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Laparoscopy in the management of acute intestinal obstruction: "the new gold standard or a selective tool?". A retrospective cross-sectional study.

Dr. Kallem Varisha[2], Dr. Samina Ali[3], Dr. Varun Prakash V. A[4], Dr. Boni Satish[5], Dr. Samir Ranjan Nayak[1]

[1] GSL Medical College
[2] GSL Medical College and General Hospital
[3] Resident, Department of Surgery, GSL Medical College and General Hospital, Rajahmundry, India
[4] Surgery Resident, Department of General Surgery, GSL Medical College, Rajahmundry, India
[5] Department of General Surgery, GSL Medical College, Rajahmundry, India

Abstract:

Background:

Acute intestinal obstruction (AIO) is a common surgical emergency requiring prompt diagnosis and management to prevent complications like gangrenous bowel, perforation, sepsis, and death of the patient. While exploratory laparotomy has been the surgical standard for acute intestinal obstruction (AIO), minimally invasive surgery is now frequently favoured for appropriately selected patients.

Objective:

The aim of this study is to evaluate the role of laparoscopic approach in the management of acute intestinal obstruction, emphasizing its safety and effectiveness in appropriately selected patients.

Methods:

A retrospective observational study of all the patients diagnosed with acute intestinal obstruction who underwent a laparoscopic approach in a tertiary care hospital from October 2023 to July 2025. The data was collected from the hospital medical records, parameters like age, sex, etiology, the preoperative diagnosis, the procedure, the intra operative diagnosis, operative time, cause of conversion, and postoperative outcome were analyzed.

Results:

A total of 40 patients were included in the study. Laparoscopy was successfully completed in 87.5% (35) patients with the rate of conversion 5 (12.5%) patients. The most common causes for conversion were dense adhesions, bowel ischemia, and fragile dilated bowel unable to be handled in laparoscopy. The mean operative time was 171.1 minutes. The patients undergoing laparoscopic management had faster recovery, earlier return of bowel function, and timely return to regular activities.

Conclusion:

Laparoscopy is a safe and effective modality of management in selected cases of AIO in a tertiary care setting, offering both diagnostic and therapeutic benefits, including faster recovery and less postoperative morbidity.

Recommendation:

Diagnostic laparoscopy should be considered in hemodynamically stable patients with suspected AIO, provided adequate surgical expertise and appropriate patient selection.

Keywords: Intestinal obstruction, Laparoscopy, Acute intestinal obstruction.
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Corresponding author
Dr Samir Ranjan Nayak
Email: drsamirnayak@gmail.com
GSL Medical College

Introduction

Acute intestinal obstruction (AIO) is the most frequent surgical complication in abdominal surgery and is one of the main reasons for emergency room visits, with high rates of morbidity and mortality. Underlying cause may vary according to the age but presenting complaints remain the same in all patients [1]. Traditionally, bowel obstruction was an absolute contraindication for

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laparoscopic approach due to the increased risk for iatrogenic injuries, the difficulty in managing dilated intestinal segments, and the limited visibility or access during surgery [2]. Conversion rates were anticipated to be high due to fragility of the distended bowel, limited working space and whenever required, prompt conversion to open was considered [3,4].

As surgical experience and laparoscopic techniques have advanced, the traditional classification of bowel obstruction as an absolute contraindication to the laparoscopic approach has shifted to being a relative one [5]. The previously significant challenges such as increased risk of iatrogenic injury, difficulty in manipulating distended bowel loops and poor visualization of the operative field have been substantially reduced. These improvements have expanded the role of laparoscopy in managing bowel obstruction, making it a viable option in carefully selected patients, particularly when performed by experienced surgeons under appropriate clinical conditions [6].

Despite these advancements, the open laparotomy approach remains the standard surgical treatment for bowel obstruction. Laparoscopy, while increasingly utilized in select cases, continues to be a topic of ongoing discussion within the surgical community [7]. Concerns persist regarding its safety and effectiveness, particularly in complex bowel obstruction [8]. As a result, the role of laparoscopy in the management of bowel obstruction remains somewhat debatable, with its use generally reserved for carefully selected patients and performed by surgeons with significant expertise in minimally invasive techniques [9,10].

The objective of this study is to evaluate the role of the laparoscopic approach in the management of acute intestinal obstruction, emphasizing its safety and effectiveness and to identify factors influencing conversion to open surgery. The findings of the study contribute to the growing body of literature supporting the use of minimally invasive techniques for improved patient outcomes in acute intestinal obstruction.

Materials & Methods

Study Design

This study was designed as a retrospective observational cohort study.

Study Setting

The study was conducted at GSL Medical College and General Hospital, Rajahmundry, Andhra Pradesh, India, a tertiary care teaching hospital.

Study Population

Adult patients (≥18 years) diagnosed with acute intestinal obstruction between October 2023 and July 2025.

Sample Size and sampling method

A total of 40 patients were included based on availability of complete medical records during the study period. Due to the retrospective nature of the study, all eligible cases were included, and a formal sample size calculation was not performed.

Inclusion criteria

- Patients aged ≥18 years who were diagnosed with acute intestinal obstruction and underwent laparoscopic management

Exclusion criteria

- Hemodynamically unstable patients
- Suspected malignant etiology
- Patients with uncontrolled comorbidities, deemed unfit for laparoscopy
- Complicated obstruction requiring primary laparotomy
- Missing data set

Variables

Independent variables

Age, sex, BMI, ASA, grade, prior surgical history

Dependent variables

Operative outcome, complications

Confounders

Comorbidities, duration of symptoms

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Quantitative variables

Continuous variables were expressed as mean±standard deviation, while categorical variables were expressed as frequencies and percentages.

Bias control

To minimize bias, all data were extracted from standardized hospital records. Outliers were identified through statistical screening and were subsequently verified by manual review of the original medical records.

Data collection

Data was collected retrospectively from hospital records and compiled in a structured format for analysis. The dataset was assessed for completeness, consistency, and heterogeneity.

Statistical Analysis

Data was analyzed using descriptive statistics. Continuous variables were expressed as mean standard deviation. Statistical significance was considered at p value < 0.05. Missing data was identified, cross verified with original medical records and cases with incomplete variables were eliminated during data extraction.

Ethical consideration

Ethical clearance was obtained from the Institutional ethics committee, and the study was carried out in accordance with approved protocols. Patient confidentiality was maintained throughout the study.

Methodology

All participating patients underwent a standardised initial resuscitation protocol prior to surgery which included intravenous fluids to correct fluid and electrolyte imbalance, nasogastric tube decompression to relieve proximal bowel distension and routine preoperative laboratory investigations.

Diagnostic workup done and documented for the cases included Plain X ray abdomen in erect posture, Ultrasonography (USG) of abdomen and pelvis, Computed tomography (CT) scan, when clinically indicated.

The diagnosis of acute bowel obstruction was established in relation to the clinical history, physical examination findings, and radiological evidence. Preoperative fitness for surgery was assessed using the American Society of Anaesthesiologists (ASA) Physical status classification system [11].

Operative technique: All the patients in the study group were subjected to diagnostic laparoscopy after obtaining the consent. Under general anaesthesia, pneumoperitoneum was created using open technique in all the cases. The first 10 mm/ 5mm port was placed at umbilical region/palmer's point, the additional 5 mm working ports were placed under vision depending upon the pathology. Diagnostic laparoscopy followed by bowel walk was performed to identify the site and cause of obstruction. Laparoscopic procedures were converted to open laparotomy in cases involving irreversible bowel ischemia, or dense inoperable adhesions, contaminated surgical field to ensure adequate visualization and surgical field control. The intraoperative findings, procedures performed and indications for conversion were documented.

Post operative outcomes were assessed and documented which included return of bowel motility, removal of ryles tube, resumption of oral intake, length of hospital stay, readmission and its cause, respiratory complications and mortality.

A total of 60 patient records with acute intestinal obstruction were identified from hospital records during the study period

↓

6 cases were excluded due to hemodynamic instability (unfit for surgical intervention)

↓

7 cases were excluded due to suspected malignant etiology with a prior history of radiation

↓

4 cases were excluded due to anticipated operative difficulty based on preoperative factors (age >80 years, ASA grade >II, and significant cardiac comorbidities)

↓

3 cases were excluded due to incomplete data availability

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A total of 40 cases were included in the final analysis

Results

A total of 40 patients were included in the study. Preoperatively patient characteristics were considered and only patients categorized as low risk and without any of the after-mentioned high-risk features were considered suitable for laparoscopic management. The baseline demographic profile is summarized in Table *1*.

Table 1: PRE OPERATIVE CHARACTERISTICS

Variable	Category	Value
AGE		52±2 yrs
SEX	Male	22
	Female	18
BMI	19-25	37
	>25	3
ASA grade [11]	I	26
	II	14
Previous surgical history	Open	6
	Laparoscopic	4

The study population had a mean age of 52±2 years. Male predominance was observed and most of them had a normal BMI (19-25 kg/m²). The majority of the patients (65%) were categorised as ASA Grade I [11], indicating good preoperative fitness. Previous abdominal surgical history was noted in 25% of patients, with predominance of open procedures.

Figure *1* illustrates the age distribution of the study population, depicting the overall pattern and frequency of cases across different age groups.

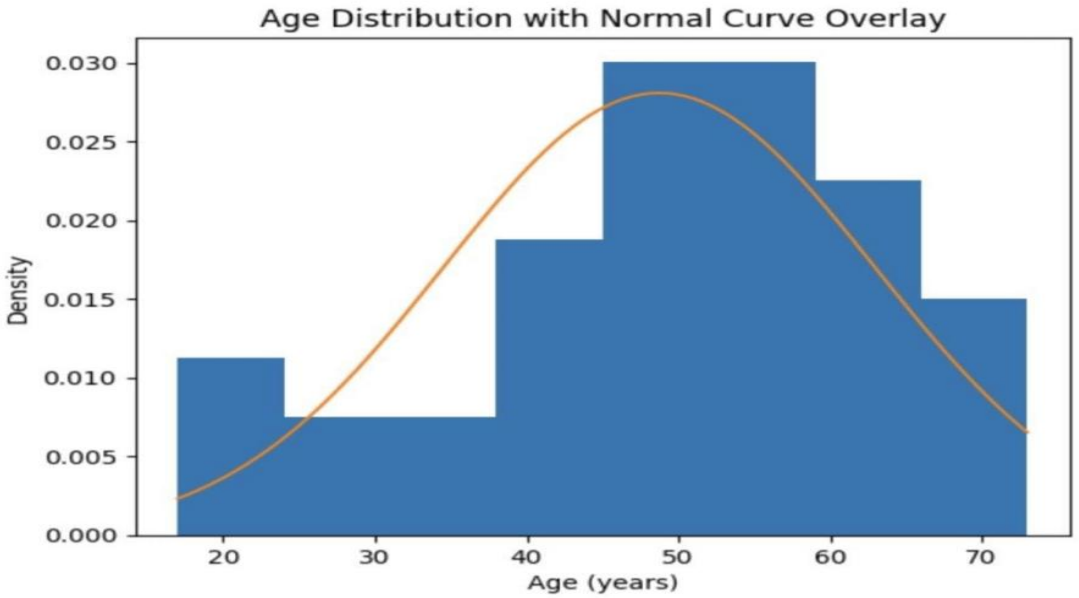

Figure 1: AGE DISTRIBUTION CURVE

The clinical features at presentation are detailed in TABLE *2*. Abdominal pain was the most consistent symptom followed by vomitings. The mean duration of symptoms before hospital presentation was 4.6 ±2 days.

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Symptom	n (%)
Pain	38 (95%)
Vomitings	33(82.5%)
Abdominal distension	15(37.5%)
Peritoneal signs	8(20%)
Time of presentation	4.6 ±2 days

Table 2: CLINICAL PRESENTATION

Radiological findings are summarised in TABLE 3. Plain abdominal radiography confirmed the diagnosis of obstruction in the majority of the patients, whereas ultrasonography aided in the localisation of the obstruction. CT abdomen performed in selective patients provided additional information regarding etiology and complications like closed loop obstruction and ischemia.

Table 3: PREOPERATIVE RADIOLOGICAL FINDINGS

PRE OPERATIVE INVESTIGATION	N	Finding	n (%)
Xray erect abdomen	37	Dilated central bowel loops with multiple air fluid levels	33(89.1%)
		peripheral colonic dilatation with visible haustra	4 (10.8%)
USG abdomen	33	Dilated bowel loops (>3cm in SBO , >6cm in LBO)	31(93.9%)
		Increased bowel peristalsis	26(78.7%)
		Identification of transition point	18(54.5%)
CT abdomen	9	Transition point identified	9 (100%)
		Hernia related obstruction	3(33.3%)
		Large bowel mass	2(22.2%)
		Features of ischemia / gangrene	2(22.2%)
		closed loop obstruction	1(11.1%)

The intraoperative etiologies are presented in TABLE 4.

Table 4: INTRAOPERATIVE ETIOLOGIES

Etiology	n(%)
Adhesions	20(50%)
Hernia	6(15%)
Stricture	5(12.5%)
Miscellaneous	7(17.5%)
Large bowel mass	2(5%)

Adhesions (Figure 2) were the most common intraoperative finding, followed by strictures (Figure 3) and obstructed groin hernias (Figure 4). Miscellaneous causes included Meckel's diverticulum (Figure 5) and bowel-uterine peritoneal fold (Figure 6).

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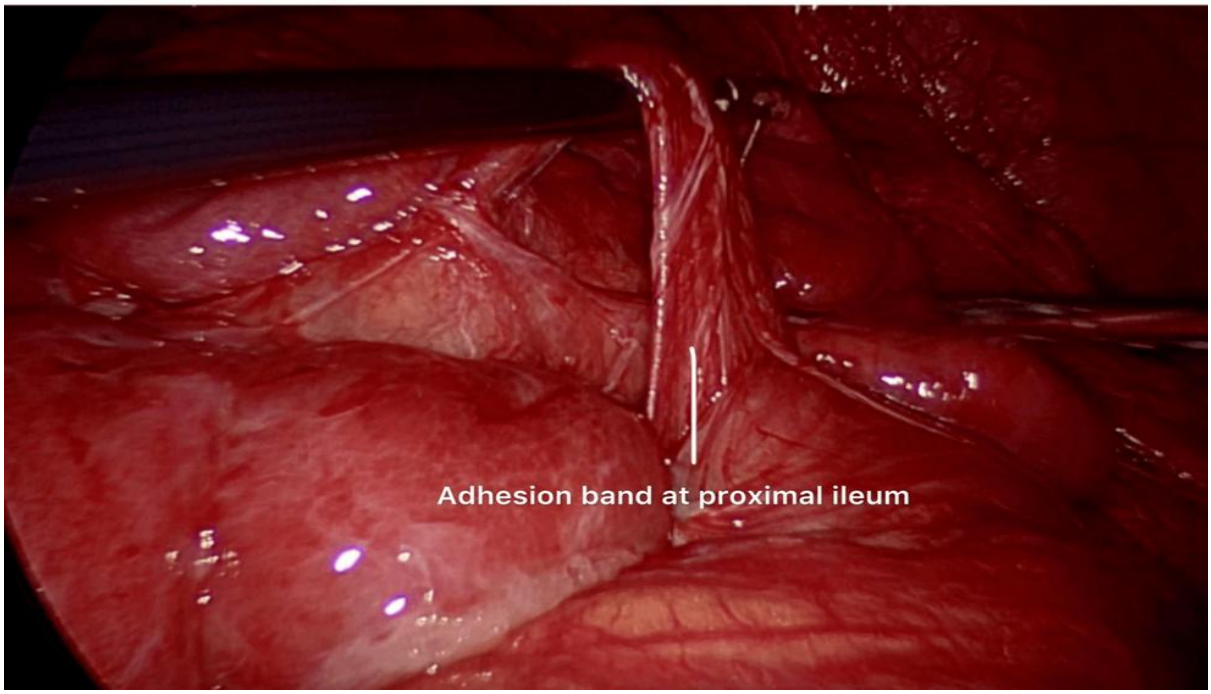

Figure 2: ADHESIONS IN LAPAROSCOPY

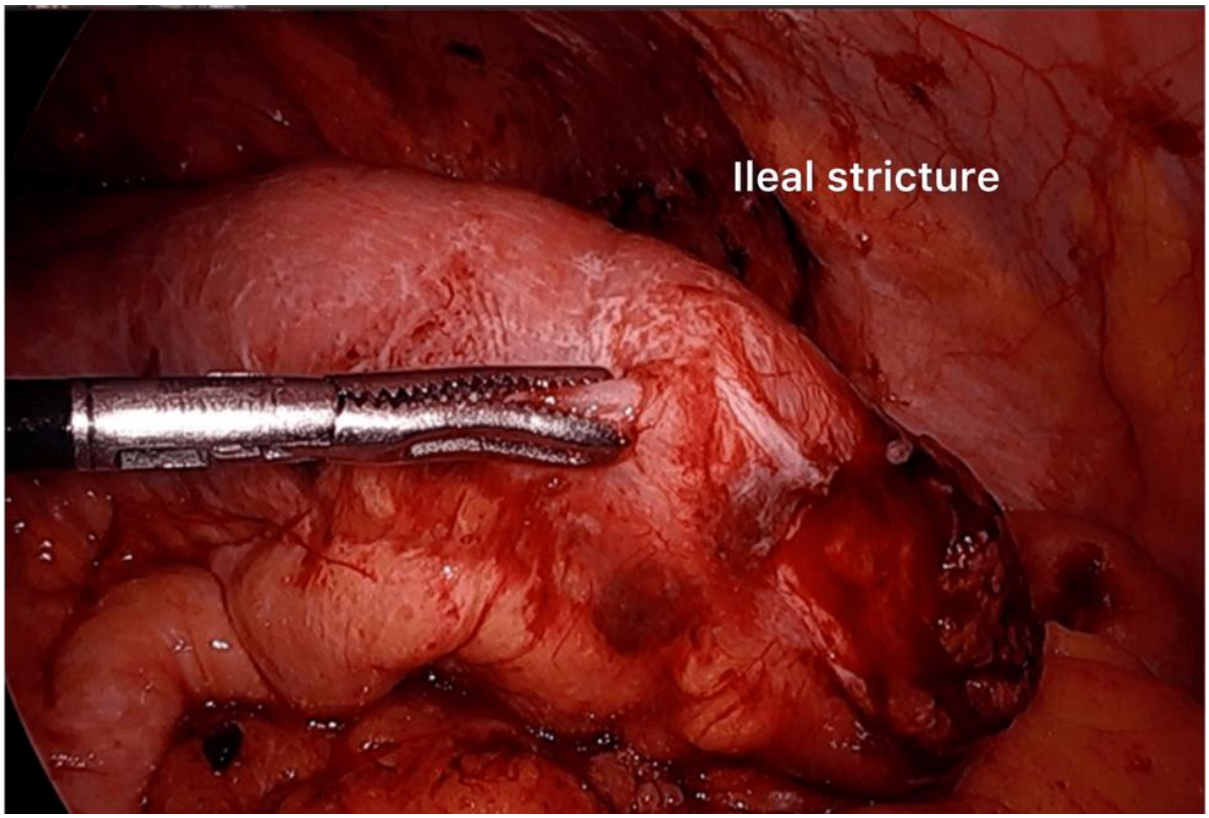

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Figure 3: ILEAL STRICTURE IN LAPAROSCOPY

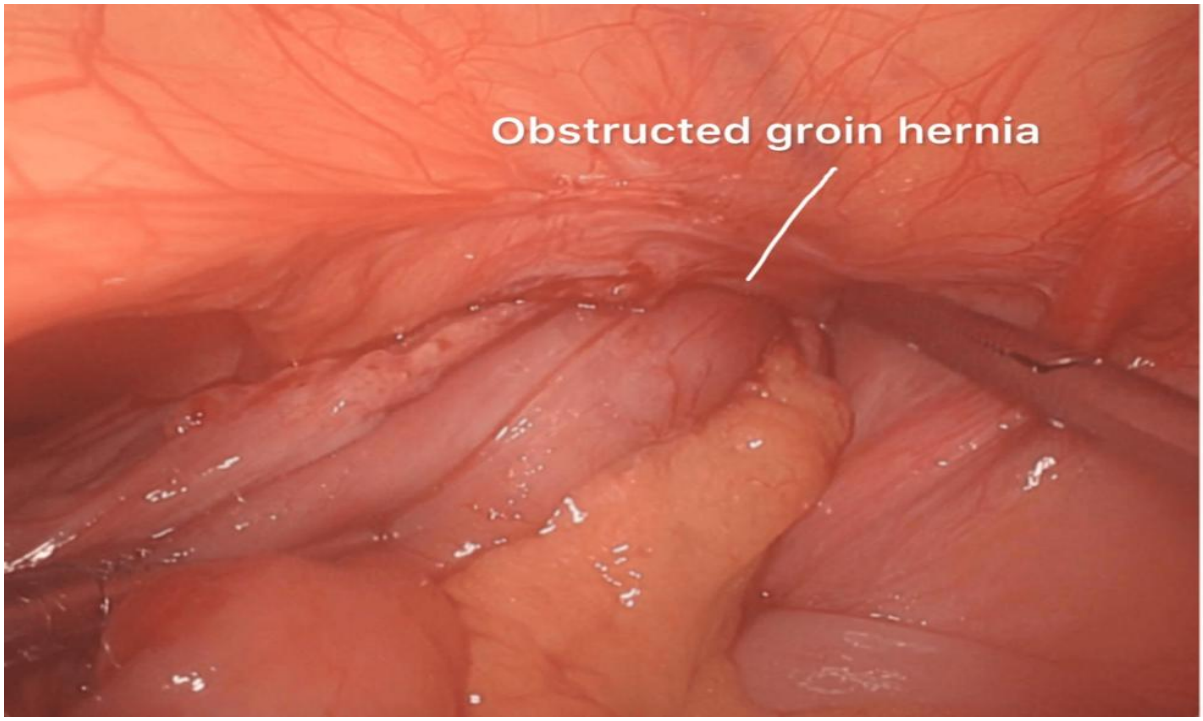

Figure 4: OBSTRUCTED GROIN HERNIA IN LAPAROSCOPY

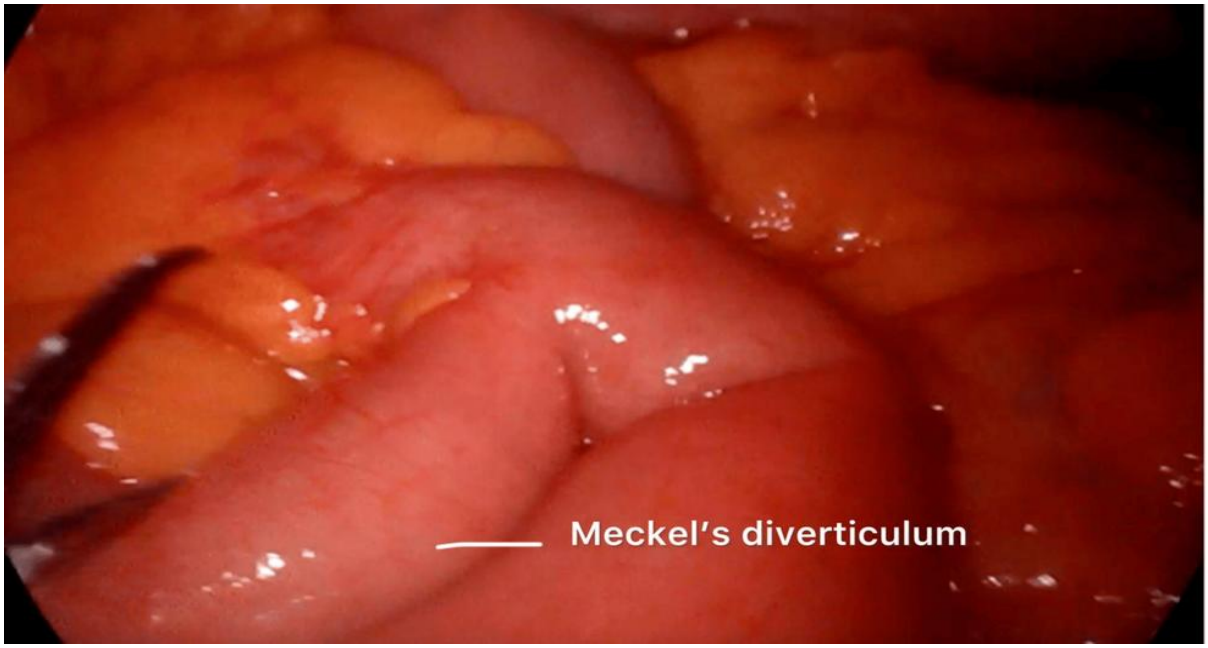

Figure 5: MECEKEL'S DIVERTICULUM IN LAPAROSCOPY

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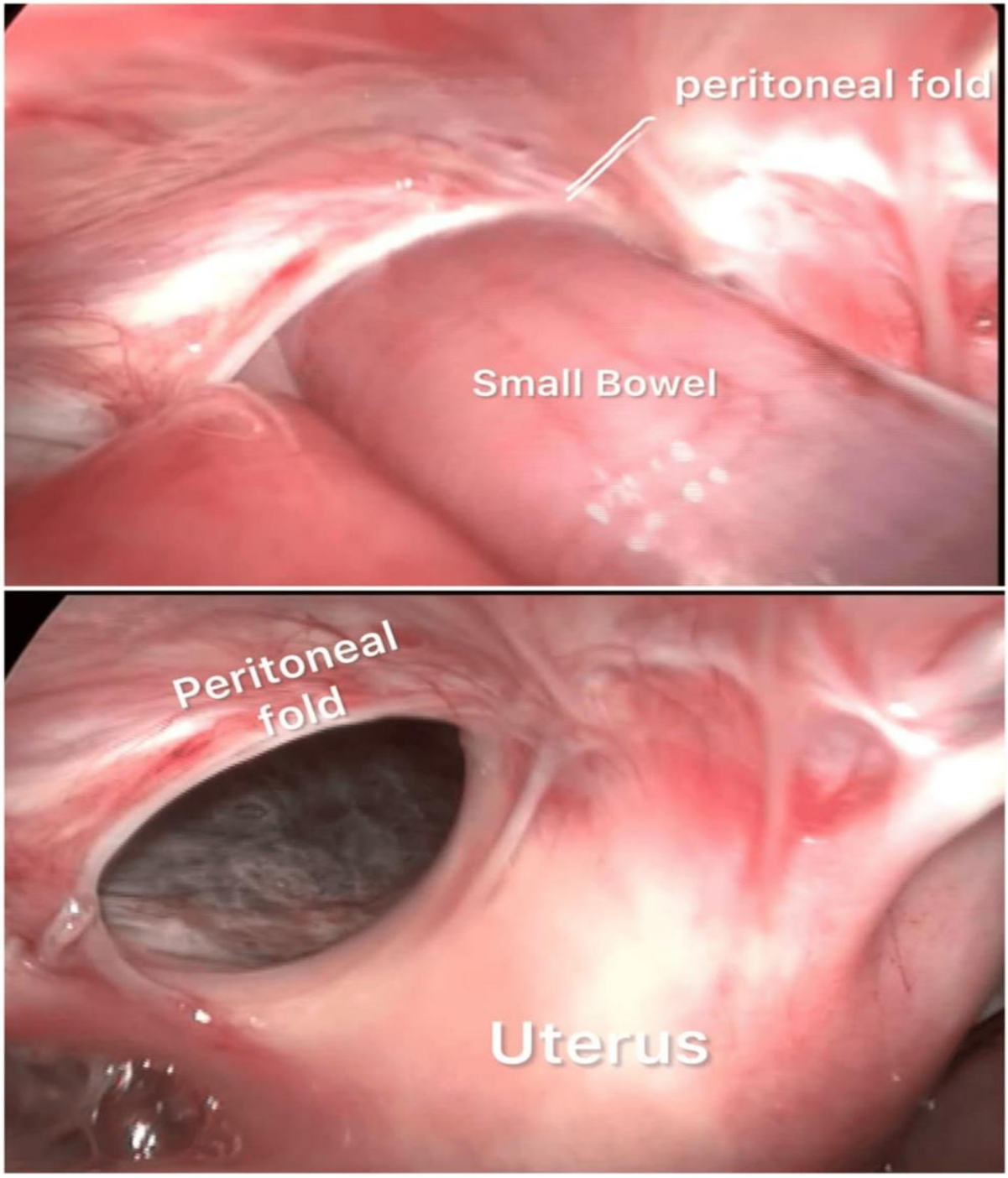

Figure 6: BOWEL IN UTERINE PERITONEAL FOLD

Operative outcomes are shown in TABLE 5. Laparoscopic surgery was performed in 87.5% patients, indicating high feasibility. The reasons for conversion in the remaining patients are detailed in TABLE 6.

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Table 5: OPERATIVE OUTCOME

Operative outcome	N (%)
Completed laparoscopically	35(87.5%)
Conversion to open	5(12.5%)

Table 6: INTRA OPERATIVE ETIOLOGY OF CASES CONVERTED TO OPEN

Etiology	N
Difficulty to perform bowel walk	2
Gangrene	2
Large bowel mass	1

Stoma was fashioned in 2 out of 5 cases. Postoperative outcomes in the laparoscopic group and laparotomy group are summarised in TABLE 7 and TABLE 8 respectively.

Table 7: POSTOPERATIVE OUTCOME IN PATIENTS WHO UNDERWENT LAPAROSCOPY

Outcome	N
Mortality	1
Respiratory complication	2
Prolonged ventilatory support	1

Table 8: POSTOPERATIVE OUTCOME IN PATIENTS WHO UNDERWENT LAPAROTOMY

Outcome	N
Mortality	1
Acute kidney injury due to hypovolemia	2
Early recurrent obstruction	1

Laparoscopic surgery was completed in 87.5% of individuals whereas the rate of conversion to laparotomy was around 12.5%. Most common causes of conversion to laparotomy are difficulty to perform bowel walk, large bowel mass, unidentified bowel ischemia (Figure 7).

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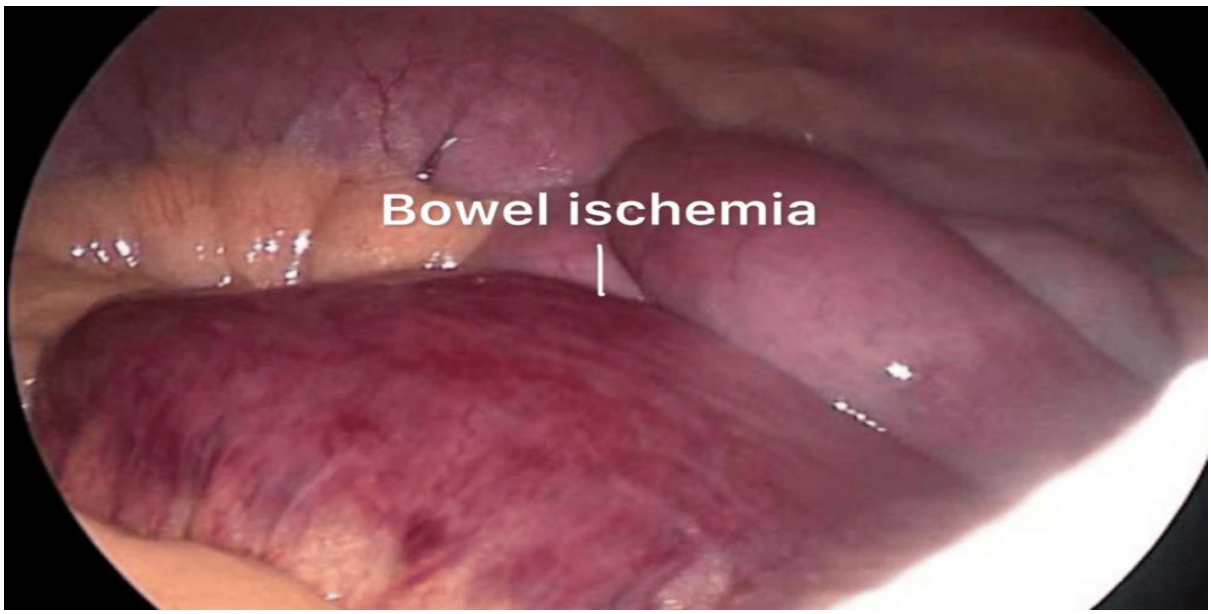

Figure 7: BOWEL ISCHAEMIA IN LAPAROSCOPY

In our study one case of intraoperative iatrogenic bowel injuries was recorded, but it was managed laparoscopically

Figure *8* depicts the range and mean average duration of surgery among the patients.

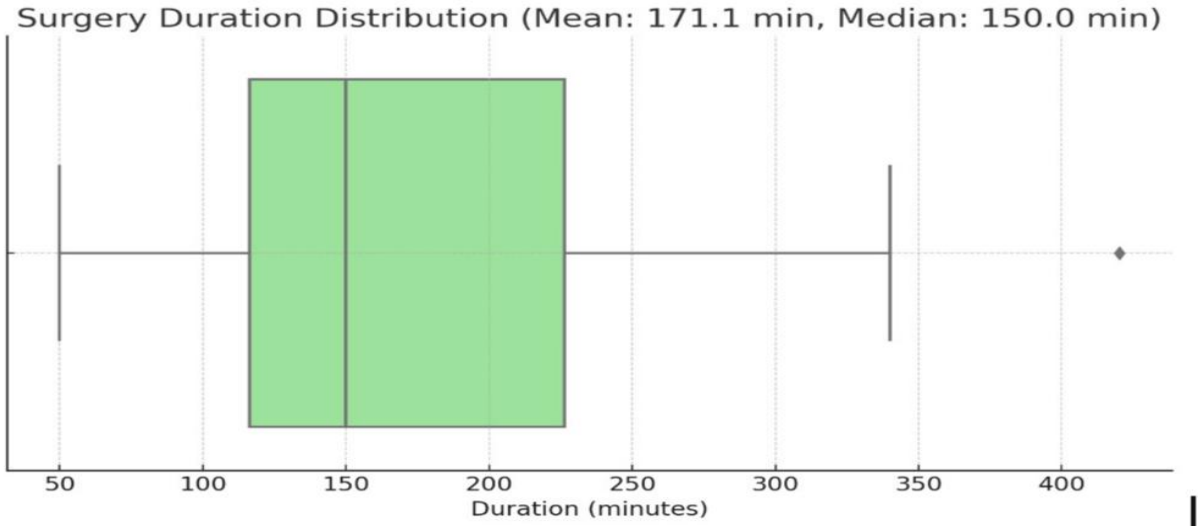

Figure 8: DURATION OF SURGERY

Average time taken for laparoscopic surgery was 171.1 min (2hours, 51mins) and a correlation between duration of surgery and postoperative recovery outcome was drawn which gave a p value of 0.14, so the result is not statistically significant at the 95% confidence level.

Postoperative recovery outcomes were tachycardia and tachypnoea till day 1. By postoperative day 3 most patients (96%) had good recovery with ERAS protocol [12] followed for almost all of the cases.

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All the patients operated laparoscopically were followed up till 30 days, 1 death was reported on day 22 after discharge from hospital under stable circumstances. The causative origin was more inclined towards the patient's high risk despite rigorous selection rather than the laparoscopic approach itself.

Figure *9* illustrates the distribution of postoperative mortality according to intraoperative etiology, demonstrating that mortality was high among cases of perforation and gangrene. Complications were most frequent in patients with perforation or gangrene, followed by stricture-related obstruction. Adhesive obstruction was associated with fewer complications. Adhesive obstruction was associated with fewer complications.

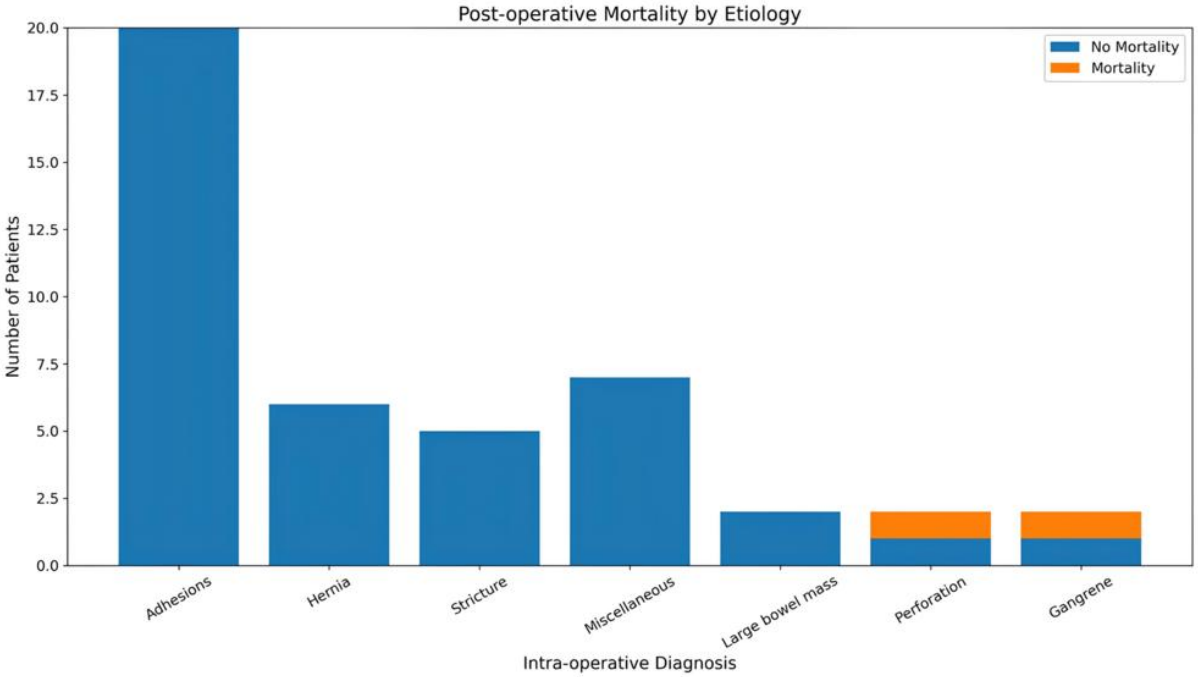

Figure 9: STACKED BAR CHART SHOWING POSTOPERATIVE OUTCOME BY INTRA OPERATIVE DIAGNOSIS

Discussion:

The present study demonstrated that laparoscopic management of acute intestinal obstruction was feasible in 87.5% of patients, with a conversion rate of 12.5%. Adhesions were the most common etiology, and patients undergoing laparoscopic management showed faster postoperative recovery and earlier return of bowel function. Numerous clinical trials and studies have compared the laparoscopic approach to open laparotomy in the management of intestinal obstruction, with many favouring laparoscopy due to its minimally invasive nature and association with faster postoperative recovery [4,13,14]. However, despite these encouraging findings, there remains a lack of comprehensive data regarding appropriate patient selection for laparoscopic management, as well as limited discussion on the intra operative challenges that surgeons face during these procedures. As a result, the overall utility and feasibility of laparoscopy in cases of acute intestinal obstruction have not been extensively explored.

In recent years, the growing expertise among the surgeons in minimally invasive techniques has contributed to the rising popularity of laparoscopy in this context. Emerging studies have increasingly supported its safety and effectiveness, reinforcing its potential role in the treatment of intestinal obstruction when performed under the right clinical conditions [13].

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Despite the fact that there can be high conversion rates, they have been considerably reduced through increased experience and better patient selection [15]. For example, in 1995 the Swiss Surgical Society designed a multicentre prospective study with 537 patients and obtained a 32.4% conversion rate [16]. In 2001, Levar et al. conducted a retrospective multicentre study on 308 patients that produced a conversion rate of 54.6%[5]. A recent meta-analysis by O′Connor et al. that included 2,005 patients showed a lower conversion rate of 29%[4,17], which was reduced to 17% in the group of Mancini et al. In our study the conversion rate was 12.5%, which is close to the figures published in the recent literature.

Patients with bowel distension greater than 4 cm in imaging studies, suspected intestinal ischemia or peritonitis are relative contraindications for laparoscopy and are thus preferred for open method by the surgeons along with the other exclusion criteria. So with this more specific approach in patient selection, the conversion rate can be further reduced [13].

Creating pneumoperitoneum with open technique has proved to be safe, especially in cases with distended loops of small bowel. Placing trocar in previous incision sites was avoided [17]. The cause of obstruction was identified with initial diagnostic laparoscopy, if a definite cause was not found with no relief of obstruction an obligatory open conversion was done [14,18]. Several authors emphasize that, in accordance with the principle of 'premium non nocere', the use of energy devices should be used with caution in the restricted working space of the abdomen, to minimize the risk of iatrogenic injuries, thereby decreasing the chances of conversion to open [19]. History of previous abdominal surgery, peritonitis, recurrent obstruction were associated with increased difficulty during laparoscopy and higher chances of conversion to open [20].

Laparoscopy provides lower occurrence of adhesions compared to open, which thus lowers the potential risk of recurrence of obstruction in future [21]. Other than the selected exclusion criteria as discussed above, it can be said that laparoscopic approach can be done in all the patients with intestinal obstruction given that the surgeon is well versed in laparoscopy.

Conclusions

Laparoscopy has emerged as a safe and effective option for the management of selected cases of acute intestinal obstruction (AIO), particularly in the setting of tertiary care centres where surgical expertise and advanced facilities are readily available. When patients are carefully selected, laparoscopy offers both diagnostic clarity and therapeutic intervention within the same procedure. The minimally invasive approach allows for direct visualisation of the obstruction site, which can be especially valuable in cases where the underlying cause is unclear from imaging studies alone. Furthermore, in cases such as single-band adhesions or early-stage obstruction, laparoscopy can facilitate effective treatment without the need for conversion to an open procedure.

However, the success of laparoscopic management largely depends on the surgeon's experience and judgment, particularly in recognizing when conversion to open surgery is necessary to ensure patient safety. With proper case selection and skilled execution, laparoscopy serves as a valuable tool in the surgical management of AIO, contributing to improved outcomes and enhanced recovery in appropriate patients.

Limitations

This study is limited by its retrospective design and single-center setting, exclusion of cases due to incomplete data; however, standardized data collection and consistent surgical protocols strengthen the reliability of the findings.

Generalizability

The findings of this study may be applicable to similar tertiary care settings but require validation through larger multicentre prospective studies.

Recommendation

Laparoscopic management should be considered in selected patients with acute intestinal obstruction, provided appropriate expertise and facilities are available.

Acknowledgement

The authors acknowledge the support of the Department of General Surgery, Department of Anaesthesiology, and Medical Records Department.

List of abbreviations.

AIO – Acute Intestinal Obstruction

ASA – American Society of Anesthesiologists

CT – Computed Tomography

ERAS – Enhanced Recovery After Surgery

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Conflict of interest.

The authors declare no conflict of interest.

Source of funding

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Data availability

The datasets used and analyzed during the current study are not publicly available due to institutional policies and patient confidentiality.

Author contributions

Concept and design: Dr. Samir Ranjan Nayak, Dr. Kallem Varisha, Dr. Samina Ali

Data collection: Dr Kallem Varisha, Dr Samina Ali, Dr Varun Prakash V A, Dr Boni Satish

Analysis and interpretation: Dr. Samir Ranjan Nayak, Dr. Kallem Varisha, Dr. Samina Ali

Manuscript drafting: Dr. Kallem Varisha, Dr. Samina Ali, Dr. Varun Prakash V A, Dr. Boni Satish

Critical revision: Dr. Samir Ranjan Nayak, Dr. K.L. Narasimha rao, Dr. D.Abhivardhan

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