



THE ROLE OF CONSERVATION AND FACTORS PREDICTING SURGICAL TREATMENT IN ADHESIVE BOWEL OBSTRUCTION

Sah Prasad Rupesh*, Awale Laligen, Pandit Narendra, Khaniya Sudeep and Adhikary Shailesh

Department of Surgery, BPKIHS, Dharan, Nepal.

*Corresponding Author: Dr. Sah Prasad Rupesh

Department of Surgery, BPKIHS, Dharan, Nepal.

Article Received on 11/12/2017

Article Revised on 01/01/2018

Article Accepted on 21/01/2018

ABSTRACT

Background: Post-operative adhesions are a frequently encountered problem after abdominal surgeries. Surgery-postoperative adhesions- Surgery is a continuous process and we have to break this process. There is always a debate about the optimal treatment: surgical or medical management. This study is done to evaluate how long patients with bowel obstruction caused by postoperative adhesions can tolerate conservative treatment and also to determine the predictive factors which indicate operation. **Methods:** Thirty patients with previous laparotomy diagnosed as intestinal obstruction were prospectively analysed and were enrolled in this study. **Results:** During the one year period, thirty patients were included in the study who met the inclusion criteria; 18 (60%) patients were treated conservatively and 12 (40%) patients underwent surgical intervention. In a total of 30 patients, 10 (33.3%) patients attended follow up clinic and were fine with no complaints. Eight (66.7%) in operated group attended follow up clinic and were fine. **Conclusion:** The actual incidence of serious complications in patients with small bowel obstruction due to postoperative adhesions is low. The effectiveness of the most common treatment option was related to clinical, laboratory and radiological parameters. Most patients could be managed conservatively. Close monitoring in the absence of clinical signs suggestive of complications. There is no limitation of an observation period before proceeding to surgical intervention is required.

KEYWORDS: Adhesive bowel obstruction, conservative management, surgery.

INTRODUCTION

Postoperative adhesion formation is a complex interaction of cellular components involved in inflammation and tissue repair. The current hypothesis is that manipulation of the serosal surfaces and exposure to non-organic materials disrupts the mesothelium, resulting in a local inflammatory response, with an influx of fibroblasts which facilitates the creation of fibrin-based adhesions.^[1,2] It has been found that mature adhesions are complex tissues with ingrowth of capillaries, adipose tissue, smooth muscle and nerve fibers that are typically found in complex regenerating structures.

Post-operative adhesions are a frequently encountered problem after abdominal surgeries. They are the most common cause of small bowel obstruction in adults.^[3,4,5] Clinically, the obstruction may progress to life-threatening complications or follow a more benign course. At one time, immediate laparotomy was performed in almost all cases of small bowel obstruction^[6,7], but recent studies on the natural history of adhesive small bowel obstruction have shown that more than 50% of cases resolve with a conservative, non-operative approach using intravenous hydration,

decompression with a short nasogastric tube or long nasointestinal tube, or temporary elimination of oral nourishment^[8,9,10,11] and close monitoring for disease progress, surgical treatment may still be required in some patients because of significant complications, such as strangulation, or the failure of conservative management.^[8,9,10,12] Classic signs of strangulated bowel are fever, leucocytosis, tachycardia, local tenderness or presence of irreversible damage to the intestines.^[13,14,15,16] Some author recommended only a limited observation period of 24 to 48 hours^[17,18] but others suggest a longer period is safe, although the recommended upper limit is 5 days.^[19,20] Conservative treatment extending beyond 5 days was never successful and surgery was inevitable in all patients whose obstruction did not resolve within 5 days. The diagnosis was based on the patient's history, clinical evaluation and radiographic findings and whether the patient underwent operation and the findings during operation. The clinical course for each patient was underlined, depending upon whether the patient underwent operation or was treated conservatively, with a special attention to the outcome and complications. In the absence of any signs of strangulation or radiologic features of complete intestinal obstruction, patients with adhesive small bowel

obstruction can be managed safely with non-operative treatment. However, in the absence of any clinical or radiological evidence of resolution, the benefit of avoiding an operation must be carefully weighed against the potentially increased risk of bowel resection with further delay on a case-by-case basis. When the timing of operative management is delayed, complications may include increased mortality and morbidity, prolonged hospital stay and eventually greater healthcare costs. To minimize the delay of surgery for patients who require it, predictive factors for operation indication should be established.

There is debate about the optimal treatment: surgical or medical management. Some authors^[17,18,21] have emphasized the importance of early operation for any attack of bowel obstruction because of the possibility of serious sequelae with delayed treatment. However, there is no question that the problem subsides spontaneously in a significant number of patients, who therefore need not require reoperation.^[22,23,24]

At our hospital, we manage approximately 5% of patients with intestinal obstruction and 27% cases are affected by adhesive obstruction. We undertook this study to evaluate how long patients may safely be treated conservatively, also wanted to assess factors that might suggest the need for surgical intervention. It could also help make a policy to treat these type of patients in the future. My study is different from those done elsewhere in the following ways: (1) regarding the optimal observation period (upto 72 hours) for conservative management. (2) Combined diagnostic approaches based on patients history, clinical evaluation, laboratory and radiographic findings.

MATERIALS AND METHODS

The study was Cross-sectional Descriptive study, carried out in the Department of Surgery of BPKIHS. All patients with previous laparotomy diagnosed as intestinal obstruction were recruited in study for a period of one year (March 2014-April 2015). The exclusion criteria for this study were:

- Patients having comorbidity with symptoms similar to those of adhesive small bowel obstruction, and therefore able to confound the analysis (examples, patients with Crohn's disease, radiation enteritis or intra-abdominal malignancies)
- Early post-operative obstruction (occurring within the first three months after an abdominal or gynecological surgery.)

Ethical clearance was taken from the Institutional ethical review board (Code No: IERB/303/014) before the start of the study. The hospital records (clinical background and laboratory data) of patients with bowel obstruction due to postoperative adhesions were studied and evaluated retrospectively. Prospectively, data collected were included: the number of admissions, type of management for each admission, duration of

conservative treatment, number of repeated laparotomies, and operative findings. The diagnostic criteria for adhesive small bowel obstruction included: (1) history of previous laparotomy (defined as initial laparotomy) (2) clinical features of mechanical ileus, such as vomiting, abdominal pain, abdominal distention and constipation; (3) obvious evidence of small bowel obstruction on plain x-ray of the abdomen; (4) exclusion of other organic lesions by radiological contrast study. All the patients presenting with adhesive bowel obstruction were included in the study and assessed thoroughly by clinical examination and investigations. Detail history were taken in the form of age, gender, body mass index, duration of the symptoms, preceding history of prior surgery, when operated, type of surgery, nature and indication of operation, operative findings, first or recurrent attacks, frequency of operations, operated interval, presence of any co morbid condition) were noted. Clinical examination were done to note the site of pain, onset, duration, associated factors, aggravating factors and relieving factors. The signs of systemic toxicity were seen including mental status, hypotension, temperature and tachycardia. Abdominal signs, abdominal girth and bowel sounds were recorded. The patients were subjected to the investigation required to calculate the predictive factors, which included age, gender, co-morbidities: cardiac diseases, cerebral diseases, past adhesive small bowel obstruction, number of past laparotomies and signs of strangulations. Laboratory data on admission: total count, C reactive protein, blood sugar, amylase, creatinine phosphokinase, blood urea nitrogen. The predictive factors needed for surgery included: (1) **Clinical:** (a) old age, presence of fever, tachycardia, dehydration, localised tenderness, symptoms of bowel obstruction which includes abdominal distention, nausea, vomiting, pain and constipation persisting for more than 72 hours (b) signs of peritonitis: tenderness, rebound tenderness, guarding, rigidity, absent bowel sounds etc, increasing abdominal girth, bile content on nasogastric tube, presence of ascites, lack of passage of stool, flatus etc. (2) **Laboratory:** Leukocytosis, high serum creatinine phosphokinase and C reactive protein levels etc. (3) **Radiological:** No evidence of gas observed in plain abdominal film distal to obstruction, in the dye study if gastrograffin failed to reach the colon in 24 hours, presence of peritoneal fluid on the CT scan etc.

All the patients were admitted to the surgical ward unit one with the diagnosis of adhesive bowel obstruction and the time duration from the onset of history to the admission and surgical intervention were also observed. Before operation, they were kept nil by mouth. They were administered with normal saline or ringer lactate solution, routine hematology and biochemical tests were done and urine output monitored. They were subjected for operation if not improved and operation findings were recorded. After the improvement of the general condition, patients were discharged. The time from admission to discharge, the duration of hospitalization

was recorded. The follow up and evaluation of the patients were done and also the health condition of the patients was monitored in the surgical clinics.

RESULTS

During the one year period, thirty patients were included in the study who met the inclusion criteria; 18 (60%) patients were treated conservatively and 12 (40%) patients underwent surgical intervention.

Age and Gender

In our study, the patients were in the age group between 5 – 92 years. The mean age of patients was **43.3±21.23 years (Mean ± SD)**. The female to male ratio was 1.3:1. The age and gender distribution is illustrated in table 1.

Table 1: Age and Gender Distribution.

Characteristics	Years	No. of patients (n 30)	Percentage (%)
Age group	<40	11	36.7
	40 – 60	12	40.0
	≥60	7	23.3
Mean age ±SD		43.3 ± 21.23	

Gender	Number of patients (n 30)	Percentage (%)
Female	17	57.0
Male	13	43.0

Preoperative stay

The duration between admission and operation was 1-6 days as shown in figure 1.

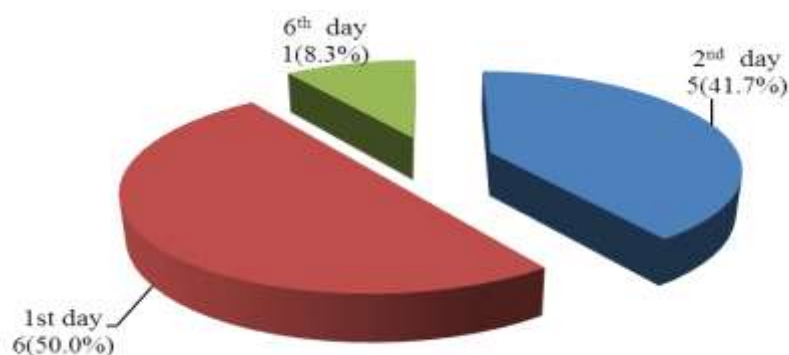


Figure 1.

Number of past operations

Out of 30 patients, 25 (83.3%) patients were operated once earlier and 5 (16.7%) patients were operated twice as illustrated in figure 2.

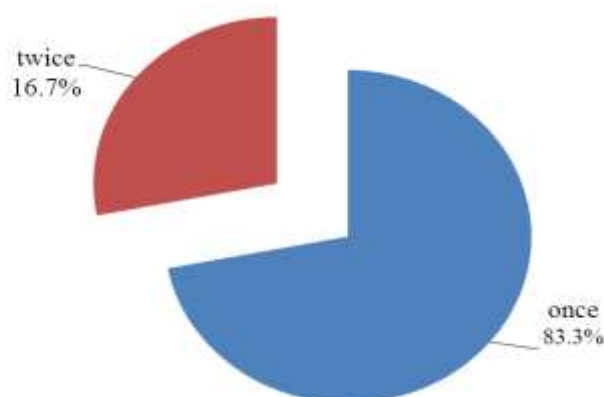


Figure 2.

Past operated

As shown in table 2.

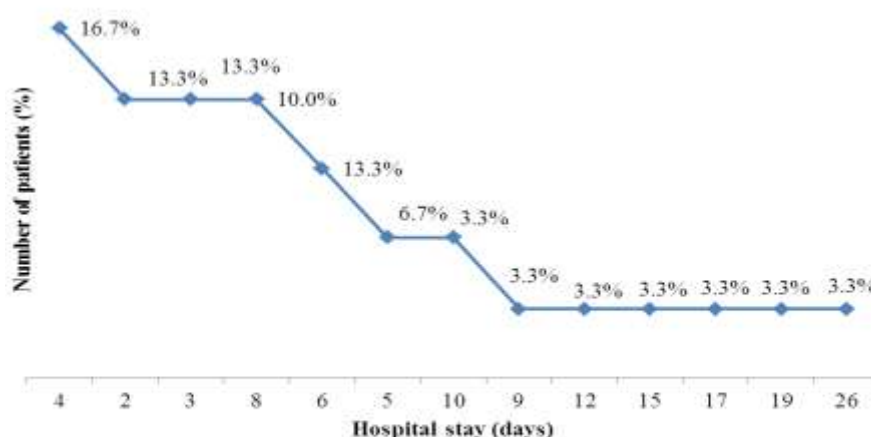
Table 2: Previous surgery.

Past operated	Number of patients	Percentage (%)
Exploratory laparotomy	15	50.0
Pelvic surgery	8	26.7
Open appendectomy	4	13.3
Laparoscopy (cholecystectomy and appendectomy)	3	10.0
Total	30	100

Total duration of hospital stay

Total duration of hospital stay from admission to discharge ranged from 2 to 26 days (average 7days). Most of patients stayed for 2 to 4 days. Long duration hospital stay mainly belonged to operated patients. The

causes for long duration stay were post-operative complications, premorbid conditions, old age, poor health conditions, etc. Total duration of hospital stay was illustrated below in figure 3.

**Figure 3.****Chief Complaints**

In our study, majority of the patients were having pain in abdomen, abdominal distention and vomiting in both

conservative group and operated group as illustrated in table 3 and figure 4.

Table 3: Chief complaints.

CHIEF COMPLAINTS	Number of non-operated patients (n 18)	Number of Operated patients (n 12)	Number of total patients (n 30)	Significance p value
Pain abdomen	17 (94.4)	12 (100.0)	29 (96.7)	0.406
Vomiting	16 (88.8)	10 (83.3)	26 (86.7)	0.661
Abdominal distension	6 (33.3)	10 (83.3)	16 (53.3)	0.007*
Obstipation	3 (16.7)	6 (50.0)	9 (30.0)	0.051
Constipation	4 (22.2)	3 (25.0)	7 (23.3)	0.860
Fever	1 (5.6)	0	1 (3.3)	0.213
Miscellaneous (headache)	1 (5.6)	0	1 (3.3)	0.406
Total	18	12	30	

* Significant p value.

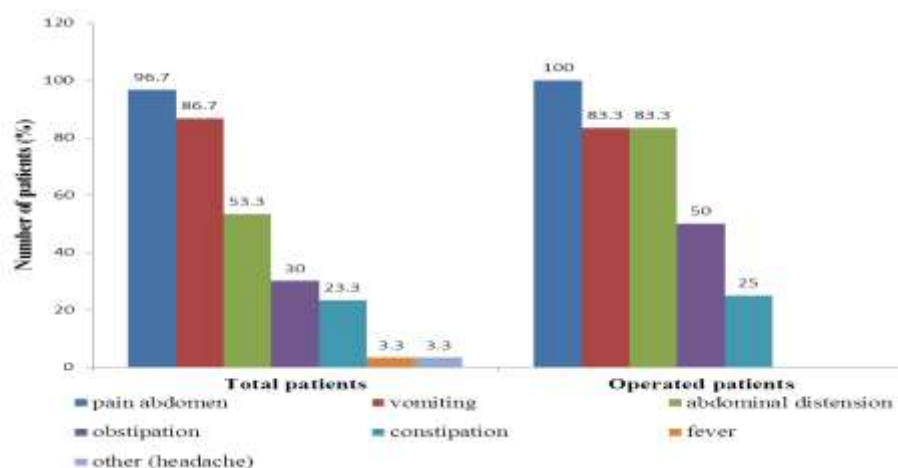


Figure 4.

Examination findings

In our study, majority of the patients were stable on general examination. Out of 30 patients, 5(16.7%) patients were toxic looking and majority 25(83.3%) were stable.

Abdominal examination

As shown in table 4 and figure 5.

Table 4: Abdominal examination.

Abdominal examination	Non-operated patients	Operated patients (%)	Total patients (%)	Significance p value
Tenderness	17 (94.4)	12 (100.0)	29 (96.6)	0.406
Rebound tenderness	6 (33.3)	10 (83.3)	16 (53.3)	0.007*
Guarding	3 (16.7)	7 (58.3)	10 (33.3)	0.018*
Rigidity	2 (11.1)	4 (33.3)	6 (20.0)	0.136
Total	18	12	30	

* Significant p value.

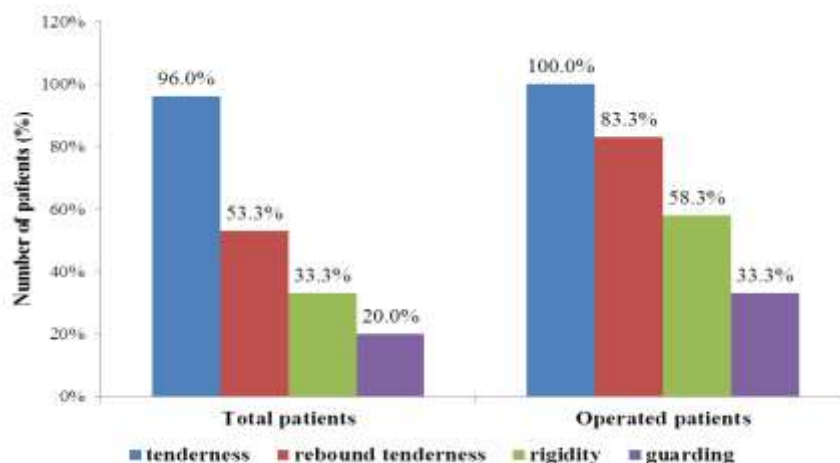


Figure 5.

Nasogastric aspirate

As illustrated in table 5.

Table 5: Nasogastric aspirate.

Nasogastric aspirate (ml)	Non-operated patients	Operated patients	Total patients	Significance P value
High (>500ml)	0	9 (75.0)	9 (30.0)	0.000
Low(<500ml)	18 (100.0)	3 (25.0)	21 (70.0)	
Total	18	12	30	

Laboratory parameters**Table 6: Biochemical parameters.**

Raised	Non-operated patients (%)	Operated patients (%)	Total patients (%)	Significance P value
TOTAL LEUCOCYTE COUNT	6 (33.3)	7 (58.3)	13 (43.3)	0.176
C REACTIVE PROTEIN	3 (16.7)	6 (50.0)	9 (30.0)	0.051
RANDOM BLOOD SUGAR	0	0	0	
AMYLASE	0	0	0	
CREATININE PHOSPHOKINASE	0	6 (50.0)	6 (20.0)	0.001*
BLOOD UREA	0	0	0	

* Significant p value.

Table 7: Plain skiagram.

X-rays findings	Non-operated patients (%)	Operated patients (%)	Total patients (%)	Significance p value
Dilated bowel loops (supine)	3 (16.7)	10 (83.3)	13 (43.3)	0.001*
Multiple air-fluid levels (erect)	0	10 (83.3)	10 (33.3)	0.000
Total	18	12	30	

* Significant p value.

Table 8: Abdominal Ultrasonography.

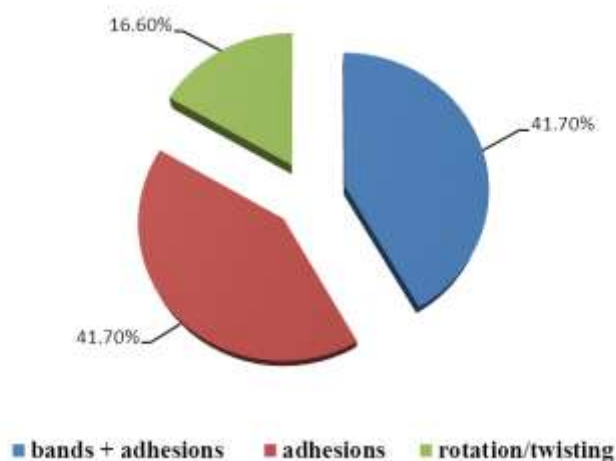
Ultrasonography abdomen	Non-operated patients (%)	Operated patients (%)	Total patients (%)
Dilated /prominent bowel loops	2 (11.1)	10 (83.3)	12 (40.0)
Fluid in abdomen	5 (27.8)	8 (66.6)	13 (43.3)
Total	18	12	30

Operative findings

All those patients who failed to improve on conservative management were subjected to operative procedures as shown in table 9 and figure 6.

Table 9: Operative findings.

Operative findings	Bands+ Adhesions	Adhesions Only	Rotation/ Twisting
Total patients (n 12)	5	5	2

**Figure 1.****Post- operative complication**

During the postoperative period, 5 (41.6%) patients developed post-operative complications as shown in table 11 and figure 7.

Table 10: Postoperative complications.

Postoperative complications	Surgical site infections	Chest infection	Right Subdiaphragmatic collection
Total patients (n 12)	3	1	1

Patient's satisfaction

At the time of discharge, all patients (100%) were satisfied in each group.

with no complains and not attended follow up clinic again.

Follow-Up

In a total of 30 patients, 10 (33.3%) patients attended follow up clinic at 2 week of discharge and were fine

In operated group, 8 (66.7%) attended follow up at 2 week of discharge and were fine and not attended follow up clinic again.

Table 11: Predictive factors.

Parameters	Non-operated patients (n 18)	Operated patients (n 12)	Total patients (n 30)	Significance P value
Clinical				
I. Complaints				
a. Pain abdomen	17	12	29	0.406
b. Vomiting	16	10	26	0.661
c. Abdominal distention	6	10	16	0.007*
d. Obstipation				
e. Constipation	3	6	9	0.051
f. Fever	4	3	7	0.860
g. Others	1	0	1	0.213
	1	0	1	0.406
II. General condition				
a. Toxic look	0	5	5	
b. Fair	18	7	25	
III. Abdominal examinations				
a. Tenderness	17	12	29	0.406
b. Rebound tenderness	6	10	16	0.007*
c. Guarding	3	7	10	0.018*
d. Rigidity	2	4	6	0.136
IV. Abdominal Girth				
a. Static	18	10	28	0.073
b. Increasing	0	2	2	
V. Nasogastric Output				
a. High	0	9	9	0.000
b. Low	18	3	21	

* Significant p value.

Table 12 (a): Predictive factors (Biochemical).

Parameters	Non-operated patients (n 18)	Operated patients (n 12)	Total patients (n 30)	Significance P value
Raised Biochemical parameters				
a. Total leukocyte count	6	7	13	0.176
b. C reactive protein	3	6	9	0.051
c. Creatinine phosphokinase	0	6	6	0.001*

* Significant p value.

Table 12 (b): Predictive factors (Radiological).

Parameters	Non-operated patients (n 18)	Operated patients (n 12)	Total patients (n 30)	Significance P value
Radiological				
I. Plain skiagram				
a. Dilated bowel loops	3	10	13	
b. Multiple air-fluid levels	0	10	10	0.001*
II. Abdominal ultrasonography				
a. Dilated bowel loops	2	10	12	0.000
b. Multiple air-fluid levels	5	8	13	

* Significant p value.

DISCUSSION

Formation of adhesions after transperitoneal operation may be both beneficial and deleterious. On one hand, adhesions may localize suture line leakage or isolate an inflammatory process, thus preventing more widespread disease. On the other hand, they may contribute to morbidity, with obstruction being the major serious complication. Small bowel obstruction due to postoperative adhesions develops in 6 to 11% of all patients undergoing laparotomy.^[24] It may occur at any time after the initial laparotomy and result in frequent re-admissions in subsequent years.^[25,26]

Age

In this study, the age of the patients ranged from 5 to 92 years with mean age of 43.3±21.23 which was different to a study done by Shih SC et al^[27] where the age ranged from 18 to 80 years and the mean age of 49 years. In a study done by Tanaka S et al^[28], age ranged from 17 to 91 years and the mean age of 67 years. Our is a tertiary referral centre and we took all complicated cases for management.

Gender

We found that there were a total of 17 females (57%) and 13 (43%) males with female: male ratio of 1.3:1. There were 51.6% females and 48.4% males with female: male ratio of 1.07:1 in the study of Shih SC et al.^[27] In the study of Tanaka S et al^[28], 45.3% of the patients were female and 54.7% of the patients were male with female: male ratio of 0.8:1.

Co-morbid condition

In our study, 2 (6.7%) patients had tuberculosis, 1(3.3%) patient had hypertension and 1(3.3%) patient had diabetes mellitus. In a study of Tanaka S et al^[28], 6 (11.3%) patients had cardiac diseases and 7 (13.2%) patients had cerebral diseases.

Frequency of past operations

In our study, 25 (83.3%) patients were operated once and 5(16.7%) patients were operated twice. In the study of

Shih SC et al^[27], 152 (98%) patients were operated once, 2 (1.4%) patients operated twice and only 1 (0.6%) patient operated thrice. In the study of Tanaka S et al^[28], 47 (88.7%) patients were operated once, 5 (9.4%) patients operated twice and only 1 (1.9%) patient operated thrice.

Timing of operation

The timing of operative intervention is probably the most controversial factor in patients with adhesive small bowel obstruction. In our study, the duration between admission and operation ranged from 1-6 days and the total duration of hospital stay ranged from 2-26 days (average 7 days). A total of 60% patients were managed conservatively by us. Seventy five percentages of patients were managed conservatively in a study of Shih SC et al.^[27] Seror D et al^[29] successfully managed 73% of cases conservatively and 65% were successfully managed conservatively in a Barkan H et al^[30] study. Shih SC et al^[27] concluded surgically treated patients had a shorter observation time on an average of 5.4 days vs 6.9 days for those who resolved spontaneously. In our study, surgically treated patients had an observation time on an average of 1.8 days vs 7 days on conservatively managed patients. This suggested that these patients had relatively early onset of signs suggestive of complications. In our study, it also occurred most commonly after manipulation of the lower abdominal and pelvic surgeries. There are as yet no totally reliable clinical predictors to differentiate episodes that will resolve spontaneously from those that will require surgery. Even with the imminent onset of bowel strangulation, signs indicating this serious condition, such as fever, leukocytosis and peritoneal signs, are not always present.

Presentation

In our study, the most common presenting symptom was pain abdomen which was present in 29 (96.7%) patients followed by vomiting in 86.7%, abdominal distention in 53.3%. Obstipation was present in 30% followed by constipation in 23%. Similar findings were seen in

Fleshner PR et al^[31] and Shams M et al^[32], where pain abdomen was the major complaint which was present in around 96% and 86% of the total cases respectively. In our study, the most common abdominal examination was tenderness which was present in 29 (96.7%) patients followed by rebound tenderness in 53% which was different from study done by Fleshner PR et al^[31], where tenderness was present only in 54%. In our study, abdominal distention, rebound tenderness and guarding had significant p value (<0.05). This suggested that these presentations had more strong predictive factors and these patients were more likely to be operated.

Laboratory parameters

In our study, the rate of surgical indication was significantly higher in patients with a high serum creatinine phosphokinase concentration, compared to the patients of low serum creatinine phosphokinase concentration which was comparable to the study conducted by Tanaka S et al^[28] where the rate of surgical indication was significantly higher in patients with a serum CPK concentration of ≥ 130 IU/L, compared to patients with a serum CPK concentration of less than 130 IU/L. Increase in serum CPK (especially to ≥ 130 IU/L) may indicate the severity of adhesive small bowel obstruction, even without strangulation. Therefore, careful observation is needed for patients with a serum CPK (especially to ≥ 130 IU/L). Also, increase in total leucocyte count and C reactive protein were the other biochemical parameters that may indicate the severity of adhesive small bowel obstruction. In our study, the operated group had raised total leucocyte count and C reactive protein as compared to non-operated group. In the study done by Seror D et al^[29], the surgically treated group had total leucocyte count averaged 12000/ mm³ which was raised. Also, in the study of Shams M et al^[32], the operated group had raised total leucocyte count (> 12000 /dl) as compared to non-operated group. In our study, creatinine phosphokinase had a significant p value (<0.05) and hence a strong predictive factor than others

Radiological studies

Plain skiagram of the abdomen was the main tool to diagnose the adhesive bowel obstruction followed by abdominal ultrasonography and computed tomography.

In our study, 43% and 33% of patients had dilated bowel loops and multiple air-fluid levels respectively in plain abdominal x-rays whereas in operated patients, 83% each had dilated bowel loops and multiple air-fluid levels which was comparable to the study conducted by Komatsu I et al^[33] where 99% and 96% had air-fluid level in conservatively treated and operated patients respectively. Dilated bowel loops on plain erect abdominal x-ray was a strong predictive factor as it had a significant p value (<0.05) in our study.

Operative details

In our study, all those patients who failed to improve on conservative management were subjected to operative procedures. Out of 12 operated patients, 5 (41.7%) patients had intra-abdominal bands as well as adhesions. Five (41.7%) patients had only intra-abdominal adhesions and 2 (16.6%) patients had twist in the bowel loops. In the study done by Seror D et al^[29], 81% had adhesions, 9% had an internal hernia, 7% had a tumor or malignant spread and 3% were found to have intussusceptions.

CONCLUSION

The actual incidence of serious complications in patients with small bowel obstruction due to postoperative adhesions is low. The effectiveness of the most common treatment option was related to clinical, laboratory and radiological parameters. Most patients could be managed conservatively. Close monitoring in the absence of clinical signs suggestive of complications. There is no limitation of an observation period before proceeding to surgical intervention is required.

Limitations of the study

The limitations of the study design include: specific details about the patient's prehospital course. Delay in intervention may be difficult to define because duration of non-operative management begins with the time of admission rather than the time of symptom onset. Another limitation of our study was the short time period for follow up. The numbers of cases have been low and statistical analysis difficult to apply. We need to continue this study further on a large volume of patients.

REFERENCES

1. Holland-Cunz S, Boelter AV, Waag KL. Protective fibrin- sealed plication of the small bowel in recurrent laparotomy. *Pediatr Surg Int.*, 2003; 19: 540-3.
2. Becker JM, Stucchi AF. Intra-abdominal adhesion prevention: Are we getting any closer? *Ann Surg*, 2004; 240: 202-4.
3. Füzûn M, Kaymak MFE, Harmancioğlu Ö, Astarcioglu K. Principal causes of mechanical bowel obstruction in surgically treated adults in Western Turkey. *Br J Surg*, 1991; 78: 202-203.
4. Lee SH, Ong ETL. Changing pattern of intestinal obstruction in Malaysia: a review of 100 consecutive cases. *Br J Surg*, 1991; 78: 181-182.
5. McEntee G, Pender GMD, Mulvin D, McCullough M, Naeeder S, Farah S, Badurdeen MS, Ferraro V, Cham C, Gillham N, Matthews P. Current spectrum of intestinal obstruction. *Br J Surg*, 1987; 74: 976-980.
6. Davidson AT Sr. Early operation in the treatment of small bowel obstruction. *J Natl Med Assoc.*, 1981; 73: 245- 6.
7. Fabri PJ, Rosemurgy A. Reoperation for small intestinal obstruction. *Surg Clin North Am*, 1991; 71: 131- 46.

8. Seror D, Feigin E, Szold A, et al. How conservatively can postoperative small bowel obstruction be treated? *Am J Surg*, 1993; 165: 121-5.
9. Sosa J, Gardner B. Management of patients diagnosed as acute intestinal obstruction secondary to adhesions. *Am Surg*, 1993; 59: 125-8.
10. Cox MR, Gunn IF, Eastman MC, et al. The safety and duration of non-operative treatment for adhesive small bowel obstruction. *Aust N Z J Surg*, 1993; 63: 367-71.
11. Gowen GF. Long tube decompression is successful in 90% of patients with adhesive small bowel obstruction. *Am J Surg*, 2003; 185: 512-5.
12. Hofstetter S R. Acute adhesive obstruction of the small intestine. *Surg Gynecol Obstet*, 1981; 152: 141-4.
13. Zollinger RM, Kinsey DL. Diagnosis and management of intestinal obstruction. *Am Surg*, 1964; 30: 1-5.
14. Leffall LD, Syphax B. Clinical aids in strangulation intestinal obstruction. *Am J Surg*, 1970; 120: 756-9.
15. Delany HM. Prognostic factors in infarction of the intestine. *Surg Gynecol Obstet*, 1972; 135: 253-65.
16. Shatila AH, Chamberlain BE, Webb WR. Current status of diagnosis and management of strangulation obstruction of the small bowel. *Am J Surg*, 1976; 132: 299-303.
17. Otamiri T, Sjudahl R, Ihse I. Intestinal obstruction with strangulation of the small bowel. *Acta Chir Scand*, 1987; 153: 307-310.
18. Sosa J, Gardner B. Management of patients diagnosed as acute intestinal obstruction secondary to adhesions. *Am Surg*, 1993; 59: 125-128.
19. Hall RI. Adhesive obstruction of the small intestine: a retrospective review. *Br J Clin Pract*, 1984; 38: 89-92.
20. Seror D, Feigin E, Szold A, Allweis TM, Carmon M, Nissan S, Freund HR. How conservatively can postoperative small bowel obstruction be treated? *Am J Surg*, 1993; 165: 121-126.
21. Mucha P J. Small bowel obstruction. *Surg Clin North Am*, 1987; 67: 597-620.
22. Wolfson P J, Bauer JJ, Gelernt IM, Kreel I, Aufses AH Jr. Use of the long tube in the management of patients with small-intestinal obstruction due to adhesions. *Arch Surg*, 1985; 120: 1001-1006.
23. Brolin RE, Krasna MJ, Mast BA. Use of tubes and radiographs in the management of small bowel obstruction. *Ann Surg*, 1987; 206: 126-133.
24. Bass KN, Jones B, Bulkley GB. Current management of smallbowel obstruction. *Adv Surg*, 1997; 31: 1-34.
25. Tanphiphat C, Chittmittrapap S, Prasopsunti K. Adhesive small bowel obstruction: a review of 321 cases in a Thai hospital. *Am J Surg*, 1987; 145: 283-287.
26. EllisH, Moran BJ, Thompson JN, ParkerMC, WilsonMS, Menzies D, McGuire A, Lower AM, Hawthorn RJS, O'Brien F, Buchan S, Crowe AM. Adhesion-related hospital readmissions after abdominal and pelvic surgery: a retrospective cohort study. *Lancet*, 1999; 353: 1476-1480.
27. Shih SC, Jeng KS, Lin SC, Kao CR, Chou SY, Wang HY, Chang WH, Chu CH, Wang TE. Adhesive Small bowel obstruction: How long can patients tolerate conservative treatment? *World J Gastroenterol*, 2003; 9(3): 603-605.
28. Tanaka S, Yamamoto T, Kubota D, Matsuyama M, Uenishi T, Kubo S, Ono K. Predictive factors for surgical indication in adhesive small bowel obstruction. *Am J Surg*, 2008 Jul; 196(1): 23-7.
29. Seror D, Feigin E, Szold A, Allweis TM, Carmon M, Nissan S, Freund HR. How conservatively can postoperative small bowel obstruction be treated? *Am J Surg*, 1993 Jan; 165(1): 121-5.
30. Barkan H, Webster S, Ozeran S. Factors predicting the recurrence of adhesive small bowel obstruction. *Am J Surg*, 1995 Oct; 170(4): 361-5.
31. Fleshner PR, Siegman MG, Slater GI, Brolin RE, Chandler JC, Aufses AH Jr. A prospective, randomized trial of short versus long tubes in adhesive small-bowel obstruction. *Am J Surg*, 1995 Oct; 170(4): 366-70.
32. Shams M, Farrag S., Gamal M. POST APPENDECTOMY ADHESIVE SMALL INTESTINAL OBSTRUCTION, IS CONSERVATIVE TREATMENT OF VALUE. *Egyptian Journal of Surgery*, April, 2007; 26(2): 81-86.
33. Komatsu I, Tokuda Y, Shimada G, Jacobs JL, Onodera H. Development of a simple model for predicting need for surgery in patients who initially undergo conservative management for adhesive small bowel obstruction *Am J Surg*, 2010 Aug; 200(2): 215-23.