SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Barjees and Arundas, 2025
doi: 10.21276/SSR-IIJLS.2025.11.3.9

Original Article

open access

Comparison of Postoperative Pain and Recovery Between Onlay and Sublay Mesh Repair for Ventral Hernia

Barjees Haris R[1], Arundas H[2]*

[1]Assistant Professor, Department of General Surgery, Malabar Medical College and Research Centre, Modakallur Kozhikode Kerala, India

[2]Assistant Professor, Dept of Community Medicine, PSP Medical College, Chennai, India

***Address for Correspondence:** Dr Arundas H, Assistant Professor, Dept of Community Medicine, PSP Medical College, Chennai, India
E-mail: harigeetham3392@gmail.com

Received: 31 Jan 2025/ Revised: 24 Feb 2025/ Accepted: 17 Apr 2025

ABSTRACT

Background: Ventral hernia repairs are often performed with either the onlay or sublay mesh technique. The use of either technique may affect postoperative pain, recovery, and complication rates. This study will compare the short-term results of onlay versus sublay mesh repair on postoperative pain and recovery-related outcomes.

Methods: Over 18 months, a prospective, randomized trial was carried out in a tertiary care institution. Eighty patients suffering from primary or incisional ventral hernias were randomly assigned to either onlay or sublay mesh repair. Pain post-surgery was assessed using the Visual Analog Scale (VAS) at 6, 24, and 48 hours and on the 7th postoperative day. The factors used for ascertaining recovery were time to ambulation, hospital stay, and recommencement of daily activities.

Results: Post-operative pain scores were lower in the onlay group at 6, 24, and 48 hours ($p<0.001$). Mean ambulation time and hospital stay were also significantly reduced in favor of the onlay group ($p<0.001$). Both groups had comparable complication rates, although seroma formation was more frequent in the sublay group, while wound infections were greater in the onlay group.

Conclusion: Onlay mesh repair provides better short-term results, such as less postoperative pain and quicker recovery than sublay repair. The sublay method might yield better long-term prevention of recurrence. Technique selection should be individualized according to patient-specific variables.

Key-words: Onlay mesh, Sublay mesh, Ventral hernia, Postoperative pain, Recovery, Hernia repair

INTRODUCTION

Ventral hernias, especially incisional hernias, continue to be a notable postoperative issue after abdominal procedures, with the incidence being 10% to 20% based on procedure type and patient factors [1]. Operative repair is the gold standard treatment, with mesh support being the consensus as better than primary suture repair owing to reduced recurrence. Yet, the ideal anatomical plane for mesh deployment—viz. onlay (above the fascia) or sublay (below the rectus muscle but above the peritoneum)—is a contentious issue still being debated. Both the onlay and the sublay approach seek to produce long-lasting support of the abdominal wall, yet they differ by the degree of dissection, the level of surgical difficulty, and closeness to the life structures. The onlay method is technically less demanding, has less dissection of intra-abdominal organs, and tends to be faster to accomplish. Nevertheless, it could have an increased risk of wound complications because of its superficial positioning (Martins *et al.* [2]; Jairam *et al.* [3]). On the contrary, less infection and recurrence are seen with the sublay technique but with higher dissection that may warrant increased operating time and postoperative pain (Sevinc *et al*. [4]; Shah *et al*. [5]).

How to cite this article
Barjees HR, Arundas H. Comparison of Postoperative Pain and Recovery Between Onlay and Sublay Mesh Repair for Ventral Hernia. SSR Inst Int J Life Sci., 2025; 11(3): 7368-7373.

Access this article online
https://iijls.com/

crossref doi: 10.21276/SSR-IIJLS.2025.11.3.9

Early mobilization and postoperative pain management are the predefined indicators affecting patient satisfaction. Several studies into the two methods report mixed results. For example, Sevinc *et al*. [4] included a prospective randomized trial that had good long-term results using the sublay method, although with higher initial pain levels. Likewise, Venclauskas *et al*. [6] achieved a rate of decreased recurrence with sublay repair but recorded more pain during an early postoperative period. On the other hand, some other studies such as Wéber *et al*. [7] have reported improved surgical findings along with lower complication rates with onlay repair in a five-year follow-up study.

The recent randomized trials of Shah *et al*. [5] and Hassan *et al*. [8] provide more information about the perioperative outcomes in Indian populations. While these studies have indicated that onlay mesh repair might serve as an advantage in terms of reduced surgical time and lesser postoperative pain in the early days as compared with sublay repair, which might better handle long-term complications and recurrences, Hassan *et al*. [8] interestingly found that both techniques allowed for management of small to medium-sized hernias, being associated with onlay repair that had fewer wound complications and faster recovery.

In addition to systematic reviews like the Cochrane review by den Hartog *et al*. [1], multicenter trials, including the PRIMA study by Jairam *et al*. [3] have emphasized mesh placement as a key component in the prevention of incisional hernias and associated complications. Such reviews give results that usually depend greatly on location mesh and patient factors, meaning that an individual approach will generally be needed.

As far as early recovery and postoperative pain are concerned, they are important clinical indications for ventral hernia repair; hence, this study aims to compare the onlay and sublay methods based on postoperative pain and recovery parameters. The intent of this research will be evidence synthesis and real-world examination to clarify the preferred mesh placement method in everyday clinical practice.

MATERIALS AND METHODS

Study Design and Setting- This prospective, comparative study was carried out over 18 months at a tertiary care surgery center. The main aim was to compare postoperative pain and recovery in terms of outcomes after ventral hernia repair through the onlay or sublay mesh technique.

Patient Selection- Eligible candidates were adult patients aged between 18 and 70 years, with a primary or incisional ventral hernia, and undergoing elective open mesh repair. Recurrent hernias, strangulated or complicated hernias, immunocompromised status, coagulopathy, or severe comorbidities (e.g. advanced cardiopulmonary disease) were excluded to ensure homogeneity. Patients were recruited consecutively and randomly allocated to the onlay or sublay group by a computer-generated randomization schedule.

Surgical Technique- All operations were carried out with general or regional anesthesia by senior surgeons well-trained in both procedures. In the onlay group, the mesh was inserted anterior to the anterior rectus sheath following primary fascial closure, and fixed with interrupted polypropylene sutures. In the sublay group, the mesh was positioned in the retromuscular space (posterior rectus sheath and rectus muscle) following careful dissection and closure of the posterior sheath. Standard polypropylene mesh was utilized in both groups. Perioperative prophylactic antibiotics were given, and wound closure was performed in layers using absorbable sutures for the subcutaneous tissue and non-absorbable sutures for the skin.

Postoperative Pain Assessment- Postoperative pain was measured on the Visual Analog Scale (VAS), documented at 6, 24, and 48 hours postoperatively, and on the 7th postoperative day. All patients were treated with a standard analgesic protocol, and pain scores were documented by blinded nursing personnel unaware of the surgical method employed. The main pain result was the mean VAS score during the initial 48 hours, which measures acute postoperative pain.

Recovery Parameters- Recovery was assessed in terms of time to ambulation, hospital stay, time to resumption of normal daily activities, and rate of early postoperative complications like seroma, hematoma, wound infection, and dehiscence. Follow-up was done on the 7th postoperative day, at 1 month, and 3 months. All complications were recorded and graded according to the Clavien-Dindo classification system.

crossref doi: 10.21276/SSR-IIJLS.2025.11.3.9

Statistical Analysis- Data was entered and processed with SPSS software version 25.0. Continuous variables like pain scores, hospital stay duration, and ambulation time were reported as means with standard deviations and compared using the independent t-test. Categorical variables like complication rates were reported as frequencies and compared using the chi-square or Fisher's exact test. A p-value of <0.05 was used to consider all comparisons statistically significant.

Ethical approval- Ethical permission was granted from the Institutional Ethics Committee, and written informed consent was obtained from all participants before enrollment.

RESULTS

A total of 80 patients were included in the study, with 40 patients in each of the onlay and sublay mesh repair groups. The two groups were similar in age, gender distribution, body mass index (BMI), and type of hernia (primary or incisional) without any statistically significant differences (p>0.05). The average patient age in the onlay group was 48.6±10.2 years and in the sublay group 47.1±9.8 years. The patient population in both groups included a majority of women, 55% in the onlay and 50% in the sublay group.

Table 1: Baseline Characteristics of Patients in Onlay and Sublay Groups

Characteristic	Onlay Group (n=40)	Sublay Group (n=40)	p-value
Mean Age (years)	48.6±10.2	47.1±9.8	0.54
Female (%)	22 (55%)	20 (50%)	0.65
Mean BMI (kg/m²)	26.8±2.5	27.1±2.2	0.48
Type of Hernia (Incisional)	24 (60%)	26 (65%)	0.63

Postoperative pain, as assessed by the Visual Analog Scale (VAS), was uniformly lower in the onlay group throughout the early postoperative course. At 24 hours, the mean VAS score was 4.1±0.9 in the onlay group versus 5.6±1.1 in the sublay group (p<0.001). Likewise, at 48 hours, pain levels were significantly lower in the onlay group. By the 7th postoperative day, pain scores had fallen in both groups, but the difference was no longer statistically significant.

Table 2: Postoperative Pain Scores (VAS) in Onlay and Sublay Groups

Time Post-Surgery	Onlay Group (Mean±SD)	Sublay Group (Mean±SD)	p-value
6 hours	5.0±1.0	6.2±1.3	0.001
24 hours	4.1±0.9	5.6±1.1	<0.001
48 hours	3.3±0.7	4.7±1.0	<0.001
Day 7	2.0±0.6	2.3±0.8	0.08

Fig. 1 depicts the trend of pain scores at 6h, 24h, 48h, and Day 7, showing a sharper decline in the onlay group.

doi: 10.21276/SSR-IIJLS.2025.11.3.9

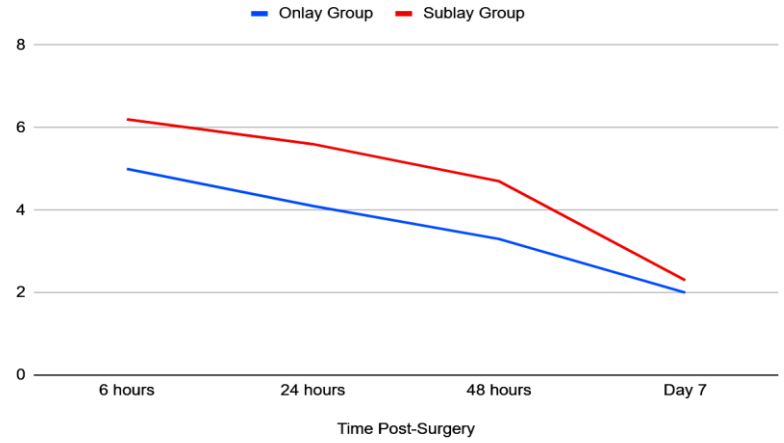

Fig. 1: Comparison of Mean VAS Scores Over Time Between Onlay and Sublay Groups

The time to ambulation was significantly less in the onlay group (1.6±0.4 days) than in the sublay group (2.3±0.5 days, p<0.001). The hospital stay was also less in the onlay group, averaging 4.1±1.1 days versus 5.3±1.3 days in the sublay group (p=0.002). Return to routine activity was earlier in the onlay group (13.5±3.2 days) compared with the sublay group (17.1±4.0 days, p=0.001).

Regarding complications, the sublay group had a higher incidence of seroma formation (15% vs. 10%), although this was not statistically significant. Wound infections were more common in the onlay group (12.5% vs. 5%), potentially as a result of the more superficial placement of the mesh, although this was also not significant (p=0.29).

Table 3: Postoperative Recovery and Complications

Parameter	Onlay Group (n=40)	Sublay Group (n=40)	p-value
Time to Ambulation (days)	1.6±0.4	2.3±0.5	<0.001
Hospital Stay (days)	4.1±1.1	5.3±1.3	0.002
Return to Activity (days)	13.5±3.2	17.1±4.0	0.001
Seroma (%)	4 (10%)	6 (15%)	0.49
Wound Infection (%)	5 (12.5%)	2 (5%)	0.29

DISCUSSION

In this study, a comparative analysis of onlay and sublay mesh repair methods for ventral hernia showed marked variation in postoperative pain and outcomes of recovery. Patients undergoing onlay mesh repair had uniformly low pain scores in the early postoperative period with significantly lower Visual Analog Scale (VAS) scores at 6, 24, and 48 hours. Moreover, such milestones of recovery as a time to ambulation, hospital stay, and daily activity return were earlier in the onlay group. While both methods had acceptable safety profiles, slightly more seroma formation was seen in the sublay group, whereas superficial wound infections were slightly higher in the onlay group, most probably due to more superficial mesh positioning.

These results concur with Bessa *et al.,* who in a randomized study of para-umbilical hernias determined that onlay repair had significantly less early postoperative pain and faster recovery than the sublay technique, even though wound-related complications occurred more frequently in the onlay group [9]. In a similar vein, Ahmed and Mehboob noted improved short-term comfort and reduced immediate postoperative pain in patients who had onlay repair,

crossref doi: 10.21276/SSR-IIJLS.2025.11.3.9

though long-term recurrence was marginally improved in the sublay group, noting the nuance of short-term versus long-term durability [10].

Our findings also concur with the PRIMA trial long-term analysis by Van den Dop *et al*., which validated that both onlay and sublay mesh insertions significantly decreased incisional hernia rates from suture-only closure in midline laparotomies. Nevertheless, whereas sublay was popular for late recurrence results, there were no significant differences in patient-focused metrics such as early postoperative recovery and pain, as suggested by the fact that onlay repair represents a feasible choice for non-complex hernias where early recovery is paramount [11].

A comparative study from the Americas Hernia Society Collaborative by Haskins *et al.* also illustrated that onlay repairs, especially when supported by tissue adhesives, were correlated with shorter operative time and similar rates of complications to sublay mesh insertion, and thus they are an effective and less technically challenging option in carefully selected cases [12].

Our results also resonate with the conclusions of Demetrashvili *et al.*, whose randomized comparison of open retromuscular (sublay) and onlay techniques found longer hospital stay and ambulation delay in the sublay group, but with a trend to fewer wound complications and lower recurrence at longer follow-up [13]. Conversely, Pereira and Gururaj, in their systematic review, highlighted the better long-term recurrence results of the sublay technique but recognized its correlation with longer operative time and delayed recovery, as seen with the trade-offs in our study [14].

Notably, Natarajan *et al.* compared several open and laparoscopic hernia repair methods and concluded that although laparoscopic methods provided the quickest recovery, onlay mesh repair had superior early results regarding pain and hospital stay—supporting our observation that onlay fixation might be optimal for patients where early recovery is a clinical priority [15].

Combined, the results of this research and literature provide evidence that although sublay repair can have long-term benefits as a recurrence preventer, the onlay method has superior short-term benefits in the form of less pain, earlier mobilization, and less hospital stay. The repair technique should therefore be individualized according to patient-related factors, the surgeon's experience, and clinical scenario, reconciling short-term recovery requirements with long-term integrity.

CONCLUSIONS

In conclusion, this study proves that onlay mesh repair for ventral hernias has substantial benefits when it comes to managing postoperative pain and early recovery since patients in the onlay group had decreased pain scores, faster ambulation, and shorter hospitalizations compared to the sublay group. Whereas both methods are linked to similar complication rates, the sublay method does offer a slight advantage in avoiding seroma collection and recurrence in the long term. Still, for patients who value quicker recovery and less initial postoperative pain, onlay repair is an option that is viable and effective. The onlay versus sublay mesh repair should ultimately be individualized based on both short-term goals of recovery and long-term risk of recurrence.

CONTRIBUTION OF AUTHORS

Research concept- Barjees Haris R, Arundas H
Research design- Barjees Haris R
Supervision- Arundas H
Materials- Barjees Haris R, Arundas H
Data collection- Barjees Haris R
Data analysis and Interpretation- Arundas H
Literature search- Arundas H
Writing article- Barjees Haris R, Arundas H
Critical review- Barjees Haris R
Article editing- Barjees Haris R, Arundas H
Final approval- Arundas H

REFERENCES

[1] den Hartog D, Dur AH, Tuinebreijer WE, Kreis RW. Open surgical procedures for incisional hernias. Cochrane Database Syst Rev., 2008; 2008 (3): CD006438. doi: 10.1002/14651858.CD006438.pub2.

[2] Martins EF, Dal Vesco Neto M, et al. Onlay versus sublay techniques for incisional hernia repair: 30-day postoperative outcomes. Arq Bras Cir Dig., 2022; 35: e1692. doi: 10.1590/0102-672020220002e1692.

[3] Jairam AP, Timmermans L, Eker HH, EGJM-Pierik R, Klaveren DV, et al. Prevention of incisional hernia with prophylactic onlay and sublay mesh reinforcement versus primary suture only in midline laparotomies (PRIMA): 2-year follow-up of a

doi: 10.21276/SSR-IIJLS.2025.11.3.9

multicentre, double-blind, randomised controlled trial. Lancet, 2017; 390(10094): 567-76. doi: 10.1016/S0140-6736(17)31332-6.

[4] Sevinç B, Okuş A, Ay S, Aksoy N, Karahan Ö. Randomized prospective comparison of long-term results of onlay and sublay mesh repair techniques for incisional hernia. Turk J Surg., 2018; 34(1): 17-20. doi: 10.5152/turkjsurg.2017.3712.

[5] Shah DK, Patel SJ, Chaudhary SR, Desai NR. Comparative study of onlay versus sublay mesh repair in the management of ventral hernias. Updates Surg., 2023; 75(7): 1991-96. doi: 10.1007/s13304-023-01532-5.

[6] Venclauskas L, Maleckas A, Kiudelis M. One-year follow-up after incisional hernia treatment: results of a prospective randomized study. Hernia, 2010; 14(6): 575-82. doi: 10.1007/s10029-010-0686-8.

[7] Wéber G, Baracs J, Horváth OP. "Onlay" mesh provides significantly better results than "sublay" reconstruction. Prospective randomized multicenter study of abdominal wall reconstruction with sutures only, or with surgical mesh—results of a five-years follow-up. Magy Seb., 2010; 63(5): 302-11. doi: 10.1556/MaSeb.63.2010.5.3.

[8] Hassan F, Gaurav K, Kumar K, Kumar K, Balamurali B, et al. A comparative study of elective sublay versus onlay repair for non-complex, small, and medium-size incisional hernia: Post-operative complications in a tertiary hospital in Ranchi, India. Cureus, 2024; 16(5): e59593. doi: 10.7759/cureus.59593.

[9] Bessa SS, El-Gendi AM, Ghazal AH, Al-Fayoumi TA. Comparison between the short-term results of onlay and sublay mesh placement in the management of uncomplicated para-umbilical hernia: a prospective randomized study. Hernia, 2015; 19(1): 141-46.

[10] Ahmed M, Mehboob M. Comparisons of onlay versus sublay mesh fixation technique in ventral abdominal wall incisional hernia repair. J Coll Physc Surg Pak., 2019; 29(9): 819-22. doi: 10.29271/jcpsp.2019.09.819.

[11] Van den Dop LM, Sneiders D, Yurtkap Y, et al. Prevention of incisional hernia with prophylactic onlay and sublay mesh reinforcement vs. primary suture only in midline laparotomies (PRIMA): long-term outcomes of a multicentre, double-blind, randomised controlled trial. Lancet Reg Health Eur., 2023; 36: 100787. doi: 10.1016/j.lanepe.2023.100787.

[12] Haskins IN, Voeller GR, Stoikes NF, et al. Onlay with adhesive use compared with sublay mesh placement in ventral hernia repair: Was Chevrel right? An Americas Hernia Society Quality Collaborative analysis. J Am Coll Surg., 2017; 224(5): 962-70. doi: 10.1016/j.jamcollsurg.2017.01.048.

[13] Demetrashvili Z, Pipia I, Loladze D, et al. Open retromuscular mesh repair versus onlay technique of incisional hernia: a randomized controlled trial. Int J Surg., 2017; 37: 65-70. doi: 10.1016/j.ijsu.2016.12.008.

[14] Pereira C, Gururaj S. Onlay versus sublay mesh repair for incisional hernias: a systematic review. Cureus, 2023; 15(1): e34156. doi: 10.7759/cureus.34156.

[15] Natarajan S, Meenaa S, Thimmaiah KA. A randomised prospective study to evaluate preperitoneal mesh repair versus onlay mesh repair and laparoscopic IPOM in incisional hernia surgery. Indian J Surg., 2017; 79(2): 96-100. doi: 10.1007/s12262-015-1430-5.