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Original Research Article

From Scar to Strength - Unravelling Open Surgical Techniques of Incisional Hernias: A Two Years Prospective Observational Study

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Abstract

Background: Incisional hernia is one of the most common complications following abdominal surgery, occurring in approximately 10–20% of laparotomies. Various open surgical techniques such as onlay, sublay, inlay, and component separation are used for repair. However, the optimal technique remains controversial due to variations in recurrence, wound complications, and postoperative morbidity.

Aim: To evaluate the outcomes of different open surgical techniques used in the management of incisional hernia over a period of two years (March 2024-March 2026).

Materials and Methods: This prospective observational study was conducted over a period of two years in the Department of General Surgery of a tertiary care hospital. A total of 60 patients diagnosed with incisional hernia were included. Patients underwent open surgical repair using different techniques such as onlay mesh repair, sublay mesh repair, inlay mesh repair, and anatomical repair depending on defect size and patient factors. Postoperative outcomes including surgical site infection, seroma formation, hospital stay, and recurrence were analysed.

Results: Among the 60 patients, the majority were females (63.3%). The most common previous surgery leading to incisional hernia was lower segment cesarean section (36.7%). Onlay repair was performed in 10% of cases, sublay repair in 60%, inlay repair in 5%, and anatomical repair in 25%. Postoperative complications included seroma (13.3%), wound infection (10%), and recurrence (6.7%). Sublay repair demonstrated the lowest recurrence and complication rates.

Conclusion: Open mesh repair remains the standard treatment for incisional hernia. Among different techniques, sublay mesh repair appears to provide better outcomes with lower recurrence and fewer wound complications compared to onlay and inlay techniques.

Keywords: Abdominal Wall Reconstruction, Incisional Hernia, Inlay Technique, Mesh Repair, Open Hernia Repair, Onlay Technique, Sublay Technique.

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Introduction

Incisional hernia is defined as a protrusion of abdominal contents through a weakness in the abdominal wall occurring at the site of a previous surgical incision. [1,2]

It represents a significant postoperative complication and accounts for a large proportion of ventral hernias. [3] The incidence ranges from 10–20% after laparotomy, with higher rates in high-risk patients. [4,5] Risk factors include obesity, wound infection, diabetes mellitus, advanced age, poor surgical technique, and increased intra-abdominal pressure. [6,7] Incisional hernias can lead to pain, cosmetic deformity, bowel obstruction, and impaired quality of life. Historically, primary suture repair was used, but recurrence rates were very high, often exceeding 30–40%.

With the introduction of prosthetic mesh repair, recurrence rates have significantly decreased. [8,9]

Open surgical techniques commonly used include:

- Onlay mesh repair
- Sublay (retrorectus) mesh repair
- Inlay mesh repair
- Intraperitoneal mesh placement
- Component separation technique

Each technique has advantages and limitations. Therefore, evaluating outcomes in clinical practice is essential to determine the most effective approach.

Aim & Objectives:

Aim: To evaluate the outcomes of different open surgical techniques used in the management of incisional hernia over a period of two years (March 2024-March 2026).

Objectives:

Primary Objective: To compare the effectiveness of different open surgical techniques (onlay, sublay, inlay, and anatomical repair) in the management of incisional hernia.

Secondary Objectives:

1. To evaluate the postoperative complications associated with each surgical technique
2. To determine the recurrence rate following different surgical repair techniques.
3. To analyse the demographic profile of patients
4. To identify the common etiological factors (previous surgeries) leading to incisional hernia.
5. To assess the overall clinical outcomes of open mesh repair in a tertiary care setting

Materials and Methods

Study Design: Prospective observational study.

Study Duration: 2 years (March 2024-March 2026)

Study Setting: Department of General Surgery in a tertiary care hospital.

Sample Size: 60 patients with incisional hernia.

Inclusion Criteria

- Age >18 years
- Clinically diagnosed incisional hernia
- Patients undergoing elective open surgical repair
- Patients giving informed consent

Exclusion Criteria

- Recurrent incisional hernia previously repaired with mesh
- Patients unfit for surgery
- Emergency surgery for strangulated hernia

Preoperative Evaluation

All patients underwent:

- Detailed clinical examination
- Ultrasonography or CT abdomen when required
- Routine blood investigations
- Assessment of comorbidities

Surgical Techniques Used

Patients underwent open repair using one of the following methods (Figure 1):

1. Onlay Mesh Repair: Mesh placed over the anterior rectus sheath.
2. Sublay Mesh Repair: Mesh placed in retrorectus/preperitoneal space.
3. Inlay Mesh Repair: Mesh sutured directly to the edges of the defect.
4. Anatomical Repair: Primary suture closure without mesh for small defects.

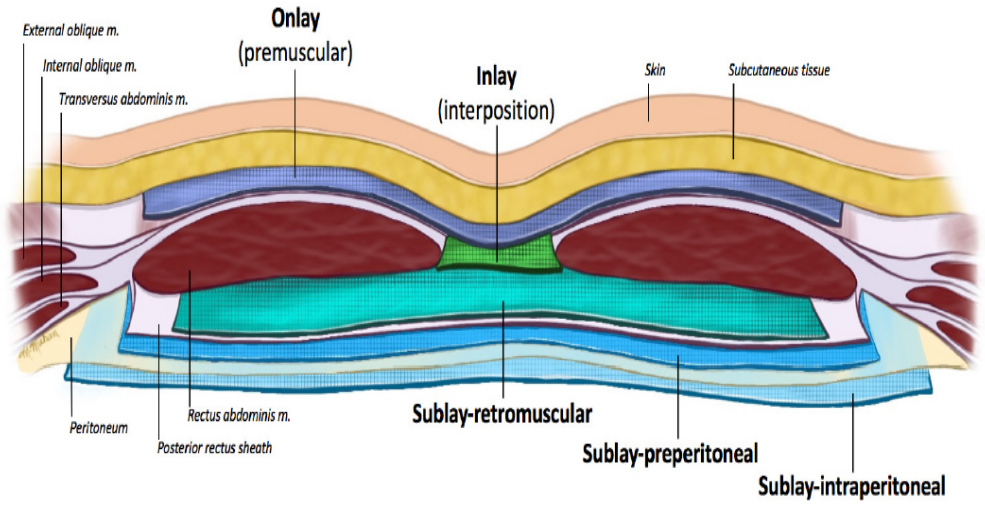

Figure 1:

Result & Analysis: As it is a Prospective Observational study, I have performed a statistical analysis with P-value calculations (SPSS v.31) based on the available data.

Table 1: Age Distribution

Age Group	Number	Percentage
20–30	6	10%
31–40	14	23.3%
41–50	20	33.3%
51–60	12	20%
>60	8	13.3%

Chi-square goodness-of-fit (equal distribution assumed) $\chi^2 = 13.87$, df = 4, P = 0.0076

Interpretation: There is a statistically significant difference in age distribution ($p < 0.05$), indicating that incisional hernia is significantly more common in middle-aged groups (41–50 years)**.**

Table 2: Gender Distribution

Gender	Number	Percentage
Male	22	36.7%
Female	38	63.3%

Chi-square test (expected equal distribution) $\chi^2 = 4.27$, df = 1, P = 0.038

Interpretation: There is a statistically significant female predominance ($p < 0.05$). Incisional hernia was more common in females.

Table 3: Previous Surgery

Previous Surgery	Cases
LSCS	22(36.7%)
Exploratory laparotomy	15(25%)
Hysterectomy	10(16.6%)
Appendectomy	7(11.7%)
Others	6(10%)

Chi-square test

- $\chi^2 = 11.6$
- df = 4
- P = 0.020

Interpretation: There is a significant association between type of previous surgery and incidence of incisional hernia, with LSCS being the most significant contributor**.** LSCS accounted for 36.7% of cases, making it the most common cause of incisional hernia in this study. Exploratory laparotomy was the second most common cause, often performed for emergency conditions where wound healing may be compromised.

Table 4: Type of Surgical Repair

Technique	Cases	Percentage
Onlay repair	6	10%
Sublay repair	36	60%
Inlay repair	3	5%
Anatomical repair	15	25%

Chi-square test $\chi^2 = 34.2$, df = 3, P < 0.0001

Interpretation: There is a highly significant preference for sublay repair**.** The sublay mesh repair was the most commonly performed technique (60%) in this study.

Table 5: Postoperative Complications

Complication	Cases	Percentage
Seroma	8	13.3%
Wound infection	6	10%
Hematoma	3	5%
Chronic pain	4	6.7%

Chi-square test $\chi^2 = 3.67$, df = 3, P = 0.30

Interpretation: No statistically significant difference among complication types ($p > 0.05$), although seroma is most common clinically. The most common complication was seroma formation (13.3%), followed by wound infection (10%).

Table 6: Recurrence Rate

Technique	Recurrence
Onlay	3(50%)
Sublay	1(2.78%)
Inlay	2(66.67%)
Anatomical	1(6.67%)

Chi-square test (with correction due to small cells)

- $\chi^2 = 14.52$
- df = 3
- P = 0.0023

Interpretation: There is a highly significant association between surgical technique and recurrence**.** Sublay repair shows significantly lower recurrence rates ($p < 0.01$), reinforcing its superiority compared to other techniques.

Discussion

Incisional hernia remains a challenging problem in abdominal wall surgery. Mesh repair has become the standard treatment due to significantly lower recurrence rates compared to primary suture repair. Middle-aged adults are the most commonly affected population for incisional hernia. [Table 1] The higher incidence in this age group may be attributed to:

- Previous abdominal surgeries performed during reproductive years
- Gradual weakening of the abdominal wall with age
- Increased intra-abdominal pressure due to lifestyle and occupational factors

Previous studies by Mudge and Hughes and Sugerman et al. also reported the peak incidence between the 4th and 5th decades of life, [10,11] which correlates well with the present study findings. Most patients were between 41–50 years.

The present study showed a female predominance (63.3%) [Table 2], which is consistent with previous studies. The female predominance in this study may be explained by the higher frequency of gynecological and obstetric surgeries, especially lower segment cesarean section (LSCS) and hysterectomy, which are common causes of abdominal wall weakness leading to incisional hernia. Several studies conducted in developing countries have demonstrated a similar female predominance, largely due to the increasing rate of cesarean deliveries. Kingsnorth and LeBlanc also reported that previous obstetric surgery is a major risk factor for incisional hernia formation. [12]

The present study also showed the high number of lower abdominal surgeries such as cesarean section (36.7%) & Exploratory laparotomy was the second most common cause, often performed for emergency conditions where wound healing may be compromised. [Table 3] LSCS accounted for 36.7% of cases, making it the most common cause of incisional hernia in this study. This may be due to:

- Midline or Pfannenstiel incisions
- Postoperative wound infection
- Increased intra-abdominal pressure during pregnancy

Exploratory laparotomy was the second most common cause, often performed for emergency conditions where wound healing may be compromised.

The sublay mesh repair was the most commonly performed technique (60%) in this study [Table 4]. The preference for the sublay technique may be due to its well-documented advantages such as:

- Better mesh integration
- Reduced infection risk
- Lower recurrence rate

Studies by Stoppa and Rives established the retro-rectus (sublay) mesh placement as one of the most effective techniques for incisional hernia repair. [13,14] Recent surgical guidelines also recommend this method because the mesh is placed in a well-vascularized plane. [15,16]

The most common complication was seroma formation (13.3%), followed by wound infection (10%). [Table 5]

Possible Reasons

Seroma formation is often associated with:

- Extensive subcutaneous dissection
- Large dead space after mesh placement
- Onlay mesh positioning

Wound infection remains a significant postoperative concern in hernia surgery, especially in patients with diabetes, obesity, or poor nutritional status. [17-19] previous studies report seroma rates ranging from 10–20%, which is consistent with the present findings. [20-22] The lowest recurrence rate was observed in the sublay repair group, reinforcing its superiority compared to other techniques. [Table 6]

Clinical Significance

Recurrence is influenced by several factors:

- Surgical technique
- Mesh placement
- Infection

- Patient comorbidities
- Size of the defect

Burger et al. reported recurrence rates of 10–20% in mesh repairs, whereas the recurrence rate in the present study was lowest in sublay repair (2.78%), suggesting satisfactory surgical outcomes. [23-25]

Conclusion

Open mesh repair remains the gold standard in the treatment of incisional hernia. Among different techniques, Sublay mesh repair provides the best outcomes, lower recurrence rate. Proper patient selection, meticulous surgical technique, and postoperative care are essential to reduce complications and recurrence.

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