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Original Research

Correlation of Duration of Symptoms with Intraoperative Severity in Acute Intestinal Obstruction: A Prospective Observational Study.

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Abstract

Background: Acute intestinal obstruction is a frequent surgical emergency in which persistent luminal blockage can progress from bowel distension and venous congestion to ischaemia, gangrene, perforation, and sepsis. Symptom duration before operative treatment could provide a simple marker of intraoperative disease severity. **Objectives:** To determine the correlation between symptom duration and intraoperative severity among patients undergoing emergency surgery for acute intestinal obstruction. **Methods:** This prospective observational study included 100 consecutive adults who underwent emergency surgery for acute intestinal obstruction at Government Medical College, Srikakulam, Andhra Pradesh, India, from July to December 2023. Symptom duration was recorded from the reported onset of obstruction-related symptoms to surgery. Intraoperative findings were classified as mild, moderate, or severe. Associations were examined using the chi-square test, one-way analysis of variance, Spearman correlation, and receiver operating characteristic analysis. **Results:** The mean age was 48.7 ± 15.6 years, 62.0% were male, and the mean symptom duration was 50.6 ± 32.8 hours. Postoperative adhesions were the leading cause of obstruction. Severe intraoperative disease increased from 7.1% among patients presenting within 24 hours to 73.3% among those presenting after 72 hours. Symptom duration was strongly correlated with intraoperative severity ($r_s=0.71$, $p<0.001$). Bowel ischaemia, gangrene, perforation, contamination, resection, postoperative complications, intensive care requirement, hospital stay, and mortality increased significantly with longer symptom duration. A duration exceeding 48 hours predicted severe findings with 71.4% sensitivity and 75.0% specificity; the area under the curve was 0.82. **Conclusion:** Longer symptom duration was strongly associated with advanced intraoperative pathology and poorer postoperative outcomes. Early recognition, referral, resuscitation, and timely operative decision-making are essential to reduce bowel loss and adverse outcomes in acute intestinal obstruction.

Keywords: acute intestinal obstruction; symptom duration; bowel ischaemia; intraoperative severity; emergency surgery.

Introduction

Acute intestinal obstruction is a common cause of emergency surgical admission and represents a major contributor to morbidity, bowel resection, prolonged hospitalisation, and death. The condition develops when the forward passage of intestinal contents is interrupted by a mechanical lesion or, less commonly, by functional failure of bowel propulsion. Patients typically present with colicky abdominal pain, vomiting, abdominal distension, and failure to pass stool or flatus. Clinical expression varies with the site, completeness, cause, and duration of obstruction, while delayed recognition can obscure classical features and permit rapid physiological deterioration [1,2].

The aetiological spectrum differs across populations and has changed with advances in abdominal surgery. Postoperative adhesions are the predominant cause of small-bowel obstruction in many contemporary series, whereas external hernias, malignancy, volvulus, intussusception, and inflammatory strictures remain important causes. Indian reports have also documented a mixed pattern in which adhesions and obstructed hernias account for a substantial proportion of cases [2,3]. Because acute obstruction frequently affects patients with dehydration, electrolyte imbalance, infection, or coexisting illness, both the obstructing lesion and the physiological consequences require urgent assessment.

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Continued obstruction increases intraluminal pressure and bowel-wall tension. Venous and lymphatic outflow become impaired first, followed by mural oedema, reduced arterial perfusion, ischaemia, bacterial translocation, necrosis, and perforation. Identifying strangulation before irreversible injury remains difficult because no isolated symptom, laboratory value, or imaging sign is completely reliable. Current guidelines support computed tomography, repeated clinical examination, resuscitation, and selective non-operative management when peritonitis, strangulation, and ischaemia are absent [4,5]. Clinical prediction models and computed tomography findings can improve recognition of patients requiring surgery, but operative judgement remains central [6-8].

Time is therefore an important component of risk assessment. Earlier studies associated delayed diagnosis and treatment with bowel resection, postoperative complications, and death [9,10]. Subsequent investigations found worse outcomes when operative treatment was delayed beyond 48 hours or when unsuccessful non-operative management continued for more than three days [11,12]. Population-level analyses also linked prolonged delay to surgery with increased mortality and longer postoperative hospitalisation [13,14]. Nevertheless, the relationship between the total duration of symptoms and the actual severity encountered during surgery has received less attention in prospective hospital-based research, particularly in regional Indian settings.

The present study was undertaken to evaluate whether symptom duration correlates with intraoperative severity in adults undergoing emergency surgery for acute intestinal obstruction. The primary objective was to determine the association between predefined duration categories and mild, moderate, or severe intraoperative disease. Secondary objectives were to examine the relationship of symptom duration with bowel ischaemia, gangrene, perforation, peritoneal contamination, bowel resection, postoperative morbidity, length of hospital stay, and in-hospital mortality, and to assess the predictive performance of a symptom duration exceeding 48 hours for severe intraoperative findings.

METHODOLOGY

Study design and setting: A hospital-based prospective observational study was conducted in the Department of General Surgery, Government Medical College, Srikakulam, Andhra Pradesh, India, from July 2023 to December 2023. The study evaluated adult patients undergoing emergency operative treatment for acute mechanical intestinal obstruction.

Study population and sampling: Consecutive patients aged 18 years or older with clinical and radiological evidence of acute intestinal obstruction who underwent emergency laparotomy were screened. Postoperative paralytic ileus, intestinal pseudo-obstruction, primary mesenteric vascular occlusion without mechanical obstruction, chronic subacute obstruction, cases managed entirely without surgery, and incomplete records were excluded. A total of 100 eligible patients were enrolled.

Clinical assessment and management: Demographic details, symptom duration, previous abdominal surgery, comorbidities, vital signs, abdominal findings, and laboratory results were recorded using a structured form. Radiography, ultrasonography, and contrast-enhanced computed tomography were performed according to clinical need. Initial treatment included bowel rest, nasogastric decompression when indicated, intravenous fluids, electrolyte correction, monitoring, analgesia, and antibiotics for suspected strangulation, perforation, or contamination. Surgery was undertaken for peritonitis, suspected strangulation or ischaemia, complete obstruction, perforation, clinical deterioration, or failure of an appropriate non-operative trial [4,5].

Exposure and intraoperative severity assessment: Symptom duration was the interval from patient-reported onset of the first obstruction-related symptom to surgery and was grouped as ≤ 24 , 25-48, 49-72, and >72 hours. Severity was assigned after exploration. Mild disease indicated simple obstruction with viable bowel; moderate disease included marked distension, oedema, congestion, or reversible perfusion impairment; and severe disease included irreversible ischaemia, gangrene, perforation, gross contamination, or bowel injury requiring resection. Aetiology, operative findings, procedure, and stoma formation were documented. The framework reflected recognised predictors of operative need and bowel ischaemia [6-8].

Outcome assessment: Patients were followed until discharge or in-hospital death. Recorded outcomes included surgical-site infection, any postoperative complication, intensive care requirement, hospital length of stay, and mortality. More than one intraoperative or postoperative event could be recorded in the same patient.

Statistical analysis: Data were analysed using IBM SPSS Statistics version 26.0. Continuous variables were summarised as mean $\pm$ standard deviation or median with interquartile range, while categorical variables were expressed as frequency and percentage. The chi-square test or Fisher exact test was used for categorical comparisons. Mean symptom duration across severity categories and mean hospital stay across duration groups were compared using one-way analysis of variance. Spearman rank correlation assessed the relationship between symptom duration and intraoperative severity. Receiver operating characteristic analysis evaluated symptom duration >48 hours as a predictor of severe disease. A two-sided p-value <0.05 was considered statistically significant.

Ethical considerations: Necessary permission was taken before initiation this study. Written informed consent was obtained from each participant or a legally authorised representative when the clinical condition prevented direct consent. Confidentiality was maintained, and the study was conducted in accordance with the Declaration of Helsinki.

Results

A total of 100 patients who underwent emergency surgery for acute intestinal obstruction were included. The mean age was 48.7 ± 15.6 years, and 62.0% were male. The mean duration of symptoms before surgery was 50.6 ± 32.8 hours, with a median of 44 hours. Abdominal pain was present in all patients, while vomiting, abdominal distension, and obstipation occurred in 84.0%, 79.0%, and 71.0%, respectively. Postoperative adhesions were the most frequent cause of obstruction, followed by obstructed or strangulated hernia and intestinal malignancy. Baseline characteristics and the aetiological distribution are presented in Table 1.

Table 1. Baseline demographic, clinical, and aetiological characteristics of the study participants

Variable	Category/Value	Frequency	Percentage
Total sample size	-	100	100.0
Age, years	Mean $\pm$ SD	48.7 ± 15.6	-
Age group	18-30 years	14	14.0
	31-40 years	18	18.0
	41-50 years	25	25.0
	51-60 years	23	23.0
	>60 years	20	20.0
Sex	Male	62	62.0
	Female	38	38.0
Duration of symptoms, hours	Mean $\pm$ SD	50.6 ± 32.8	-
	Median (IQR)	44 (24-72)	-
Presenting symptoms*	Abdominal pain	100	100.0
	Vomiting	84	84.0

	Abdominal distension	79	79.0
	Obstipation	71	71.0
	Fever	29	29.0
	Dehydration	26	26.0
	Tachycardia	34	34.0
Aetiology of obstruction	Postoperative adhesions	34	34.0
	Obstructed/strangulated hernia	24	24.0
	Intestinal malignancy	17	17.0
	Volvulus	12	12.0
	Intussusception	7	7.0
	Other causes	6	6.0

*Multiple symptoms were present in some patients. SD: standard deviation; IQR: interquartile range.

According to symptom duration, 28 patients underwent surgery within 24 hours of symptom onset, 34 between 25 and 48 hours, 23 between 49 and 72 hours, and 15 after more than 72 hours. Intraoperative severity increased progressively across these categories. Severe disease was observed in 7.1% of patients in the ≤24-hour group and 73.3% in the >72-hour group. In contrast, mild disease declined from 64.3% to 0%. The association between symptom duration and intraoperative severity was statistically significant ($\chi^2=38.01$, degrees of freedom=6, $p<0.001$), as shown in Table 2.

Table 2. Association between duration of symptoms and intraoperative severity

Duration of symptoms	Mild severity, n (%)	Moderate severity, n (%)	Severe severity, n (%)	Total
≤24 hours	18 (64.3)	8 (28.6)	2 (7.1)	28
25-48 hours	10 (29.4)	18 (52.9)	6 (17.6)	34
49-72 hours	3 (13.0)	11 (47.8)	9 (39.1)	23
>72 hours	0 (0.0)	4 (26.7)	11 (73.3)	15
Total	31 (31.0)	41 (41.0)	28 (28.0)	100

$\chi^2=38.01$; degrees of freedom=6; $p<0.001$.

The mean symptom duration was 24.3 ± 12.1 hours among patients with mild disease, 48.6 ± 18.4 hours among those with moderate disease, and 82.7 ± 30.6 hours among those with severe disease. This difference was statistically significant ($F=56.63$, $p<0.001$). Spearman rank correlation demonstrated a strong positive relationship between symptom duration and intraoperative severity ($r_s=0.71$, $p<0.001$).

Adverse intraoperative findings became more frequent with increasing symptom duration. Bowel ischaemia increased from 3.6% among patients undergoing surgery within 24 hours to 53.3% among those treated after 72 hours. Bowel gangrene increased from 0% to 46.7%, and bowel perforation increased from 0% to 26.7%. The requirement for bowel resection rose from 7.1% in the earliest group to 66.7% in the latest group. Significant associations were also observed for gross peritoneal contamination and stoma formation (Table 3).

Table 3. Major intraoperative findings according to duration of symptoms

Intraoperative finding*	≤24 hours (n=28)	25-48 hours (n=34)	49-72 hours (n=23)	>72 hours (n=15)	p-value
Bowel ischaemia	1 (3.6)	4 (11.8)	7 (30.4)	8 (53.3)	<0.001
Bowel gangrene	0 (0.0)	2 (5.9)	5 (21.7)	7 (46.7)	<0.001
Bowel perforation	0 (0.0)	1 (2.9)	3 (13.0)	4 (26.7)	0.009
Gross peritoneal contamination	1 (3.6)	4 (11.8)	8 (34.8)	8 (53.3)	<0.001
Bowel resection required	2 (7.1)	6 (17.6)	10 (43.5)	10 (66.7)	<0.001
Stoma formation	0 (0.0)	1 (2.9)	3 (13.0)	4 (26.7)	0.009

Values are expressed as frequency (percentage). *Individual patients could have more than one intraoperative finding.

Receiver operating characteristic analysis showed that symptom duration exceeding 48 hours predicted severe intraoperative findings with a sensitivity of 71.4%, specificity of 75.0%, positive predictive value of 52.6%, and negative predictive value of 87.1%. The area under the curve was 0.82 (95% confidence interval: 0.73-0.91; $p<0.001$), indicating good discriminatory performance.

Postoperative morbidity increased with delayed operative treatment. The overall complication rate was 28.0%, and six patients died, giving an in-hospital mortality rate of 6.0%. Complications occurred in 10.7% of patients in the ≤24-hour group and 60.0% in the >72-hour group. Intensive care requirement, surgical-site infection, and hospital stay also increased across duration categories. Mean hospital stay rose from 5.2 ± 1.8 days to 12.4 ± 4.7 days, while mortality increased from 0% to 20.0% (Table 4). Overall, prolonged symptom duration was associated with more advanced intraoperative pathology and poorer postoperative outcomes.

Table 4. Postoperative outcomes according to duration of symptoms

Postoperative outcome	≤24 hours (n=28)	25-48 hours (n=34)	49-72 hours (n=23)	>72 hours (n=15)	p-value
Any postoperative complication	3 (10.7)	7 (20.6)	9 (39.1)	9 (60.0)	0.003
Surgical-site infection	1 (3.6)	3 (8.8)	5 (21.7)	5 (33.3)	0.028
Postoperative intensive care requirement	1 (3.6)	3 (8.8)	6 (26.1)	7 (46.7)	0.001
Hospital stay, mean $\pm$ SD, days	5.2 ± 1.8	7.1 ± 2.6	9.6 ± 3.8	12.4 ± 4.7	<0.001
In-hospital mortality	0 (0.0)	1 (2.9)	2 (8.7)	3 (20.0)	0.049

Values are expressed as frequency (percentage), except hospital stay.

Discussion

This prospective study demonstrated a strong duration-dependent relationship between symptoms and operative severity in acute intestinal obstruction. Patients treated after longer symptom intervals had substantially higher frequencies of ischaemia, gangrene, perforation, contamination, bowel resection, postoperative complications, intensive care use, prolonged admission, and death. The gradient was marked: severe disease increased from 7.1% within 24 hours to 73.3% after 72 hours, and symptom duration correlated strongly with severity. These observations support symptom duration as a clinically accessible risk marker, while recognising that treatment decisions must integrate examination, physiological status, laboratory results, and imaging.

The demographic and aetiological pattern was broadly consistent with earlier literature. Markogiannakis et al. described abdominal pain, vomiting, distension, and constipation as dominant presentations and identified adhesions, hernias, and malignancy as major causes [2]. The Chandigarh experience also documented the continuing importance of adhesions and hernias in Indian surgical practice [3]. In the present study, adhesions accounted for 34.0%, reflecting the long-term consequence of previous abdominal operations described in international guidance [4].

The biological plausibility of the observed correlation is strong. Persistent luminal obstruction produces progressive distension, impaired

venous drainage, mural oedema, reduced arterial inflow, bacterial translocation, necrosis, and perforation. Early reports linked diagnostic delay with bowel loss and septic complications [9], while Fevang et al. identified bowel gangrene and treatment delay as important determinants of adverse outcome after surgery [10]. The present rise in resection from 7.1% to 66.7% across duration groups is consistent with this progression.

Our findings also agree with studies examining operative timing. Joseph et al. reported worse morbidity and longer hospital stay when surgery for adhesion-related obstruction was delayed beyond 48 hours [11]. Keenan et al. found that unsuccessful non-operative trials extending beyond three days increased postoperative morbidity [12]. Peacock et al. observed higher risk-adjusted 30-day mortality when laparotomy occurred more than 72 hours after admission [13]. Using the Nationwide Inpatient Sample, Schraufnagel et al. likewise demonstrated that delayed operative management was associated with death and a longer postoperative stay [14].

The strong correlation and good receiver operating characteristic performance suggest that duration can support triage, especially where advanced imaging is not immediately available. Nevertheless, it should not function as an isolated trigger for laparotomy. Selected patients with uncomplicated adhesive obstruction can safely undergo closely monitored non-operative treatment, whereas peritonitis, strangulation, ischaemia, clinical deterioration, or high-risk computed tomography findings require urgent surgery [4,5,8]. Prediction models described by Zielinski et al. further show that combinations of clinical and radiological variables outperform single findings [6,7]. In practice, symptom duration should heighten vigilance, accelerate referral and imaging, and lower the threshold for exploration when other severity indicators are present.

Limitations

This single-centre study included only patients who underwent emergency surgery, excluding conservatively managed obstruction and limiting applicability to the entire obstruction spectrum. Symptom onset was based on patient or caregiver recall, introducing recall error. The investigator-defined severity categories were not externally validated, and some component findings overlapped. The modest sample restricted subgroup analyses by aetiology, comorbidity, and obstruction level. Long-term recurrence and functional outcomes were not assessed.

Conclusion

Symptom duration showed a strong positive correlation with intraoperative severity in patients undergoing emergency surgery for acute intestinal obstruction. Delays beyond 48 hours were associated with increasing bowel ischaemia, gangrene, perforation, peritoneal contamination, resection, stoma formation, postoperative morbidity, intensive care use, prolonged hospitalisation, and mortality. A symptom duration exceeding 48 hours demonstrated good ability to identify severe intraoperative disease, although duration should be interpreted with clinical, laboratory, and radiological findings. Early recognition at the community level, rapid referral, prompt resuscitation, repeated surgical assessment, and timely exploration in patients with suspected strangulation are essential to preserve bowel viability and improve short-term outcomes across emergency surgical settings with substantial referral delays.

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