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Laparoscopic management of incisional hernia with special emphasis on intraperitoneal mesh-related complication and advantages over open method

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ABSTRACT

Background: Ventral hernias (VHs) occur as a result of weakness in the musculofascial layer of the anterior abdominal wall. The most popular classification is congenital, acquired, incisional, and traumatic. **Aims and Objectives:** The aim of this study is to compare the effectiveness and safety of open versus laparoscopic repair of incisional hernia and to discuss important controversial issues for both procedures, including patient selection, technique, and operative care for laparoscopic repair of VH, operative time of laparoscopic repair of VH, intraoperative and post-operative complications, post-operative pain, post-operative morbidity, and length of hospital stay. **Materials and Methods:** This prospective study was done in Maharani Laxmi Bai Medical College; Jhansi between January 2021 and June 2022 including 70 patients of incisional hernia were selected for treatment of hernia repair. Thirty-five patients were subjected to laparoscopic incisional hernia repair and 35 patients were subjected to open incisional hernia repair. **Results:** The findings of the present study demonstrate that laparoscopic incisional hernia repair was safe and in comparison with open incisional repair comparatively less intraoperative blood loss, less post-operative pain, less post-operative complication, less hospital stay, early return to normal activity, and less recurrence. The incidence of enterotomy was slightly more in an open method which was found non-significant difference ($P \geq 0.05$). Hence, it is concluded that laparoscopic incisional hernia repair should be the procedure of choice. **Conclusions:** Laparoscopic incisional hernia repair was safe and better when compared with open incisional hernia repair.

Key words: Incisional hernia; Laparoscopic hernia repair; Intraperitoneal mesh; Open hernia repair Hernia recurrence; Post-operative complications; Surgical outcomes; Ventral hernia; Minimally invasive surgery; Mesh fixation techniques

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INTRODUCTION

An incisional hernia develops in 3%–13% of laparotomy incisions. Primary suture repair of ventral hernias (VH) yields unsatisfactory results. The introduction of a prosthetic mesh to ensure abdominal wall strength without tension 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. A minimally invasive approach was applied to the repair of VH, with the expectation of earlier recovery, fewer post-operative complications, and decreased recurrence rates.[1]

The risk factors for the development of incisional hernia include obesity, diabetes, emergency surgery, post-operative wound dehiscence, smoking, and post-operative wound infection. The risks of repairing an incisional hernia which should be explained to the patient when obtaining consent include seroma formation, wound infection, injury to intra-abdominal structures, and recurrence. Major complications which can occur in the repair of large incisional hernias

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include mesh infection and enterocutaneous fistula which may result in prolonged morbidity and require reoperation.[2]

It is now accepted that only the smallest (<3 cm) incisional hernias should be repaired with primary tissue approximation with sutures and this topic will not be discussed further.[3] Small incisional hernias with time develop into larger incisional hernias due to the continuous presence of intra-abdominal hydrostatic pressure of 15 cm of water, diaphragmatic contractions occurring with respiration, increases in abdominal pressure occurring with coughing and straining raising pressure to over 80 cm of water and myofascial retraction of the lateral muscles. As a result, the abdominal cavity contracts, and the right of domicile for the herniated visceral mass is lost.[4] Due to several previous operations, many of these patients have poor-quality abdominal wall musculature which coupled with multiple comorbid medical problems, present a surgical and anesthetic challenge.

Where endoscopic access is a viable option for intra-abdominal surgery, it should be used on the grounds that laparoscopic access results in considerably fewer wound hernias and post-operative episodes of small bowel obstruction.[5]

Because a large area of prosthetic mesh is utilized in the repair of large incisional hernias, it is probably this area of surgery that will benefit maximally from the development of biocompatible meshes with near-physiological functional properties that produce the lowest possible foreign body reaction and be of the minimum necessary tensile strength.[6]

Aims and objectives

The aim of this study is to compare the effectiveness and safety of open versus laparoscopic repair of incisional hernia and to discuss important controversial issues for both procedures including.

- Patient selection
- Technique and operative care for laparoscopic repair of VH
- Operative time of laparoscopic repair of VH
- Intraoperative and post-operative complications
- Post-operative pain
- Post-operative morbidity
- Length of hospital stay.

MATERIALS AND METHODS

Ethical

Ethical Committee's approval was duly taken. Data were collected in the department of general surgery from the bedside tickets of the patients after taking a short history and informed consent from the patient.

Source of data

This prospective study was done in Maharani Laxmi Bai Medical College; Jhansi between January 2021 and June 2022 including 70 patients of incisional hernia were selected for treatment of hernia repair. Thirty-five patients were subjected to laparoscopic incisional hernia repair and 35 patients were subjected to open incisional hernia repair.

Inclusion criteria

- Patients with non-complicated VH
- Fascial defect by USG >2 cm–5 cm
- No obstructed hernia
- No inguinal hernia
- No chronic kidney disease
- No liver disease.

Exclusion criteria

- Severe hemodynamic instability
- Obstructed hernia
- All inguinal hernias
- Fascial defect by USG <2 cm and >5 cm
- Chronic liver disease and chronic kidney disease patients.

Statistical analysis

The data were summarized as mean values with standard deviations (SD). The statistical analysis was performed using t-test. The Statistical Package for the Social Sciences (SPSS) 26.0 for Windows computer software (SPSS Inc., Chicago, IL) will be used for statistical analysis. $P<0.05$ will be considered significant.

Methodology

Laparoscopic VH repair

- Position: 20° head end low with 10–20° opposite side tilt (opposite to surgeon)
- Anesthesia: General Anesthesia
- Intra-abdominal pressure: 10–14 mmHg.

Steps

Pneumoperitoneum was created with the veress needle at the Palmar's point. Alternative sites for veress needle include any point farthest from the hernial site, for example, right iliac fossa for patients with left upper abdominal hernia.

Laparoscopic VH repair was carried out using three lateral ports along the anterior axillary line, one 10 mm camera port, and two 5 mm working port. Alternatively, the ports were positioned with the aim of getting a maximum working length inside the abdomen. Intra-abdominal adhesiolysis inside the sac was carried out using preferably

the cold scissor and cautery or harmonic scalpel whenever needed. The margin of defect was defined and appropriate Mesh was selected to have at least 5 cm overlap around the margin of defect. The appropriate Mesh of minimum size 15 × 15 cm or larger was taken and at 8 points fixed vicryl 2-0 suture for later use.

Mesh was then rolled up like a cigarette and inserted inside the abdomen via the 10 mm camera port. The Mesh used was polypropylene lightweight Mesh. Selection of fixation sites for the Mesh was done on the flat abdomen without pneumoperitoneum and then reconfirmed after placing the Mesh intraperitoneally, whether the size is adequate with a 5 cm overlap. The Mesh fixation was then done with multiple 2-0 polyglactin (vicryl) sutures which had been pre-inserted. These sutures were taken out through the anterior abdominal wall with the help of laparoscopic suture needle carrier and were supplemented with the use of tackers. The 10 mm port was closed with polyglactin 2-0. The 2–5 mm ports were left as such (Figure 1).

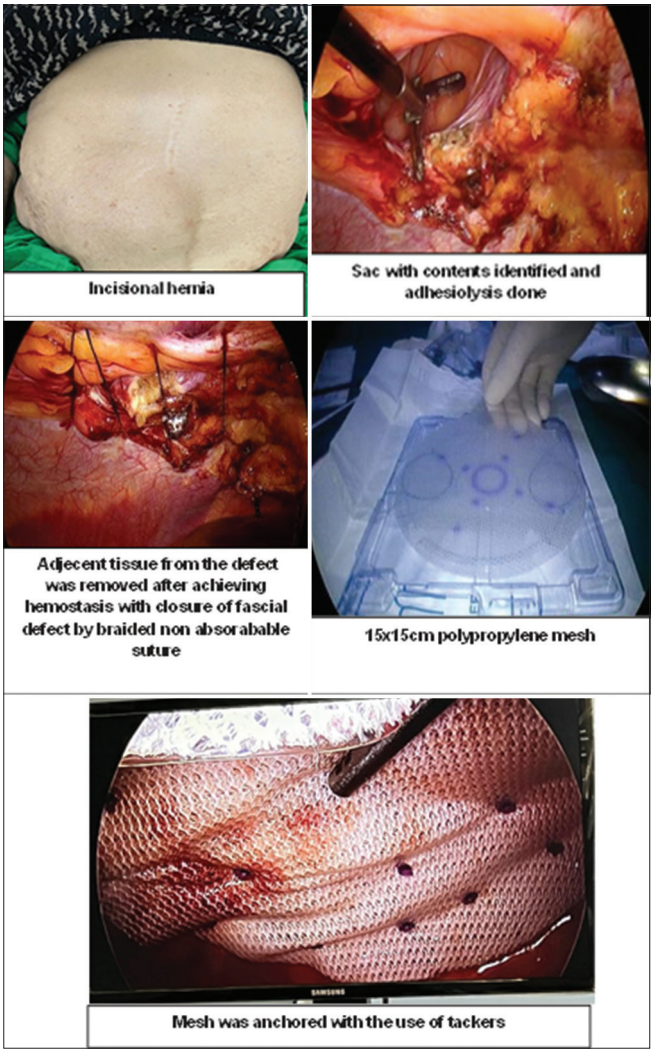

Figure 1: Laparoscopic procedure for incisional hernia

Repair principle

The presence of VH in patients is an indication for surgical repair intraperitoneal onlay Mesh repair was done in laparoscopic repair whereas sublay Mesh repair was done during open hernia repair. Proline mesh will be used.

RESULTS

The age distribution of patients in this study shows that the majority of the cases (52.86%) fall within the 41–60 years age group. This suggests that incisional hernia is more prevalent in middle-aged adults. The study included a smaller proportion of patients under 40 years (28.57%) and those above 60 years (18.57%). This distribution highlights that incisional hernias are less common in the younger and older populations compared to the middle-aged group (Table 1).

The sex distribution in this study indicates that incisional hernia is more common in females, with 60% of the cases being female and 40% male. This aligns with previous findings that suggest a higher incidence of incisional hernias in women, possibly due to factors such as pregnancy, which can weaken the abdominal wall. The equal distribution between the two treatment groups (open and laparoscopic) ensures a balanced comparison between the genders (Table 2).

The post-operative complications observed in this study reveal that laparoscopic incisional hernia repair (Group B) had fewer complications compared to the open method (Group A). Specifically, wound infection and seroma were significantly lower in the laparoscopic group (3.5% each) compared to the open group (14.28% and 11.42%, respectively). Notably, there were no instances of enterotomy, mesh infection, or recurrence in the laparoscopic group, while the open group had occurrences of these complications at 3.5% each. This suggests that the laparoscopic method may offer a safer alternative with fewer post-operative complications (Table 3).

The comparison of surgical parameters between open and laparoscopic incisional hernia repair shows significant differences. The laparoscopic group (Group B) experienced less intraoperative blood loss (26.57±4.500 mL vs. 49.57±8.859 mL) and reported lower post-operative pain scores on all 5 days post-surgery. However, the mean operating time was longer in the laparoscopic group (71.86±5.077 min) compared to the open group (60.60±4.972 min). Despite the longer operative time, the laparoscopic group had a shorter hospital stay (2.60±0.651 days) and quicker return to normal activity

(11.97±1.855 days), indicating overall better outcomes for patients undergoing laparoscopic repair (Table 4).

DISCUSSION

This prospective study was done in Maharani Laxmi Bai Medical College; Jhansi between January 2021 and June 2022 including 70 patients of incisional hernia were selected for treatment of hernia repair. Thorty-five patients were subjected to laparoscopic incisional hernia repair and 35 patients were subjected to open incisional hernia repair.

Demographic

The demographic analysis revealed no significant difference between the two groups regarding age and gender distribution, with a P=0.26. The mean age in Group A was 51.97±14.106 years, and in Group B, it was 48.09±14.339 years. The majority of incisional hernias (52.86%) occurred in the 41–60 years age group. Our study showed that incisional hernias were more common in females, with 60% of cases, compared to 40% in males, aligning with findings by Pereira and Rai.,[7] who also reported a higher incidence of incisional hernias in females.

Table 1: Age distribution in our study

Age (in years)	n	Percentage
20–40 years	20	28.57
41–60 years	37	52.86
>60 years	13	18.57
Total	70	100

Table 2: Sex-wise distribution in our study

Sex	Group A (Open incisional hernia)		Group B (Laparoscopic incision hernia)	
	n	%	n	%
Male	14	40.00	14	40.00
Female	21	60.00	21	60.00
Total	35	100	35	100

Table 3: Post-operative complication

Complication	Group A (Open incisional hernia)		Group B (Laparoscopic incision hernia)	
	n	%	n	%
Enterotomy	1	3.5	0	0.00
Wound infection	5	14.28	1	3.5
Seroma	4	11.42	1	3.5
Mesh infection	1	3.5	0	0.00
Recurrence	1	3.5	0	0.00

Intraoperative blood loss

In our study, the mean intraoperative blood loss was significantly different between the two groups, with Group A experiencing 49.57±8.859 mL and Group B showing a reduced amount of 26.57±4.500 mL, and this difference was statistically significant with a P=0.0001. These findings are consistent with the results of a study by Eker et al.,[8] in 2014, titled "Laparoscopic versus Open Incisional Hernia Repair," which reported that median blood loss during laparoscopic repair was significantly lower at 10 mL compared to 50 mL in open repair, with a P=0.05. This comparison underscores the advantage of laparoscopic techniques in minimizing intraoperative blood loss.

Duration of surgery

In our study, the mean duration of surgery was 60.60±4.972 min in Group A and 71.86±5.077 min in Group B, with the difference being statistically significant (P=0.0001). These findings align with the results reported by Pereira and Rai, Eker et al.,[8] and Basheer et al.,[9] where similar differences in operative duration were observed. In addition, the operative field in Group A was notably clearer and better, contributing to the shorter surgery duration.

Pain (visual analogue scale [VAS])

The VAS scores were significantly lower in Group B compared to Group A from post-operative day 1 to day 5. The mean VAS for pain in Group A was 4.83±0.707 on day 1, 4.43±0.502 on day 2, 3.74±0.443 on day 3, 2.86±0.355 on day 4, and 2.29±0.622 on day 5, whereas in Group B, it was 4.37±0.490, 4.03±0.169, 3.11±0.404, 2.37±0.490,

Table 4: Mean comparison of open incisional hernia repair versus laparoscopic incisional hernia repair

Parameter	Group A (Open incisional hernia)	Group B (Laparoscopic incisional hernia)	P-value (t-test)
Mean age (years)	51.97±14.106	48.09±14.339	0.26 (NS)
Mean intraoperative blood loss (mL)	49.57±8.859	26.57±4.500	0.0001
Mean operating time (min)	60.60±4.972	71.86±5.077	0.0001
Mean post-operative Visual Analog Scale pain score			
Day 1	4.83±0.707	4.37±0.490	0.002
Day 2	4.43±0.502	4.03±0.169	0.0001
Day 3	3.74±0.443	3.11±0.404	0.004
Day 4	2.86±0.355	2.37±0.490	0.0001
Day 5	2.29±0.622	1.94±0.591	0.02
Mean hospital stay (days)	6.51±0.919	2.60±0.651	0.0001
Mean return to normal activity (days)	19.74±1.120	11.97±1.855	0.0006

and 1.94±0.591 on the corresponding days. These findings align with those reported by Pereira and Rai.,[7] Eker et al.,[8] and Navarra et al.,[10] who observed significant differences in pain levels between open and laparoscopic incisional hernia repair groups.

Complications

In our study, wound infection was observed in 14.28% of patients in Group A (Open incisional hernia repair) compared to 3.5% in Group B (Laparoscopic incisional hernia repair), as shown in Table 3. Recent studies, such as those by Kingsnorth and LeBlanc,[3] have reported infection rates ranging from 0.7% to 2% for laparoscopic VH repairs, while Ríos et al.,[11] have documented rates as high as 9–18% for open inguinal and incisional hernia repairs. Similarly, seroma formation was more common in Group A (11.42%) than in Group B (3.5%), which is consistent with findings from Tsimoyiannis et al.,[12] study on laparoscopic ventral hernioplasty. Mesh infection occurred in 3.5% of cases in Group A, with no cases reported in Group B, paralleling the results of a study by Mohamed and Abdelmgeed.[13] Finally, recurrence was noted in 3.5% of patients in Group A, with no recurrences observed in Group B, a result also reflected in the 2022 study by Gupta et al.[14]

Duration of hospital stay

In our study mean hospital stay in Group A (Open incisional hernia repair) was 6.51±0.919 days and in Group B was 2.60±0.651. The difference was seen to significant with P=0.0001 (S).

Pereira and Rai[7] in the year 2021 conducted a study entitled "Open Versus Laparoscopic VH Repair: A Randomized Clinical Trial" where we saw a longer duration of hospital stay in the case of open incisional hernia repair as compared to the laparoscopic group (6.23±0.35 vs. 2.17±1.12 days, P=0.02).

Return to normal activity

In our study, the mean return to normal activity in Group A (Open incisional hernia repair) was 19.74±1.120 days, and in Group B was 6.51±0.919 days. The difference seemed to be significant with P=0.0006 (S).

Similar result was also observed by Gupta et al.,[14] in the year 2022 who conducted a study entitled "A comparative study of laparoscopic versus open ventral hernia repair" where they found that in laparoscopic VH repair patient returned to work within 11.72±4.335 days of post-operative day but in Open VH repair return to work was noted within 17±5.392 days. The difference was found to be statistically significant (P=0.0002).

Limitations of the study

This was a single-centered study.

CONCLUSIONS

In our study, it can be concluded that laparoscopic incisional hernia repair offers several advantages over the open method. The laparoscopic approach demonstrated significantly lower intraoperative blood loss, reduced post-operative pain, fewer complications such as wound infections and seromas, and shorter hospital stays. In addition, patients who underwent laparoscopic repair returned to normal activities more quickly compared to those who underwent open surgery. Although the laparoscopic technique had a longer operative time, the overall patient outcomes were better, making it a safer and more effective option for incisional hernia repair. These findings support the recommendation that laparoscopic repair should be the preferred method when feasible, particularly in cases where minimizing post-operative complications and facilitating faster recovery are critical considerations.

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