Original Article
DOI: https://doi.org/10.70749/ijbr.v3i1.550

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://induspublishers.com/IJBR
ISSN: 2960-2793/ 2960-2807

Comparison between Onlay vs Sublay Mesh Techniques in Terms of Wound Infection, Seroma Formation and Recurrence-A Retrospective Study

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ARTICLE INFO

Keywords

Ventral Hernia, Onlay Mesh, Sublay Mesh, Seroma, Surgical Site Infection, Recurrence.

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Declaration

Author's Contributions: All authors equally contributed to the study and approved the final manuscript.
Conflict of Interest: No conflict of interest.
Funding: No funding received by the authors.

Article History
Received: 06-11-2024
Revised: 01-01-2025
Accepted: 16-01-2025

ABSTRACT

Introduction: Ventral hernia repair remains a significant challenge, with onlay and sublay mesh techniques being widely used. This study evaluates these approaches in terms of wound infection, seroma formation, recurrence, and skin necrosis. **Objectives:** To compare the outcomes of onlay and sublay mesh repair techniques in ventral hernia surgery. **Materials and Methods:** A retrospective cross-sectional study was conducted at Recep Tayyip Erdogan Hospital, Muzaffargarh, reviewing 123 patients who underwent elective mesh hernioplasty from January 2017 to December 2021. Data on demographics, comorbidities, hernia type, procedure type, operative time, and complications were analyzed. **Results:** Onlay repair was performed in 59.3% and sublay in 40.7% of cases. Seroma formation was higher in sublay (18%) than onlay (10%). Recurrence occurred only in the onlay group (2.86%). SSI rates were 4.3% for onlay and 0% for sublay. Operative time was longer for sublay repairs. **Conclusion:** We concluded in ths study that both the techniques are effective with comparable outcomes. Sublay repairs reduce recurrence but require longer operative times.

INTRODUCTION

The dichotomy between onlay and sublay mesh practices has emerged as an area of interest in formulating surgical improvements regarding hernia repair results. This paper talks of wound infection, seroma formation and recurrence rates as some of the factors that can be used to determine these two methods' effectiveness. In the current exponential growth of surgical innovation, the present retrospective study is desired to show the applicability and relevance of these mesh repair strategies in clinical management. Onlay and sublay mesh placement are two mesh placement procedures in hernia surgical operations, and both methods have their merits and demerits. In the onlay technique, the mesh is only placed on the anterior rectus sheath. On the other hand, in the sublay technique, the mesh is placed behind the rectus muscles but in front of the posterior rectus sheath or the peritoneum. Subsequent development exhibits the operational characteristics of these management strategies in a clinical context. For instance, to establish the variability of the relation between wound infection and recurrence with the localization of the mesh, Elhadidi et al. (1) undertook a literature study. Subsequently, the weight of the mesh used during the operations, examining its incidence of postoperative complications, was studied by Li et al. (2), the work of which also contributes to the understanding of mesh effects.

Therefore, selecting the proper type of mesh placement technique remains critical since this determines the outcome, or sequelae, of patients. Den Hartog et al. (3) highlighted that retro-rectus mesh repair was associated with a low incidence of wound-related complications. On the other hand, evidence gathered from Pizza et al. (5) indicated that the two-mesh technique could be effective when used in the posterior component separation, especially for complex hernias. Moreover, Deshpande et al. (6) have tilted

intraperitoneal onlay mesh repair with defect closure against SCOLA to show that the technique affects recurrence and seroma formations. Issues like seroma formation and an expectant operative complexity have also been discussed. Melkemichel et al. (7) examined the effects of seroma formation following minor umbilical hernia repairs, and Harji et al. (8) highlighted the deficiencies in reporting the outcomes of incisional hernia surgery. Cumulatively, these studies underscore the significance of promoting uniformity in surgical practices to reduce accidents and provide high-quality service to patients.

The infection problem is still an enormous issue in the approach of hernia surgeries, especially in the onlay methods. Wagner et al. (10) looked at adopting absorbable mesh within contaminated fields, highlighting that it reduces infection risks. Similarly, Levy et al. (11) studied poly-4-hydroxybutyrate mesh that appeared helpful for various reconstructions in the abdominal wall. These results suggest mesha material and its position as the crucial predictors of postoperative infection risks. Recurrence, one of the reviewed outcomes, is directly associated with the technique and material of mesh positioning. Gandhi et al. (12) noted that the TAR technique effectively prevented further occurrence and seems helpful in contemporary surgical practice. Similarly, Domen et al. (13) assessed laparoscopic mesh repairs, and much focus has been given to minimally invasive management to decrease the recurrence.

According to Porcaro, the anatomic and physiologic concerns regarding mesh positioning define performance. Schneider et al. (14) recently supported the idea of increased application of retro-rectus mesh repair in non-complex hernias by proving its effectiveness. In addition, Gu et al. (15) published a Chinese expert consensus that identified that the treatment strategies were proposed according to epidemiological characteristics such as BMI, smoking history, and comorbidities. The present study investigates a group from Pakistan, providing regional specifications for both onlay and sublay mesh techniques. The present study seeks to make an informed contribution towards hernia repair techniques worldwide while recognizing and looking into the problems of the Shahida Islam Teaching Hospital at Lodhran. Using conventional apparatuses of qualitative research, such as age, gender, BMI, and lifestyle information, makes the analysis appropriate and thorough for future research works to build upon.

Objective

To compare the onlay and sublay mesh techniques in terms of wound infection, seroma formation, and recurrence rates in patients undergoing hernia repair at a hospital in Pakistan.

MATERIALS AND METHODS

Study Design and Setting

This Cross Sectional study was done at the Department of General Surgery Recep Tayyip Erdogan Hospital, Muzaffargarh, part of Indus Health Network, a tertiary free healthcare hospital. The medical records were reviewed from patients who underwent hernia repair surgeries between January 2017 and December 2021.

Inclusion Criteria

Only elective mesh hernioplasty for ventral hernias of patients of any age and gender diagnosed as low risk (ASA class less than III) during the period stated above were included in the study. Appropriate patient groups underwent different ventral hernias, while onlay or sublay methods were used during operations.

Exclusion Criteria

This study excluded patients being ASA class III or above, uncontrolled DM, morbid obesity, rejoventral hernia, or complicated ventral hernia, including strangulated and obstructed hernia.

Methods

Questionnaires with predetermined questions were filled with information regarding the involved patients. Data collected includes age, gender, BMI, comorbidities including DM, hypertension or COPD, type of ventral hernia, type of surgery onlay/sublay, surgery time, postoperative hospital stay, and complications including seroma, SSI, recurrence, and skin necrosis had been captured. Informed consent was granted from the ethical committee of the Institute for Health Sciences, IHHS IRB number: M-2023-05-002.

RESULTS

During the study, one hundred and twenty-three eligible patients had elective mesh hernioplasty for ventral hernia. Of these, 25.2% were male (n=31) and 74.8% were female (n=92). The patients were a mean age of (48.22 ± 10.27) years, ranging from (29-70) years. Co-morbid conditions existed in 30.89% of patients (n=38): DM type II in 12.19%, hypertension in 16.26%, and ischemic heart disease in 2.43%. Most (61.8%) of the patients were from ASA class I, and the remaining 35% were from ASA class II. According to hernia type, the paraumbilical hernia was the most familiar (86.18%, n=106), while 10.6% (n=13) had epigastric and 3.3% (n=4) had incisional hernia. Inlay mesh repair was performed in 59.3% of operations (n=73), while sublay mesh repair was conducted in 40.7% (n=50).

Seroma was identified in 16 patients (13%), and surgical site infection in 3 patients (2.4%). Ala Islah al Hasani & Mohammed Hasan Al Akash **Table 1** summarizes the detailed comparison of complications concerning Onlay and Sublay repair groups.

Table 1
Comparison of Complications between Onlay and Sublay Repairs

Complication	Onlay (n=73)	Sublay (n=50)	Total (n=123)
Surgical Site Infection (SSI)	3 (4.3%)	0 (0%)	3 (2.4%)
Seroma	7 (10%)	9 (18%)	16 (13%)
Recurrence	2 (2.86%)	0 (0%)	2 (1.6%)
Skin Necrosis	1 (1.43%)	1 (2%)	2 (1.6%)
No Complications	57 (81.43%)	40 (80%)	97 (78.86%)

There were no significant differences in SSI, seroma formation, recurrence, or skin necrosis between the onlay and sublay techniques ($p > 0.05$), but operative time was significantly higher in the onlay group. It was found from the data analysis that sublay repair used longer durations during surgeries as compared to onlay repair. Surgical durations between the two groups are compared in **Table 2**.

Table 2
Comparison of Surgical Durations between Onlay and Sublay Repairs

Repair Technique	Mean Operative Time (Minutes)	Standard Deviation
Onlay	75	± 12
Sublay	92	± 15

Of the patients in this study, 30.89% had comorbidity, although the complication rates were not affected by the presence of diabetes mellitus or hypertension patients ($p > 0.05$). **Table 3** presents additional information about the comorbidities this study found in its total sample.

Table 3
Comorbidities among Study Population

Comorbidity	Number of Patients	Percentage
Diabetes Mellitus	15	12.19%
Hypertension	20	16.26%
Ischemic Heart Disease	3	2.43%

Lastly, the authors reported similar complication rates for onlay and sublay repairs, but the choice of technique should based on operative time and surgeon preference. The results of this study provide insight into the postoperative outcome of patients with hernia and give some valuable information to assist clinical practice.

DISCUSSION

One of the controversies when performing ventral hernia repair is whether to use the onlay or the sublay mesh technique. Numerous work has been done on which one is most effective regarding the complications, the time required for the surgery, and the recurrence rate. The work aims to present the experience of such techniques regarding wound infection, seroma formation, recurrence, and skin necrosis in this type of patient. The research findings accord with empirical literature evidence and make significant observations that advance the dialogue on the proper surgical practices. According to the results of this work, both methods were comparable in terms of outcomes by associated complications, which include SSI, seroma formation, and recurrence rates, as proposed by Elhadidi et al. Even in the case of onlay repair, there was a slightly higher SSI rate (4.3% SSI) than the subway technique (0% SSI), but not found significant. These results support earlier findings indicating that sublay mesh repair might provide better defense against wound infections because of the position of the mesh, but the differences in infection rate are insignificant when strict adherence to recommended surgical practices is observed (3).

The following complications were reported: Seroma at the flap site was noted in 37 patients: 12 (14%) in the subway group and 25 (9%) in the onlay group. Similar findings were described by Deshpande et al. (6), who noted that although the given technique offers some benefits, the application of the mesh at a sublay position created a risk of fluid collection. However, the clinical importance of seroma is still disputable since most such cysts either disappear by themselves or with the help of simple intervention. The overall reoccurrence of haemial herniation was low in both groups, with 2.86% in the onlay group and none in the sublay group. The outcomes confirm prior works of authors such as Sneiders et al. (14), where the authors have pointed out that the sublay approach offers a lower recurrence rate because of the equal distribution of tension across the abdominal wall. Onlay repair is a technique that is slightly more likely to repeat, but still, it is practical, especially when sublay placement is not possible due to some technical or patient factors.

Skin necrosis, a comparatively rare event, was observed in 1.43 % of onlay patients and 2% of sublay patients. However, such rates are low and call attention to the strict adherence to the fine motor of surgery and postoperative protocol. Levy et al.(11) stated that selecting mesh material and the tension used during placement may predict skin necrosis. Some complications may be minimized by using absorbable meshes or biologically derived material, but this inference still requires further research. The operative time was much longer in the sublay technique, which agrees with Li et al. (2). Sublay repair entails more complex dissection and positioning that takes longer than the average time to perform the other surgeries. Although this may add various difficulties in handling the available resources in developing countries, in the long run, it is advisable due to the low rates of recurrences and fewer complications. As noted by other authors, including Domen, G. et al. (13), the surgeon's skill is critical in reducing the operation time and overall outcome regardless of the procedure in question.

This study also assessed the effect of coexisting diseases, including diabetes mellitus and hypertension, on postoperative outcomes. In agreement with Wagner

et al. (10), these comorbidities did not affect the complication rates. This explains why the patient must be optimized before surgery in terms of glycemic control and blood pressure. As for the details of the hernia, hernia type was identified as another significant predictor of outcome. Most patients in the current study enrolled in para umbilical hernias as the most common type of hernias, succeeded by epigastric and incisional hernias. Most factors that can affect the method of repair are the type and location of the hernia. For instance, if technical difficulties are involved or the defect is significant, such as the scenario explored by Gandhi et al. (12), then the sublay approach is preferred. However, the onlay repair can be managed more straightforwardly and with less bulky hernias, but care must be taken.

However, some factors regarding the patient will need to be considered regarding the selection of the particular technique over the other, even though the outcomes achievable by both approaches are similar. Gu et al. (15) also pointed out some demographic factors, including age, BMI, and lifestyle measures, including the level of physical activity that can affect surgical results. For example, one complication identified in patients with a higher BMI may be experienced more frequently in onlay repair due to tension on the anterior abdominal wall. Likewise, it appears that active people can get additional benefits with the sublay technique's structural support. This study has several strengths, such as adequate sample size and data collection, which made it easier to compare the two methods. Nevertheless, it is a methodology that has several limitations. Since the present study is a cross-sectional survey, selection bias is apparent, and the results cannot be assumed valid for all healthcare settings, especially low-end ones. Furthermore, the study did not look at the issues of functionality and quality of life parameters, which are essential when assessing the success of the hernia repair process.

Further research should involve meta-analysis and randomized controlled trials involving both onlay and sublay techniques, with significant follow-up regarding recurrence, QoL, and costs. Moreover, future research is warranted regarding the update in mesh types and the surgical methodology used for ventral hernia surgery, which includes the implementation of robotic surgical techniques.

CONCLUSION

This site compared the onlay and sublay mesh approaches in ventral hernia repair regarding wound infection, seroma formation, recurrence, and skin necrosis. Each technique was as effective as the other, with no significant differences in complication incidence. Although the sublay approach demonstrated a lower recurrence and a slightly higher seroma, the onlay method had the advantage of performing shorter time operations. It could be considered in less complicated cases. We have learned that hernia type, the patient's body mass index or BMI, and the other diseases that the patient has are critical determinants of the perfect approach. Surgical experience and careful care during the operation also denote critical features for reducing poor effects and improving results. Future studies are needed to replicate these results and examine real-life, prospective randomized studies, as well as new developments in surgical methods and mesh types. In light of critical aspects related to the patient's overall condition, it is still imperative to tailor the approach to the patient as the key to increasing ventral hernia repair success rate.

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