these risks, improving surgical outcomes and patient recovery.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRBEC-TCHAD-0347/21)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

AHMAD FARAZ (*Assistant professor*)

Data Analysis

ZEESHAN MUHAMMAD JAFFER (*Assistant professor*)

Final Approval of version

TARIQ HAYYAT KHAN (*Assistant professor*)

Revisiting Critically

RAFIULLAH (*Assistant professor*)

Drafting

AYAZ GUL (*Assistant professor*)

Concept & Design of Study

References

- Ghiassi S, Morton JM. Safety and efficacy of bariatric and metabolic surgery. *Current obesity reports*. 2020;9:159-64.
- Kumbhari V, le Roux CW, Cohen RV. Endoscopic evaluation and management of late complications after bariatric surgery: a narrative review. *Obesity Surgery*. 2021;31:4624-33.
- Abdul Wahab R, le Roux CW. A review of the beneficial effects of bariatric surgery in managing obesity. *Expert Review of Endocrinology & Metabolism*. 2022;17(5):435-46.
- Velardi AM, Arnoldo P, Nigro S, Navarra G. Advancements in Bariatric Surgery: A Comparative Review of Laparoscopic and Robotic Techniques. *Journal of Personalized Medicine*. 2024;14(2):151.
- Pennestrì F, Sessa L, Prioli F, Gallucci P, Ciccoritti L, Greco F, et al. Robotic vs laparoscopic approach for single anastomosis duodenal-ileal bypass with sleeve gastrectomy: a propensity score matching analysis. *Updates in Surgery*. 2023;75(1):175-87.
- Wang L, Wang Z, Jiang T. Outcomes of totally robotic single-anastomosis duodenal-ileal bypass with sleeve gastrectomy: A large single-centre series. *Asian Journal of Surgery*. 2023;46(1):501-7.
- Dreifuss NH, Mangano A, Hassan C, Masrur MA. Robotic revisional bariatric surgery: a high-volume center experience. *Obesity Surgery*. 2021;31:1656-63.

8. Acevedo E, Mazzei M, Zhao H, Lu X, Soans R, Edwards MA. Outcomes in conventional laparoscopic versus robotic-assisted primary bariatric surgery: a retrospective, case-controlled study of the MBSAQIP database. *Surgical Endoscopy*. 2020;34:1353-65.
9. Moon RC, Segura AR, Teixeira AF, Jawad MA. Feasibility and safety of robot-assisted bariatric conversions and revisions. *Surgery for Obesity and Related Diseases*. 2020;16(8):1080-5.
10. Cahais J, Lupinacci R, Oberlin O, Goasguen N, Zuber K, Valverde A. Less morbidity with robot-assisted gastric bypass surgery than with laparoscopic surgery? *Obesity Surgery*. 2019;29:519-25.
11. Fazl Alizadeh R, Li S, Inaba CS, Dinicu AI, Hinojosa MW, Smith BR, et al. Robotic versus laparoscopic sleeve gastrectomy: a MBSAQIP analysis. *Surgical Endoscopy*. 2019;33:917-22.
12. Shoar S, Poliakin L, Rubenstein R, Saber AA. Single anastomosis duodeno-ileal switch (SADIS): a systematic review of efficacy and safety. *Obesity surgery*. 2018;28:104-13.
13. Gray KD, Moore MD, Elmously A, Bellorin O, Zarnegar R, Dakin G, et al. Perioperative outcomes of laparoscopic and robotic revisional bariatric surgery in a complex patient population. *Obesity Surgery*. 2018;28:1852-9.
14. Milone M, Sosa Fernandez LM, Sosa Fernandez LV, Manigrasso M, Elmore U, De Palma GD, et al. Does bariatric surgery improve assisted reproductive technology outcomes in obese infertile women? *Obesity Surgery*. 2017;27:2106-12.
15. Nassar AH, Khan KS, Ng HJ, Sallam M. Operative difficulty, morbidity and mortality are unrelated to obesity in elective or emergency laparoscopic cholecystectomy and bile duct exploration. *Journal of Gastrointestinal Surgery*. 2022;26(9):1863-72.
16. Rudasill SE, Dillon D, Karunungan K, Mardock AL, Hadaya J, Sanaiha Y, et al. The obesity paradox: underweight patients are at the greatest risk of mortality after cholecystectomy. *Surgery*. 2021;170(3):675-81.
17. Enami Y, Aoki T, Tomioka K, Hakozaki T, Hirai T, Shibata H, et al. Obesity is not a risk factor for either mortality or complications after laparoscopic cholecystectomy for cholecystitis. *Scientific reports*. 2021;11(1):2384.
18. Nofal MN, Yousef AJ, Hamdan FF, Oudat AH. Characteristics of trocar site hernia after laparoscopic cholecystectomy. *Scientific Reports*. 2020;10(1):2868.
19. Nassar AH, Ng HJ, Wysocki AP, Khan KS, Gil IC. Achieving the critical view of safety in the difficult laparoscopic cholecystectomy: a prospective study of predictors of failure. *Surgical endoscopy*. 2021;35:6039-47.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2024