

## Sublay hernioplasty versus onlay hernioplasty in incisional hernia: A comparative study

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### Abstract

**Objective:** This study aims to compare the results of sublay hernioplasty and onlay mesh hernioplasty in incisional hernia repair in patients.

**Introduction:** Incisional hernia is a common complication in patients undergoing surgeries of abdomen. A wide range of careful procedures have been created, running from stitching strategies to different kinds of prosthetic work fix and different options available for mesh repair which are onlay, inlay and sublay.

**Materials and Methods:** A retrospective study was carried out on 100 patients who underwent incisional hernia repair with sublay hernioplasty or onlay hernioplasty between July 2016 and June 2020 in District Head Quarter (DHQ), Teaching Hospital, Gujranwala. The patients were divided into two equal groups (groups A and B). Patients in group-A were treated with sublay repair, whereas patients in group-B were treated with onlay repair. All patients underwent a pre-operative assessment and post-operative follow-up. Outpatient clinical notes, discharge summary, operative notes, and laboratory data were reviewed.

**Results:** Sublay hernioplasty end up being better option than onlay hernioplasty. There was a statistically significant difference between the two groups regarding post-operative wound infection, seroma and hematoma. There was statistically significant difference between two groups as regards post-operative recurrence.

**Conclusion:** Sublay mesh repair showed excellent short-term results, with minimal morbidity. It resulted in fewer post-operative complications and no recurrence. Compared with the onlay technique (in the literature) sublay mesh repair is a gold standard treatment for incisional hernia repair.

**Keywords:** Incisional hernia, mesh repair, sublay mesh repair

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### Introduction:

Incisional hernias are ventral hernias that occur through an operation occur in 2–11% of laparotomies.<sup>1</sup> Incisional hernias enlarge over time and might produce to such complications as pain, discomfort, bowel obstruction, incarceration, and strangulation. Furthermore, incisional hernias reduce the standard of life and also the chances for employment. Improvement within the quality of life is that the major reason for seeking surgical care.<sup>2</sup> Incisional hernia surgery continues to be a challenge for the overall surgeon. Repair of those hernias comes with a high

recurrence rate, high morbidity, and thus high costs. Common complications are reherniation, seroma formation, and wound infection.<sup>2</sup> Incisional hernia repair can be done by either an laparoscopic or a open technique. The open technique may be an easy herniorrhaphy (Mayo duplication or fascia adaptation), a components separation technique or Hernioplasty. Laparoscopic correction is usually performed with a mesh. The recurrence rate for suture repair is almost as high as 54%, and for open mesh hernioplasty up to 32%.<sup>3</sup> The rate of recurrence for open repair appears to be a bit higher than that

of the laparoscopic mesh procedure, but with a shorter hospital stay.<sup>4</sup> The onlay mesh repair is that the placement of prosthetic mesh between the subcutaneous tissues of the paries and also the anterior rectus sheath and therefore the sublay mesh repair is that the space created between the rectus muscle and posterior rectus sheath. The latter technique has several advantages, one in every of which is that it doesn't transmit the infection from subcutaneous tissues to the mesh because it lies quite deep within the preperitoneal plane.<sup>5</sup> Many surgeons consider the sublay mesh hernioplasty as gold standard for the open abdominal incisional hernias repair.<sup>6</sup>

#### Material and Methods:

A retrospective study was conducted on 100 patients who underwent incisional hernia repair with sublay hernioplasty or onlay hernioplasty between January 2017 and February 2020 in DHQ/Teaching Hospital Gujranwala in surgical unit 2. Two groups were made (groups 1 and 2). Patients in group 1 were treated with sublay mesh hernioplasty, whereas patients in group 2 were treated with onlay mesh hernioplasty. All patients were subjected to preoperative assessment and postoperative follow-up. Outpatient clinical notes, discharge summary, operative notes, and laboratory data were reviewed.

Investigations: Each patient underwent the following evaluations: (1) Complete blood picture, (2) Liver function tests, (3) Fasting and post-prandial blood glucose, (4) Renal Function tests, (5) Radiograph of the chest and of abdomen in erect and supine positions if there was obstruction, (6) Abdominal ultrasound, (7) ECG.

Pre-operative preparation: (1) Patients who had hypertension, diabetes mellitus, or cough were controlled pre-operatively. (2) The night before surgery nil orally was advised and enema was advised once at night and once in the morning. (3) A nasogastric tube and Foley catheter were inserted at the start of the procedure. (4) Patients were explained about the effects and complications of the procedure. (5) A broad-spectrum antibiotic was given to all patients before the

procedure. (6) The anesthetist was informed that if patient is diabetic. (7) Diabetic patients should be placed first in the morning operating list to ensure timings as predictable as possible for blood sugar management.

Operative methods: The operations were performed under general Anesthesia and old scar was excised, and the hernial sac and defect were exposed adequately. The sac was opened and the content was reduced after adhenolysis. The excess sac was excised. In onlay repair, the hernia defect was closed primarily with an interrupted or running continuous nonabsorbable suture. After that, the mesh was cut to a diameter 10 cm greater than the defect and fixed to the fascia with two concentric rings of interrupted 2/0 polypropylene sutures. A suction drain was used and the skin was closed.

In sublay repair, the preperitoneal, retromuscular space was dissected about 5–6 cm beyond the edge of the defect where the mesh was positioned and fixed by 2/0 polypropylene sutures. The muscular aponeurotic structures were repaired with prolene no. 1, followed by skin closure (Figs. 2 and 3). In all patients a polypropylene mesh was used. No major postoperative bleeding occurred in any patient and there was no incidence of perioperative mortality.

Post-operative management: All patients have NPO until bowel sounds positive and then oral sips allowed and semisolids next day.

They received post-operative analgesia on the first and second post-operative days with Ketolorac 30mg OD and Paracetamol 1g Iv TDS. Antibiotics were given as per ward policy. Chest physiotherapy and nebulization were started once the patient completely out from anesthesia effect and mobilization started. Skin sutures were removed on normally 10th post operative day and was advised not to hold heavy weight and to use abdominal belt. Each patient assessed for any post-operative complication and asked for follow up first fortnightly for 1 month then monthly for 12 month and then yearly.

Table 1:

	Mean	Count
Age in years of Sublay Mesh Hernioplasty	40	
Sex of Sublay Mesh Hernioplasty		
Male		12
Female		38
Infection in Sublay Mesh Hernioplasty		
Yes		04
No		46
Sinus formation in Sublay Mesh Hernioplasty		
Yes		0
No		50
Hematoma formation in Sublay Mesh Hernioplasty		
Yes		02
No		48
DVT formation in Sublay Mesh Hernioplasty		
Yes		1
No		49
Removal of Mesh in Sublay Mesh Hernioplasty		
Yes		0
No		50
Recurrence in Sublay Mesh Hernioplasty		
Yes		0
No		50
Cosmetic results in Sublay Mesh Hernioplasty		
Very bad		02
Bad		09
Good		18
Excellent		21
Seroma in Sublay Mesh Hernioplasty		
Yes		07
No		43
Patient Satisfaction in Sublay Mesh Hernioplasty		
Yes		44
No		06

### Results

Both the table 1 and table 2 showing no difference in age and sex but there is difference in complications and patient satisfaction which shows increase in infection rate 8% in sublay as compare to 16% in onlay hernioplasty. No case of sinus formation seen in sublay but 8% seen in onlay. Hematoma formation occur in 4% patients of sublay as compare to 6% in onlay mesh hernioplasty. 2% cases of DVT seen but no any patient need removal of mesh and no recurrence

seen with better cosmetic result and better patient satisfaction in sublay mesh hernioplasty as compare to DVT seen in 4% cases recurrence seen 6% and removal of mesh seen in 8% cases with less patient satisfaction and not very good cosmetic results seen in onlay mesh hernioplasty.

### Discussion:

Incisional hernia define as a diffuse protrusion of the peritoneum and abdominal contents through a previous weak scar after an operation or accidental wound. Incisional hernia is reported in 10-15% of laparotomy incisions and 1-5% of laparoscopic port-site incisions.<sup>7</sup> But mainly it occurs in 2/3rd of patients within the first 5 years and that at least another third appear 5–10 years after the operation. The incidence of incisional hernia more in female patients, in the obese, and in the older age group. Small hernias less than 2cm in diameter are often closed with primary tissue repairs with great success. However, larger hernias have a high recurrence rate of up to 30–50% when a tissue repair alone is performed. Hernia recurrence is very annoying to patients as well as for surgeons. The mesh fixation technique became the gold standard procedure for incisional hernia in late 90's.<sup>8</sup> The golden rules before the placement of mesh were the rigorous aseptic technique, repair of the whole previous surgical scar, repair must be tension-free, sutures should be 1 cm deep and 1 cm apart and suture length vs wound length must be 4:1 (Jenkin's rule). The mesh must be large enough to ensure a 5 cm overlap of the underlying fascial defect in all directions. The judicious use of antibiotics is mandatory for prophylaxis of infection.<sup>9</sup> Although mesh repair has excellent results but still limitations are there due to increased risk of infection with placement of a foreign body and high cost still exist.<sup>10</sup> There is higher rate of recurrence in patient undergoing primary tissue repair. Strict restriction to observe the principles of incisional hernia repair lessen the postoperative complication and reduces the recurrence rate.<sup>11</sup>

Serious complications following ventral and incisional hernia repair are rare. It is pertinent

Table 2:

	Mean	Count
Age in years of Onlay Mesh Hernioplasty	40	
Sex of Onlay Mesh Hernioplasty		
Male		14
Female		36
Infection in Onlay Mesh Hernioplasty		
Yes		08
No		42
Sinus formation in Onlay Mesh Hernioplasty		
Yes		02
No		48
Hematoma formation in Onlay Mesh Hernioplasty		
Yes		03
No		47
DVT formation in Onlay Mesh Hernioplasty		
Yes		02
No		48
Removal of Mesh in Onlay Mesh Hernioplasty		
Yes		04
No		46
Recurrence in Onlay Mesh Hernioplasty		
Yes		03
No		47
Cosmetic results in Onlay Mesh Hernioplasty		
Very bad		04
Bad		16
Good		22
Excellent		08
Seroma in Onlay Mesh Hernioplasty		
Yes		19
No		31
Patient satisfaction in Onlay Mesh Hernioplasty		
Yes		36
No		14

to know the detailed medical history especially about the presence of chronic cough, constipation and urinary retention.<sup>12</sup>

Mesh hernia repair is an excellent mode of repair for patients with large defects specially more than 4cm of the anterior abdominal wall. Although polypropylene mesh has long been regarded as the implant of choice for repairing abdominal wall defects, there is still controversy regarding the best site of its placement.<sup>13</sup> They

include onlay repair in which mesh is placed in the subcutaneous plane above the anterior rectus sheath or external oblique; inlay repair in which mesh is sutured to the hernial neck; sublay repair in which mesh is placed in the retromuscular layer above the posterior rectus sheath, preperitoneal repair in which mesh is placed between the peritoneum and posterior rectus sheath and intraperitoneal repair in which mesh is placed from inside the peritoneal cavity and fixed to anterior abdominal wall.<sup>14</sup> An excellent method is preperitoneal. As compared to simple open repair, sublay mesh hernioplasty is technically demanding. This technique of submuscular approach can be used to repair hernias with subcostal, gridiron, and Pfannenstiel incisions. This placement of the mesh in this plane has both the mechanical and physiologic advantages. The pressure in the abdomen pushes the mesh forcefully against the abdominal wall. A large overlap gives a sufficient area for growth of tissue and strong fixation, providing firm reattachment for the lateral abdominal muscles. If the anterior sheath can be closed, the mesh is also separated from the subcutaneous tissues.<sup>6</sup> The main advantages of preperitoneal mesh repair are as follows: less chance of mesh infection and erosion through the skin because the graft lies in the preperitoneal plane between the posterior rectus sheath and the peritoneum; avoidance of adhesions, bowel obstruction, enterocutaneous fistula, and erosion of the mesh; and minimal morbidity. The main disadvantages are that the procedure is more time consuming and requires extensive preparation of the preperitoneal plane and surgical experience.<sup>4</sup> In contrast to sublay the onlay mesh hernioplasty is not mechanically as good as the intraabdominal pressure forces the mesh away from the repair. As compared to sublay onlay mesh repair need extensive tissue dissection, which causes an increase risk of seroma, hematoma formation and infection; it is also associated with a higher incidence of local wound problems, although by expertise it was concluded that it is technically simpler than sublay repair and could be carried out by surgical residents.<sup>3</sup> Prevention of wound infection is therefore a main objective

in all abdominal operations. Other associated risk factors in the presents is the obesity in nine patients (30%) and chronic obstructive pulmonary disease in six patients (20%). In a similar international study conducted by Hamy et al, the complication rates from onlay hernioplasty were as follows: 25% for wound infection, 5.7% for flap necrosis, 30% for seroma, 3% for mesh infection, and 10% for recurrence. In the present study the corresponding results were as follows: 40% for wound infection, 6.7% for flap necrosis, 40% for seroma, 6.7% for mesh infection, and 13.3% for recurrence. For sublay hernioplasty the complication rates in the international study by De Vries Reilingh et al. were as follows: 7% for wound infection, 30% for seroma, and 7% for recurrence. In the study by Kumar et al., the recurrence rate was 10.8% in onlay mesh repair, while 9% in sublay group in reported patients.<sup>15</sup> Shaheryar et al. found a recurrence rate in onlay repair was 8%, while in sublay repair was 3%.<sup>16</sup> Memon et al. concluded that sub-lay mesh technique is a gold standard technique for ventral abdominal wall hernias.<sup>17</sup>

In a study by Saber et al., seroma formation after suction drain removal was observed in 6% patients in onlay mesh repair and in 2% in sublay mesh repair. Purulent wound infection was observed in 8% onlay repair, while 4% patients in sublay repair.<sup>18</sup> The study by Kumar et al. revealed that the wound infection was more in onlay (13.33%) compared to underlay repair (11.11%).<sup>15</sup> Shahryar et al. reported 17% and 8% infection rate in onlay and sublay mesh repair, respectively.<sup>16</sup> In a study by Ibrahim et al., mean duration of hospital stay in the onlay group ranged from 3 to 9 ( $4.63 \pm 0.35$ ) days, whereas it was 1-4 ( $2.62 \pm 0.74$ ) days in the sublay group ( $p=0.063$ ).<sup>19</sup>

Our study gave the following results for complications from sublay hernioplasty: Infection 8%, sinus formation none, hematoma 4%, seroma 14% with no recurrence; as compare to onlay where infection 16%, sinus formation 4%, hematoma 6%, seroma 38% with recurrence 6%.

Memon et al. concluded that sub-lay mesh tech-

nique is a gold standard technique for ventral abdominal wall hernias.<sup>20</sup>

#### **Conclusion:**

Sublay mesh repair showed excellent short-term results, with minimal morbidity. It resulted in fewer post-operative complications and no recurrence. Compared with the onlay technique (in the literature) sublay mesh repair is a gold standard treatment for incisional hernia repair. But this is true when done by experienced surgeon and patient selection is also important.

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#### **Role and contribution of authors:**

Farhan Tahir, collected the data, references and did the initial writeup.

Abdul Rehman Alvi, critically review the article and made useful changes.

Amin Warraich, collected the referencess and helped in introduction writing.

Mobeen Adnan, collected the references and helped in discussion writing.

Azam, critically review the article and made the final changes

Gull Rukh Khawar, collected the data, references and helped in introduction writing.

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