

## Original Research Article

# A comparative study of various techniques of incisional hernia repair in a tertiary care center at Bikaner (North-West Rajasthan)

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### ABSTRACT

**Background:** Incisional hernia can be defined as an internal abdominal wall defect that develops after a previously closed laparotomy. Aim of present study was to compare open suture repair and mesh repair (onlay and sublay), various factors predisposing to incisional hernia and evaluate complications following surgery for incisional hernias.

**Methods:** A prospective study was conducted in 60 cases of incisional hernia admitted in Department of General Surgery, PBM Hospital Bikaner between October 2017 to September 2018. 20 cases were selected in each group (open anatomical repair, onlay mesh repair and sublay mesh repair). All cases were followed up for 6 months postoperatively.

**Results:** Incisional hernia was found to occur more often in 41-60 years age group (61.67%) and in females. Wound infection (46.67%) after index surgery was most important risk factor followed by obesity. LSCS (30%) was found to be most common index surgery followed by hysterectomy (28.33%). Seroma was most common postoperative complication (5% patient in anatomical repair group, 30% patients in onlay group and 10% patients in sublay group). Only one recurrence (5%) was observed in anatomical repair group over a period of 6 months follow up.

**Conclusions:** Sublay mesh repair is superior to onlay mesh repair and Anatomical suture repair regarding recurrence rate. Local postoperative complications like seroma formation or wound infection were more common in mesh repair surgery than anatomical repair. Among mesh repair these complications were higher in onlay group than sublay repair.

**Keywords:** Incisional hernia, Anatomical repair, Mesh repair

### INTRODUCTION

Incisional hernia can be defined as an internal abdominal wall defect that develops after a previously closed laparotomy. It commonly develops as a result of disruption of tissue adjacent to the area of abdominal wall incision closure and also due to tension placed on the tissue as a result of suturing. In prospective studies with sufficient follow-up, up to 20% incidences of incisional hernia have been reported after laparotomy.<sup>1</sup> Risk lies between 0.2-2% after laparoscopy.<sup>2</sup> Recent studies have shown about two third of incisional hernia appear within

first five years and at least another third appear 5-10 years after operation.<sup>3</sup> Repair of large abdominal incisional hernias has a recurrence rate of up to 33% after first repair and 44% after second repair – mostly within 3 years of the repair.<sup>2,4</sup> Anemia, diabetes mellitus, alcoholism, obesity have been associated with a high percentage of post-operative hernias. Other patient related risk factors include female gender, older age, abdominal aortic aneurysm, abdominal distension, chronic respiratory disease and jaundice. Index operation related risk factors are type of incision, closure technique, suture material used, emergency surgery, wound failure

including wound infection and dehiscence.<sup>5,6</sup> Apart from discomfort and pain, incisional hernia may lead to serious conditions such as incarceration (6-15%) or strangulation of bowel (2%).<sup>7</sup> If not promptly reduced, these conditions can be fatal.

### **Open suture repair**

It includes simple fascial closure, modified mayo technique, use of internal retention sutures, 'keel' procedures, the nuttall procedure, use of layered steel wire and others.<sup>8,9</sup> Modified mayo technique includes overlapping of fascial edges and use of internal retention sutures.

*Disadvantages:* The common complications after open suture repair are wound related and include wound infection, hematoma, seroma, stitch sinuses and flap necrosis.

### **Open mesh repair**

Those include: inlay where mesh is sutured between the fascial gap; onlay where mesh is placed on top of the fascia; sublay or the Rives-Stoppa technique where mesh is placed anterior to the posterior rectus sheath; or intra-peritoneal underlay.

### **Onlay repair**

Peritoneum is closed after reduction of the viscera.

*Advantages:* The extraperitoneal onlay mesh repair is associated with a lower recurrence rate (10%) (Machairas, Misiakos, Liakakos and Karatzas) However, onlay repair is technically easy to perform.<sup>10</sup>

*Disadvantages:* With onlay repair, skin flaps must be created, which increase the risk of wound complications and mesh infection.

### **Sublay repair**

Sublay repair is often considered more challenging and complex to perform. Dissection of this plane can risk damaging the muscles, blood supply, and nerves to the rectus abdominis. However, this space potentially protects the mesh from both superficial wound complications and intra peritoneal contents. In addition, it also allows for load bearing tissue in growth from two directions.

Complications due to mesh range from mild skin problems such as skin infections, non-healing wounds, and seroma formation to severe chronic pain, life threatening bowel obstruction and chronic fistula development.

The recurrence rate after open suture repair may be as high as 24-54% (Luijendijk et al), and for open mesh

repair, up to 34% (Ludijendijk et al, Paul et al, Burger, Lange, Halm, Kleinrensink and Jeekel).<sup>11,12</sup> In a recent Cochrane review, the authors conclude that mesh repair is superior to suture repair because of its lower recurrence rate (den Hartog, Dur, Tuinebreijer and Kreis).<sup>13</sup>

The current study was carried out to assess the magnitude of this problem, various factors leading to development of this condition and to compare the various techniques of incisional hernia repair in terms of advantages and disadvantages and to find out best repair according to individual patient criteria.

### **Aims and objectives**

- To study comparison between open suture repair and open mesh repair (sublay and onlay) to show superiority of one surgical procedure over the other.
- To review the factors that predispose to incisional hernia in order to facilitate their prevention.
- To evaluate complication following surgery for incisional hernias.

### **METHODS**

The study was conducted as prospective study based on convenience sampling in 60 cases of incisional hernia admitted in Department of General Surgery, PBM Hospital Bikaner between October 2017 to September 2018. The cases were randomly assigned into three groups (A) open anatomical repair group (B) On lay repair group {Mesh placement on the sheath after closing the defect and (C) sublay group {Mesh placement between sheath and peritoneum}. 20 cases were allotted in each group. Observations were made with regards duration and ease of operation, wound complications, mesh infections, hospital stay, morbidity and recurrence and to determine whether this influence short/long term complication after repair of incisional hernia.

### **Inclusion criteria**

All patients with incisional hernia between age 15 years to 65 years.

### **Exclusion criteria**

Exclusion criteria were patients with obstructed or strangulated incisional hernia, intra-abdominal malignancies, pregnant women with incisional hernia and recurrent incisional hernia were excluded from study.

Patients were advised to follow up post operatively on 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> month.

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean±SD (min-max) and results on categorical measurements are presented in number (%). Anova test and chi-square tests have been used to find

the significance of study parameters on categorical scale between two or more groups.

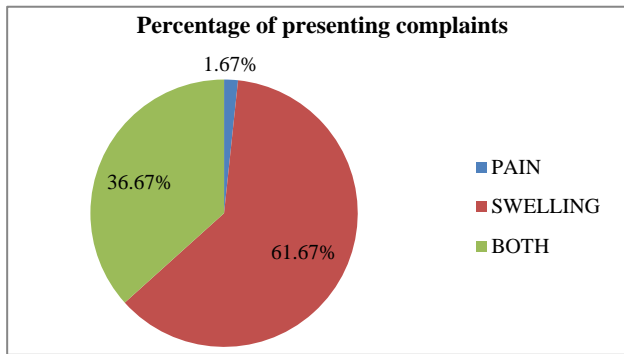
**RESULTS**

Maximum numbers of cases (41.67%) were in age group of 51-60 years followed by 41-50 years age group (31.67%). Mean age group in our study was 47.06±8.54 years. Majority of the patients (70%) in our study were females while only 30% were males. This may be due to multiple deliveries in female makes the abdominal wall weaken and prone for herniation.

**Table 1: Distribution of cases according to risk factors.**

S.no	Risk factors	Number	Percentage (%)
1	Chronic cough	11	18.33
2	Wound infection	28	46.67
3	Smoking	16	26.67
4	Diabetes	6	10
5	Constipation	7	11.67
6	Alcoholic	7	11.67
7	Obesity	16	26.67

The most common risk factor was wound infection in previous surgery which was observed in 46.67% of the patients followed by smoking and obesity seen in 26.67% of the cases each. Alcoholism and constipation were observed in 11.67% of the cases each.

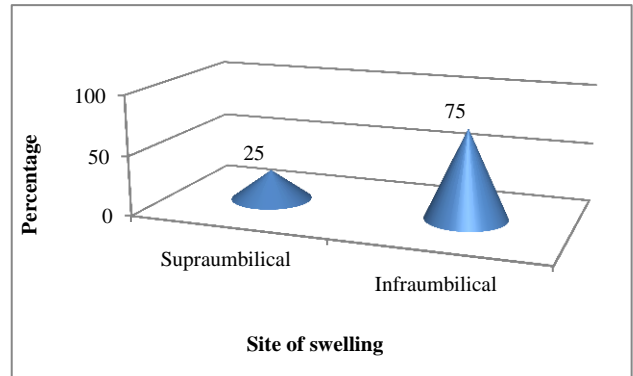


**Figure 1: Distribution according to clinical presentation.**

Majority of the patients 61.67% had swelling as the main presenting complaint followed by both swelling and pain in 36.67% of the patients. Pain alone as presenting symptom without swelling was observed in only one patient (1.67%).

Maximum numbers of swelling 75% were infraumbilical while only 25% of incisional hernias were supraumbilical. This may be because of the following features: Intraabdominal hydrostatic pressure is higher in lower abdomen compared to upper abdomen in erect position i.e., 20 cm of water and 8 cm of water respectively; absence of posterior rectus sheath below

arcuate line; infraumbilical midline incision is used commonly in gynaecological surgeries; the infraumbilical part has a relatively poor abdominal wall musculature.

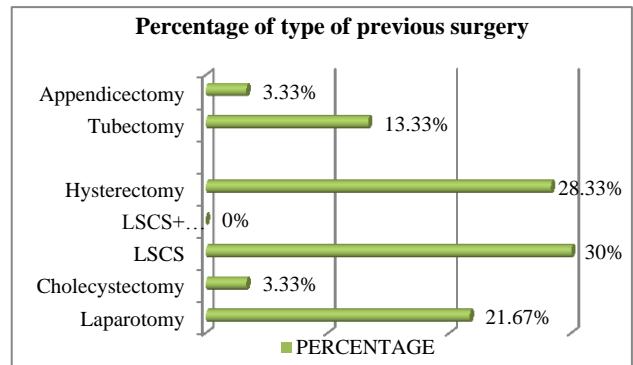


**Figure 2: Distribution of the cases according to the position of the swelling.**

**Table 2: Time of onset of incisional hernia after previous surgery.**

S.no	Time of onset (years)	Number	Percentage (%)
1	<1	22	36.67
2	1-5	17	28.33
3	5-10	11	18.33
4	>10	10	16.67
Total		60	100

Maximum number of incisional hernia (36.67%) occurred within one year of previous surgery. 28.33% of cases happened in 1-5 years of previous surgery while 18.33% appeared in 5-10 years. Only 16.67% cases of incisional hernia occurred after 10 years of previous surgery.



**Figure 3: Distribution according to type of previous surgery.**

The most common surgery observed was LSCS in 30% patients followed by hysterectomy seen in 28.33% patients. Laparotomy was observed in 21.67% cases while tubectomy was noticed in 13.33% cases. Appendectomy and cholecystectomy were the least common previous surgery preceding incisional hernias which were observed only in 3.33% patients each.

**Table 3: Distribution of cases according to previous incision type.**

Site	Type of incisions	Number	Percentage (%)
<b>Upper</b>	Midline	10	16.67
	Right paramedian	1	1.67
	Right subcostal	2	3.33
<b>Lower</b>	Midline	41	68.33
	Pfannensteil	4	6.67
	RIF	2	3.33

The most common incision observed was midline and infraumbilical in 68.33% of cases while 16.67% cases had supraumbilical midline incision. The other lesser common incision found were right subcostal, Mc Burney's incision (RIF) observed in 3.33% of cases. Pfannensteil incision was noticed in 6.67% of cases while only one case (1.67%) had right paramedian incision.

The muscle tone was good in 78.33% of cases while 21.67% had poor muscle tone.

Maximum number of cases 88.33% had defect size of lesser than 5cms while 8.33% had defect size of 5-10 cms. Only 3.33% cases had defect size of greater than 10 cms.

**Table 4: Distribution of cases according to duration of surgery (in minutes).**

S.no	Duration of surgery	Group A		Group B		Group C		P value
		No	%	No	%	No	%	
1	< 60 mins	14	70	8	40	4	20	0.0001
2	> 60 mins	6	30	12	60	16	80	
	Mean	52.15±9.51 mins		68.1±13.81mins		77.15±14.37 mins		

**Table 5: Distribution according to postoperative complications.**

S.No	Complications	Group A		Group B		Group C		P value
		No	%	No	%	No	%	
1	Seroma	1	5	6	30	2	10	0.007
2	Superficial wound infection	1	5	3	15	2	10	0.002
3	Hematoma					Nil		
4	Wound Gapping					Nil		
5	Mesh Infection					Nil		
6	Fat Necrosis					Nil		
7	Paralytic Ileus					Nil		
8	Small bowel Obstruction					Nil		
9	Fistula from mesh to skin					Nil		
10	Enterocutaneous Fistula					Nil		
11	DVT					Nil		
12	Respiratory Infections					Nil		
13	UTI					Nil		

In Group A, 70% of patients attain their daily activity within 10 days while 25% took 10-20 days to return to their physical activity. In Group B, majority of patients 65% started their physical activity in 10-20 days while 30% started within 10 days of the surgery. Only one

Most of the surgeries were completed in more than 60 minutes in Group B and C while in Group A, maximum surgeries (70%) were done within one hour. In group B 60% and in Group C, 80% of cases took more than one hour. The average duration of surgery in Group A, B and C were 52.15±9.51 mins, 68.1±13.81 mins and 77.15±14.37 mins. P value is 0.001 which is statistically significant.

Seroma formation was the most common complication observed in 30% of the subjects in Group B while in Group A and C it was seen only in one (5%) and two (10%) patients respectively.

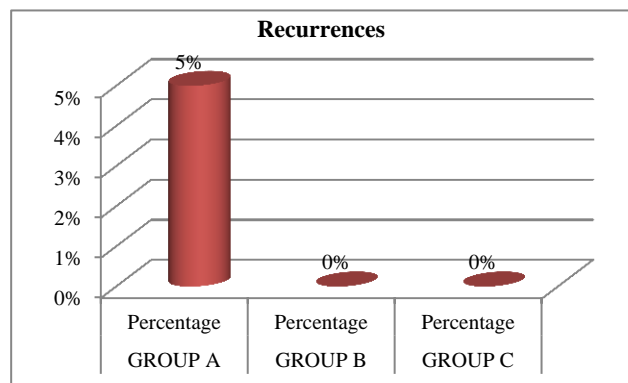
The other less common complication observed was superficial wound infection which was observed in 15% of cases in Group B, 10% of cases in Group C and 5% in Group A. There were no systemic postoperative complications.

The difference of postoperative complications among the three categories was statistically significant.

In Group A, 5% of the patients had recurrences while in group B and C no recurrence was observed.

patient took more than 20 days to start physical activity in both Group A and Group B. In Group C, majority of patients 55% gain their physical activity in 10-20 days while 30% started it within 10 days. 15% of patients took more than 20 days to start physical activity. The p-value

is 0.039 by chi square test which is statistically significant.



**Figure 4: Distribution of cases according to recurrences at follow up at six months.**

In Group A maximum number of cases (60%) stayed for 7 days after surgery similarly in Group C majority of the patients (55%) stayed for 7 days while in Group B, only 5% stayed for one week and 95% took more than one week. The average duration of hospital stay in Group A is  $6.75 \pm 0.91$  days which are shorter than mesh repair groups. In Group B the average hospital stay is  $8.55 \pm 0.60$  days while in Group C it is shorter  $7.55 \pm 0.68$  days. On comparison of average hospital stay of three groups, p value is 0.0001 by Anova test which is statistically significant.

## DISCUSSION

The mean age in our study was  $47 \pm 8.54$  years which was comparable with the study of Bhattaria (47 years), Ellis et al (49.4 years), Jehad (50.5 years) and Dhaigude (49.46%) and differs from the study of Garg where the mean age was  $23.82 \pm 3.14$  years which is lesser than our study.<sup>14-18</sup>

The sex incidence of incisional hernia in our study was 1:2.3 (M: F) showing a female preponderance. This was likely because of laxity of abdominal muscles due to multiple pregnancies and also an increased incidence of obesity in females. The present study was comparable to authors Jehad and Garg where male: female ratio was 25:39 and 37:63 respectively.<sup>16,18</sup>

Similar to our study, Bose and Garg also found wound infection as the major risk factor in their study followed by obesity.<sup>18,19</sup> Similar to our study, Bhattaria also showed that smoking (27.27%) and alcoholism (9.09%) were important risk factors for incisional hernia.<sup>14</sup> The incidence of chronic cough as risk factor in our study was similar to study by Garg, Nanjappa and Bose et al.<sup>18-20</sup>

Similar to our study Kumar, Tulaskar and Amer et al also found the swelling as the main presenting complaint followed by swelling and pain.<sup>21-23</sup>

In our study, 75% of the incisional hernias were in midline and infraumbilical which was found to be concordant with the Bhattaria, Nanjappa and Thakore.<sup>14,20,24</sup> Our study differed from the study by author Goel<sup>25</sup> who showed supraumbilical as the common site of incisional hernia compared to infraumbilical.

In our study 36.67% of patients developed incisional hernia within 1 year of previous surgery, 28.33% within 1-5 years and 18.33% in 5-10 years. It was comparable to the study by Garg and Amer et al where approximately one third of incisional hernia occurred within one year of the previous surgery.<sup>18,23</sup>

Similar to our study, many authors also observed increased incidence of incisional hernia in previous LSCS followed by hysterectomy.<sup>14,21,22</sup>

Similar to our study Kumar, Tulaskar and Amer et al have also shown lower midline incision as the most common incision in previous surgery which had lead to incisional hernia.<sup>21-23</sup> Our study differs from Omer and Fakhar who had found comparatively increased incidence of right paramedian incision (11.7%) and (12%) respectively.<sup>23,26</sup>

In our study poor muscle tone was observed in 21.67% cases, which is similar to the study by Nanjappa where the incidence is 26.7% while Kumar has shown poor muscle tone in 42.85% of cases which is higher than the incidence found in our study.<sup>20,21</sup>

Majority of the incisional hernia size was lesser than 10 cms (96.67%) in our study. It is similar to Kumar who found size of lesser than 10cms in 96% cases.<sup>27</sup>

On comparison of average duration of surgery our study was concordant to study by Baracs and Dhaigude who also showed shorter duration of surgery in anatomical repair compared to mesh repair and among mesh repair surgery by sublay technique was longer than onlay technique which could be explained with easier operative onlay technique.<sup>17,28</sup>

Based on distribution of postoperative complications between anatomical and mesh repair groups our study is similar to the study by Luijendijk and Shiv Kumar but differs from study by Jehad who showed increased incidence of seroma formation in anatomical repair group.<sup>11,16,21</sup> Superficial wound infection was the second most common complication observed in our study. In anatomical group it was 5% while in mesh group the incidence was 12.5%. Our study is similar to Luijendijk who has also shown increased incidence of wound infection in mesh group but differs from the Kumar and Jehad who have observed increased wound infection in anatomical group.<sup>11,21,16</sup> There was no incidence of mesh infection, wound gaping, bowel obstruction or fistula formation in our study similar to the study of authors who also did not observed these complications.<sup>16,21</sup>

On comparing seroma formation in onlay and sublay group our study was concordant with the study of authors Baracs, Lamani and Dhaigude who also observed increased incidence of seroma formation in onlay group.<sup>17,28,29</sup> In our study incidence of wound infection was 15% in onlay group while in sublay group it was 10% similar to the study by authors.<sup>17,28,29</sup>

In terms of recurrence rate our study is comparable to the study by Luijendijk, Baracs, Kumar, Tulaskar and Jacobus who also found increased incidence recurrence in anatomical repair group compared to mesh repair.<sup>11,21,22,28,30</sup> Among the mesh repair groups in our study no recurrence has been observed while Kharde and Dhaigude have found higher recurrence in onlay group compare to sublay group in 6 months follow up period.<sup>17,31</sup>

In our study the average duration of hospital stay was higher in mesh repair group compared to anatomical repair group similar to the study by Baracs, Jehad and Kumar.<sup>16,27,28</sup> Similarly, onlay group had longer hospital stay compared to sublay group which was similar to the study by authors.<sup>17,22,28</sup>

## CONCLUSION

It is concluded that though anatomical repair techniques takes lesser operative time and though it is associated with lesser postoperative complications, early return to physical activity, and shorter hospital stay but it has been associated with higher recurrence rate than mesh repair.

Among mesh repair techniques though sublay repair takes longer operative time, longer time to return to physical activity but it has been associated with lesser postoperative complications and lesser recurrence rate.

As lower midline incisions are more associated with incisional hernia so their use should be restricted whenever possible. Meticulous aseptic technique and careful closure of the abdominal wound is necessary to prevent incisional hernia. Proper preoperative evaluation of the patients with high risk factors is an important factor in preventing recurrence of incisional hernia. Postoperative complications in mesh repair for incisional hernia can be decreased by thorough patient evaluation, pre-operative skin preparation, meticulous operative technique, use of drains, use of peri operative broad spectrum antibiotics, early ambulation and chest physiotherapy.

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