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Outcomes of Onlay Versus Sublay Mesh Hernioplasty for Ventral Abdominal Hernias

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ABSTRACT

Objective: To compare surgical outcomes of Onlay versus Sublay technique of mesh hernioplasty among patients with ventral abdominal hernia.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of General Surgery, Combined Military Hospital, Rawalpindi Pakistan, from Oct 2021 to Mar 2022.

Methodology: A total of 78 patients were selected, using convenience sampling, with reducible incisional, paraumbilical, supraumbilical or epigastric hernia, with a hernial defect measuring ≥2 cm. All preoperative parameters were recorded, and postoperative outcomes were monitored on follow-up at 2 weeks, 1 month and 2 months. Data was analyzed for statistical significance with *p*-value ≤0.05 being considered significant.

Results: Open Onlay repair was performed on 41(52.6%) patients whereas the remaining 37(47.4%) cases had open Sublay mesh hernioplasty. The commonest ventral hernia types were paraumbilical 43(55.1%) and incisional 28(35.9%). Sublay procedure lasted for a significantly longer duration ($p<0.001$) but wound infections (OR: 1.67) and seromas (OR: 1.50) were slightly more frequent among the Onlay repair group ($p=0.372$ and $p=0.521$ respectively) whereas postoperative pain and wound dehiscence showed a similar rate of occurrence. Recurrence was more common after Sublay repair (14, 38%) as compared to Onlay 10(24.4%).

Conclusion: The comparison between Onlay and Sublay mesh hernioplasty showed comparable surgical outcomes, with each technique presenting distinct advantages. While Sublay procedures took longer and had higher recurrence rates, they showed slightly lower wound complications. The choice of technique should be individualized based on patient factors and surgeon expertise.

Keywords: Herniorrhaphy, Hernia repair, Hernioplasty, Onlay, Sublay, Ventral hernia.

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INTRODUCTION

The management of ventral abdominal wall hernias (VAHs) remains highly heterogeneous despite mesh hernioplasty (MHP) being the gold standard of surgical intervention with VAHs clinically manifesting as supraumbilical, paraumbilical, epigastric, parastomal or incisional hernias in up to 9.9% of cases following a midline laparotomy.[1] Although there still exists no consensus as to which patients should be considered for conservative management versus elective hernia repair, it is advisable to opt for MHP whenever the hernia defect measures 2 cm or more, however, emergent cases cab be at an increased risk for mesh-related complications and must be individually assessed.[2] There is also an ongoing debate regarding the efficacy of Onlay versus Sublay mesh repair, regarding minimal number of complications as during the latter technique, a separate retromuscular or retrorectus plane is created laparoscopically, and a mesh is placed over the underlying peritoneum,[3] while the former, an open technique, allows mesh placement directly over the hernial orifice.[4] An extensive meta-analysis concluded that recurrence of incisional hernia was more common among Onlay repair while Sublay repair was less likely to cause surgical site infections (SSIs).[5] Similar findings have been reported in a 1-year follow-up study conducted by Venclauskas *et al*.,[6] While one author could not report any statistically significant differences between the two techniques,[7] one large multicenter randomized controlled trial showed that Onlay repair possesses a significantly better efficacy than Sublay with the former exhibiting a relatively low recurrence rate.[8] In the United States, elective hernia repair costs more than $3 billion to their healthcare system annually,[9] highlighting the significance of selecting an effective hernia repair technique which can help cut down recurrence risk, and in turn promote cost-effectiveness. With this perspective, our single-center

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study was designed to compare the relative outcome of Onlay versus Sublay mesh hernioplasty.

METHODOLOGY

This quasi-experimental study was conducted at the Department of Surgery, Combined Military Hospital (CMH), Rawalpindi, Pakistan, from October 2021 to March 2022, after obtaining approval of Ethics Review Committee (Dated: 02-09-2021). All participants were enrolled using non-probability convenience sampling technique. Sample size was calculated to be 98 using Cochran's formula, with confidence interval of 95%, absolute precision of 10% with 49.23% of patients undergoing Sublay repair (10) and 50.76% of patients undergoing Onlay repair.[10]

Inclusion Criteria: We included patients less than 70 years of age, with reducible (non-incarcerated) hernial contents, having the size of hernial orifice ≥2 cm and possessing cardiopulmonary surgical fitness.

Exclusion Criteria: We excluded patients who were pregnant females, having a history of surgical intervention for ventral abdominal hernias, previously diagnosed with severe medical comorbidities or having body-mass index (BMI) ≥35.0.

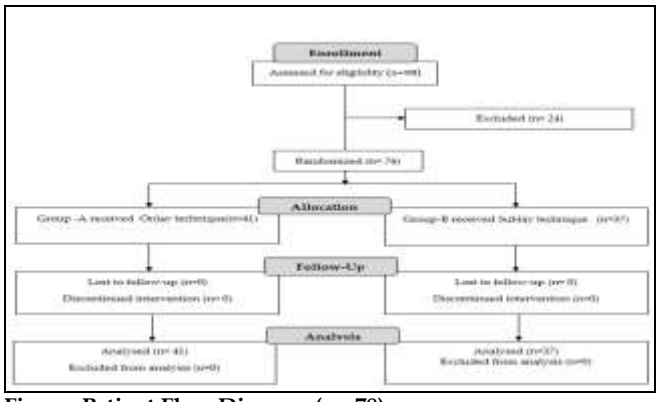

Figure: Patient Flow Diagram (n= 78)

Patient diagnosis was confirmed by means of an abdominal ultrasound scan which confirmed the presence of a hernial orifice as well as hernial contents. Patient demographic data and underlying risk factors for hernia (obesity, smoking, chronic cough) were entered into a self-designed data collection tool. Factors pertinent to surgical intervention such as timing of operation, and surgical technique (Onlay/Sublay) were also noted. Outcome of Onlay or Sublay mesh hernioplasty was noted as postoperative surgical site pain, SSIs, wound dehiscence, seroma or hernia recurrence. Postoperative pain was defined as a persistent surgical site discomfort lasting for 3 days or longer. Outcome was reassessed at regular follow-up intervals i.e., at 2 weeks, 1 month and 2 months.

Statistical analysis of data was done using Statistical Package for Social Sciences (SPSS) version 23.0. Pearson's chi-square test was used to assess the statistical correlation between data. Odds ratio (OR) was calculated for all outcome variables and *p*-value ≤0.05 was considered significant.

RESULTS

Data from 78 participants was included in the final analysis, in which a total of 41 patients underwent Onlay repair while the remaining 37 under-went Sublay technique. Mean age for the former group was 49.2±12.6 years, and 46.2±15.4 years in the latter group. Up to 22(54%) Onlay cases were males while 23(62.2%) were males in the second group. The distribution of ventral hernias in our sample size was as follows: paraumbilical 43(55.1%), incisional 28(35.9%), supraumbilical 2(2.6%) and epigastric 5(6.4%). Moreover, the Sublay procedure lasted for a significantly longer duration as compared to the Onlay technique (p<0.001), as mentioned in Table-I.

Table-I: Baseline Parameters of Study Participants (n = 78)

Baseline Characteristics		Surgical Technique (n = 78)		*p*-value
		Onlay Repair (n=41)	Sublay Repair (n=37)	
Age in years (Mean±SD)		49.2±12.6	46.2±15.4	Nil
Gender	Males (%)	22(53.7%)	23(56.1%)	0.448
	Females (%)	19(46.3%)	14(34.1%)	
Duration of Operation (minutes)	60-70 (%)	25(61%)	3(8.1%)	<0.001
	70-80 (%)	11(26.8%)	13(35.1%)	
	80-90 (%)	4(9.7%)	13(35.1%)	
	>90 (%)	1(2.4%)	8(21.6%)	
Type of Hernia	Paraumbilical (%)	24(58.5%)	19(51.4%)	0.868
	Incisional (%)	13(31.7%)	15(40.5%)	
	Supraumbilical (%)	1(2.4%)	1(2.7%)	
	Epigastric (%)	3(7.3%)	2(5.4%)	
Defect size (cm)	<2 (%)	3(7.3%)	Nil	0.208
	2-4 (%)	24(58.5%)	21(56.8%)	
	>4 (%)	14(34.1%)	16(43.2%)	

A relatively higher frequency of surgical site infections (SSIs) was encountered in Onlay repair group with a 1.67 times higher risk for SSIs. Seroma occurrence was also found to be more frequent within the Onlay repair group (OR: 1.50). However, postoperative pain and wound dehiscence showed

comparable frequency among both the intervention groups. A relatively higher recurrence rate was observed for hernia among Sublay repair (38.0% as compared to 24.4% for Onlay repair). None of the operative outcomes showed any significant statistical correlation with any particular intervention group as shown by Table-II.

Table-II: Surgical Outcomes of Onlay vs. Sublay Repair (n=78)

Surgical Outcome		Surgical Technique (n = 78)		Odds Ratio (OR)	*p*-value
		Onlay Repair (n=41)	Sublay Repair (n=37)		
Surgical Site Infections (%)		10(24.4%)	6(16.2%)	1.67	0.372
Seroma (%)		9(22%)	6(16.2%)	1.50	0.521
Postoperative pain (%)		8(19.5%)	7(18.9%)	1.04	0.947
Wound Dehiscence (%)		5(12.2%)	4(10.8%)	1.20	0.848
Hernial Recurrence (%)		10(24.4%)	14(37.8%)	0.53	0.199
Hospital stay (Days)	< 1 (%)	6(14.6%)	6(16.2%)	Nil	0.430
	1-2 (%)	22(53.7%)	24(64.9%)		
	> 2 (%)	13(31.7%)	7(18.9%)		

DISCUSSION

Our study did not encounter any statistically significant difference between the Onlay and Sublay mesh repairs in terms of their surgical outcome. Although the Sublay procedure requires a significantly longer operative duration as compared to Onlay, the risk of surgical site infections, postoperative pain, seroma, and wound dehiscence is comparatively higher among the Onlay patients.[11,12] With Onlay technique, a mesh is placed directly above the hernia defect, in contact with the surrounding environment, especially during wound re-exploration, which can substantially enhance the overall frequency of bacterial contamination and SSIs, potentially limiting the healing capacity of the wound.[13] In one randomized controlled trial comprising a total of 100 cases of incisional hernia, a significantly higher operative duration for Sublay repair (p=0.001) was reported, as documented in the current study, however, the Sublay group showed improved outcome in terms of postoperative pain and wound-related complications whereas the Onlay group was 3 times more likely to report postoperative complications (p=0.029), still the hernia recurrence rate did not show any noticeable intergroup variation.[14] Another randomized controlled study also reported a significantly lower frequency of wound infections following Sublay repair of ventral hernias,[15] with the occurrence of post-hernioplasty seroma also reported to be much less in Sublay technique.[16] In another study, the overall post-operative frequency of seroma and surgical site infections was reportedly 3 and 4 times higher, respectively, as compared to the Onlay group, which was considered to be statistically significant (p<0.05).[17] In an extensive meta-analysis consisting of 21 studies, Sublay mesh repair showed a superior outcome showing the lowest risk of wound infections in contrast to other types of hernia repair.[18] Hernia relapse rates were found to be comparable between both groups, but a relatively lower risk of recurrence was reported among the Onlay patients (OR: 0.53). In a 5-year long randomized multi-center study, recurrence was encountered among 20% of Sublay repair cases in contrast to 12% Onlay cases.[19] Conversely, other studies show contradictory evidence indicating a relatively higher frequency of hernial recurrence in Onlay cohort.[14,17] We believe that these results could show a possible variation on the basis of repair technique, surgeon operating skills, size of hernia defect, and patient-related comorbidities. Although the present study did not show a statistically significant improvement in using Sublay mesh placement over Onlay repair, the results revealed a higher risk of SSIs and seroma formation among the Onlay group.

LIMITATION OF STUDY

We enrolled a comparatively smaller number of patients in both groups as well as an absence of a randomized controlled model with comparatively shorter follow-up period (≤2 months) which may have led to poor documentation of complications secondary to mesh hernioplasty. Further long-term studies with larger sample sizes may be needed to definitively establish superiority of either technique.

CONCLUSION

Both Onlay and Sublay mesh hernioplasty techniques showed comparable surgical outcomes in ventral hernia repair. While Sublay repairs required significantly longer operative times, they demonstrated slightly lower rates of wound infections and seromas compared to the Onlay technique, however, the Sublay group unexpectedly showed a higher recurrence rate. Given these findings, the choice between techniques should be individualized based on patient factors and surgeon expertise.

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Authors' Contributions

The following authors have made substantial contributions to the manuscript as under:

SS & SRQN: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AL & HR: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

MHK & QTUH: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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