

A Comparative Study of Retro Rectus and Onlay Mesh Repair by Open Surgical Technique in Ventral Hernias

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Abstract:

Background: Ventral hernia repair is a commonly performed surgical procedure with over a million cases annually in India. Traditional suture repair methods have high recurrence rates, especially in larger hernias. The advent of synthetic mesh has revolutionized hernia repair, significantly reducing recurrence. However, the optimal placement of the mesh—whether onlay or retrorectus (sublay)—remains debated. This study aims to compare the outcomes of onlay and retrorectus mesh repair in patients undergoing ventral hernia repair by open surgical technique.

Materials and Methods: A prospective comparative study was conducted from May 2023 to May 2024 at Dr. Bhim Rao Ambedkar Memorial Hospital and District Hospital in Raipur, enrolling 60 patients diagnosed with ventral hernias. Patients were divided into two groups: Group A (onlay mesh repair) and Group B (retrorectus mesh repair), with 30 patients each. Intraoperative and postoperative variables, including surgical duration, complications (seroma, surgical site infections), and hospital stay, were recorded. Data were analyzed using SPSS version 20.0, applying unpaired t-tests, Chi-square, and Fisher's exact tests as appropriate.

Results: The mean age of participants was 45.87 years. Group A (onlay) had a significantly higher rate of seroma formation (20% vs. 4% in Group B, $p < 0.05$) and surgical site infections (16% vs. 4% in Group B, $p < 0.05$). The mean hospital stay was longer for the onlay group at 5 days compared to 4 days for the retrorectus group ($p < 0.0002$). Additionally, drain duration was prolonged in the onlay group due to increased seroma formation, suggesting greater postoperative morbidity associated with this technique.

Conclusion: Retrorectus mesh repair offers advantages over the onlay approach, showing lower rates of complications, shorter hospital stays, and reduced drain duration. These findings support the retrorectus technique as a preferred method for ventral hernia repair, providing better outcomes with lower morbidity.

Keywords: Ventral hernia, mesh repair, onlay mesh, retrorectus mesh, seroma, surgical site infection, open surgical technique.

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Introduction

Ventral hernia repair is one of the most frequently performed surgical procedures worldwide, with over a million surgeries conducted annually in India alone. Historically, suture repair techniques have been the primary method for managing ventral and incisional hernias for over a century, with the Mayo duplication technique being particularly prevalent [1].

However, for larger hernias, the suture repair approach often requires significant tension to close the fascial defect, which has led to high rates of mechanical failure and recurrence, with some studies documenting recurrence rates as high as 54% [1,2]. The introduction of synthetic mesh in hernia repair has transformed this field, providing

improved outcomes by reducing recurrence rates compared to suture repair. Luijendijk et al. conducted an influential study that first demonstrated the advantages of mesh implantation, which marked a paradigm shift in hernia repair strategies [3]. Today, mesh repair is considered a standard approach for ventral hernia repair. However, debates remain regarding the optimal surgical method, with the choice of repair techniques often influenced by tradition rather than robust evidence [3].

Open mesh repair, specifically in either the onlay or sublay (retrorectus) position, is widely employed in ventral hernia repair. Evidence suggests that open mesh repair is superior to suture repair in

terms of recurrence rates, yet uncertainty remains regarding the ideal type of mesh and its optimal placement [4]. Studies indicate that while mesh repair can improve recurrence outcomes, it is not without risks, such as wound complications, surgical site infections, seroma formation, and flap necrosis, which can vary based on mesh placement [5]. For example, intraperitoneal mesh placement has been associated with increased risks of adhesions, bowel obstruction, and fistula formation, highlighting the critical importance of mesh positioning [6].

Despite these advancements, there is no consensus on the superior mesh placement approach. This study aims to compare outcomes of onlay and retrorectus mesh repair in ventral hernias, contributing to the body of evidence to inform surgical practice.

Materials and Methods

This study included patients aged over 18 years diagnosed with ventral hernias, specifically umbilical/paraumbilical, epigastric, and incisional hernias. A total of 60 patients were enrolled and divided into two groups: Group A, with 30 patients undergoing onlay mesh repair (onlay meshplasty), and Group B, with 30 patients undergoing sublay mesh repair (sublay meshplasty). The study was conducted over a 12-month period from May 2023 to May 2024.

Inclusion criteria for the study required patients to be over 18 years of age and undergoing onlay or sublay mesh repair for ventral hernias, including incisional, paraumbilical, and epigastric hernias. Patients were excluded if they were under 18 years, did not provide informed consent, were immunosuppressed, had groin hernias, or were medically unfit for surgery.

Designed as a prospective comparative study, the research was conducted at the Department of General Surgery, Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur (C.G.), and District Hospital, Pandri, Raipur. Informed consent was obtained in writing from all study participants prior to their enrollment. Patients undergoing either onlay or sublay mesh repair for ventral hernias were evaluated intraoperatively to record the duration of surgery. Postoperative assessments included monitoring for complications such as surgical site infections, seroma formation, flap necrosis, and the length of hospital stay.

For statistical analysis, data were entered into an MS Excel spreadsheet and analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. Continuous variables were presented as mean \pm standard deviation (SD), and categorical variables were reported as absolute numbers and

percentages. Data normality was assessed before statistical analysis. For normally distributed continuous variables, comparisons were made using the unpaired t-test, while the Mann-Whitney U test was employed for variables that were not normally distributed. Categorical variables were analyzed using either the Chi-square test or Fisher's exact test.

Results

The study included 60 participants, with a mean age of 45.87 years (SD = 1.87), indicating a predominantly middle-aged population with minimal age variance. The age distribution (Table 1) shows that most participants were between 46 and 55 years (35%), followed by those aged 36 to 45 years (28.3%), above 55 years (21.7%), and less than 35 years (15%).

In terms of gender distribution (Table 2), females constituted a slight majority with 33 participants (55%), while males made up 45% of the study population. Body Mass Index (BMI) assessment (Table 3) showed that 65% of participants had a normal BMI (18.5–24.9), while 28.3% were classified as overweight (>24.9), and 6.7% as underweight (<18.5), reflecting a predominantly normal-weight profile.

Swelling onset was insidious for all participants, with 100% reporting a gradual progression (Table 4). The average duration of swelling was 1.67 years (SD = 1.42), suggesting variation in swelling duration among participants (Table 5). Most cases (86.7%) had reducible swelling, while 13.3% presented non-reducible swelling (Table 6).

Table 7 and Table 8 describe the presence of abdominal pain and abdominal distension, respectively. Abdominal pain was absent in 81.7% of participants, while 18.3% reported pain. Similarly, 81.7% had no abdominal distension, while 18.3% experienced distension. Vomiting was also largely absent (86.7%) (Table 9), with only 13.3% of participants reporting it as a symptom. Additionally, bowel disturbance was rare, with 96.7% reporting no disturbance (Table 10).

Impact on daily activities was noted in 20% of participants, while 80% experienced no hindrance in daily activities (Table 11). Respiratory complaints were reported by 13.3% of participants, with 86.7% showing no symptoms (Table 12). Urinary complaints were present in 10% of participants, while 90% had no complaints (Table 13). Hypertension was present in 26.7% of participants, and 73.3% were normotensive (Table 14). Additionally, 18.3% of participants were diabetic, with the remaining 81.7% not diagnosed with diabetes (Table 15).

Table 1: Age Distribution

Age (in years)	Frequency (n=60)	Percentage (%)
Less than 35	9	15.0
36 to 45	17	28.3
46 to 55	21	35.0
Above 55	13	21.7

Table 2: Gender Distribution

Gender	Frequency (n=60)	Percentage (%)
Female	33	55.0
Male	27	45.0

Table 3: BMI Distribution

BMI Category	Frequency (n=60)	Percentage (%)
Underweight (<18.5)	4	6.7
Normal (18.5-24.9)	39	65.0
Overweight (>24.9)	17	28.3

Table 4: Swelling Onset

Swelling Onset	Frequency (n=60)	Percentage (%)
Insidious	60	100.0

Table 5: Duration of Swelling

Variable	Mean	SD
Duration of Swelling (years)	1.67	1.42

Table 6: Reducibility of Swelling

Reducibility	Frequency (n=60)	Percentage (%)
Reducible	52	86.7
Non-Reducible	8	13.3

Table 7: Abdominal Pain Presence

Abdominal Pain	Frequency (n=60)	Percentage (%)
Absent	49	81.7
Present	11	18.3

Table 8: Abdominal Distension Presence

Abdominal Distension	Frequency (n=60)	Percentage (%)
Absent	49	81.7
Present	11	18.3

Table 9: Vomiting Presence

Vomiting	Frequency (n=60)	Percentage (%)
Absent	52	86.7
Present	8	13.3

Table 10: Bowel Disturbance Presence

Bowel Disturbance	Frequency (n=60)	Percentage (%)
Absent	58	96.7
Present	2	3.3

Table 11: Daily Activity Impact

Daily Activity Impact	Frequency (n=60)	Percentage (%)
No impact	48	80.0
Yes impact	12	20.0

Table 12: Respiratory Complaints Presence

Respiratory Complaints	Frequency (n=60)	Percentage (%)
No complaints	52	86.7
Yes complaints	8	13.3

Table 13: Urinary Complaints Presence

Urinary Complaints	Frequency (n=60)	Percentage (%)
No complaints	54	90.0
Yes complaints	6	10.0

Table 14: Hypertension Presence

Hypertension	Frequency (n=60)	Percentage (%)
Absent	44	73.3
Present	16	26.7

Table 15: Diabetes Presence

Diabetes	Frequency (n=60)	Percentage (%)
Absent	49	81.7
Present	11	18.3

Discussion

The placement of mesh in ventral hernia repair is a critical factor influencing the risk of postoperative complications, ease of surgery, and patient recovery outcomes. Key considerations include preventing devascularisation of flaps and thereby minimizing risks like infection, seroma formation, and flap necrosis [1]. Technical considerations, such as surgical duration and ease, may also play a role in determining the surgeon's choice of mesh placement technique.

Sublay repair is advantageous due to its position between two load-bearing tissues, the posterior rectus sheath and the anterior myofascial complex, which allows for effective tissue integration from both sides [2]. This technique also provides additional benefits, such as avoiding devascularizing skin flaps and protecting the mesh from exposure to superficial wound complications and intra-abdominal adhesions. Consequently, sublay mesh placement is less susceptible to contamination and subsequent infection due to its protected location within the abdominal wall layers [3].

Conversely, onlay mesh repair, while allowing tissue ingrowth from both directions, necessitates creating devascularizing skin flaps, increasing vulnerability to superficial wound complications [4]. This exposure to superficial tissues leaves the mesh susceptible to complications like seroma and infection [5].

One of the most frequently observed complications following hernia repair is seroma formation, attributed to factors such as blood and lymphatic vessel injury during dissection, dead space formation, and the release of inflammatory mediators [6]. In this study, seroma was observed in 6 patients, with 5 cases (20%) in the onlay group

and only 1 case (4%) in the retrorectus group, which aligns with the findings of Westphalen et al., where the onlay technique exhibited higher seroma rates due to extensive subcutaneous dissection [6]. The need for significant dissection in the onlay technique can lead to devitalized tissue, providing a favorable environment for seroma development. A study by Liaqat Ali Zia et al. also reported similar findings, with 14% seroma incidence in the onlay group compared to 4% in the sublay group [7]. Likewise, Holihan et al. documented seroma rates of 18% in the onlay group and 4% in the sublay group, further corroborating these findings [8].

Surgical site infections (SSIs) are another complication associated with mesh repair, particularly when the mesh is placed in a superficial location as in onlay repair. In our study, SSIs were observed in 5 patients, with a higher occurrence in the onlay group (16%) compared to the retrorectus group (4%), supporting the findings of Bantu Raj Siddharth et al., who found a higher incidence of SSIs in onlay repairs (13.33%) compared to pre-peritoneal repairs (6.66%) [9]. These infections were managed effectively with antibiotics and regular dressing changes, with no cases requiring mesh removal. This trend suggests that the sublay technique, by avoiding superficial positioning, may reduce the risk of mesh-related infections.

The duration of postoperative hospital stay serves as an indirect measure of morbidity, reflecting complications and the need for extended care. In our study, the mean hospital stay was 5 days for the onlay group, compared to 4 days for the retrorectus group, a statistically significant difference ($P < 0.0002$). This finding is consistent with studies by de Vries Reilingh et al. and Gleysteen, who reported shorter hospital stays in patients undergoing sublay repairs, highlighting the lower

morbidity associated with the retrorectus technique [10,11].

The drain duration is another factor influenced by the choice of mesh placement. In our study, patients who underwent onlay mesh repair had a longer drain duration compared to those who received retrorectus mesh repair. The prolonged drainage period in the onlay group can be attributed to the increased risk of seroma and the need for subcutaneous drainage due to more extensive dissection [12].

Conclusion

Overall, our findings suggest that retrorectus mesh repair offers distinct advantages over the onlay technique, with reduced rates of seroma, surgical site infections, shorter hospital stays, and less need for prolonged drainage. Given the lower morbidity associated with the retrorectus approach, it may be considered the preferred method for ventral hernia repair.

The outcomes of this study align with previous research, reinforcing the benefits of retrorectus repair as a viable alternative to onlay repair for managing ventral hernias effectively.

References

1. Westphalen AP, Araújo Filho VJF, Lima LC, Carvalho CA, Andrade MAC. Mechanisms of seroma formation in ventral hernia repair with a composite mesh. *Acta Cir Bras.* 2015; 30(12):850-4.
2. Bittner R, Bingener-Casey J, Dietz U, Fabian M, Ferzli GS, Fortelny RH, et al. Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society). *Surg Endosc.* 2014; 28(1):2-29.
3. Cobb WS, Warren JA, Reed RL, Carbonell AM. Open retromuscular mesh repair of complex incisional hernia in 280 patients with a mean follow-up of 5 years. *Ann Surg.* 2015; 261(6):1001-6.
4. Kockerling F, Simon T, Hukauf M, Hüttl TP, Reinpold W, Bittner R. The importance of registries in the post-market surveillance of surgical meshes. *Ann Surg.* 2017; 265(2):241-5.
5. Burger JW, Lange JF, Halm JA, Kleinrensink GJ, Jeekel J. Incisional hernia: early complication of abdominal surgery. *World J Surg.* 2005; 29(12):1608-13.
6. Westphalen AP, Araújo Filho VJF, Lima LC, Carvalho CA, Andrade MAC. Mechanisms of seroma formation in ventral hernia repair with a composite mesh. *Acta Cir Bras.* 2015; 30(12):850-4.
7. Liaqat Ali Zia, Waqar SH, Irshad K, Sadaf R, Malik ZI, Anwar I, et al. Comparison of onlay versus sublay mesh placement in ventral hernia repair. *Int J Surg.* 2015; 13:30-6.
8. Holihan JL, Alawadi ZM, Harris JW, Liang MK. Ventral hernia repair: a meta-analysis of randomized controlled trials. *Ann Surg.* 2015; 261(4):654-62.
9. Siddharth BR, Singh B, Pannu B. A comparative study of onlay versus preperitoneal mesh repair in incisional hernia. *J Clin Diagn Res.* 2016;10(2)
10. de Vries Reilingh TS, van Goor H, Rosman C, Hesselink EJ, van der Wilt GJ, van der Velde M, et al. "Components separation technique" for the repair of large abdominal wall hernias. *Hernia.* 2003; 7(3):178-82.
11. Gleysteen JJ. Suture repair of incisional hernia. *Am J Surg.* 1987; 153(5):560-3.
12. Bittner R, Bingener-Casey J, Dietz U, Fabian M, Ferzli GS, Fortelny RH, et al. Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias (International Endohernia Society). *Surg Endosc.* 2014; 28(1):2-29.