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Comparative Study between Open and Laparoscopic Incisional Hernia Repair with Meshplasty- A Prospective Analysis of 60 Cases

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Abstract: *Introduction: Incisional hernia is a common problem faced by general surgeons. Open repair is associated with incidence of post operative pain, seromas, hematoma and wound infection leading to prolonged hospital stay and added costs. Laparoscopic repair, though technically demanding, is believed to have better post-operative outcomes and shorter length of stay*
Aims: *To compare the post-operative complications between laparoscopic and open incisional hernia repair*
Methods: The study was conducted in the tertiary care government medical college from October 2016 to December 2016 after approval from ethics committee. It was a prospective study of 60 patients of diagnosed incisional hernias operated within the same time period. They were divided into two groups- group1 included cases of open repair by onlay mesh and group 2 included cases of laparoscopic repair by IPOM. Their data was prospectively maintained and analysed.
Results: *30 patients underwent laparoscopic and 30 underwent open incisional hernia repair in the mentioned period. No difference was noted in operative time and intra-operative complications between the two procedures (p >0.05). Post-operative complications like wound infection, seroma formation, flap necrosis, paralytic ileus were similar (p>0.05). The length of hospital stay and return to work was significantly higher in open repair (p<0.01).*
Conclusion: *Both laparoscopic and open repair of incisional hernia show good results with similar post operative complications, though hospital stay and return to work is longer after open repair.*
Keywords*: Incisional hernia; laparoscopic repair; open repair; complications; outcomes*

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I. Introduction

Incisional hernia is a common surgical problem, occuring as a result of weakness in the musculo-fascial layer of anterior abdominal wall after surgery. Traditionally, open repair was performed for treatment. In open repair, positioning of the mesh makes it necessary to perform an extensive surgical dissection of soft tissue planes. This is associated with increased incidence of post operative pain, seromas, hematoma and wound infection leading to prolonged hospital stay and added costs.

Recently after advent of laparoscopic techniques, newer prosthetic materials and fixation devices, laparoscopic repair of incisional hernia is becoming more frequent. In 1993 Le blanc and Booth, first described the Laparoscopic Incisional hernia repair by Intra Peritoneal Onlay Mesh [IPOM] insertion without closure of fascial gap [1]. Since then increasing number of reports has confirmed that it can be successfully applied and has low rates of complications and recurrence [2]. Though many other repairs have been described, the search is still on for an ideal technique that is both surgeon and patient friendly with low morbidity and recurrence. Laparoscopic repair is believed to be a step in that direction. The issues with laparoscopic repair are longer learning curve, higher cost and risk of bowel adhesions with the intra-peritoneally placed mesh. The problem of bowel adhesion seems to be solved with introduction of inert and non adhesive prosthetic material such as PTFE and composite meshes. Thus laparoscopic repair has gained momentum.

In this study, we compared outcomes of laparoscopic and open repair of incisional hernia in terms of post-operative complications, length of stay and recovery.

II. Aims

1. To compare intra-operative and post-operative complications between laparoscopic and conventional open incisional hernia repair
2. To compare the post operative pain between laparoscopic and conventional open incisional hernia repair

3. To compare the duration of hospital stay and the time taken to resume work between laparoscopic and conventional open incisional hernia repair

III. Methods

The study was conducted in the tertiary care government medical college from October 2016 to December 2016 after approval from ethics committee. It was a prospective study of 60 patients of diagnosed incisional hernias operated within the same time period. They were divided into two groups- group1 included cases of open repair by onlay mesh and group 2 included cases of laparoscopic repair by IPOM.

INCLUSION CRITERIA

1. Patients with incisional hernia operated on elective basis.

EXCLUSION CRITERIA

1Presence of infection and peritonitis.
2 Patient with ascites
3COPD
4Pregnancy
5 Incisional hernia operated in an emergency.
6 Incisional hernia where mesh is not used for repair.

Technique:

Open repair: Incisions were made in the old scar depending on the localization and size of the hernia. The subcutaneous layer and scar tissue were dissected from the abdominal wall to identify and expose the hernia sac. The hernia port size was measured. Opening and resection of the hernia sac was avoided. Whenever possible, the posterior rectus sheath or peritoneum was dissected from the rectus muscles. After closing of the peritoneum and the defect in rectus sheath, an onlay mesh was positioned , with at least 5-cm overlap at all sides. The mesh was fixated to the rectus muscle at each corner and side with nonabsorbable (polypropylene) sutures. Subcutaneous drains with low-vacuum closed systems were placed in case of large dissection areas. The skin was closed with monofilament absorbable sutures or staples.

Laparoscopic repair (IPOM): Laparoscopic incisional hernia repair was performed through 3 to 5 abdominal trocars (one 10 mm and 2 to four 5 mm). Pneumoperitoneum was achieved by Veress needle or open introduction of a blunt-tip trocar for inflation with carbon dioxide to achieve intra-abdominal pressure up to 15 mm Hg. A 0° or 30° laparoscope was used to provide a view of the inner surface of the abdominal wall. The additional 5-mm trocars were positioned at the opposite site of the hernia. The hernia port size was measured. Extensive adhesiolysis was performed if necessary using diathermy. The omentum and bowel were detached from the abdominal wall to expose the hernial defect. The hernia sac was not dissected. The mesh was introduced into the abdominal cavity through the 10-mm trocar. The mesh was then placed over the defect with at least 5-cm overlap at all sides. Fixation of the mesh was achieved by 5-mm nonabsorbable tackers (Protack AutoSuture; Tyco Healthcare). A concentric ring of tackers was placed in the peripheral margin of the mesh. Transfascial sutures were often used for mesh positioning and supplementary fixation. Hemostasis was achieved before removal of the trocars. All 10-mm trocar fascial defects were closed. Skin defects were closed with absorbable monofilament sutures.

Points of comparison between open and laparoscopic repair
1. Type of anesthesia: General or spinal
2. Operative details: Type of mesh,
Type of fixation devices used,
Type of suturing technique and
Placement of drain or not

3. Operative time – The time calculated from induction of anesthesia till closure of skin.
4. Intra-operative complications
- Enterotomy
- Injury to major organ
- Intra-peritoneal bleeding
- Anaesthesia related complications

5. Post -operative complications Early:
• Hematoma,

• Wound infection: Assessed by ASEPSIS score
• Seroma: Postoperative occurrence of Seroma is defined by clinical examination. A significant seroma is defined as seroma that caused pain or discomfort, erythema, infection.
• Mesh infection:
• Flap necrosis

6. Postoperative pain- graded by amount of analgesic drugs used and recorded by Visual Analog Scale (VAS) score
7. Recovery from ileus
8. Hospital stay
9. Cost effectiveness- the parameters used to compare cost effectiveness will be
a. Cost of mesh- to the patient/ to the hospital
b. Cost of fixation device to the patient/ to the hospital
c. Cost of additional treatment in case of infection- to the hospital.
d. Hospital stay- to the hospital
e. Loss of days of work- to the patient

Statistical analysis: Categorical data were expressed as percentage (%). Continuous data were presented as mean and standard deviation. Statistical analysis was performed using SPSS version 24.0 (IBM Corp. N.Y.). Continuous data was analysed using Mann-Whitney test. Categorical data was analysed using Pearson's Chi square test or Fischer's Exact test. A p value of less than 0.05 was considered statistically significant.

Results: 30 patients underwent Laparoscopic and 30 underwent open mesh repair for incisional hernia at our center.
Demography: Gender and age distribution is mentioned below (Table 1, 2). There was no difference in gender and age distribution between the two groups (p >0.05).

Table 1: Gender distribution of laparoscopic and open repair

Gender	**Group**		**Total**
Gender	**Lap**	**Open**	
Female	22	14	36
Female	73.3%	46.7%	60.0%
Male	8	16	24
Male	26.7%	53.3%	40.0%
Total	30	30	60
	100.0%	100.0%	100.0%
p- value - 0.064			

Table 2: Age distribution of laparoscopic and open repair

Variables	**Group**	**N**	**Mean**	**SD**	**p- value**
Age	**Lap**	30	44.5	7.9	**0.327**
	Open	30	47.4	13.8	

Operative findings: All laparoscopic repairs were performed in general anesthesia, whereas 63.3% open repairs were in spinal anesthesia. Mean operative time was 93.3 minutes for laparoscopic and 103.3 minutes for open repair (p=0.263) (Table 3). Though more intra-operative complications were seen in laparoscopic repair (13.3%) compared to open repair (6.7%), it was not statistically significant (p >0.05) (Table 4).

Table 3: Operative times in laparoscopic and open repair

Variables	**Group**	**N**	**Mean**	**SD**	**p- value**
Operative Time	**Lap**	30	93.3	30.3	**0.263**
	Open	30	103.3	37.8	

Table 4: Intra-operative complications between laparoscopic and open repair

Intra-op Complications	**Group**		**p- value**
Intra-op Complications	**Lap**	**Open**	
Enterotomy	0	2	**0.49**
Enterotomy	0.0%	6.7%	
Converted to Open	1	0	**1.0**
Converted to Open	3.3%	0.0%	
Injury to Major Organ	0	0	**NA**
Injury to Major Organ	0.0%	0.0%	
Intrapertoneal bleeding	1	0	**1.0**

Intrapertoneal bleeding	3.3%	0.0%	
Anaesthesia Related	0	0	**NA**
Anaesthesia Related	0.0%	0.0%	
Other Technical Problems	2	0	**0.49**
Other Technical Problems	6.7%	0.0%	
Total	4	2	**>0.05**

Post-operative outcomes: Though more early post-operative complications were seen in open repair, it was not statistically significant (Table 5). Similarly, no difference was observed between in late post-operative complications (Table 6).
There was no difference in post-operative pain scores and return of bowel movements between both procedures (Table 7, 8). However, hospital stay and return to work was significantly longer in open repair ($p<0.01$) (table 8).

Table 5: Early post-operative complications in laparoscopic and open repair

Early Post-op Complications	**Group**		**p- value**
Early Post-op Complications	**Lap**	**Open**	
Flap Necrosis	0	5	**0.052**
Flap Necrosis	0.0%	16.7%	
Wound Infection	1	6	**0.103**
Wound Infection	3.3%	20.0%	
Mesh Infection	0	1	**1.0**
Mesh Infection	0.0%	3.3%	
Port Site Hernia	0	0	**NA**
Port Site Hernia	0.0%	0.0%	

Table 6: Late post-operative complications in laparoscopic and open repair

Late Post-op Complications	**Group**		**Total**	**p- value**
Late Post-op Complications	**Lap**	**Open**		
Hematoma	0	3	3	**0.237**
Hematoma	0.0%	10.0%	5.0%	
Seroma	0	0	0	**NA**
Seroma	0.0%	0.0%	0.0%	

Table 7: Post-operative pain between laparoscopic and open repair

Pain	**Group**		**Total**	**p- value**
Pain	**Lap**	**Open**		
Immediate Post-op	4	2	6	**0.671**
Immediate Post-op	13.3%	6.7%	10.0%	
Persistent Pain	2	1	3	**1.00**
Persistent Pain	6.7%	3.3%	5.0%	

Table 8: Other post-operative variables between laparoscopic and open repairs

Variables	**Group**	**N**	**Mean (days)**	**SD**	**p-value**
Recovery from Ileus	**Lap**	30	1.07	1.05	**0.074**
	Open	30	1.67	1.47	
Hospital Stay	**Lap**	30	3.20	1.21	**<0.01**
	Open	30	5.60	2.47	
Resumption of Daily work	**Lap**	30	4.00	1.55	**<0.01**
	Open	30	7.03	2.93	

IV. Discussion

Incisional hernias develop in 2%–20% of laparotomy incisions, leading to approximately 90,000 ventral hernia repairs per year. Although a common general surgical problem, an "ideal" method for repair has yet to be identified, as evidenced by documented recurrence rates of 25%–52% with primary open repair [3]. Factors associated with formation of an incisional hernia include wound infection, immunosuppression, morbid obesity, previous operations, prostatism, and surgery for aneurysmal disease. Abdominal wall defects are typically observed within the first 5 years after the surgical incision is made, but they may develop long afterward. [4].

Traditional primary repair requires a laparotomy with suture approximation of fascial tissue on each side of the defect. However, recurrence rates after this procedure range from 41% to 52% during long-term follow-up [5]. The introduction of a prosthetic mesh to ensure abdominal wall strength and make it a tension

free repair has decreased the recurrence rate, but open repair requires significant soft tissue dissection in tissues that are already of poor quality as well as flap creation, increasing complication rates and affecting the recurrence rate. Laparoscopic repair of ventral hernias is believed to result in earlier recovery, fewer postoperative complications, and decreased recurrence rates [6].

In our study, equal gender and age distribution was noted between open and laparoscopic repairs. Our findings are similar to a study by Park et al. [7]. The mean operative time was similar in both techniques. A meta-analysis by Awaiz et al. also showed similar operative times ((SMD −0.08, 95 % CI −4.46, 4.30, p = 0.97) in their study [8]. However, Carbajo et al [9] shower lesser operative time for laparoscopic hernia repair ($p<0.05$). In small incisional hernia, introduction of trocars and positioning of instruments can be time-consuming. In the open technique, the hernia is often already reduced within this time. In the laparoscopic technique, the positioning and fixation of the mesh to the ventral abdominal wall can be time-consuming [10]. The incidence of bowel or solid organ injury, bleeding, anesthesia complications were similar in both techniques. No cases of laparoscopy required conversion to open. The incidence of flap necrosis, wound infection and seroma formation were similar. Our results differ from those published by Olmi et al. [11] and Misra et al. [12] which show fewer post-operative complications after laparoscopic repair.

Though post-operative pain and recovery from ileus was similar, length of stay and return to work was significantly longer after open repair in our study. Several studies have shown a shorter length of hospital stay after laparoscopic incisional hernia repair (1.5 vs 3 days) [9, 13, 14]. The meta-analysis by Awaiz et al. [8] showed comparable overall complications (OR −1.07, 95 % CI −0.33, 3.42, p = 0.91), wound infection (OR 0.49, 95 % CI 0.09, 2.67, p = 0.41), wound hematoma or seroma (OR 1.54, 95 % CI 0.58, 4.09, p = 0.38), reoperation rate (OR −0.32, 95 % CI 0.07, 1.43, p = 0.14), time to oral intake (SMD −0.16, 95 % CI −1.97, 2.28, p = 0.89), length of hospital stay (SMD −0.83, 95 % CI −2.22, 0.56, p = 0.24), back to work (SMD −3.14, 95 % CI −8.92, 2.64, p = 0.29), recurrence rate (OR 1.41, 95 % CI 0.81, 2.46, p = 0.23), and postoperative neuralgia (OR 0.48, 95 % CI 0.16, 1.46, p = 0.20). The meta-analysis by Sajid et l. [15] showed Open repair was associated with significantly higher complication rates and longer hospital stays than laparoscopic repair.

Laparoscopic repair of incisional hernia is equally effective as open repair with the added benefits of shorter hospital stay and early return to activity. However, the longer learning curve and added cost along with technical difficulty in large hernias make it prudent to keep the option of open repair available.

Our study has limitations. It has a small sample size with limited follow up, making it difficult to study recurrence rates. Studies of longer duration will throw better light on outcomes of both techniques.

V. Conclusion

Both laparoscopic and open repair of incisional hernia show good results with similar post operative complications, though hospital stay and return to work is longer after open repair.

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