

# Outcome of Open Intraperitoneal Dual Mesh Versus on-Lay Mesh for Incisional Hernia Repair

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## Abstract

**Background :** incisional hernia is any abdominal wall gap with or without a bulge in the area of a postoperative scar. There are different methods for treating incisional hernia . Mesh is always used to decrease the recurrence rate to less than 10%. Different types and different methods of mesh hernioplasty.

**Objective :** to compare the outcome of open intraperitoneal mesh versus on-lay mesh hernioplasty.

**Method :** this prospective study conducted in Al- Fayhaa Teaching hospital between February 2016 and February 2018. The patients with incisional hernia are divided into two groups . Group A treated by open intraperitoneal optimized composite mesh, and group B managed by on-lay mesh .the patients followed for 24 months following surgery to compare between the two groups regarding , operative time , hospital stay and post operative complications.

**Result :** eighty patients included in the study . In group A , the mean operative time was (  $90 \pm 10.24$  minutes) while for group B was (  $70 \pm 17.53$  minutes ). The average hospital stay was (  $3.34 \pm 1.27$  days) and (  $5 \pm 3.73$  days) for group A and group B respectively .seroma developed in 12.5% for intraperitoneal group and 27% for on-lay group. Surgical site infection was 2.5% in group A and 15 % in group B. No patient developed recurrence of hernia in group A , while 7.5 % of group B developed recurrence during the period of follow up.

**Conclusion:** open intraperitoneal mesh hernioplasty is much better than on-lay method regarding the operative time , hospital stay and post operative complications.

**Keywords :** *incisional hernia , intraperitoneal , on-lay , hernioplasty.*

## Introduction

Incisional hernia is any abdominal wall gap with or without a bulge in the area of a postoperative scar <sup>1</sup>. Incisional hernia is common surgical problem and occurs in 2-10% of laparotomies <sup>2</sup> .

The risk factors contributing to the development of incisional hernia include: anaemia, body mass index over  $25 \text{ kg} / \text{m}^2$ , smoking , chronic obstructive pulmonary

disease <sup>(3,4)</sup> , multiple prior procedures , prior incisional hernia and, technical error during repair in addition to wound infection which increases the risk of incisional hernia to 1.9 time <sup>5</sup> . Repair of incisional hernia have always been a challenging procedure for the surgeon because of the distorted anatomy following previous surgery .

There are different methods of treating incisional hernia .Until 1958 , suturing repair was used , but now is not recommended as it has high recurrence rate 31-54 % . For that reason an another method which is prosthetic mesh should always be used ( either open or laparoscopic ) to decrease the recurrence rate to less than 10% <sup>6</sup> . But the mesh has many disadvantages like seroma ,hematoma , infection <sup>7</sup> ,sinuses , adhesions and recurrence of hernia.

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There are different types of meshes like polypropylene (pp), polyester, expanded polytetrafluoroethylene (ePTFE) and combined meshes.

A more recent movement in the design of combined synthetic meshes is to construct a mesh consisting of a polypropylene base coated with absorbable polymers<sup>8</sup>. The main purpose of using combined mesh is to decrease the adhesion between the mesh and the bowel.

In incisional hernia, the mesh should be wide enough to cover the defect in all directions (at least 4 cm wider than the defect) since smaller size may lead to recurrence<sup>9</sup>. The ideal mesh must have good tensile strength, be inert, non-carcinogenic, stable in case of infection and able to develop an inflammatory response and avoid tissue rejection<sup>10</sup>. The mesh is placed in a variety of ways. Techniques of mesh placement include on-lay, intraperitoneal and sandwich. In on-lay technique, the mesh is placed over the external oblique fascia. In the intraperitoneal technique, the mesh is placed intraperitoneally. In sandwich technique, one mesh is placed on-lay and one is placed intraperitoneally. It is known that an ideal mesh to be used inside the peritoneal cavity in contact with the bowel needs to have a high reactivity side to promote tissue growth at the abdominal wall and another side with the capacity to avoid adhesion<sup>11</sup>.

The Parietex composite mesh is made from a composite structure of mono-filament polyester textile on one side and a hydrophilic absorbable collagen film on the other side to decrease the adhesion between the mesh and the bowel.

### **Aim of the Study**

is to compare the outcome of incisional hernia repair between two methods of mesh hernioplasty: open intraperitoneal dual mesh and on-lay mesh repair.

### **Patients and method**

This prospective study was carried out in Al-Fayhaa Teaching Hospital in Basra from February 2016 to February 2018.

Total 80 patients with incisional hernia admitted to the surgical unit as elective cases, divided into 2 groups: group A (n= 40) managed by open intraperitoneal optimized composite mesh (polyester with collagen coated film). The other group is group B (n = 40) managed by on-lay polypropylene mesh. All patients

received the same preoperative antibiotic (ceftriaxone 1 gram intravenously with induction of general anaesthesia and 4000 IU of low molecular weight heparin subcutaneously). Regarding group A the mesh was fixed intraperitoneally by multiple nylon sutures, its collagen side toward the abdominal cavity, while in group B we used (polypropylene) mesh fixed to the anterior rectus sheath. Subcutaneous redivac drain was used for both groups. Post-operative antibiotics were used for 7 days. The patients were followed for 24 months following surgery. In some cases when complications occurred we managed them accordingly. The data were analysed using SPSS statistics software version 23, mean, average and Dunnett multiple comparison test.

### **Inclusion criteria**

1. Midline incisional hernia.
2. The hernial defect less than 10 cm diameter.
3. Body mass index less than 40 kg/m<sup>2</sup>.

### **Exclusion criteria**

1. Emergency surgery (incarcerated hernia).
2. Chronic obstructive pulmonary disease.
3. Immunocompromised patient.
4. Smoker patients.
5. Recurrent incisional hernia.
6. Non midline hernia.

### **Parameters of comparison**

1. Age of the patient.
2. Gender.
3. Duration of surgery.
4. Hospital stay post operation.
5. Drain removal time.
6. Return to the usual activity.
7. Post-operative complications (early and late).

### **Result**

Eighty patients complaining of incisional hernia referred to Al-Fayhaa Teaching Hospital from February

2016 to February 2018 were managed as two groups by using intraperitoneal dual mesh and on- lay mesh.

Regarding the age , patients were divided for five groups as shown in table 1.

**Table 1 : The age distribution of patients in both groups.**

Age (year)	Group A (intraperitoneal)	Group B ( on-lay )
20 _ 29	3	2
30_ 39	15	9
40_ 49	12	14
50 _59	7	10
60 and above	3	5
Total	40	40

**Table 2 : gender distribution in both groups.**

Gender	Group A ( intraperitoneal)	Group B on-lay)
Male	18 ( 45%)	11 ( 27.5%)
Female	22 ( 55% )	29 ( 72.5%)
	40 (100%)	40 ( 100%)

In intraperitoneal mesh group 45% ( n= 18) were male and 55% ( n= 22) were female . On-lay group 72.5% were female. Female forms 63.75% ( n= 51 ) of all patients.

**Table 3 : different parameters for comparison.**

	Group A (Intraperitoneal )	Group B ( on-lay)	P value
Duration of surgery Minute ( mean ± SD)	90 ±10.24	70 ±17.53	P= 0.001
Hospital stay (Average ± SD )	Average 3.34 ± 1.27 days Range 2-6	Average 5 ± 3.73day Range 3-8	P= 0.05
Time of drain removal	7 day	10 day	P= 0.01
Return to usual activity ( median ± SD	28± 4.32 days	50 ± 6.75 days	P= 0.05

In group A ( intraperitoneal mesh ) , the operative time ranged from 60 to 110 minutes with a mean operative time of 90 ± 10.24 minutes , while in group B ( on-lay) the operative time ranged from 50 to 95 minutes with a mean operative time of 70 ± 17.53 minutes ( p= 0.001).

The duration of hospital stay ranged from 2-6 days with an average duration of ( $3.34 \pm 1.27$  days) in intraperitoneal group , while in on-lay group the duration ranged from 3-8 days with average of ( $5 \pm 3.73$  days)  $p= 0.05$ .

**Table 4 : early and late complications in both groups.**

Post operative complications	Group A (Intraperitoneal)	Group B (On-lay )	P value
Early complications			
Seroma	5 ( 12.5 %)	11 ( 27%)	<0.05
Haematoma	1 ( 2.5%)	4 ( 10%)	<0.01
Surgical site infection	1 ( 2.5%)	6 (15%)	<0.001
Late complication (Recurrence)	Zero ( 0%)	3 ( 7.5%)	< 0.05

Early and late complications were listed in table 4 .seroma developed in 12.5% in intraperitoneal group and 27 % in on-lay group (  $p= 0.05$  ). Haematoma developed in 2.5% and 4 % in intraperitoneal and on-lay groups respectively  $p=$  .

Regarding surgical site infection developed 2.5 % of group A and 15% of group B (  $p= 0.001$  ).

Recurrence of the incisional hernia which is the late complication was noted in 3 patients ( 7.5%) in on-lay group , while non of intraperitoneal group developed recurrence during the period of follow up (  $p< 0.05$  ).

### Discussion

Incisional hernia is 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.<sup>12</sup>. Repair of incisional hernia is an ongoing challenge in surgical practice and a wide spectrum of surgical techniques have been developed ranging from direct suture technique to the use of various types of mesh to close the defect and strengthening the musculofascial tissues to avoid recurrence <sup>13</sup>.

When considering the best location for the placement of mesh , a number of features are to be considered. Firstly , technique that avoid the devascularisation of flap will prevent wound complications like infections, flap necrosis, and surgical site infection . Secondly , technical ease and duration of surgery may affect the surgeon's choice <sup>14</sup>.

In our study the mean duration of surgery , in cases underwent intraperitoneal mesh repair was (  $90 \pm 10.24$  minutes), while in cases with on-lay mesh repair was (  $70 \pm 17.53$  min.) the difference is statistically significant(  $p= 0.001$  ) . Other studies showed similar result ( Godara et al. <sup>15</sup> . And Glysteen <sup>16</sup>.)

This difference in time is may be due to more time needed in intraperitoneal method to create wider clear intraperitoneal surface and release the adhesion of previous surgery , while in on-lay method no need for that as the mesh fixed to the anterior rectus sheath. Miller K, et al showed longer time needed for intraperitoneal mesh fixation as compared to on-lay method <sup>17</sup>.

The average duration of hospital stay was  $3.34 \pm 1.27$  days (range 2-6 days )for intraperitoneal group and  $5 \pm 3.73$  days ( range 3-8 days ) for on-lay group (  $p= 0.05$ ). Other study showed average hospital stay 7 days for intraperitoneal group and 9 days for on-lay group <sup>18</sup>.

Regarding post operative complications, seroma developed in 12.5% and 27% in intraperitoneal and on-lay mesh respectively (  $p= 0.05$  ) , Godara et al study shows similar rate of complication <sup>15</sup> . Seroma formed in on-lay more than intraperitoneal technique , may be due to that on-lay technique needs more subcutaneous dissection to place the mesh which leads to devitalized tissue and seroma formation.

Other study by Salamone G, Licari L <sup>19</sup>, showed the similar result of our study.

The difference of heamatoma formation is significant

between both groups, it founds in 2.5% and 10% in intraperitoneal and on-lay mesh respectively ( $p=0.01$ ).

Surgical site infection in intraperitoneal technique was 2.5% while in on-lay technique it was 15% (the difference is statistically significant  $p=0.001$ ). The superficial location of mesh makes it in danger of infection if there is wound infection. This infection treated by antibiotics and wound dressing and no need for mesh removal. This result agreed with many other studies that found on-lay technique is associated with higher rate of wound infection<sup>20,21</sup>.

The recurrence of hernia in our study is 7.5% in on-lay mesh while in intraperitoneal mesh, none of our patients developed recurrence, this result agreed with study done by Vries Reillingh et al. who noticed recurrence of 23% in on-lay technique and no recurrence in intraperitoneal technique<sup>22</sup>. Gleysteen found recurrence rate of 20% and 4% on-lay and intraperitoneal mesh respectively<sup>16</sup>. Other studies showed higher recurrence rate with on-lay mesh as compared with intraperitoneal mesh<sup>13,23,24</sup>. This lower recurrence rate in intraperitoneal mesh may be explained that mesh in this place can not be dislodged or ruptured by increasing intra-abdominal pressure, but instead is fixed in place by the same force that caused the hernia.

### Conclusion

From our study we concluded that the use of intraperitoneal composite mesh is better than on-lay placed mesh regarding the hospital stay and postoperative complications.

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**Conflict of Interest:** Nil

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