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ORIGINAL ARTICLE

Evaluation of Early Postoperative Outcomes of Open and Laparoscopic Emergency Repair for Incarcerated Anterior Abdominal Wall Hernias

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ABSTRACT

Background: Incarcerated anterior abdominal wall hernias represent a frequent surgical emergency with potential for serious complications. Surgical repair can be performed using either open or laparoscopic techniques, each with distinct intraoperative and postoperative profiles.

Objectives: To evaluate and compare the early postoperative outcomes of open versus laparoscopic emergency repair in patients with incarcerated anterior abdominal wall hernias.

Study Design & Setting: This was a prospective comparative study conducted at the Department of Surgery, HITEC Institute of Medical Sciences and HIT Hospital Taxilla over a period of 6 months.

Methodology: A total of 120 patients diagnosed with incarcerated anterior abdominal wall hernias were enrolled and divided into two equal groups: 60 underwent open repair, and 60 underwent laparoscopic repair. Data were collected on demographics, operative details, postoperative pain (VAS), complications, hospital stay, and time to return to normal activity. Statistical analysis was performed using SPSS version 25.0 with a p-value < 0.05 considered significant.

Results: The mean operative time was significantly longer in the laparoscopic group (76.2 ± 14.1 min) compared to the open group (64.5 ± 12.3 min; $p < 0.001$). However, laparoscopic repair resulted in significantly shorter hospital stay (3.9 ± 1.2 vs. 5.8 ± 1.4 days) and faster return to activity (7.6 ± 2.9 vs. 11.2 ± 3.5 days; $p < 0.001$). Surgical site infections were more frequent in the open group (15% vs. 5%; $p = 0.04$). Postoperative pain scores were significantly lower in the laparoscopic group on both day 1 and day 3.

Clinical Implication: Laparoscopic repair offers superior early postoperative outcomes and should be considered where feasible in emergency settings.

Conclusion: Laparoscopic emergency repair was associated with better early outcomes than open repair in incarcerated hernia patients.

Keywords: Abdominal hernia, emergency surgery, laparoscopic repair, open hernia repair, postoperative outcomes, surgical site infection.

INTRODUCTION

Anterior abdominal wall hernias are a prevalent surgical condition, frequently encountered in both elective and emergency settings.[1] Among these, incarcerated hernias represent a significant subset that demands prompt surgical intervention to prevent life-threatening complications such as strangulation, bowel ischemia, or perforation.[2,3] Incarceration, defined as the trapping of herniated contents within the abdominal wall defect, often necessitates emergency repair to restore bowel viability and prevent systemic deterioration.[4]

Historically, open hernia repair has been the gold standard for treating incarcerated hernias, offering direct access to the hernia sac and ease in managing necrotic or ischemic bowel segments. However, advancements in minimally invasive surgery have introduced laparoscopy as a viable alternative, even in emergency situations.[5] Laparoscopic techniques offer several potential advantages, including reduced postoperative pain, shorter hospital stay, quicker return to normal activities, and lower incidence of wound complications. Nevertheless, concerns remain regarding the safety and feasibility of laparoscopy in emergency settings, particularly in cases with bowel obstruction or compromised hemodynamics.[6,7]

The early postoperative period is critical in evaluating the success of hernia repair. Parameters such as operative time, length of hospital stay, wound infection, postoperative pain, need for bowel resection, and overall morbidity provide meaningful insights into the effectiveness and safety of the chosen surgical approach.[8] Incarcerated anterior abdominal wall hernias are a common surgical emergency requiring prompt intervention to prevent complications. Open and laparoscopic techniques are the two primary surgical options for repair.[9] While open repair is traditionally used, laparoscopic surgery has gained popularity due to its minimally invasive nature. Early postoperative outcomes such as pain, hospital stay, recovery time, and complications can vary significantly between the two approaches. Evaluating these outcomes helps guide optimal surgical decision-making.[10] The choice between open and laparoscopic repair often depends on surgeon expertise, availability of resources, and the patient's clinical condition at presentation. With growing experience in minimally invasive techniques and better instrumentation, laparoscopic repair is increasingly being considered even in emergency settings.[11]

Most existing studies are retrospective in nature, and there is a paucity of high-quality data directly comparing the early postoperative results of open versus laparoscopic emergency hernia repair in such cases. Furthermore, variations in surgical expertise, patient comorbidities, and institutional resources contribute to heterogeneity in outcomes, underscoring the need for contextual and evidence-based assessments. This study aims to evaluate and compare the early postoperative outcomes of open and laparoscopic emergency repair for incarcerated anterior abdominal wall hernias. By analyzing key parameters such as postoperative complications, operative duration, hospital stay, and recovery profiles, we aim to provide robust data to guide surgeons in selecting the most appropriate and effective surgical approach in emergency settings. The findings are expected to contribute to surgical decision-making and potentially improve the quality of emergency hernia care.

MATERIALS AND METHODS

This prospective comparative study was conducted at the Department of General Surgery of HITEC Institute of Medical Sciences and HIT Hospital Taxilla from March 2023 to August 2023 after obtaining approval from the institutional ethical review board. A total of 120 patients presenting with incarcerated anterior

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abdominal wall hernias requiring emergency surgical repair were included. The sample size of 120 was calculated using OpenEpi software, considering a 95% confidence level, 80% power, and expected difference of 20% in postoperative complication rates between the open and laparoscopic groups, based on previous studies.

Patients were selected through consecutive non-probability sampling. Inclusion criteria were adults aged 18 to 75 years who presented with clinically diagnosed incarcerated anterior abdominal wall hernias, including umbilical, paraumbilical, and epigastric hernias, confirmed intraoperatively. Patients with recurrent hernias, generalized peritonitis, hemodynamic instability, known coagulopathy, or contraindications to general anesthesia were excluded.

After informed written consent, patients were allocated into two groups based on the type of surgical intervention received. Group A underwent emergency open hernia repair, while Group B underwent emergency laparoscopic hernia repair. The choice of surgical approach was based on the operating surgeon's clinical judgment, availability of laparoscopic equipment, and patient condition at presentation. All surgeries were performed under general anesthesia by experienced surgeons with comparable proficiency in both open and laparoscopic techniques.

Demographic data, comorbidities, type and size of hernia, and intraoperative findings were recorded. The primary outcomes assessed were early postoperative complications including wound infection, seroma, postoperative ileus, and need for re-intervention. Secondary outcomes included operative time (in minutes), postoperative pain (measured using Visual Analog Scale on day 1 and 3), length of hospital stay (in days), and time to return to normal activities.

Postoperative pain was managed according to standardized protocols in both groups, and patients were followed until discharge and subsequently for 30 days postoperatively in the outpatient department. Data were entered and analyzed using SPSS version 25.0. Quantitative variables such as age, operative time, and hospital stay were expressed as mean ± standard deviation, and compared using independent sample t-test. Categorical variables like gender, type of hernia, and complication rates were expressed as frequencies and percentages, and analyzed using chi-square or Fisher's exact test as appropriate. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The mean age of patients in the open repair group was 52.3 ± 11.4 years, while in the laparoscopic repair group it was 50.7 ± 10.9 years. Males were 56.7% in the open group and 53.3% in the laparoscopic group. The mean BMI was 26.8 ± 3.1 kg/m² in the open group and 27.1 ± 2.9 kg/m² in the laparoscopic group. Hypertension was present in 35.0% of patients undergoing open repair and in 31.7% of those undergoing laparoscopic repair. Diabetes mellitus was observed in 30.0% of patients in the open group and 25.0% in the laparoscopic group. Umbilical hernias were the most common type, found in 63.3% of patients in the open repair group and 66.7% in the laparoscopic group as given in table 1.

The mean operative time was shorter in the open repair group (64.5 ± 12.3 minutes) compared to the laparoscopic group (76.2 ± 14.1 minutes). Bowel resection was required in 10.0% of open repairs and 6.7% of laparoscopic repairs. Conversion to open surgery occurred in 8.3% of laparoscopic cases. The mean hospital stay was longer for the open repair group (5.8 ± 1.4 days) compared to the laparoscopic group (3.9 ± 1.2 days). The mean time to return to normal activity was also longer in the open group (11.2 ± 3.5 days) than in the laparoscopic group (7.6 ± 2.9 days) as given in table 2.

Surgical site infection occurred more frequently in the open repair group (15.0%) compared to the laparoscopic group (5.0%), with a statistically significant difference (p = 0.04). Seroma formation was reported in 11.7% of patients undergoing open repair and 8.3% in those receiving laparoscopic repair. Postoperative ileus was seen in 6.7% of open repairs and 3.3% of laparoscopic cases. Re-intervention was required in 3.3% of open group patients and 1.7% of laparoscopic cases. Readmission within 30 days occurred in 5.0% of the open group and 1.7% of the laparoscopic group as given in table 3.

Table 1: Baseline Demographic and Clinical Characteristics of Patients (n = 120)

Variable	Open Repair (n = 60)	Laparoscopic Repair (n = 60)	p-value
Mean Age (years) ± SD	52.3 ± 11.4	50.7 ± 10.9	0.38
Male Gender, n (%)	34 (56.7%)	32 (53.3%)	0.71
BMI (kg/m²) ± SD	26.8 ± 3.1	27.1 ± 2.9	0.53
Hypertension, n (%)	21 (35.0%)	19 (31.7%)	0.69
Diabetes Mellitus, n (%)	18 (30.0%)	15 (25.0%)	0.52
Type of Hernia (Umbilical), n (%)	38 (63.3%)	40 (66.7%)	0.71

Table 2: Intraoperative and Postoperative Outcomes

Outcome Variable	Open Repair (n = 60)	Laparoscopic Repair (n = 60)	p-value
Mean Operative Time (minutes) ± SD	64.5 ± 12.3	76.2 ± 14.1	<0.001
Bowel Resection Required, n (%)	6 (10.0%)	4 (6.7%)	0.51
Conversion to Open, n (%)	–	5 (8.3%)	–
Mean Hospital Stay (days) ± SD	5.8 ± 1.4	3.9 ± 1.2	<0.001
Mean Time to Return to Activity (days) ± SD	11.2 ± 3.5	7.6 ± 2.9	<0.001

Table 3: Postoperative Complications within 30 Days

Complication	Open Repair (n = 60)	Laparoscopic Repair (n = 60)	p-value
Surgical Site Infection, n (%)	9 (15.0%)	3 (5.0%)	0.04
Seroma Formation, n (%)	7 (11.7%)	5 (8.3%)	0.54
Postoperative Ileus, n (%)	4 (6.7%)	2 (3.3%)	0.40
Re-intervention Required, n (%)	2 (3.3%)	1 (1.7%)	0.56
Readmission Within 30 Days, n (%)	3 (5.0%)	1 (1.7%)	0.31

Table 4: Postoperative Pain Score (VAS Scale)

Postoperative Day	Open Repair (Mean ± SD)	Laparoscopic Repair (Mean ± SD)	p-value
Day 1	6.8 ± 1.2	4.9 ± 1.3	<0.001
Day 3	4.2 ± 1.1	2.6 ± 1.0	<0.001

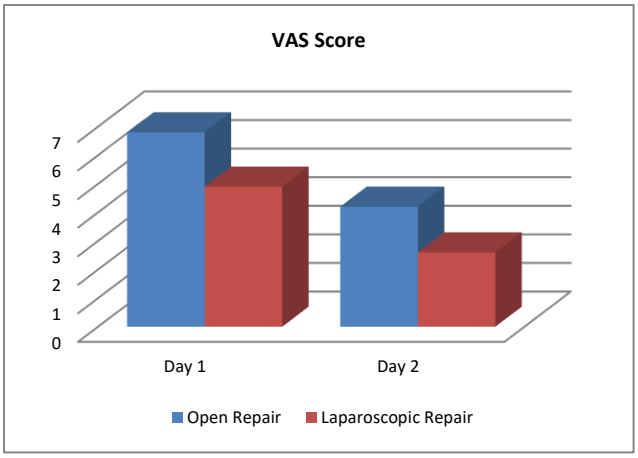

Figure 1: Postoperative Pain Score (VAS Scale)

On postoperative day 1, the mean pain score on the Visual Analog Scale (VAS) was higher in the open repair group (6.8 ± 1.2) compared to the laparoscopic group (4.9 ± 1.3). By day 3, pain scores had decreased in both groups, with the open group reporting a mean score of 4.2 ± 1.1 and the laparoscopic group 2.6 ± 1.0. The differences in pain scores between the two groups on both days were statistically significant ($p < 0.001$) as given in table 4.

DISCUSSION

Incarcerated anterior abdominal wall hernias are a common surgical emergency requiring prompt intervention to prevent complications. Open and laparoscopic techniques are the two primary surgical options for repair.[12] While open repair is traditionally used, laparoscopic surgery has gained popularity due to its minimally invasive nature.[13] Early postoperative outcomes such as pain, hospital stay, recovery time, and complications can vary significantly between the two approaches. Evaluating these outcomes helps guide optimal surgical decision-making. This study aims to compare early postoperative results between open and laparoscopic emergency repairs in such cases.

Our study compared early postoperative outcomes between open and laparoscopic emergency repair of incarcerated anterior abdominal wall hernias, demonstrating several parallels and contrasts with the recent literature. Consistent with findings by Dal et al. (2023), our results showed significantly longer operative time in the laparoscopic group (76.2 ± 14.1 min vs. 64.5 ± 12.3 min, $p < 0.001$), but this was offset by a shorter hospital stay (3.9 ± 1.2 vs. 5.8 ± 1.4 days, $p < 0.001$) and faster return to activity (7.6 ± 2.9 vs. 11.2 ± 3.5 days, $p < 0.001$).[19] This aligns with their observation that longer laparoscopic procedures are balanced by faster recovery and less postoperative pain ($p < 0.001$). Similarly, Mehmood et al. (2023) reported improved quality of life scores and significantly lower pain levels in the laparoscopic group (VAS 2.92 ± 0.08 vs. 4.88 ± 0.12), consistent with our significantly lower pain scores on both postoperative day 1 (4.9 ± 1.3 vs. 6.8 ± 1.2, $p < 0.001$) and day 3 (2.6 ± 1.0 vs. 4.2 ± 1.1, $p < 0.001$).[15] These findings reinforce the advantage of laparoscopic repair in terms of postoperative discomfort and mobilization.

Contrasting with AlWadaani et al. (2023), who found no significant difference in operative time (Group I: 126.07 ± 9.7 min vs. Group II: 98.57 ± 10.1 min, $p=0.807$) or hospital stay (1.36 ± 0.72 vs. 1.57 ± 0.99 days, $p=0.482$) between open and laparoscopic groups, our study showed significant differences in both parameters.[14] This discrepancy may relate to differences in surgical techniques, patient populations, or urgency of cases, as AlWadaani et al. included a variety of hernia types and elective repairs.[14] Our postoperative complication rates further support the benefits of laparoscopic repair. Surgical site infections were significantly lower in the laparoscopic group (5% vs. 15%, $p=0.04$), in line with Dal et al. (2023), who reported complication rates of 7.5% vs. 15% favoring laparoscopic repair ($p=0.048$).[19] In contrast, AlWadaani et al. (2023) did not find significant differences in complications (14.28% vs. 21.43%, $p=0.658$). This may reflect differences in perioperative care and patient comorbidities.[14]

Our demographic findings of comparable mean ages (52.3 ± 11.4 vs. 50.7 ± 10.9 years, $p=0.38$) and male predominance mirror the observations of Ertekin et al. (2023), who reported no significant differences in age between groups (44.11 ± 15.82 vs. 43.18 ± 15.36 years, $p=0.809$).[16] Moisin et al. (2022) similarly noted a predominance of males in the 51-70 years age group with common comorbidities such as hypertension and obesity, consistent with our findings of 35% hypertension and mean BMI around 27 kg/m^2.[17,18] Dissanayake et al. (2020) highlighted smoking and bowel resection as independent predictors of complications. Our study noted bowel resection was required in 10% of open and 6.7% of laparoscopic cases ($p=0.51$), but no significant difference was found, which may reflect differences in patient selection and intraoperative decision-making.[20]

A key strength of this study is its comparative design with equal group distribution, allowing a balanced analysis of outcomes. Real-world emergency settings and standardized follow-up protocols enhance the generalizability of results. Objective outcome measures such as VAS scores and hospital stay increase reliability. However, the study was conducted in a single center, limiting broader applicability. Long-term outcomes and recurrence rates were not assessed. The sample size, while adequate for early outcomes, may be underpowered for rare complications.

CONCLUSION

Laparoscopic repair of incarcerated anterior abdominal wall hernias was associated with shorter hospital stay, less postoperative pain, and faster recovery. Open repair had a shorter operative time but higher surgical site infection rates. Laparoscopy appears favorable for early postoperative outcomes in emergency hernia repair.

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