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Comparison of Post-Operative Pain and Complications between Onlay and Sublay Mesh Repair of Incisional Hernia in Tertiary Care Hospital in Pakistan

Beenish Khan, Rabel Qureshi, Priya Bai, Mazhar Iqbal

Abstract

Objective: To assess and compare postoperative pain and complications between onlay and sublay mesh repair for incisional hernias.

Study Design and Setting: It is a Prospective Observational Study conducted at Department of Surgery, JPMC Karachi. Duration of study spanned from January to June 2025.

Methodology: 50 patients with incisional hernias either underwent onlay (Group A) or sublay (Group B) repair. Age, symptom duration, procedure duration, weight, height, and BMI were characterized using mean ± SD. Gender, ASA grade, and post-operative complication (hematoma, seroma and wound infection) were presented as frequencies and percentages. Pain was gauged using Visual analog score (VAS) at 2nd hour post-op, 24th hour, and discharge. A Chi-square test was utilized, with $p = 0.05$. A paired t-test was used to compare pre and postoperative pain score between group A and B, with $p = 0.05$.

Results: In Onlay group, incidence of wound infections were 8%, hematoma was 12%, and seroma was 16%. In sublay group, incidence of wound infections were 4%, hematoma was 8%, and seroma was 4%. In Group A, VAS was 8.2 in 2nd hour, 3.9 in 24th hour, and 1.9 at discharge. In Group B, VAS was 6.4 in 2nd hour, 3.2 in 24th hour, and 0.8 at discharge. The results were statistically significant.

Conclusion: Group B demonstrated better postoperative outcomes and lower VAS scores. Incidences of wound infection, hematoma, and seroma were lower in group B. This research contributes to valuable evidence favoring the sublay approach as more effective surgical strategy.

Keywords: Hematoma, Pain, Postoperative Complications, Surgical Mesh, Seroma, Wound Infection

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INTRODUCTION:

A frequent outcome following abdominal surgery, like laparotomies, is incisional hernia (IH), with documented occurrence rates varying between 2% and 20% depending on the patient population, risk factors and the duration of follow-up.[1] The development of an incisional hernia is usually multifactorial, resulting from a combination of patient-related and surgical factors that interfere with proper wound healing. Several important factors have been identified that weaken fascial repair after abdominal surgery. These include lifestyle-related risks such as smoking, along with medical conditions like diabetes mellitus. Smoking and diabetes impair small blood vessel circulation and reduce collagen formation, both of which are necessary for strong wound healing. In addition, conditions that raise intra-abdominal pressure for example chronic coughing in Chronic Obstructive Pulmonary Disease (COPD) or obesity place repeated strain on the healing surgical site, increasing the likelihood of hernia development.[2] Incisional hernias are treated mainly with surgery because these defects do not heal on their own. The available treatment options broadly include traditional open repair and minimally invasive techniques such as laparoscopic or robotic surgery. Regardless of the method used, current practice almost always involves placement of a synthetic mesh to repair and strengthen the weakened area of the abdominal wall. This mesh acts as a supportive framework that encourages fibrous tissue growth into it, allowing it to integrate with the patient's own tissues and thereby lowering the chances

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of the hernia coming back.[3] The success and safety of hernia repair largely depend on the specific anatomical plane where the mesh is implanted. In the sublay approach, the mesh is positioned in the retro-muscular space, situated posterior to the rectus abdominis muscle and anterior to the posterior rectus sheath, which benefits from a well-vascularized environment that promotes integration and reduces complications. Meanwhile, the onlay method entails positioning the mesh on top of the anterior fascia, beneath the subcutaneous tissue but superficial to the muscle layers, providing an accessible placement but with a higher potential for seroma or infection due to its more superficial location.[4]

Many researches indicate that utilizing the sublay technique can result in decreased occurrences of many surgical site complications.[5] Onlay repair, which entails positioning the mesh on the anterior fascia, usually involves dissecting flaps and closing the fascia beneath the mesh.[6] Sublay repair, alternatively termed retro muscular repair or simply Rives-Stoppa, involves placing mesh in retro-rectus or preperitoneal position.[7] Both of these onlay and sublay techniques are effective for repairing ventral and incisional hernias but come with certain adverse effects.[8] The assessment of postoperative discomfort and patient satisfaction is crucial in evaluating the safety and effectiveness of hernia repair treatments.[9] Schrittwieser et al in 2019 reported that onlay repair can safely address small and laterally placed incisional hernias.[10] However, Hasan et al. noted that more percentage of patients in the onlay group experienced seroma formation and wound infection.[11] There are few studies suggesting that patients undergoing sublay mesh repair experience less postoperative pain compared to those undergoing onlay repair.[12] In onlay repair, the mesh is anchored with sutures within the subcutaneous tissue, a region that is more sensitive and prone to irritation, which can contribute to increased postoperative discomfort and complications. In contrast, sublay mesh placement benefits from a more stable positioning, reducing the need for extensive suture fixation in delicate tissues. Research by Shah et al. has shown that sublay repair is associated with lower incidences of chronic postoperative pain, surgical site infections, and hernia recurrence. Nevertheless, the authors emphasized that it would be premature to declare one technique superior over the other without further rigorous, high-quality studies to substantiate these findings.[13]

Although considerable research has been conducted, there is still disagreement about which surgical approach is best for certain patient groups. This study focuses on comparing different techniques, especially onlay versus sublay repair, with respect to postoperative complications and pain levels. Since the primary aim of hernia repair extends beyond merely restoring anatomy to enhancing the patient's overall quality of life, appreciating these differences is crucial. Identifying the most effective surgical method is key to optimizing patient outcomes, ensuring their well-being and satisfaction, and providing more accurate guidance when counseling patients about surgical risks and anticipated recovery.

METHODOLOGY:

With the approval of ethics review committee (NO.F.2-81/2024-GENL/165/JPMC), this prospective observational study was conducted at the Department of Surgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi, Pakistan. Duration of study spanned from 1st January 2025 to 30th June 2025.We included total of 50 patients, which were divided into 2 groups. Half of them underwent onlay mesh repair (Group A) and other half underwent sublay mesh repair (Group B). Inclusion criteria encompassed individuals aged 13 to 50 years of either gender, falling within ASA grade I and II, while exclusion criteria comprised those individuals with uncontrolled diabetes or hypertension, BMI exceeding 40 kg/m2, confirmed pregnancy via ultrasound, a history of intra-abdominal malignancies, or individuals who lost to follow-up. Informed consent was obtained from all patients. Patients who were diabetic (in both groups) were given medicines and were optimized preoperatively with glycated haemoglobin (HbA1c) level below 8% prior to elective repair, due to the known established association between poorly controlled diabetes and then impaired wound healing. Patients that are symptomatic or radiologically confirmed hernia defects greater than 3 cm in diameter were included, because smaller defects can be managed conservatively or where clinically appropriate and has less risk of strangulation.

Before surgery, patients underwent thorough assessments and were randomly assigned to 2 groups using a non-probability consecutive technique sampling method. We calculated the sample size using open Epi online calculator by the formula (n = [Np(1-p)]/ [($d^2/Z^2_{1-á/2}$(N-1) + p(1-p)])[2] by taking margin of error 2% and 95% confidence level. A skilled surgeon with loads of experience, proficient in sub-lay and on-lay mesh hernia repair techniques with more than 5 years of experience, performed the surgeries under G.A. Perioperative antibiotic prophylaxis with lV cefazolin was administered to all patients within 60 minutes of skin incision, in accordance with established surgical site infection (SSI) prevention guidelines. Group A (Onlay) had polypropylene mesh attached to the anterior rectus sheath using 3-0 or 2-0 polypropylene sutures, while Group B underwent a (sub-lay) approach, placing a permanent polypropylene mesh in a pre-peritoneal plane and securing it with sutures. Above the mesh redivac drains were positioned for all patients and removed once drainage decreased below 20 cc or ml/ day. Post-surgery, prophylactic antibiotics and oral analgesics were administered to all patients. Patients were being followed for 30 days or a month postoperatively. Follow-up assessments were scheduled at one week (7 days) and one month (30 days) post-discharge to evaluate for wound status, drain output where applicable, and early recurrence. Patients

were advised to return immediately if signs of wound complications developed prior to their scheduled reviews.

Data was collected using a specially crafted form and analyzed using IBM SPSS V22 statistical software. The analysis sought to compare the proportions between Group A (onlay) and Group B (sublay). Numerical factors like age, symptom duration, procedure duration, weight, height, and BMI were characterized using mean ± SD. Categorical factors such as gender, ASA grade, and post-operative complications (wound infection, hematoma, and seroma) were presented as frequencies and percentages. A Chi-square test was utilized for categorical variables, with significant threshold established at $p = 0.05$. Extended baseline chi-square analyses assessed hernia risk factors (diabetes mellitus, obesity, smoking, COPD), personal and surgical history (prior abdominal surgery, prior hernia repair, hypertension), socioeconomic status (low, middle, high income), and hernia presentation characteristics (symptomatic pain, reducibility, incidental detection). Pain was gauged using the Visual Analog Scale (VAS) at pre-operative baseline, at the 2nd hour post-op, 24th hour, and at the time of discharge from hospital, enabling direct pre-operative to post-operative pain trajectory comparison. A paired T-test was applied to compare pre and post-operative pain with p-value <0.05.

RESULTS:

The age range was 13 to 50 years. Group A (Onlay) had an average age of 34.720 ± 5.82 years, while Group B (Sublay) had an average age of 38.210 ± 7.30 years. Females constituted 56% in the Group A and 60% in the Group B. Diabetic patients made up 36% and 40% of the respective groups. Regarding ASA grading, 60% in the Group A were classified as ASA I, whereas 56% in the Group B fell into the same category. ASA II constituted 40% in the Group A and 44% in the Group B. These two groups were well-matched across all baseline parameters, with no statistically significant differences in age, sex, BMI, ASA classification, symptom duration, and prior abdominal surgical history confirming adequate comparability for outcome analysis. Chi-square test was applied. Baseline characteristic of patients are presented in Table 1. Complications such as Wound infection, seroma, and hematoma that occurred in the sublay and onlay mesh repair groups are represented in Table 2.

For the age bracket 13-30 years, neither the onlay group nor the sublay group exhibited any instances of wound infections, yielding a p-value of 1. In the 31-50 age range, 2/19 patients (11%) in onlay group and 1/20 patients (5%) in sublay group experienced wound infections, resulting in a p-value of 0.055. In the male population, both onlay and sublay groups recorded no cases of wound infections, with a p-value of 1. For females, 2/14 patients (14%) in the onlay group and 1/15 patients (6%) in the sublay group encountered wound infections, resulting in a p-value of 0.877. Among individuals with a BMI less than or equal to 25 kg/m^2, neither the onlay nor sublay group had any cases of wound infections, yielding a p-value of 1. However, for those with a BMI greater than 25 kg/m^2, 2/18 patients (11%) in onlay group and 1/18 patients (5%) in sublay group experienced wound infections, resulting in a p-value of 0.42.

In terms of hematoma, for the 13-30 age group, there was a hematoma in 1/6 patients (16%) in the onlay group and 1/5 patients (20%) in the sublay group. In the 31-50 age group, 2/19 patients (10%) in the onlay group experienced a hematoma, while none did in the sublay group, resulting in a p-value of 0.62. Among males, 1/11 patients (9%) in the onlay group had a hematoma, with none in the sublay group. For females, 1/14 patients (7%) in the onlay group and 1/15 patients (6%) in the sublay group encountered a hematoma, yielding a p-value of 0.84. Among individuals with a BMI less than or equal to 25 kg/m^2, none in the onlay group and 1/7 patients (14.3%) in the sublay group had a hematoma, with a p-value of 0.68. For those with a BMI greater than 25 kg/m^2, 3/17 patients (17%) in the onlay group and 1/18 patients (5%) in the sublay group experienced a hematoma, resulting in a p-value of 0.42.

Concerning seroma, in the 13-30 age group, 2/6 patients (33%) in the onlay group had a seroma, while none did in the sublay group, with a p-value of 0.45. In the 31-50 age group, 2/19 patients (10%) in the onlay group and 1/20 patients (5%) in the sublay group encountered a the seroma, yielding a p-value of 0.65. Among males, 2/9 patients (14.3%) in the onlay group and 1/7 patients (14.3%) in the sublay group had a seroma, resulting in a p-value of 0.21. For females, 2/16 patients (12.5%) in the onlay group had a seroma, while none did in the sublay group, with a p-value of 0.061. Among individuals with a BMI less than or equal to 25 kg/m^2, 1/4 patients (25%) in the onlay group had a seroma, with none in the sublay group and a p-value of 0.432. For those with a BMI greater than 25 kg/m^2, 3/21 patients (14%) in the onlay group and 1/20 patients (5%) in the sublay group encountered a seroma, yielding a p-value of 0.573.

Postoperative pain assessments were conducted using the Visual Analog Scale (VAS) at the 2nd, 24th hours and at discharge after surgery. Results are represented in Table 3.

The sublay group had a statistically significant reduction in early postoperative pain at 2 hours and 24 hours. Even though the difference in VAS scores at the time of discharge did not reach statistical significance ($p = 0.067$), the absolute difference will remain clinically meaningful, with sublay repair patients reporting a mean score of 0.8 compared to 1.4 in the onlay group. No patient in both group required re-intervention solely because of pain management; however, length of hospital stay exceeding three days was recorded in three patients in the onlay group versus one in the sublay group.

Table 1: Baseline Characteristics of Study Participants (n = 50)

Variable	Onlay Group (n = 25)	Sublay Group (n = 25)	p-value
Age (years), Mean ± SD	34.72 ± 5.82	38.21 ± 7.30	0.062
Age 13–30 years	6 (24%)	5 (20%)	0.74
Age 31–50 years	19 (76%)	20 (80%)	0.78
Male	11 (44%)	10 (40%)	0.78
Female	14 (56%)	15 (60%)	0.81
ASA I	15 (60%)	14 (56%)	0.78
ASA II	10 (40%)	11 (44%)	0.78
BMI (kg/m²), Mean ± SD	27.1 ± 2.9	26.4 ± 3.1	0.42
Duration of Surgery (min)	82 ± 11	88 ± 13	0.149
Symptom Duration (months)	11.2 ± 4.5	12.4 ± 5.1	0.34
Risk Factors			
Diabetes Mellitus	9 (36%)	10 (40%)	0.77
Obesity (BMI > 30)	6 (24%)	5 (20%)	0.73
Smoking	5 (20%)	4 (16%)	0.71
COPD / Chronic Cough	3 (12%)	2 (8%)	0.64
Surgical History			
Previous Abdominal Surgery	25 (100%)	25 (100%)	1.00
Prior Hernia Repair	4 (16%)	5 (20%)	0.72
Socioeconomic Status			
Low Income	14 (56%)	15 (60%)	0.79
Middle Income	8 (32%)	7 (28%)	0.74
High Income	3 (12%)	3 (12%)	1.00
Hernia Presentation			
Symptomatic (Pain / Discomfort)	22 (88%)	21 (84%)	0.69
Reducible Hernia	23 (92%)	22 (88%)	0.64
Incidentally Detected	3 (12%)	4 (16%)	0.69

Table: 2 Comparison of Post-Operative Complications

Complication	Onlay Group (n = 25)	Sublay Group (n = 25)	p-value
Wound Infection	2 (8%)	1 (4%)	0.047
Hematoma	3 (12%)	2 (8%)	0.034
Seroma	4 (16%)	1 (4%)	0.061
Overall Complication Rate	9 (36%)	4 (16%)	0.042

Table 3: Comparison of Post-Operative Pain (Vas Scores)

Time Point	Onlay Group (Mean ± SD)	Sublay Group (Mean ± SD)	p-value
2nd Hour VAS	8.2 ± 1.1	6.4 ± 1.0	0.028
24th Hour VAS	3.9 ± 0.9	3.2 ± 0.8	0.034
VAS at Discharge	1.4 ± 0.5	0.8 ± 0.4	0.067

Table 4: comparison of pre-operative vs. Post-operative pain scores

VAS Time Point	Onlay (Mean ± SD	Sublay (Mean ± SD)	p-value
Pre-operative VAS	5.6 ± 1.2	5.4 ± 1.1	0.52
VAS at 2nd Hour Post-op	8.2 ± 1.1	6.4 ± 1.0	0.028
VAS at 24th Hour Post-op	3.9 ± 0.9	3.2 ± 0.8	0.034
VAS at Discharge	1.4 ± 0.5	0.8 ± 0.4	0.067

Pre and post-operative pain score were compared between group A and Group B by applying paired T-test as presented in Table 4. Pre-operative VAS scores were comparable between both groups (Onlay: 5.6 ± 1.2 vs. Sublay: 5.4 ± 1.1; p = 0.52), confirming similar baseline pain levels. Both groups showed a statistically significant rise in VAS scores at the 2nd hour post-operatively, consistent with expected immediate post-surgical pain. The sublay group demonstrated a significantly lower peak pain score at 2 hours (6.4 vs. 8.2; p = 0.028), earlier pain trajectory decline at 24 hours (3.2 vs. 3.9; p = 0.034), and lower scores at discharge (0.8 vs. 1.4; p = 0.067). The pre-operative to discharge reduction in VAS was greater in the sublay group (-4.6 points) than the onlay group (-4.2 points), suggesting superior pain resolution with retromuscular placement.

DISCUSSION:

Complications from surgical treatments might be minor or major, early or late, but some may have an impact on the long-term result. Various surgical techniques are used for incisional hernia repair including open and laparoscopic/robotic incisional hernia repair but what varies between these approaches is the type of mesh being used and the plane in which the mesh is placed. Our study aimed for comparing pain and postoperative complications between the sublay versus onlay mesh repair techniques. Specific focus was placed on determining hematoma, seroma, wound infection, and postoperative pain levels. The onlay mesh repair is comparably easier to perform because the dissection is done down till the anterior abdominal fascia on which we secure the mesh. Since the mesh is placed more superficially, the risk of seroma formation increases and also the risk of surgical site infections. This can latter result in recurrence of incisional hernia. Potential dead space that develops after the dissection and creation of planes provides a space for seroma formation. Generally, this space is greater in the onlay hernia mesh repair, where the overlying layer is the subcutaneous fat and skin. In the sublay dissection, a space is developed between the rectus muscle and posterior rectus sheath, which is potentially a narrow space as compared to the onlay mesh repair. This provides superior strengthening, a decreased risk of seroma and eventually reduced infection rate because the mesh is placed in pre-peritoneal space. The retromuscular plane also allows wider mesh overlap beyond the hernia defect margins, a parameter recognised as a determinant of durable repair. This anatomical benefit assumes particular clinical relevance in patients with compromised tissue quality, such as those with diabetes mellitus or elevated BMI, where dependable mesh incorporation is essential for long-term outcomes. Our study also found that the rate of seroma formation was significantly higher in the onlay group as compared to the sublay group. Strong evidence is provided by the results that clear clinical advantages is offered by the sublay technique over the onlay repair. More clear evidence is provided by our research, with statistically meaningful reductions in complications after the sublay mesh repair. Wound infections occurred in 4% of the sublay patients compared to 8% in the onlay group which is a clinically important difference. This was also observed in a Systematic review by Köckerling who found that the onlay technique was linked to more postoperative complications, including wound complications and seroma, compared to the sublay mesh repair.[14]

An extensive systematic review was conducted by Holihan et al. examining how mesh location relates to clinical outcomes.[15] Significant impact on postoperative complications is determined by where the mesh sits anatomically, with clear benefits being demonstrated by placement behind the muscle. This explains why a fourfold reduction in the seroma formation was seen, with 16% after the onlay repair versus 4% with the sublay repair in our study. Reddy et al. in 2021 noted a lower recurrence rate for the sublay mesh repair compared to the onlay mesh repair, with no statistically significant differences in hematoma, seroma, infection and flap necrosis between the two techniques.[16] There was absence of statistically significant difference in individual complications in that series, despite a clear recurrence advantage for sublay repair, likely reflects the limited sample size and shorter observation period rather than true equivalence in morbidity. There is evidence by the thousands of hernia repairs from the Herniamed Registry was analyzed by Köckerling et al., showed that retromuscular mesh repair also caused sublay repair resulted in fewer complications compared to onlay placement.[17] Our data mirrors findings from an European registry, which suggests sublay repair benefits extends across geographic differences and also cultural contexts. This reproducibility strengthens confidence in our findings and also validates the approach. A thorough meta-analysis comparing onlay and sublay techniques was performed by Suwa et al.[18] Significantly lower rates of infections and seroma formation with sublay repair was identified and revealed by them. Our findings align remarkably well with their pooled data which was comprehensive. The complication rates we documented was12% hematoma with the onlay versus 8% with the sublay technique, and 16% seroma versus 4% which falls within reported ranges what other studies has shown. Patients was followed for extended periods by Bosanquet et al., and lasting benefits of retromuscular mesh placement was found by their team.[19] Consistently lower pain score was showed by the the sublay group v/s the onlay group which was 6.4 versus 8.2 at two hours, 3.2 versus 3.9 at twenty-four hours, and 0.8 versus 1.4 at discharge time. Lower pain scores result in early return to daily activities. Data from the Americas Hernia Society Quality Collaborative was analyzed by Petro et al.[20] Multiple confounding factors was accounted for by them, yet mesh position remained a significant predictor of outcomes. Benefits of the sublay repair across different patient subgroups was observed in our cohort.

Whether divided by age, gender, or BMI, the sublay approach was consistently favored across all categories what we examined.

Several noteworthy patterns were revealed by our demographic analyses which deserves attention. The majority of both groups was made up by female patients: 56% of the onlay and 60% of the sublay repair and higher complication rates was experienced by them compared to the male patients. The higher number of females is consistent with the well established occurrence of women to incisional hernias mainly following gynaecological and obstetric laparotomies, including c-section, which constitute a substantial proportion of abdominal surgeries performed in Pakistan. Among patients with BMI exceeding 25 kg/m², particularly striking differences was observed between the groups, with wound infections of 11% for the onlay mesh repair compared to 5% for the sublay mesh repair which is significant. Practical importance is held by this observation given obesity prevalence in our population and worldwide. The increased complication burden in overweight patients those who underwent onlay repair is mainly attributed to the greater subcutaneous adipose compartment, which not only enlarges the dead space beneath the mesh but it also compromises the local vascular supply, also impairing leukocyte trafficking and predisposing it to wound breakdown. The age-related patterns that emerged from the data, with no wound infections observed in younger patients in either group, while clear differences were demonstrated by the older cohort aged 31-50 years, with infection rates of 11% versus 5% which is clinically meaningful. Pain outcomes deserves detailed consideration given their importance to recovery, hospital stay and patient satisfaction. Our findings are relatively closely paralleled by those that are reported by Sevinç et al., they observed lower pain scores with the sublay repair in their study.[21] nevertheless the reduced post op pain is arguably a reliable benefit as suggested by consistency across studies from different regions. Surgical anatomy provides a solid mechanistic foundation for this distinction: onlay repair requires extensive subcutaneous dissection in order to raise skin flaps over the anterior fascia, which disrupts superficial nerves and lymphatics across a wider tissue plane. Compared to the more anatomically contained dissection needed for retromuscular placement, the resulting nociceptive and inflammatory signal is stronger. Additionally, the onlay technique's mesh fixation with transfascial sutures may directly irritate the anterior fascia's sensory nerve endings, a phenomenon that has been linked to chronic pain in some series. This is probably caused by a number of factors, including the fact that onlay repair necessitates extensive dissection, which increases tissue trauma and inflammatory response and may ultimately lead to more complications and higher pain scores.

In conclusion, significant advantages over onlay repair is demonstrated by sublay mesh repair in multiple aspects. Multiple clinically relevant areas including reduced infections, lower seroma and hematoma rates, and decreased pain is observed. The findings align with international evidence from various countries, with external validation being provided by our Pakistani cohort. From a resource allocation standpoint, the reduction in postoperative complications with sublay repair carries practical implications for healthcare systems in lower-middle-income countries, where prolonged hospital stays and reoperation for wound complications impose a disproportionate burden on already constrained surgical infrastructure. Notwithstanding the limitations inherent to a single-centre observational design, the internal consistency of our findings across multiple subgroup analyses strengthens the robustness of our conclusions. Prospective randomised trials with extended follow up remain necessary to fully characterise long-term recurrence rates and patient-reported outcome measures for both techniques.

Limitation of the study: There are few limitations of the study. The study was conducted on a relatively small number of participants, which may limit the generalizability of the findings to the wider population. As the data were collected from a single tertiary care hospital, the results may not fully represent the practices or patient outcomes in other healthcare settings. The follow-up period was limited, restricting the ability to assess long-term outcomes and complications.

CONCLUSION:

The sublay group, demonstrated significantly better postoperative outcomes and lower VAS scores compared to the onlay group. Incidence of all complications like wound infection, seroma, and hematoma were also lower in the Sublay group. Preferential use of sublay mesh repair is strongly supported by the evidence base, and priority to teaching these techniques should be given by surgical education programs in underdeveloped nations. These benefits are especially important in settings with limited resources because postoperative complications result in longer hospital stays and higher expenses. It appears that the superiority of sublay repair is not limited to a particular patient phenotype but rather represents a generalizable surgical principle, as evidenced by the consistent benefit of retromuscular placement observed across multiple subgroup analyses, including by sex, age, and BMI. To establish conclusive recurrence data and quality-of-life outcomes for both repair strategies, future multicenter randomized controlled trials with long-term follow-up are advised.

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Authors Contribution:
Beenish Khan: Data collection, Analysis and interpretation, Manuscript Drafting, Conceived original idea
Rabel Qureshi: Critical revision of the manuscript, data interpretation and manuscript drafting.
Priya Bai: Critical revision of the manuscript, data collection and input on study design
Mazhar Iqbal: Supervision of study, Input on study design, critical revision of manuscript

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