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## Comparative study between the sublay versus onlay techniques of mesh hernioplasty in case of ventral hernias

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### Abstract

**Background:** Abdominal hernias are common surgical conditions that can be presented as emergency and elective surgeries. Ventral hernia repair has always been a major challenge for surgeons. The mesh hernioplasty method has been considered the golden option for preventing or minimizing the incidence of recurrence, but the question is where surgeons should place the mesh or onlay.

**Objective:** To compare the onlay versus sublay technique for ventral hernia in terms of performance and outcome.

**Methodology:** Prospective study (120) of patients undergoing ventral hernia repair. We collect our cases for three years from (May 1, 2017 to May 2020) and will continue until (January 2022). Sixty patients were treated with onlay mesh repair (group A) and 60 patients were treated with underlay mesh repair (group B). Data collected in both groups were performed with respect to operative time, placement, and time required for drain removal, wound infection, and recurrence rate. Follow-up was performed every three months for 24 months. Data were analyzed using SPSS version 18, Fisher's exact test as appropriate; a p-value less than 0.05 was considered statistically significant.

**Results:** In the sublay group, seroma formation was found in two patients (3.33%), while in 12 (20%) in the onlay group. Wound infection was found in one patient (1.66%) in the sublay group and 6 (10%) in the onlay group. no septic mesh was removed in the sublayer group, one mesh was removed in the onlay type. In the onlay group, recurrence was found in 4 patients (6.66%), while no recurrence occurred in the sublay group. Conclusion: Sublay mesh hernioplasty is a better alternative to onlay mesh hernioplasty for all forms of ventral hernias.

**Keywords:** Sublay, onlay, mesh repair, ventral hernia

### Introduction

Ventral hernia: A ventral hernia is defined by a protrusion through the anterior fascia of the abdominal wall. These defects can be categorized as spontaneous, congenital or acquired or according to their location on the abdominal wall up to epigastric hernias occur from the xiphoid process to the umbilicus, umbilical hernias occur at the umbilicus, paraumbilical and hypogastric hernias are the least common spontaneous hernias that occur below navel in midline. Acquired hernias typically appear after surgical incisions and are therefore called incisional hernias.

### Etiology

The formation of ventral hernias is a multifactorial and complex process. Three types of ventral hernias are recognized: spontaneous, congenital and incisional hernias. In 90% of patients, this is an acquired defect, which is a direct consequence of increased abdominal pressure. A number of patient-related factors can lead to ventral hernias, including obesity, older age, male gender, sleep apnea, emphysema and other chronic lung conditions, abdominal distention, steroids, etc. Incisional hernias are unique in that they are the only abdominal wall hernias that are considered iatrogenic. Studies have shown that transverse incisions are associated with a reduced incidence of incisional hernia compared with midline vertical laparotomies.

### Diagnosis

Evaluation of an abdominal wall hernia requires a careful physical examination.

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As with the inguinal region, the anterior abdominal wall is assessed with the patient standing and supine, and the Valsalva maneuver is also useful to demonstrate the location and size of the hernia. Imaging modalities may play a greater role in the diagnosis of more unusual abdominal wall hernias.

### Classification

Ventral hernias are divided into: umbilical, paraumbilical, epigastric and incisional for many years, repair of ventral hernias was associated with a high rate of recurrence. In recent years, the introduction of synthetic prosthetic materials has provided the opportunity to perform a tension-free repair, reducing the recurrence rate.

### Indication

1. Pain and discomfort.
2. History of recurrent attacks of subacute obstruction, incarceration, irreducibility.
3. For cosmetic reasons for a large and unsightly hernia.

Several procedures have been described for hernia repair and hernioplasty, with tension-free mesh placement widely practiced in surgery.

- (1) Ventral hernia repair is among the most commonly performed surgical operations in the world and the two operative techniques most commonly used in ventral hernia

cases. Are onlay and sublay repairs.

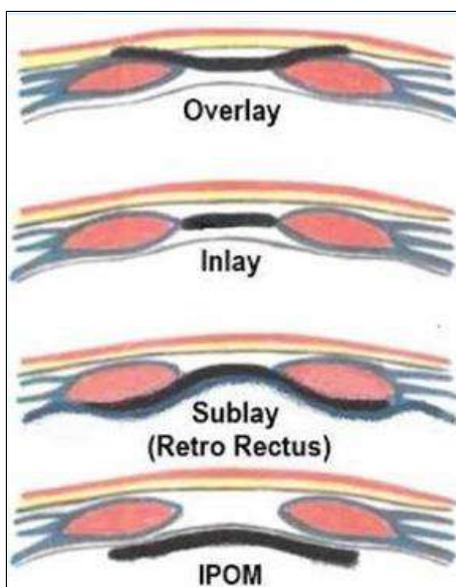
- (2) However, it remains uncertain which repair technique has proven more successful.
- (3) Initially, high-density mesh was introduced only in Mesh hernioplasty techniques. This is followed by the introduction of the mesh in the supine position, which does not require sewing the mesh at the edges of the defect.
- (4) Mesh placement in open ventral hernia there are many options for mesh placement in ventral hernias as shown in Figure (1).

An overlay-only repair places the mesh over the anterior fascia, which typically involves flap dissection and primary closure of the fascia beneath the mesh.

Inlay repair places the mesh into the hernia defect and secures the mesh around the perimeter to the edges of the fascia.

Underlay repair refers to retrorectal or preperitoneal mesh placement. It is also commonly referred to as Rives-Stoppa or retro-muscular repair.

IPOM repair means placement of mesh in an intraperitoneal position and attachment to the anterior abdominal wall<sup>[5]</sup>. In the laparoscopic literature, IPOM refers to placement of intraperitoneal mesh. Holihan conducted an exhaustive meta-analysis of 21 available studies with nearly 6,000 patients comparing the various mesh positions mentioned above.



**Fig 1:** (A, B) Show: options for mesh positions in ventral hernias

### Aim of the study

To compare onlay versus sublay technique in ventral hernia repair procedure and outcome.

### Patients and Methods

This prospective comparative study was conducted on 120 abdominal hernia patients admitted to General Surgical from (May 1, 2017 to May 1, 2020) excluding emergency surgery patients and patients without follow-up. In our study, 60 cases of ventral hernias were treated with onlay (group A) mesh and 60 cases of ventral hernias were treated with sublay (group B).

A (we used polypropylene mesh) in two groups, and choose the weathering onlay and sublay technique according to the surgeon's preference and experience. Follow-up of both groups was achieved by checking the following parameters: - operative time, location of the drain, which is applied subcutaneously,

wound complications and recurrence rate.

### Inclusion criteria

All patients of both sexes and with the following are included in the study:

1. Incisional hernias after laparotomy and recurrent hernias.
2. Primary hernias (umbilical, paraumbilical or epigastric) that were diagnosed on clinical examination and confirmed by U/S.

### Exclusion criteria

#### We exclude from our study

1. Morbidly obese patients with BMI > 40 kg/m<sup>2</sup>
2. Patients with diabetes mellitus.
3. Patients with abdominal malignancy and cirrhosis with end-stage liver disease.

4. All patients with chronic obstructive pulmonary disease (COPD), such as asthma.
5. Patients with obstructive uropathy such as benign prostatic hypertrophy (BPH).
6. Patients presented as urgent as strangulated hernia with signs of obstruction (abdominal distension, vomiting and absolute constipation) and those who were not followed up.
7. Pre-existing skin infection at the site of the hernia with local signs of inflammation (redness, heat and tenderness).

**Operating technique**

**A/ Lower mesh repair:**-The principles of retrorectal or substratum mesh repair involved two main steps; which is placing the mesh deep to the rectus muscles and extending the mesh far beyond the hernia defect. The medial border of each rectus muscle was identified by palpation, and the extreme medial border of each rectus sheath was incised along its length to enter the submuscular space. This relatively bloodless plane may have been created at the lateral edges of the rectus muscle on each side. Primary "peritoneal" closure was obtained using a posterior straight sheath above the arcuate line, the peritoneum itself, or an excess pouch below the arcuate line. The posterior rectus sheath together with the peritoneum is closed with zero proline suture. The mesh was then formed far beyond the area around the defect (about at least 5 cm). The center of the mesh was sutured to prevent malposition of the mesh, and the edges of the mesh can be attached to the posterior rectus sheath with multiple sutures. Abdominal organs are isolated from injury by a mesh layer of the posterior rectus capsule and peritoneum. This prevents adhesion to the ligament. The edges of the muscle sheath were sutured over the mesh with a non-absorbable nylon suture [13-14].

**B/ onlay mesh repair**

An onlay repair was performed through a skin incision over the bulge or defect. Using blunt dissection, both the direct capsule and the defect containing the contents of the hernia were identified. The hernial sac was clearly dissected and the contents removed, and the edges of the defect were held with Kocher forceps. The sac was treated and its contents were reduced to the abdominal cavity. The defect in the linea Alba was closed with a non-absorbable suture, and a proline mesh of adequate size was placed on the rectal sheath and fixed with sutures.

ROMVAC suction drains were placed in all cases of the two groups with a mean duration of 5 days and 7 days for sublay and onlay, respectively, and removed when drainage was less than 20 ml per 24 hours.

All operations were performed under general anesthesia, and all patients were given 1 g of a 3rd generation cephalosporin antibiotic preoperatively at the time of induction and continued until the 2<sup>nd</sup> postoperative day (1 g) daily. The rationale for using a 3rd generation cephalosporin was to provide prophylactic coverage for both gram-positive and gram-negative organisms.

**Statistical analysis**

1. Statistical software was used for data collection and analysis, namely the statistical package for social sciences SPSS version 18. Fishers exact test,  $p < 0.05$ , was considered statistically significant.
2. Each entry was double checked to avoid any possible error.
3. Graphs and tables were drawn to summarize and present the result.

**Result**

A total of 120 patients with ventral hernia were treated with sublay mesh and onlay mesh repair. The youngest patient was 20 years old and the oldest 78 years old, the average age of the patients was 48+5 years. By gender, the majority of patients were female 90 patients representing (75%) and male were 30 patients representing (25%). According to age Most patients were between (51-60) years (40) patients, which represents (33.33%) of all monitored patients. The second age group was (41-50) years, which accounted for 25% of the patients (i.e., about 58% or more than half of the patients aged (40-60) years, as shown in Table (1).

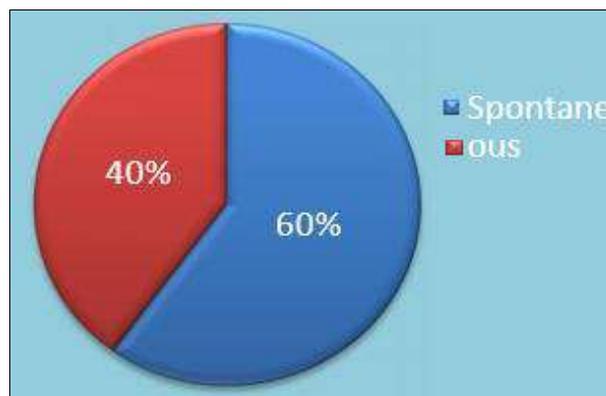
**Table 1:** Age and gender distribution

Age	Male No. 30	Female No. 90	Total	Percent
20-30	4	5	9	7.5%
31-40	8	12	20	16.66%
41-50	6	24	30	25%
51-60	8	32	40	33.33%
61-70	3	12	15	12.5%
71-80	1	5	6	5%
Total	30	90	120	100%

In our study most of hernias repaired were of a spontaneous type (60%) while that of incisional type where less and represent (40%) as noticed in Table (2) and Fig (2).

**Table 2:** Type of hernia

Type of hernia	Number of patients	Percentage
Spontaneous	72	60%
Incisional	48	40%
Total	120	100%



**Fig 2:** Type of hernia

Seroma formations was noticed in 2 patients (3.33%) in sublay group While 12 patients (20%) of onlay group had same complication.

Wound infection was observed in one patient (1.66%) in the sublay technique group, while in the onlay group [6] patients (10%). No septic mesh was removed in the bed group, while a patient (1.66%) from the second group suffered from a mesh infection and required removal.

Wound margin necrosis occurred in one patient (1.66%) after onlay repair, which was managed by excision of the necrotic margin and primary suture, and no case of flap margin necrosis occurred in the underlying group. Paralytic ileus as a complication was observed equally in both studied groups. Which was one patient (1.66%) in each group.

In terms of recurrence at follow-up in one year of traction in the sublay group, there was no recurrence of 0%, while in the onlay

group, the recurrence rate was 4 patients (6.66%). Tests of significance were evaluated using the p-value and we found it to be statistically significant for 3 outcomes that are still major problems in the surgical management of hernias, which were:

1. Seroma

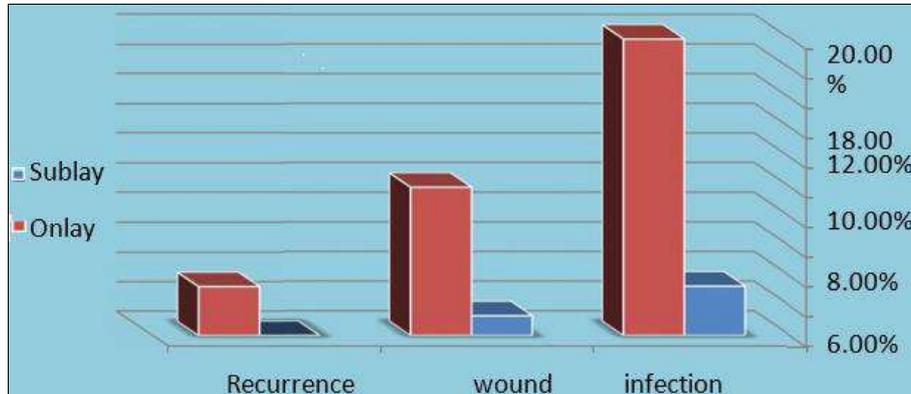
2. Wound infection

3. Repetition rate

Otherwise, there are no significant differences (statistically) in other studied variables as shown in Table (3), Figure (3).

**Table 3:** Post-operative complications

Postoperative complication	Sublay group N=60	Onlay group N=60	p-value
Seroma	2(3.33%)	12 (20%)	<0.05
Wound infection	1 (1.33%)	6 (10%)	<0.05
Mesh removal	0 (0%)	1 (2.38%)	1.000
Recurrence	0 (0%)	4 (3.33%)	<0.05
Flap necrosis	0 (0%)	1 (2.38%)	1.000
Paralytic ileus	1(1.33%)	1(3.33%)	1,000



**Fig 3:** Post-operative complications

Mean duration of surgery and time of drain removal:

In sublay group the time was (68-112) minutes mean time 72+\_10 minutes and drain require (3-8) days for drain removal with an average 5+\_2 days postoperatively.

2. In onlay group the time of surgery was (50- 80) mean time 64+\_8 minutes and drain requires (5-14) days for drain removal with an average 7+\_3 days postoperatively.

Average duration of surgery and drain removal time:

In the support group, the time was (68-112) minutes mean time 72+\_10 minutes and drainage required (3-8) days to remove the drain with a mean of 5+\_2 days after surgery.

2. In the onlay group, the operative time (50-80) averaged 64+\_8 minutes and drainage required (5-14) days to remove the drain with an average of 7+\_3 days after surgery.

**Discussion**

Ventral Abdominal wall hernia are a common surgical problem encountered in clinical practice. The outcome of the surgery is based not only on the technique used but on the experience of the operator, meticulous dissection, tension free repair etc. (26) many methods are available to deal with these hernias. Common practiced techniques for hernia repair use mesh, which is placed either in a sublay or onlay position.

Wound infection was 1(1.66%) & 6(10%) in sublay and onlay respectively. These patients were treated with appropriate antibiotics and regular dressing. Patients required removal of mesh was 1(1.66%) in onlay group because the infection was deep and not responding well to antibiotics while there is no mesh removed in sublay group. Furat Shani found seroma 12% & 1% in onlay and sublay respectively, Aly Saber found seroma 6% & 2% in onlay and sublay respectively and Kharde K *et al.*, in his study found seroma 16% & 12% in onlay and sublay respectively.

No recurrence of hernia was noticed in sublay mesh repair in our study where as in the onlay group recurrence occurred in 4 (6.66%) cases ( $p < 0.05$ ).

Aly Saber found a recurrence rate to be 8% in onlay and 3% in sublay mesh repair. Furat Shani found a recurrence rate to be 1% in onlay and no recurrence in sublay mesh repairs and Kharde K *et al.*, in his study found recurrence rate to be 4% in onlay and no recurrence in sublay mesh repair.

**Table 5:** comparison with other study

	Kharde K		Furat Shani		Aly Saber		Our study	
	Olay	Sublay	Olay	Sublay	Olay	Sublay	Olay	Sublay
No. of patient	25	25	52	50	100	100	60	60
Time of operation	(69.8) min	(77.8) min	(64) min	(88) min	(67.5) min	(100) min	(64) min	(72) min
Seroma	16%	12%	12%	1%	6%	2%	20%	3.33%
Wound infection	4%	0%	2%	1%	8%	4%	10%	1.66%
Recurrence	4%	0%	1%	0%	8%	3%	6.66%	0%

**Conclusion and Recommendations**

**Conclusion**

With the patient’s data collected from our study, it is suggested that:

1. Sublay mesh hernioplasty is a better alternative to only mesh hernioplasty for all forms of ventral hernia cases.
2. Complications with sublay mesh hernioplasty were lower than when compared to onlay (better outcome), such as with regards to recurrence rates, wound infection, drainage time, and seroma formation.

**Recommendations**

1. Because of low complications regarding infection, seroma formation and low recurrence rate in sublay mesh repair during 2 years follow up in which most of recurrence will

happen, we encourage using this method for repair of ventral hernias.

2. We recommend increasing the number of the study group and prolongation of follow up time to have much more solid results.

#### Conflict of Interest

Not available

#### Financial Support

Not available

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