

Factors Predicting Surgical Treatment in Patients with Adhesive Small Bowel Obstruction: Retrospective Single-centre Study

Tevfik Kivilcim Uprak, Muhammed Ikbal Akin, Mumin Coskun and Cumhur Yegen

Department of General Surgery, Marmara University School of Medicine, Istanbul, Turkey

ABSTRACT

Objective: To investigate the factors which predict treatment strategy in patients with adhesive small bowel obstruction.

Study Design: Descriptive study.

Place and Duration of Study: General Surgery Clinic, Marmara University Medical Faculty, Istanbul, Turkey, between January 2016 and December 2020.

Methodology: Data of the patients with adhesive small bowel obstruction (ASBO) was retrospectively collected. The demographic characteristics and laboratory findings were evaluated. Patients, who underwent conservative treatment and surgical intervention, were compared. Differences between the two groups in terms of demographic characteristics, prognostic nutritional index (PNI) scores, and neutrophil (NEU)-to-lymphocyte (LYM) ratio (NLR), were evaluated.

Results: One-hundred thirty-seven patients were included in the study. Seventy-four (54%) of the patients had conservative treatment. There was no statistically significant difference between the surgical and conservative treatment groups according to the age, gender, and ASA score ($p=0.77$, 0.21 and 0.95 respectively). The patients with congenital aetiology and low PNI scores were in significantly higher numbers among the surgical treatment group ($p < 0.001$ and $p=0.004$, respectively). In patients, who underwent surgery, the resection rate was found significantly higher in older age (63 vs. 52, $p=0.01$).

Conclusion: Patients with low PNI scores and congenital adhesive small bowel obstruction undergo operative treatment more frequently than conservative treatment. Future studies focusing on diagnostic scores to predict early surgery in ASBO patients may include these variables.

Key Words: Adhesive small bowel obstruction, PNI, Treatment strategy, Surgery.

How to cite this article: Uprak TK, Akin MI, Coskun M, Yegen C. Factors Predicting Surgical Treatment in Patients with Adhesive Small Bowel Obstruction: Retrospective Single-centre Study. *J Coll Physicians Surg Pak* 2022; **32(09)**:1127-1131.

INTRODUCTION

The most important cause of small bowel obstruction is adhesions due to the previous surgery. Intra-abdominal adhesions associated with the previous abdominal surgery constitute 75% of the small bowel obstruction cases.¹ Most small bowel obstructions are uncomplicated. However, intestinal necrosis may occur in the cases of strangulation. Therefore, early diagnosis of strangulation is essential. The clinical findings, laboratory tests, and imaging studies are routinely utilised for making the diagnosis.² However, many studies have shown that clinical parameters and laboratory measurements are ineffective in ruling out strangulation.³⁻⁵

The treatment for partial bowel obstruction is gastric decompression and intravenous fluid therapy with close observation of the patient. The standard treatment for strangulated small bowel obstruction is usually surgery.⁶ Unless there are signs of strangulation and history of persistent vomiting or specialised CT scan findings, patients with partial ASBO can be safely managed with the conservative therapy.⁷ Computed tomography is applicable to determine the advanced stage of irreversible ischemia. Several algorithms are in use to predict the severity or to determine need of early surgery in adhesive small bowel obstructions (ASBO). A reliable method is still not available to make an accurate diagnosis before ischemia develops.^{8,9}

The aim of this study was to compare operative and non-operative management in patients with ASBO to explore a factor that could determine surgical strategy in terms of demographic characteristics, PNI score, and NLR.

METHODOLOGY

Patients with ileus, who were admitted to the Emergency Department and were hospitalised in general surgery of Marmara University hospital, between January 2016 and

Correspondence to: Dr. Tevfik Kivilcim Uprak, Department of General Surgery, Marmara University School of Medicine, Istanbul, Turkey
E-mail: kuprak@gmail.com

Received: March 26, 2022; Revised: August 05, 2022;
Accepted: August 06, 2022
DOI: <https://doi.org/10.29271/jcpsp.2022.09.1127>

December 2020, were retrospectively analysed. Among these cases, mechanical obstructions due to malignancy (obstructed mass, pelvic implant, and recurrent intra-abdominal mass), were excluded. Patients over 18 years of age, hospitalised for obstruction secondary to the congenital band (not related to previous intra-abdominal surgery) or postoperative adhesion, were included in the study. Other reasons for intestinal obstruction were ruled out.

The diagnosis of the patients with adhesive small bowel obstruction was made by the clinical history, physical examination, and computed tomography (CT). Surgery was performed in the presence of a history of strangulation symptoms which include acute pain that comes on suddenly and may get more severe, bloody stools, fever and persistent vomiting, CT scan findings of free fluid, mesenteric oedema, small bowel stool sign, or devascularisation. Clinical parameter to decide the operative treatment for persistent obstruction was lack of improvement within 72 hours of conservative treatment. Conservative therapy included fluid administration, nasogastric decompression, and nil per os. Flatus and stool output were followed up twice a day.

Patients with adhesive intestinal obstruction, without previous surgery, were labelled as congenital band adhesion. All the other patients with history of abdominal surgery were referred as adhesive intestinal obstruction.

The number of previous surgeries, demographic features, laboratory data on admission (including hemogram, lactate, CRP) was analysed. The prognostic nutritional index (PNI) scores and neutrophil (NEU)-to-lymphocyte (LYM) ratio (NLR) could be used as biochemical markers. While PNI was found to be associated with short-term outcomes, especially in gastrointestinal cancers, NLR was more associated with the severity of ischemia in hernia.^{10,11} PNI scores and neutrophil (NEU)-to-lymphocyte (LYM) ratio (NLR) were calculated for the cohort. PNI score was calculated as $10 \times \text{serum albumin concentration in g/dL} + 0.005 \times \text{total lymphocyte counts per mm}^3$.¹² The duration of hospitalisation was also recorded.

The primary outcome was to reveal a factor that could determine surgical strategy by comparing operative and non-operative management in terms of demographic features, PNI score, and NLR.

Statistical Package for Social Sciences for Windows version 20 (SPSS Inc; Chicago, IL, USA) was used for statistical analyses. All the categorical variables were provided in terms of the number of cases and percentages. Depending on the data distribution, continuous variables were described as mean with standard deviation (SD) or median and range. The Shapiro-Wilk test was used to analyse the distribution of continuous variables. Two-tailed chi-square or Fisher exact tests were used to compare the categorical variables. When the distribution of data was normal, independent 2-sample t-test was used to compare ordinal and continuous variables; otherwise, the Mann-Whitney U test was used. In case adjustment

for potential confounders, logistic regression analyses were used to evaluate the predictive variables for surgical intervention for ASBO. p-values less than 0.05 were considered statistically significant.

RESULTS

A total number of 487 patients were admitted via the Emergency Department with diagnosis of intestinal obstruction, from 2016 to December 2020. The record of 4 patients could not be accessed. Two patients refused the treatment and left the hospital. Two-hundred and three (42.20%) patients were diagnosed with colorectal cancer, 52 (10.81%) patients with paralytic ileus, 26 (5.4%) with incarcerated hernia, and 33 (6.86%) with inflammatory disease, and 30 patients for different reasons were excluded. Finally, adhesive small bowel obstruction was identified in 137 out of 481 patients (Figure 1).

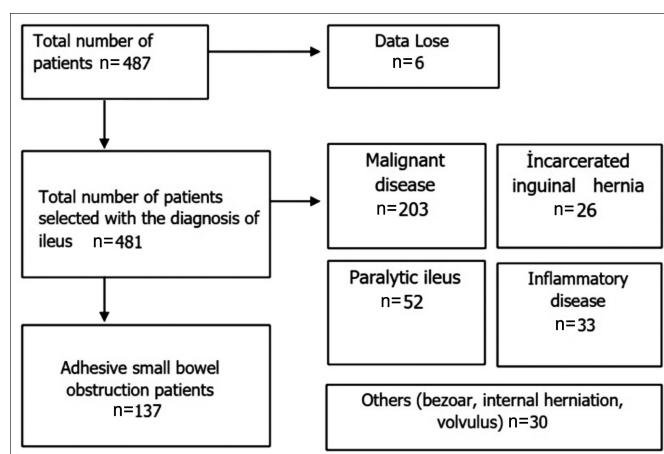


Figure 1: Flow chart of the study.

The mean age of the patients was 54 ± 17.5 years. Seventy-one (52%) of them were females and sixty-six (48%) of them were males. One-hundred and twenty-one (88%) patients had previous abdominal surgery, and sixty-three (46%) patients underwent operative treatment. Patients categorised, according to the American Society of Anaesthesiologists (ASA) Grade 1-2, 79% constituted the majority. The median length of stay was 3 (1-13) days.

The surgery and conservative management groups were compared. No significant difference was found in demographic characteristics. Surgery was performed in patients with congenital aetiology and when compared to the patients with adhesive intestinal obstruction (23% vs. 1%, $p < 0.001$), the length of hospital stay was significantly higher in the surgery group (6 vs. 2 days, $p < 0.001$). The PNI score of surgery group was significantly lower (47.7) as compared to the conservative group (51.6, $p = 0.004$, Table I).

In multivariate regression analysis, congenital etiology and low PNI score were found to be significant predictive variables for surgical intervention [HR: 0.052, (95% CI: 0.006-0.467), $p = 0.008$ and HR: 0.916 (95% CI: 0.849-0.988), $p = 0.02$, respectively]. However, Age, Gender, NLR, and CRP levels were not associated factors for predicting the surgical treatment.

Table I: Comparison between the surgery and conservative treatment groups (Univariate analysis).

	n: 137(%)	Surgery n=63 (%)	Conservative treatment n =74 (%)	p-value
Age (mean \pm SD) years	56 (19-91)	54 \pm 19.4	54 \pm 15.9	0.77*
Gender				0.21**
Female	71 (51.8)	29 (46)	42 (56)	
Male	66 (48.2)	34 (54)	32 (44)	
ASA Grade				0.95**
1	52 (38)	24 (38)	28 (38)	
2	56 (41)	25 (39)	31 (42)	
3	29 (21)	14 (22)	15 (20)	
Length of stay (days) (median)	3 (1-13)	6 (2-13)	2 (1-6)	<0.001***
Etiology				<0.001**
Congenital	16 (11.7)	15 (23)	1 (1)	
Adhesive	121 (88.3)	48 (77)	73 (99)	
PNI score (median)	50(29.5-70)	48.6 (29.5-62.5)	50.5 (34.5-70)	0.004*
NLR (median)	63 (46)	6 (1.12-23)	5.7 (1.1-47.6)	0.81***
	74 (54)			
WBC (103/ μ L)	11.6 \pm 3.9	10.60 \pm 3.5	13.7 \pm 4.46	0.01*
CRP (mg/l)	9.7 (3-168)	9.6 (3-168)	9.6 (3-151)	0.89***
Lactate (mmol/L) (mean \pm SD)	2.5 \pm 1.1	2.3 \pm 0.9	2.6 \pm 1.2	0.105*

SD: Standard deviation, WBC: White blood cell, *Independent t-test, **Chi-square test, ***Mann-Whitney U-test.

Surgical treatment was performed on 63 (45%) patients, and bowel resections were performed on 10 patients. The mean age of the resection group was found to be higher than the non-resection group (63 vs. 52, p : 0.01). There was no difference in terms of gender, aetiology, PNI score, and NLR.

DISCUSSION

The most critical factor determining the treatment is strangulation and ischemia in ASBO. A scoring system including age, pain duration, body temperature, WBC, reduced wall enhancement, and segmental mesenteric fluid at CT scan, demonstrated that this score has the power to predict bowel ischemia with good accuracy and help the surgeon to prioritise patients with intestinal ischemia.¹³ However, it is not always simple to predict the patients who will undergo surgery immediately with reliable methods. In this study, the authors compared ASBO patients, who were treated with conservative and surgical methods. While the patients with previous operations were more likely to benefit from the conservative therapy, surgical intervention was primarily performed in patients who had no previous surgery. Patients, who did not have abdominal surgery before, had a more severe obstruction and benefited less from the conservative treatment. The authors observed that the patients with congenital band adhesions, who did not have previous surgery, were mainly treated with surgical treatment. In patients with recurrent episodes and multiple prior laparotomies, a complex and high-risk procedure could be avoided, which may be one reason why conservative treatment was preferred in these patients.

When comparing non-operative treatment and surgery, it was shown that the delayed surgery increases morbidity and mortality.⁷ However, non-operative treatment is warranted for the selected patients presenting with the ASBO. The length of the delay may not significantly affect the results.

There was no difference in the rate of complications (including postoperative mortality, bowel resection, and stoma formation) among the patients initially treated with the conservative method and immediate operation.¹⁴ Since long waiting times increase the likelihood of ischemia, the most crucial factor for determining the time of surgery was how long the patients' complaints have continued before they were admitted to the hospital.^{15,16}

PNI, a new index of systemic immune nutrition, represented the immune and nutritional status of the host, and was developed to evaluate postoperative complications in patients undergoing gastrointestinal surgery.¹⁷ Subsequently, additional studies have found that the PNI is closely associated with the long-term prognosis of tumours and is an independent prognostic factor in the patient survival.^{18,19} However, to the best of the authors' knowledge, there is no previous study on association between the PNI score and the severity of intestinal obstruction. Low-PNI scores in patients, who underwent surgery, can be explained by the failure to treat intestinal obstruction with prolonged conservative methods. It may be possible to consider surgical intervention earlier in the patients with a low-PNI score at the initial diagnosis. NLR is another score for prognosis of infectious diseases and inflammation. A high-NLR may help estimate the severity of incarcerated inguinal hernias.²⁰ This marker could guide the approach to the adhesive small bowel adhesions. However, no difference was found in the NLR between the surgical or conservative group in this study. The retrospective design and small sample size of this study could be the reason for this result.

It was observed that the resection rate increased with age in the patients who underwent surgery. The physical examination findings resulting in delayed intervention are reliable. Therefore, more resections were performed in these patients. It has been reported that an early surgery in the

elderly patients with ASBO may reduce both recurrences and worsening compared to the conservative treatment.^{21,22} Early surgery in the elderly patients may reduce resection rate, and thus morbidity.

Retrospective design and the low number of patients are among the limitations of this study. Some patients were followed up in the emergency room, and in some cases, more or less time may have passed between their transfer to the surgical service. However, the surgical team also played a role in their follow-up in the emergency room.

CONCLUSION

Surgical treatment may be given priority in patients with ASBO when there is no history of previous operations and in those with low PNI scores. Further studies should include these parameters for early prediction of management.

ETHICAL APPROVAL:

According to the Declaration of Helsinki, this study was conducted in compliance with the ethical principles, and the Marmara University Institutional Review Board approved it (Approval No. date: 09.2020.1189 dated 06.11.2020).

PATIENTS' CONSENT:

Since it was designed as a retrospective study, the data were collected from the Hospital archive after approval of the Ethics Committee.

COMPETING INTEREST:

The authors declared no competing interest.

AUTHORS' CONTRIBUTION:

TKU: Conception, design, interpretation, drafting, and final approval.

MIA: Data acquisition and analysis, interpretation, critical revision, and final approval.

MC: Interpretation, drafting and final approval.

CY: Critical revision and final approval.

All the authors have approved the final version of the manuscript to be published.

REFERENCES

- Menzies D, Ellis H. Intestinal obstruction from adhesions - How big is the problem? *Ann R Coll Surg Engl* 1990; **72(1)**: 60-3.
- Millet I, Boutot D, Faget C, Pages-Bouic E, Molinari N, Zins M, et al. Assessment of strangulation in adhesive small bowel obstruction on the basis of combined CT findings: Implications for clinical care. *Radiol* 2017; **285(3)**: 798-808. doi: 10.1148/radiol.2017162352.
- Jancelewicz T, Vu LT, Shawo AE, Yeh B, Gasper WJ, Harris HW. Predicting strangulated small bowel obstruction: An old problem revisited. *J Gastrointest Surg* 2009; **13(1)**: 93-9. doi: 10.1007/s11605-008-0610-z.
- Block T, Nilsson TK, Björck M, Acosta S. Diagnostic accuracy of plasma biomarkers for intestinal ischaemia. *Scand J Clin Lab Invest* 2008; **68(3)**:242-8. doi: 10.1080/00365510701646264.
- Derikx JP. Non-invasive markers of gut wall integrity in health and disease. *World J Gastroenterol* 2010; **16(42)**: 5272. doi: 10.3748/wjg.v16.i42.5272.
- Rami Reddy SR, Cappell MS. A systematic review of the clinical presentation, diagnosis, and treatment of small bowel obstruction. *Curr Gastroenterol Rep* 2017; **19(6)**:28. doi: 10.1007/s11894-017-0566-9.
- Ten Broek RPG, Krielen P, Di Saverio S, Coccolini F, Biffi WL, Ansaloni L, et al. Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2017 update of the evidence-based guidelines from the world society of emergency surgery ASBO working group. *World J Emerg Surg* 2018; **13(1)**:24. doi: 10.1186/s13017-018-0185-2.
- Schraufnagel D, Rajae S, Millham FH. How many sunsets? Timing of surgery in adhesive small bowel obstruction. *J Trauma Acute Care Surg* 2013; **74(1)**:181-9. doi: 10.1097/TA.0b013e31827891a1.
- Zins M, Millet I, Taourel P. Adhesive small bowel obstruction: Predictive radiology to improve patient management. *Radiol* 2020; **296**:480-92. doi.org/10.1148/radiol.2020192234.
- Kanda M, Mizuno A, Tanaka C, Kobayashi D, Fujiwara M, Iwata N, et al. Nutritional predictors for postoperative short term and long-term outcomes of patients with gastric cancer. *Med (Baltimore)* 2016; **95(24)**:e3781. doi: 10.1097/MD.0000000000003781.
- Mellor KL, Powell AGMT, Lewis WG. Systematic review and meta-analysis of the prognostic significance of neutrophil-lymphocyte ratio (NLR) after R0 gastrectomy for cancer. *J Gastrointestinal Cancer* 2018; **49(3)**:237-44. doi: 10.1007/s12029-018-0127-y.
- Narumi T, Arimoto T, Funayama A, Kadowaki S, Otaki Y, Nishiyama S, et al. The prognostic importance of objective nutritional indexes in patients with chronic heart failure. *J Cardiol* 2013; **62(5)**:307-13. doi: 10.1016/j.jjcc.2013.05.007.
- Bouassida M, Laamiri G, Zribi S, Slama H, Mroua B, Sassi S, et al. Predicting intestinal ischaemia in patients with adhesive small bowel obstruction: A simple score. *World J Surg* 2020; **44(5)**:1444-9. doi: 10.1007/s00268-020-05377-6.
- Bauer J, Keeley B, Krieger B, Deliz J, Wallace K, Kruse D, et al. Adhesive small bowel obstruction: Early operative versus observational management. *Am Surg* 2015; **81(6)**: 614-20. doi.org/10.1177/000313481508100627.
- Mu JF, Wang Q, Wang SD, Wang C, Song JX, Jiang J, et al. Clinical factors associated with intestinal strangulating obstruction and recurrence in adhesive small bowel obstruction: A retrospective study of 288 cases. *Med (Baltimore)* 2018; **97(34)**:e12011. doi: 10.1097/MD.00000000000012011.
- Leung AM, Vu H. Factors predicting need for and delay in surgery in small bowel obstruction. *Am Surg* 2012; **78(4)**: 403-7. doi.org/10.1177/000313481207800428.
- Jian-hui C, Iskandar EA, Cai S irong, Chen C qi, Wu H, Xu J bo, et al. Significance of Onodera's prognostic nutritional index in patients with colorectal cancer: A large cohort

- study in a single Chinese institution. *Tumor Biol* 2016; **37(3)**:3277-83. doi: 10.1007/s13277-015-4008-8.
18. Migita K, Takayama T, Saeki K, Matsumoto S, Wakatsuki K, Enomoto K, *et al.* The prognostic nutritional index predicts long-term outcomes of gastric cancer patients independent of tumor stage. *Ann Surg Oncol* 2013; **20(8)**: 2647-54. doi: 10.1245/s10434-013-2926-5.
19. Watanabe J, Otani S, Sakamoto T, Arai Y, Hanaki T, Amisaki M, *et al.* Prognostic indicators based on inflammatory and nutritional factors after pancreaticoduodenectomy for pancreatic cancer. *Surg Today* 2016; **46(11)**: 1258-67. doi: 10.1007/s00595-016-1308-6.
20. Xie X, Feng S, Tang Z, Chen L, Huang Y, Yang X. Neutrophil to lymphocyte ratio predicts the severity of incarcerated groin hernia. *Med Sci Monit* 2017; **23**:5558-63. doi: 10.12659/msm.905728.
21. Behman R, Nathens AB, Mason S, Byrne JP, Hong NL, Pechli-
vanoglou P, *et al.* Association of surgical intervention for
adhesive small-bowel obstruction with the risk of recur-
rence. *JAMA Surg* 2019; **154(5)**:413. doi: 10.12659/MS-
M.905728
22. Tabchouri N, Dussart D, Giger-Pabst U, Michot N, Marques F,
Khalfallah M, *et al.* Only surgical treatment to be considered
for adhesive small bowel obstruction: A new paradigm.
Gastroenterol Res Pract 2018; **2018**:1-6. doi: 10.1155/
2018/9628490.

• • • • •