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Small bowel obstruction: need for surgery based on history and radiology

L. N. Meena, Neha Bhatt, Sanchit Jain*

Department of General Surgery, SMS Medical College, Jaipur, Rajasthan, India

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***Correspondence:**
Dr. Sanchit Jain,
E-mail: sanchit4088@gmail.com

ABSTRACT

Background: Small bowel obstruction is a common clinical challenge because the proper management of small bowel obstruction requires a methodology which on one hand can promptly recognise the presence of strangulation-obstruction and hence the need for urgent operative intervention; and on the other hand, can avoid a non-therapeutic laparotomy along with its associated morbidities and further adhesion formation with its potential sequelae. The study was done to identify relevant features in the patient's clinical and CT abdomen findings which when present would be highly predictive of the requirement of an operative intervention in a patient with small bowel obstruction.
Methods: The study was a hospital based analytical observational study on patients admitted from March 2013 to May 2014 with a diagnosis of small bowel obstruction and who underwent a concurrent CT abdomen. Correlation of line of management was done with respect to the three chosen parameters, obstipation (history), mesenteric edema (CT imaging) and lack of small bowel feces Sign (CT imaging).
Results: A total of 74 patients were included with Male:Female ratio being 3.1:1. Forty patients were managed conservatively and remaining underwent surgery with adhesions being the most frequent etiology. The most common operative procedure performed was adhesiolysis with or without band release. Twenty-three cases were performed by open method and remaining laparoscopically. Evaluation of the three parameters revealed that these variables, when present independently or in combination, are predictive for need for operative intervention (p-value <0.001). The sensitivity and specificity to predict the need for exploration when all 3 features were present concurrently was 38.24% and 100%, respectively.
Conclusions: Small-bowel obstruction is a common surgical dilemma, the management of which is dealt on a daily basis by surgeons and non-surgeons. The management using variables based on history and radiology may help classify patients into those requiring conservative management and those in need of early exploration.

Keywords: CT abdomen, Feces sign, Mesenteric edema, Obstruction, Obstipation, Small bowel

INTRODUCTION

Bowel obstruction continues to be one of the most common intra-abdominal conditions encountered by general surgeons in their practice. It remains a major cause of morbidity and mortality, accounting for 15% of hospital admissions for acute abdomen and up to 30% of these needs operative intervention.[1,2] Patients may present acutely or as a chronic and relapsing problem with symptoms ranging from modest discomfort to extreme illness and shock. Small Bowel Obstruction (SBO) has been and continues to be a common clinical challenge. This is so because the proper management of small bowel obstruction requires a methodology which on one hand can promptly recognize the presence of strangulation–obstruction and hence the need for urgent operative intervention; and on the other hand can avoid a non-therapeutic laparotomy along with its associated

morbidities and further adhesion formation with its potential sequelae. The management of Small Bowel Obstruction is based on clinical evaluation, biological tests, and computed tomography (CT) imaging. While a successful conservative treatment may leave adhesions that could cause recurrence; on the other hand, surgery may be the source of new adhesions like any other abdominal surgery. The purpose of present study was, therefore to identify relevant features in the patient's clinical (history of obstipation) and radiological profile (CT abdomen finding of mesenteric edema and lack of small bowel feces sign) which when present would be highly predictive of the requirement of an operative intervention in the setting of small bowel obstruction.

METHODS

Present study was a Hospital based Analytical Observational Study. Patients admitted from March 2013 to May 2014 with a diagnosis of small bowel obstruction who underwent a concurrent CT abdomen were studied prospectively. Patients presenting with frank signs of strangulation obstruction who underwent emergent operative intervention without CT imaging and patients with a known history of ascitis, laparotomy or laparoscopy within six weeks were excluded from the study cohort. The study was conducted in the Department of General Surgery, SMS Medical College, Jaipur after permission from research and review board of the hospital. The attending surgeon and patient had total decision-making ability on the course of treatment. Clinical data were recorded, including age, sex, and past history of SBO, abdominal operations, herniate, tuberculosis, malignancy, distension, pain, vomiting, peritonitis, fever, tachycardia (heart rate >100 beats/minute), leukocytosis, history of obstipation (defined as the lack of flatus and motion for 24 or more hours) The CT features were evaluated by a radiologist who was blinded to other patient characteristics. The features evaluated included small bowel feces sign (gas bubbles and debris within the "obstructed" small-bowel lumen), and mesenteric edema (hazy fluid attenuation in the mesentery of the involved intestinal segment). The appropriateness of operative or non-operative approach to management was determined by consensus of attending surgeons based on findings at exploration and the ultimate clinical course of each patient. Correlation of line of management was done with respect to the three chosen parameters, namely: 1) Obstipation (history); 2) Mesenteric edema (CT imaging); 3) Lack of Small Bowel Feces Sign (CT imaging). Performa was filled up for each patient and data was compiled using IBM SPSS v20 software and was subjected to statistical analysis. Comparisons between patient groups were evaluated using chi-square test and Student's t- tests as appropriate. Associations with small-bowel ischemia and the need for an operation during hospitalization were evaluated using logistic regression models and summarized with odds ratios (ORs) and 95% CIs.

RESULTS

In present study, a total of 74 cases of small bowel obstruction where included. Fifty eight percentage of patients in present study were below the age of 40 years. The largest group comprised of patients between the age of 31-40 and accounted for 24% of the cases. Only 4% cases were above the age of 70 yrs. Mean age of the study group was 40.23±18.1 years with the range of 13 to 90 years. No significant difference was observed according to mean age among the conservative and operative groups. Males were approximately thrice as frequent as females to present with small bowel obstruction (M:F=3.1:1).

Out of these 74, a total of 40 patients (30 males and 10 females) where managed conservatively and 34 (26 males and 8 females) needed operative intervention. Of the 34 patients explored, one was a case of non-therapeutic laparotomy with a picture of paralytic ileus per operatively. The most frequently encountered etiology was adhesions (39%) (Table 1). This was followed by tuberculosis in approximately 23% patients. The third most common etiology was appendicular, accounting for 8% cases. These three pathologies together accounted for substantial 70% cases of small bowel obstruction in study population. Malignancies of cecum and ascending colon often present with features of small bowel obstruction. Author had two cases of carcinoma of the ascending colon, having an obstructive lesion, presenting as small bowel obstruction.

Table 1: Distribution of pathology among the study group.

Pathology	Number	Percentage
Adhesions	29	39.1
Tuberculosis	17	22.9
Appendicular pathology	6	8.0
Stricture	5	6.7
Gangrene	2	2.7
Meckel's diverticulum	1	1.3
Ileo-ileal knotting	1	1.3
Intussusception	1	1.3
SMA syndrome	1	1.3
Carcinoma colon	2	2.7
Paralytic ileus	1	1.3
Idiopathic	8	10.8

The most common operative procedure performed was adhesiolysis with or without band release (44%) (Table 2). Resection-anastomosis was performed in 11 cases, accounting for 32% cases. Rt hemicolectomy, due to the presence of ileo Cecal junction mass was performed in 6 cases (17%) and appendicectomy was done in 7 cases (19%). Twenty three out of the 34 operated cases where performed by open method (66%). Eleven cases were started laparoscopically, out of which 10 were completed laparoscopically or converted to a mini laparotomy after

complete dissection and mobilization (lap assisted). One case needed a more generous laparotomy incision (lap converted to open). This was a case of ascending colon mass which needed laparotomy incision for better dissection.

Table 2: Distribution of surgical procedures.

Operative procedure	Number	Percentage
Adhesiolysis/ band release	15	44.1
Resection anastomosis	11	32.3
Appendectomy	7	20.5
Right hemicolectomy	6	17.6
Duodenojejunostomy	1	2.9
Non-therapeutic laparotomy	1	2.9

The evaluation of the three parameters with treatment modalities (Table 3). It was noted that obstipation present in 46 patients was associated with the need for operative intervention (odds ratio-4.263, 95% CI - 1.511 to 12.03). The presence was found to be significant (p-value = 0.01). Mesenteric edema (on CT) which was present in 25 patients also had a significant association with need for operation (odds ratio-39.72, 95% CI - 8.07 to 195.429, p-value <0.0001). Lack of SBFS (small bowel feces sign) on CT was noted in 45 patients also had a significant association with requirement of surgical procedure (odds ratio - 6.314, 95% CI - 2.4 to 18.6, p-value = 0.001). Also on evaluation of all the three parameters it was found that these variables, when present independently or in combination, are predictive for need for operative intervention (chi-square = 42.969 with 3 degrees of freedom, p-value <0.001).

Out of 74 patients, 36 showed presence of 1 or less of these three variables; and 33 of these 36 cases were successfully managed conservatively (Table 4). Only 3 (8%) got operated. 25 patients showed presence of 2 of these three features, out of which 7 were managed conservatively and 18 were managed operatively (72% people with 2 variables present got operated).

Lastly, 13 patients had presence of all the above three variables, and all 13 (100%) got operated. The sensitivity and specificity to predict the need for exploration when all 3 features were present concurrently were 38.24% and 100% of the time, respectively. The positive and negative predictive values were 100% and 65.57%, respectively, with an accuracy of 67.05%.

Table 3: Treatment modalities with clinic-radiological factors.

Variables		Conservative (n=40)	Operated (n=34)	Total (n=74)	p-value
Obstipation	No	21 (52.5%)	7 (20.6%)	28 (37.8%)	0.01
	Yes	19 (47.5%)	27 (79.4%)	46 (62.2%)	
Mesenteric edema	No	38 (95%)	11 (32.35%)	49 (66.22%)	<0.0001
	Yes	2 (5%)	23 (67.65%)	25 (33.78%)	
Lack of small bowel feces sign	No	23 (57.5%)	6 (17.65%)	29 (39.19%)	0.001
	Yes	17 (42.5%)	28 (82.35%)	45 (60.81%)	

Table 4: Distribution of number of variables present among conservative and operative groups.

No. of variables present	Conservative (n=40)	Operated (n=34)	Total (n=74)
0/1	33	3	36 (8% got operated)
2	7	18	25 (72% got operated)
3	0	13	13 (100% got operated)

All 74 patients were relieved of symptoms in early post op/follow up period. All patients were followed up for at least 6 weeks after relief of symptoms (conservative/ operative).

None of the patients complained of obstruction in the follow up period. In the operated patients, apart from some minor complications like transient ileus, mild cough, seromas and suture site infections, there were no major morbidities.

Average hospital stay in conservative group was 4-5 days, and that of operated group was 6-8 days.

DISCUSSION

Before the advent of CT, early exploration was the appropriate treatment paradigm to prevent complications from unrecognized strangulation obstructions.[3,4] Current CT resolution has reached a point that allows clinicians to visualize details never before imagined.[5] These details, when combined with the patient's history and physical examination, can appropriately direct the clinical course of a patient with SBO and should be incorporated into a treatment algorithm.[6-10] With the new knowledge gained in the era of CT scan and its use in management of small bowel obstruction, author wanted to apply the original definition of complete bowel obstruction to the modern

day and determine features on CT scan that can be used to further discriminate the need for operative exploration. As demonstrated, some form of colonic gas was present in the overwhelming majority of patients, thereby eliminating any discriminating ability it might have been presumed to confer. Even with further qualification of the type of pattern of colonic gas, this CT feature is not useful in determining whether the patient should undergo exploration; CT appears to be too sensitive regarding this radiographic feature. In contrast, obstipation was associated strongly with the need for exploration (Odds Ratio: 4.2) when analyzed in a multivariate setting. In addition, their two studied features on CT scan, namely presence of mesenteric edema (Odds Ratio: 39.7) and Lack of small bowel feces sign (Odds ratio: 6.3) were also strongly associated with need for operative intervention. Three features - history of obstipation, mesenteric edema, and lack of small-bowel focalization were helpful in deciding the course of management in patients presenting with small bowel obstruction. The CT imaging should be performed, therefore, to elucidate the presence of other signs of ischemia (closed-loop obstructions, pneumatosis intestinalis, or portal venous gas) and to determine the number of features present. Those patients with 3 features should undergo urgent (within 12 hours) operative exploration owing to their high risk of ischemia and high chance of requiring exploration before dismissal. Those patients with 2 or fewer risk factors can be treated initially nonoperatively with close, frequent reassessments. Those patients with 1 or fewer features can generally be managed by non-operative means. Their risk of strangulation, although present, is extremely low. Operative delay may result in greater mortality, especially in the setting of unrecognized strangulation obstruction.[11,12] Additionally, the ability to identify those patients who may not have strangulation obstruction but who will require operative intervention before dismissal for failure of the SBO to resolve can prevent delays of operative management and should decrease total hospitalization by eliminating the preoperative days of nonoperative, expectant management.

As regard to the most common etiology causing small bowel obstruction, most of studies share postoperative adhesions as the reason.[13-16] Similar findings were noted in present study as well. Out of the 34 operated cases 23 had to be performed by open method (66%). Eleven cases were started laparoscopically, out of which 10 were completed laparoscopically or converted to a mini laparotomy after complete dissection and mobilization i.e. lap assisted. One case needed a more generous laparotomy incision (lap converted to open). This was a case of ascending colon mass which needed laparotomy incision for better dissection. In various studies, the success rate of laparoscopic surgery in small bowel obstruction is between 35 % to 92%.[15-18] High success rates in some series may be due to biased selection of cases early in the course of disease. Leon et al reported at successful laparoscopic surgery of 35% while Franklin ME Jr et al reported a success rate of 92.2%.[17,18]

All 74 patients were relieved of symptoms in early post op/follow up period. All patients were followed up for at least 6 weeks after relief of symptoms (conservative/ operative). None of the patients complained of obstruction during the follow up period. Due to smaller duration of follow up, clear comment on long term recurrence cannot be made. In present study all patients were asymptomatic on mean follow up of 6 weeks.

Out of 74 patients, 36 showed presence of 1 or less of these three variables; and 33 of these 36 cases were successfully managed conservatively. Only 3 (8%) got operated. 25 patients showed presence of 2 of these three features, out of which 7 were managed conservatively and 18 were managed operatively (72% people with 2 variables present got operated). Lastly, 13 patients had presence of all the above three variables, and all 13 (100%) got operated. The sensitivity and specificity to predict the need for exploration when all 3 features were present concurrently were 38.24% and 100% of the time, respectively. The positive and negative predictive values were 100% and 65.57%, respectively, with an accuracy of 67.05%. Computed tomography has been used to predict ischemia and complete bowel obstruction in many studies. A systemic review by Mallo et al found sensitivity of 92% (range 81-100%), specificity of 93% (range 68-100%), positive predictive value of 91% (range 84-100%) and negative predictive value of 93% (range 76-100%) of CT for ischemia in the setting of SBO and suggests that a CT scan finding of partial SBO is likely to reflect a clinical condition that will resolve without surgical intervention.[19]

CONCLUSION

Small-bowel obstruction is a common surgical dilemma, the management of which is dealt with on a daily basis by surgeons and non-surgeons alike. The use of these variables in a region may identify those patients in need of surgery who may require transfer versus those who may be safely managed in an outlying facility. With widespread implementation this can help improve patient's outcomes and thus reduce resource consumption.

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