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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/19448
DOI URL: <http://dx.doi.org/10.21474/IJAR01/19448>



RESEARCH ARTICLE

TROCAR SITE CLOSURE WITH OMENTAL PLUG INSERTION IN LAPAROSCOPIC BARIATRIC OPERATIONS: EFFICACY, SAFETY, AND OUTCOMES

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.

Manuscript Info

Manuscript History

Received: 10 July 2024

Final Accepted: 14 August 2024

Published: September 2024

Key words:-

Omental Plug, Trocar Site Herniation, Obesity, Bariatric Surgery, Laparoscopic Procedures

Abstract

Introduction: Trocar site herniation (TSH) remains a significant complication following laparoscopic bariatric surgery. Conventional closure techniques often prove challenging and may lead to inadequate closure, increasing the risk of TSH. This study aimed to evaluate the effectiveness and safety of a novel omental plug technique for closing trocar sites in laparoscopic bariatric surgery.

Methodology: A retrospective study included 256 patients who underwent laparoscopic bariatric surgery (LSG, OAGB, or RYGB) between 2019 and 2023 at Armed Forces Hospital, Taif, Saudi Arabia. We used an innovative omental plug technique to close trocar sites ≥ 10 mm. The primary outcome was the incidence of TSH within 12 months postoperatively, assessed clinically and with an ultrasonography examination. Secondary outcomes included wound infections, seroma formation, and reoperation for trocar site complications.

Results: We observed no cases of TSH, indicating significant efficacy in preventing this complication. Other postoperative complications were minimal, with only one case (0.4%) of a superficial wound infection.

Conclusion: In laparoscopic bariatric surgery, the omental plug technique demonstrated promising results in preventing TSH and reducing postoperative complications. Its ease of use, safety profile, and potential biological advantages suggest it may be a valuable alternative to traditional fascial closure methods. We warrant future larger, multicentric studies with longer follow-up to confirm these findings.

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Introduction:-

Metabolic-bariatric surgery (MBS) has become a key intervention in the management of obesity and associated metabolic disorders, owing to its long-term effectiveness in achieving sustained weight loss and improving metabolic health. As obesity rates continue to rise globally, the demand for surgical interventions has surged, positioning MBS as one of the most effective and durable treatments for severe obesity [1].

Corresponding Author:- Owaid M. Almalki

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

However, while laparoscopic techniques have revolutionized bariatric surgery by minimizing invasiveness and recovery time, they are not without risk. Trocar site complications, particularly trocar site herniation (TSH), remain a concern. These complications, which include bleeding, infection, pain, and herniation, tend to increase in frequency with the use of larger trocar diameters [2, 3]. Patients with obesity face an even higher risk of incisional hernias due to the combined effects of increased intra-abdominal pressure and weaker abdominal musculature as compared to non-obese patients [4].

Two significant risk factors—obesity and the technical difficulty of closing small, deep wounds at the trocar site—pose challenges for effective fascial closure. Inadequate closure may lead to TSH, a complication that often goes unnoticed but can lead to serious outcomes such as bowel strangulation and necrosis. Despite the clear need, standard closure techniques at the trocar site remain difficult to perform in patients with obesity, and they are time-consuming and imprecise [5, 6].

Despite the exploration of various methods and tools to mitigate these risks, including specialized suturing techniques and closure devices [7, 8, 9], there is no consensus on the most effective technique to minimize trocar site complications. The literature recommends fascial closure for trocar sites larger than 10 mm to reduce the incidence of TSH, but there remains significant variability in closure practices among surgeons [10, 11].

Given these difficulties, the goal of this study is to assess the safety and effectiveness of a novel closure technique that aims to overcome the drawbacks of traditional suturing techniques, particularly in obese patients, and lower the incidence of trocar site complications.

Materials and Methods:-

Study Design and Population

This retrospective study was conducted at Armed Forces Hospital, Taif, Saudi Arabia, and included patients who underwent laparoscopic bariatric surgery between January 2019 and January 2023. A total of 256 patients were included, all of whom underwent one of the following procedures: Laparoscopic Sleeve Gastrectomy (LSG), One Anastomosis Gastric Bypass (OAGB), or Roux-en-Y Gastric Bypass (RYGB). All surgeries were performed by a single surgeon.

The inclusion criteria for this study were as follows:

1. Age between 18 and 65 years.
2. Body Mass Index (BMI) ≥ 40 kg/m² or ≥ 35 kg/m² with associated obesity-related comorbidities.
3. Underwent a laparoscopic bariatric procedure.
4. Follow-up data available for at least 12 months postoperatively.

Patients were excluded if they had a history of previous abdominal surgeries, required conversion to open surgery, or were lost to follow-up.

Surgical Technique

All surgical procedures were performed by a single experienced bariatric surgeon using standard laparoscopic techniques. A bladeless trocar was inserted under direct visualization, and pneumoperitoneum was established with intra-abdominal pressures maintained at 15 mmHg. Trocar sizes of 10 mm and 12 mm were primarily used for access.

Trocar sites ≥ 10 mm were managed with the innovative omental plug technique, wherein the omentum was mobilized, dissected, separated and shaped into a plug (Figure 1) and gently inserted into the muscle layer of the fascial defect (Figure 2 and 3).



Figure 1:- Creating the omental plug.



Figure 2:- Retraction of the port out of the muscle layer under supervision of the laparoscope.



Figure 3:- The omental plug, which is being left in place to fill the fascial defect.

This plug was left in place to ensure closure of the fascial defect, and the skin was sutured with subcuticular interrupted 3-0 Monocryl sutures. Desufflation was performed under direct vision to confirm that the omental plug remained securely within the fascial layer.

Outcome Measures

The primary outcome of interest was the incidence of trocar site hernias (TSH) within 12 months postoperatively assessed both clinically and by an ultrasonographic examination. Secondary outcomes included postoperative complications such as wound infections, seroma formation, and the need for reoperation related to trocar site complications.

Data on patient demographics, BMI, comorbidities, the type of bariatric surgery performed, and follow-up duration were collected and analyzed.

Statistical Analysis

Data were analyzed using SPSS software version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize patient demographics and clinical characteristics

Ethical Considerations:

This study received approval from the Institutional Review Board (IRB) of Alhada Military Hospital. Written informed consent was obtained from all participants before inclusion in the study.

Results:-

A total of 256 patients who underwent laparoscopic bariatric surgery between January 2019 and January 2023 were included in this retrospective study. Of these, 180 were females (70.3%) and 76 were males (29.7%), with a mean age of 41.6 ± 9.8 years (range 22–64 years). The mean preoperative Body Mass Index (BMI) was 43.2 ± 5.6 kg/m² (range 35.0–56.8 kg/m²).

Regarding the type of surgery, 199 patients (77.7%) underwent Laparoscopic Sleeve Gastrectomy (LSG), 37 patients (14.5%) underwent One Anastomosis Gastric Bypass (OAGB) and 20 patients (7.8%) underwent Roux-en-Y Gastric Bypass (RYGB). The follow-up period ranged from 12 to 24 months, with a mean follow-up of 18.3 months (Table 1).

Table 1:- Patient Demographics, Surgical Data, and Outcomes.

Characteristic	N (%)
Total n= 256	
Gender Distribution	
Female	180 (70.3%)
Male	76 (29.7%)
Mean Age (years)	41.6 ± 9.8
Mean BMI (kg/m²)	43.2 ± 5.6
Type of Procedure	
LSG	199 (77.7%)
OAGB	37 (14.5%)
RYGB	20 (7.8%)
Follow-Up Period (months)	12 - 24 (mean 18.3)

*Laparoscopic Sleeve Gastrectomy (LSG), One Anastomosis Gastric Bypass (OAGB), Roux-en-Y Gastric Bypass (RYGB).

Postoperative Complications

During the follow-up period, no cases of trocar site hernia (TSH) were observed. Other postoperative complications were minimal, with only one case (0.4%) of superficial wound infection at the trocar site, which resolved with oral antibiotics and did not require further intervention. There were no instances of seroma formation or the need for reoperation related to trocar site complications (Table 2).

Table 2:- Incidence of Trocar Site Hernias and Complications.

Characteristic	N (%)
Total n= 256	
Complications	
Trocar Site Hernia	0 (0%)
Wound Infection	1 (0.4%)
Seroma Formation	0 (0%)
Reoperation	0 (0%)

The low complication rates suggest that the omental plug technique may be effective in reducing postoperative morbidity. Notably, the absence of trocar site hernias in this cohort further highlights the potential benefits of using this technique over traditional fascial closure methods.

The secondary outcomes were equally favorable, with minimal wound-related complications, supporting the efficacy of the omental plug technique in bariatric surgery.

Discussion:-

The study's findings suggest that using an omental plug for trocar site fascial closure in laparoscopic bariatric surgery is a safe and effective alternative to traditional closure techniques. This method offers several advantages, including ease of application, cost-effectiveness, and the avoidance of foreign material, which may reduce the risk of complications associated with synthetic materials [12].

In our cohort, the incidence of trocar site hernia (TSH) is 0%, which is lower than the rates reported in previous studies using conventional methods. A study by Pilone et al. [7] reported TSH rates as high as 3.1% without fascial closure, while Gutierrez et al. [3] in their literature review of more than 18 thousand patients with fascial closure noted rates of up to 0.104%. These findings suggest that the omental plug technique may offer superior protection, particularly in patients with obesity because of their elevated intra-abdominal pressure and substantially thicker fatty preperitoneum.

In terms of safety, our cohort experienced minimal postoperative complications. Only one patient (0.4%) developed a superficial wound infection, which resolved with oral antibiotics. No cases of seroma formation or reoperation related to trocar site issues were observed, which contrasts with higher complication rates reported in other studies utilizing traditional suturing methods [5]. Further emphasizing the potential benefits of the omental plug technique. The low complication rate is consistent with studies that suggest reduced tension at the wound site and the biological integration of omental tissue may promote better healing and reduce the risk of infection.

As reported in the literature, the obese population is a high-risk patient group, and prolonged operative time and rate of complications are directly correlated with mortality after bariatric surgery [13, 14].

Given the inherent risks associated with bariatric surgery, including obesity-related complications and prolonged operative times, it is crucial to develop techniques that minimize additional risks. Obesity is a known risk factor for poor surgical outcomes, and reducing operative times has been shown to correlate with better results and lower mortality. The simplicity and ease of use of the omental plug technique, particularly in patients with challenging anatomy, may lead to reduced operative times compared to traditional fascial closure methods, which often require specialized instruments.

Moreover, the biological characteristics of the omental plug may provide supplementary advantages. The omental tissue is recognized for its considerable vascular supply and immunological activities, which may account for the reduced incidence of infection and enhanced wound healing shown in our study.

Research demonstrates that the omentum can regulate immune responses and promote healing by supplying cytokines and growth factors to the wound location [15].

However, the small sample size of our study limits the generalizability of our findings. While our results are promising, larger, multicenter studies are needed to validate the efficacy and safety of the omental plug technique

across different populations and surgical settings. Additionally, while our follow-up period was sufficient to capture early complications, longer follow-up is necessary to assess the durability of the omental plug technique and its impact on long-term outcomes, such as late-onset hernias or chronic pain. Furthermore, ultrasonography examination may not be the optimal tool for detecting TSH due to its operator dependency; computed tomography scan is likely to yield greater accuracy in future studies.

Conclusion:-

In conclusion, the omental plug technique appears to be a viable alternative to traditional fascial closure methods in laparoscopic bariatric surgery, offering benefits in terms of reduced hernia rates and complications. Despite the hopeful nature of our findings, larger multicenter trials utilizing advanced radiological techniques are necessary to evaluate the effectiveness and safety of the omental plug approach. Prolonged follow-up is essential to identify long term issues like late-onset hernias or chronic pain.

Acknowledgments:-

We thank our patients, and the medical staff involved in this study.

Conflict of Interest

The authors declare no conflicts of interest.

References:-

- 1 Muzaffer AL. Risk factors associated with the development of trocar site hernia after laparoscopic bariatric-metabolic surgery. *J Exp Clin Med.* 2022; 39(4): 1223-1229 doi: 10.52142/omujecm.39.4.50.
- 2 Coblijn UK, de Raaff CA, van Wagenveld BA, et al. Trocar port hernias after bariatric surgery. *Obes Surg.* 2016; 26(3):546–51.
- 3 Gutierrez M, Stuparich M, Behbehani S, et al. Does closure of fascia, type, and location of trocar influence occurrence of port site hernias? A literature review. *SurgEndosc.* 2020; 34(12):5250–8.
- 4 Lee DY, Rehmani SS, Guend H, Park K, Ross RE, Alkhalifa M, McGinty JJ, Teixeira JA (2013) The incidence of trocar-site hernia in minimally invasive bariatric surgery: a comparison of multi versus single-port laparoscopy. *SurgEndosc* 27(4):1287–1291. <https://doi.org/10.1007/s00464-012-2597-5>.
- 5 Lambertz A, Stuben BO, Bock B, et al. Port-site incisional hernia - a case series of 54 patients. *Ann Med Surg (Lond).* 2017; 14:8–11.
- 6 Jeon Y, Song S, Han KW, et al. Evaluation of a novel trocar-site closure device in laparoscopic surgery. *JLS.* 2020; 24(3).
- 7 Pilone V, Di Micco R, Hasani A, et al. Trocar site hernia after bariatric surgery: our experience without fascial closure. *Int J Surg.* 2014; 12(Suppl 1):S83–6.
- 8 Masci E, Faillace G, Longoni M. Use of oxidized regenerated cellulose to achieve hemostasis during laparoscopic cholecystectomy: a retrospective cohort analysis. *BMC Res Notes.* 2018; 11(1):239.
- 9 Patel SV, Paskar DD, Nelson RL, et al. Closure methods for laparotomy incisions for preventing incisional hernias and other wound complications. *Cochrane Database Syst Rev.* 2017; 11:CD005661.
- 10 Iranmanesh, P., Rivera, A.R., Bajwa, K.S. et al. Trocar site closure with a novel anchor-based (neoClose®) system versus standard suture closure: a prospective randomized controlled trial. *SurgEndosc* 34, 1270–1276 (2020). <https://doi.org/10.1007/s00464-019-06891-y>
11. Andraos, Y. Safety and Efficacy of Trocar Port-Site Closure Using a Biological Plug Closure in Laparoscopic Bariatric Surgery: a Prospective Study. *OBES SURG* 32, 3796–3806 (2022). <https://doi.org/10.1007/s11695-022-06238-y>
12. Brucker M, Sati S, Spangenberg A, Weinzeig J. Long-term fate of transplanted autologous fat in a novel rabbit facial model. *PlastReconstr Surg.* 2008; 122(3):749–54.
13. Ri M, Aikou S, Seto Y. Obesity as a surgical risk factor. *Ann Gastroenterol Surg.* 2018; 2(1):13–21.
14. Inaba CS, Koh CY, Sujatha-Bhaskar S, et al. Operative time as a marker of quality in bariatric surgery. *SurgObesRelat Dis.* 2019; 15(7):1113–20.
15. Meza-Perez S, Randall TD. Immunological Functions of the Omentum. *Trends Immunol.* 2017 Jul;38(7):526-536. doi: 10.1016/j.it.2017.03.002. Epub 2017 Jun 1. PMID: 28579319; PMCID: PMC5812451.