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Original Research Article

# Comparative Analysis of Onlay vs. Preperitoneal Mesh Repair in Hernia Surgery: An Observational Study

**Deepak Kumar Sah[1], Sudhanshu Shekhar[2]**

[1]Senior Resident, Department of Surgery, SKMCH, Muzaffarpur, Bihar
[2]Senior Resident, GMCH Purnia, Bihar

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**Corresponding Author: Dr. Sudhanshu Shekhar**
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**Abstract:**

Both incisional and spontaneous ventral hernias following abdominal surgery are considered to be part of the anterior abdominal wall. Pre-peritoneal or onlay mesh repair is possible. The use of either type of meshplasty is controversial because of variations in the simplicity of conducting the procedure, the duration of the surgery, challenges that develop in the recovery phase following surgery, as well as the procedure's return. Preoperative evaluation of 60 patients who presented with ventral hernias included clinical assessment and ultrasound to confirm the diagnosis. Following approval and fulfilment of the inclusion and exclusion criteria, onlay and pre-peritoneal mesh repairs were performed on 34 and 26 patients, respectively. In the pre-peritoneal mesh repair group, seroma formation, wound infection, and mesh infection were observed in 8.8%, 8.8%, and 2.9% of patients, respectively, and in 19.2%, 15.33%, and 7.6% of patients in the onlay mesh repair group. Of the patients in the onlay group, 11.53% experienced recurrence. The pre-peritoneal mesh repair group did not experience any recurrences. The onlay group also had a higher morbidity rate related to associate factors. Recurrent links were found between seroma development, infection, and chronic pain in onlay mesh repair and pre-peritoneal mesh repair. When a ventral hernia is repaired with an onlay mesh, there is an increased chance of recurrence, especially in patients who also have co-morbid diseases such as multiparity, obesity, or diabetes. We concluded that pre-peritoneal repair is better than onlay repair after analyzing all of these data.

**Keywords:** Incisional hernia, Onlay mesh repair, Hernioplasty, Postoperative complications, Surgical site infection, Preperitoneal mesh repair, Recurrence.



## Introduction

A hernia is a protrusion of a viscus or part of a viscus through a natural or acquired defect in the wall of its containing cavity (Sowmith and Murthy, 2022). An abdominal viscus or part of a viscus that emerges through the front abdominal wall somewhere other than the groyne is called a ventral hernia (Chan et al., 2018). Men who stand erect often develop a variety of hernias, the majority of which emerge through the front abdominal wall as noticeable, palpable swellings (See at al., 2020).

These abnormalities can be divided into two groups based on where on the abdominal wall they occur: spontaneous (primary) or acquired. Epigastric hernias can extend from the umbilicus to the xiphoid process. The umbilicus is where umbilical hernias develop. Anywhere along the Spigelian line can have a Spigelian hernia (Chen and Morrison, 2019). Incisional hernias, as the name implies, are acquired hernias that usually develop following surgical incisions (Mark et al., 2012). The patient sees a physician for symptoms relating to swelling, discomfort, acute pain, gastrointestinal problems, or cosmetic concerns (Ali et al., 2018). Ultrasound scanning or clinical examinations are easy ways to make a diagnosis. Numerous predisposing variables have been found; these could be linked to iatrogenic factors, an underlying pathologic disease, or particular patient traits. From the standpoint of the surgeon, hernia repairs are routine operations. For the repair, there are several surgical methods available (Panguluri et al., 2023).

Incisional hernias are still a highly prevalent complication following surgery. Over time, these hernias develop, making repair challenging and increasing the risk of major consequences such strangulation, enterocutaneous fistula, and intestinal obstruction (Natarajan et al., 2017). For this reason, elective repair is advised to prevent these issues. Up to 58% of suture repair cases had recurrences (Singh, et al., 2019). Because of the minimal recurrence of hernias, the conventional therapy these days is thought to be the implantation of a prosthetic mesh. The considerably higher risk of wound infection casts doubt on mesh repair's decreased

recurrence rate. Should prosthetic mesh be employed, the type and method of repair are comparable to surgical correction of ventral and incisional hernias (Sowmith and Murthy, 2022). The recurrence of hernias has been significantly reduced with the application of mesh in abdominal wall restoration as compared to original repair.

This study focuses on the etiological, anatomical, and clinico-pathological aspects that cause ventral hernias. It also examines the various methods of ventral hernia repair, with a particular focus on the results of pre-peritoneal and onlay mesh repairs.

## Materials and methods

The current observational study was carried out at the (Medical institute) in (city), India, in the department of general surgery. The institutional research and ethical research committees gave their approval to the project. All participants gave their informed consent after being informed about the study's protocol. The research was carried out between July 2017 and September 2022. In order to confirm the diagnosis, 60 patients who were admitted with a ventral hernia had preoperative clinical evaluation and ultrasound. Upon agreement and meeting the inclusion and exclusion criteria, 34 and 26 patients, respectively underwent onlay and pre-peritoneal mesh repair.

### Inclusion Criteria

Patients between age of 12 to 60, who presenting with anterior abdominal wall hernias: Umbilical hernias, Epigastric hernias, Paraumbilical hernias, Incisional hernias Spigelian hernias, and medically unfit patients for surgery and were willing to take part in the current study met the inclusion criteria.

**Exclusion Criteria:** Groin hernia

**Follow-up:** For a full year, every patient received routine follow-up care.

## Results

### Percentage Distribution of Ventral Hernias

The most prevalent category of ventral hernia in this research of 60 individuals was an incisional hernia (43.3%). The form that was least common, epigastric hernia, was 13.3% (Table 1).

**Table 1: Regarding the quantity and percentage of ventral hernias**

| Types of Hernias | No. of Patients | Percentage |
|---|---|---|
| Incisional | 26 | 43.3 |
| Paraumbilical | 14 | 23.3 |
| Umbilical | 12 | 20 |
| Epigastric | 8 | 13.3 |
| Total | 60 | 100 |

**Age Distribution:** According to the study, the highest percentages of patients (51.6%) were in their fourth decade of life. The age ranges of 11 to 20 were empty (Table 2).

**Table 2: Age distribution**

| Age in years | No. of cases | Percentage |
|---|---|---|
| 11-20 | Nil | 0 |
| 21-30 | 10 | 16 % |
| 31-40 | 31 | 51.6% |
| 41-50 | 15 | 25% |
| 51-60 | 4 | 6.6% |

**Sex Distribution:** Table 3 displays the gender distribution of the 60 patients: 44 (73.3%) were female and 16 (26.6%) were male. Female forms (n=44) 73.3% of total study group and Female to male ratio was 2.75:1 showed that incidence of ventral hernia was more in female.

**Table 3: Sex distribution**

| Sex | No. of Patient | Percentage |
|---|---|---|
| Male | 16 | 26.6 |
| Female | 44 | 73.3 |

**Type of Previous Operation in Incisional Hernia:** In current findings, out of 26 cases with incisional hernia, 7 cases Tubectomy (26.9%), 7 cases LSCS (26.9%), 4 cases (15.4%) had under gone Hysterectomy (TAH), 2 open appendectomies (7.7%), 4 laparotomy(15.4%) , and 2 oophorectomy (7.7%) (Table 4).

**Table 4: Types of previous operations in incisional hernia**

| S. No | Previous operation | Number of patients | Percentage |
|---|---|---|---|
| 1 | Tubectomy | 7 | 26.9 |
| 2 | LSCS | 7 | 26.9 |
| 3 | Hysterectomy | 4 | 15.4 |
| 4 | Open Appendectomy | 2 | 7.7 |

| | | | |
|---|---|---|---|
| 5 | Laparotomy | 4 | 15.4 |
| 6 | Oophorectomy | 2 | 7.7 |

Note: LSCS: Lower segment cesarean section

**Symptoms/Mode of Presentation:** Table 5 shows that of the patients, 45 (75%) had swelling, 8 (13.3%) had pain and swelling, and 7 (11.7%) had pain, swelling, and vomiting.

**Table 5: Illustration of data based on Symptoms**

| Symptoms | No. of Cases | Percentage |
|---|---|---|
| Swelling | 45 | 75 |
| Swelling and pain | 8 | 13.3 |
| Swelling, pain and vomiting | 7 | 11.7 |

**Illness or Associated Risk Factors:** Twenty (33.3%) of the sixty patients were obese, ten (16.7%) had diabetes, two (3.33%) were anaemic, and one (1.67%) had hypothyroidism. As a result, according to Table 6, obesity was the principally prevalent risk factor.

**Table 6: Associated risk factors/illness**

| Condition | No. of patients | Percentage |
|---|---|---|
| Obesity | 20 | 33.3 |
| Diabetes | 10 | 16.7 |
| Anemia | 2 | 3.33 |
| Hypothyroidism | 1 | 1.67 |

**Size of the Defect:** In this investigation, the largest measured flaw was 6 cm × 6 cm, whereas the minimum measured defect was 2 cm × 2 cm.

**Type of repair for mesh**: Pre-peritoneal mesh repair was performed on 34 patients, while onlay mesh repair was performed on 26 patients.

**Table 7: Type of mesh repair in the present study**

| S. No | Type of Mesh repair | No of patients | Percentage |
|---|---|---|---|
| 1 | Pre-peritoneal Mesh Repair | 34 | 56.7 |
| 2 | Onlay Mesh Repair | 26 | 43.3 |

**Duration of operation:** Compared to Preperitoneal Mesh repair (45–120 minutes), the average operation time for Onlay Mesh repair (55–100 minutes) was 75.61 minutes.

**Table 8: Mean duration of surgery in the present study.**

| Type of Mesh repair | Mean duration of surgery |
|---|---|
| Pre-peritoneal Mesh Repair (n=34) | 75.61 mins |
| Onlay Mesh Repair (n=26) | 80.64 mins |
| P value | 0.378 |

**Post-operative complications:** The most frequent side effect was seroma, which was followed by mesh and wound infections. The seroma was depleted. Regular dressings and medicines were used to treat wound infections.

**Table 9: Post-operative complications**

| S. No | Complications | Pre-peritoneal | Onlay | Percentage | |
|---|---|---|---|---|---|
| | | | | Pre-peritoneal | Onlay |
| 1 | Seroma | 3 | 5 | 8.8% | 19.2% |
| 2 | Hematoma | 0 | 0 | 0 | 0 |
| 3 | Wound infection | 3 | 4 | 8.8% | 15.3% |
| 4 | Mesh infection | 1 | 2 | 2.9% | 7.6% |
| 5 | Mesh removal | 0 | 0 | 0 | 0 |

**Follow-up and Recurrence:** For a year, every patient had routine follow-up. Only patients who underwent onlay mesh repair experienced recurrence. Of the 26 patients who received onlay mesh repair, 3 (11.53%) experienced a recurrence (Table 10).

**Table 10: Recurrence percentage**

| Type of operation | Recurrence | Percentage |
|---|---|---|
| Pre-peritoneal Mesh Repair (n=34) | 0 | 0 |
| Onlay Mesh Repair (n=26) | 3 | 11.53 |

## Discussion

Both spontaneous and, most frequently, incisional hernias following abdominal surgery are considered ventral hernias in the anterior abdominal wall. For a very long time, incisional hernias have been a common side effect of abdominal surgery; currently, most series have an incidence of 2-25% (Natarajan et al., 2017; Sowmith et al., 2022).

The current study found that the incidence of incisional hernias was 43.3%, followed by paraumbilical hernias (23.3%), umbilical hernias (20%), and epigastric hernias (13.3%). Comparable findings with previous research and publications have been reported by Chaudhary et al., 2021, there are four types of hernias: incisional (40%) paraumbilical (30%) umbilical (18%) and epigastric (11.7%) (Sowmith and Murthy, 2022). According to the current study, the age group between 31 and 40 years old has the highest occurrence, with a mean age of 38 years. The study's youngest patient was 24 years old. These results are consistent with the global data. In the current study, the female to male ratio was 2.75:1. According to Sowmith and Murthy (2022) this result was consistent with much of the literature. The proportion of female population in this study was 73.3%. Because no patient in our study was older than 60, it was discovered that ventral hernias are uncommon after that age.

Gynaecological procedures are the most often performed concomitant surgeries with incisional hernias. With a combined percentage of 26.9%, tubectomy and LSCS were found to be the most common predisposing surgeries. These were followed in this study by hysterectomy and laparotomy (15.4%), open appendectomy, and oophorectomy (7.7%). The most frequent related operation is listed as gynaecological surgeries by Chaudhary et al. (2021) and Sowmith and Murthy (2022).

In our study, 20 (33.3%) of the 60 patients had obesity, 10 (16.7%) had diabetes, 2 (3.33%) had anaemia, and 1 (1.67%) had hypothyroidism. The majority of the literature attributes the high incidence of obesity and multiparity in middle-aged women to this age group. It was shown that most patients had multiple risk factors, with obesity being the primary risk factor. Fat weakens aponeurosis, permeates muscle bundles and layers, and promotes the development of hernias. Comparable research by Chaudhary et al. (2021) and Panguluri et al. (2023) postulated that the formation of ventral and umbilical hernias, respectively, is caused by all factors that raise intra-abdominal pressure, such as obesity, ascitis, and persistent cough. In the current investigation, diabetics accounted for 70% of cases with infection of the surgical wound during the recovery phase, indicating a significantly elevated post-operative morbidity rate in this population.

Pre-peritoneal mesh repair (n=34) took less time for incisional hernias (IH) than onlay mesh repair (n=26), which took 80.92. This dissimilarity was statistically not significant (P>0.05). Analogous findings were reported by Jagtap et al. (2019), who found that the expert's mean time for meshplasty was 51 ± 10 min for onlay and 61 ± 11 min for preperitoneal (p value = 0.042), indicating a substantial difference in time between the two procedures.

Seroma was the most frequent consequence seen in 8 patients. 3 (8.8%) and 5 (19.2%) of the 8 patients were in the onlay and pre-peritoneal mesh repair groups, respectively. Seroma drainage was used to treat this issue. Due to the extensive mobilisation of subcutaneous tissue flaps required for onlay technique, which results in the creation of devascularizing skin flaps with seroma formation or infection, there was a higher risk of seroma formation (Panguluri et al., 2023). When foreign material is inserted, a transient but functional barrier is created between the deeper parietal layers' circulatory system and the subcutaneous tissues'. Any collecting seroma in pre-peritoneal repair can be absorbed by the lymphatic-rich naked posterior surface of the rectus muscles, located below the arcuate line. If there is an infection in the superficial wound, the mesh is also susceptible to infection due to its superficial placement. Seven patients in the current study had wound infections. This is consistent with research by Chaudhary et al. (2021), which had 2 (6.66%) patients in the preperitoneal repair group and 4 (13.33%) patients in the on-lay mesh repair group with wound infections. It was observed in 4 (15.3%) cases in the on-lay mesh repair group compared to 3 (8.8) cases in the preperitoneal mesh repair group. Comparable outcomes were noted in Panguluri et al. (2023) and Jawale et al. (2015).

In the current study, there was no hernia recurrence observed in the pre-peritoneal repair group; however, in the onlay group, reappearance happened in 3 (11.53%) instances. In onlay, Chaudhary et al. (2021) discovered a recurrence rate of 13.33%.

## Conclusion

When a patient presents with a ventral hernia, it's critical to identify risk factors that may be associated with the condition, such as diabetes, obesity, parity, and history of surgery. Carefully planning the type of repair—preperitoneal or onlay—will help prevent complications like seroma formation, mesh infection, wound infection, and recurrence. When compared to preperitoneal mesh repair, seroma formation, wounds, and mesh infections are observed to be more frequently linked to onlay mesh repair.

The likelihood of recurrence is increased in ventral hernia cases treated with onlay mesh repair. Co-

morbidities in certain cases such multiparity, diabetes, and obesity have a greater recurrence rate. Onlay mesh repair requires much less time for surgery than pre-peritoneal mesh repair, but its wider use is limited by accompanying problems. With the number of procedures performed, particularly in developing nations with a shortage of surgeons, this could be a worthwhile substitute for pre-peritoneal repair. Onlay mesh repair has an advantage over preperitoneal repair due to its simpler process, but its application is restricted by related problems. "Pre-peritoneal mesh repair is superior to onlay repair," is the final statement.

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