

# Therapeutic role of oral water soluble iodinated contrast agent in postoperative small bowel obstruction

Kumar P, Kaman L, Singh G, Singh R

## ABSTRACT

**Introduction:** Nonoperative measures using an oral water soluble contrast agent is a significant development in the management of patients with postoperative small bowel obstruction.

**Methods:** In this prospective randomised trial, patients were randomised into two groups: Group A patients were given an oral water soluble contrast agent and Group B patients were managed conventionally. Surgery was performed as and when indicated. The end-points of the study were to evaluate the time interval between admission and relief of obstruction, the length of hospital stay and the need for surgery.

**Results:** Of a total of 41 patients, 21 were in Group A and 20 were in Group B. The mean age of Group A patients was 40.48 +/- 14.96 years and it was 43.40 +/- 16.33 years for Group B patients (p-value is 0.553). There were 17 males and four females in Group A, and 14 males and six females in Group B (p-value is 0.441). In Group A, 14 patients had relief of obstruction after administration of the contrast material, and the mean time for relief of obstruction was 7.47 hours. In Group B, 18 patients had relief of obstruction and the time interval was 35.20 hours (p-value is less than 0.001). The mean length of hospital stay was 3.43 +/- 1.08 days for Group A and 5.33 +/- 2.95 days for Group B (p-value is 0.029). Seven patients in Group A and two in Group B were operated on (p-value is 0.071).

**Conclusion:** Administration of an oral water soluble contrast agent in postoperative small bowel obstruction helps in the earlier resolution of the obstruction and decreases the length of hospital stay.

**Keywords:** intestinal obstruction, nonoperative management of bowel obstruction, postoperative

small bowel obstruction, small bowel obstruction

*Singapore Med J 2009; 50(4):360-364*

## INTRODUCTION

Small bowel obstruction (SBO) is a very common problem in emergency surgery, and is associated with repeated hospitalisation and high morbidity and mortality. It accounts for 20% of all surgical admissions in the emergency setting.<sup>(1-3)</sup> The causes of SBO are varied, where adhesions account for 70% of all cases.<sup>(1-4)</sup> Postoperative adhesions cause SBO in 93% of patients.<sup>(4,5)</sup> The common surgeries that cause early postoperative SBO are large bowel, rectal, appendiceal and gynaecological surgeries.<sup>(4,5)</sup> Postoperative SBO can be treated by early surgery or a trial of nonoperative treatment. The majority of postoperative SBO can be managed by nonoperative conservative management with an excellent outcome and shorter length of hospital stay.<sup>(5-8)</sup> In the absence of signs of bowel ischaemia and peritonitis, initially it is safe to manage postoperative SBO nonoperatively. Recently, an oral water soluble contrast agent has begun to be used in the nonoperative management of patients with postoperative SBO.<sup>(9-11)</sup> Several prospective studies have reported contradictory findings in terms of the therapeutic role of the oral water soluble contrast agent in the management of SBO.<sup>(12-16)</sup> A prospective, randomised, controlled trial was performed to define the efficacy of an oral water soluble contrast agent in patients with postoperative SBO. The results were measured by objective criteria and compared.

## METHODS

This study was a prospective, randomised, controlled trial. After obtaining institutional ethics committee approval and full informed consent, 41 consecutive patients with postoperative SBO and who presented to the emergency services of the Nehru Hospital, Post Graduate Institute of Medical Education and Research, Chandigarh, India between January 2005 and December 2005, were included in the study. All postoperative intestinal obstruction cases

Department of  
General Surgery,  
Post Graduate  
Institute of Medical  
Education and  
Research,  
Chandigarh 160012,  
India

Kumar P, MS  
Junior Resident

Kaman L, MS, MRCS  
Associate Professor

Singh G, MS, DNB  
Professor

Singh R, MS  
Professor

**Correspondence to:**  
Dr Lileswar Kaman  
Tel: (91) 172 274 7585  
ext 6640  
Fax: (91) 172 274 4401  
Email: kamanlil@  
yahoo.com

which presented with clinical and radiological evidence of SBO were included. The exclusion criteria were: patients with postoperative SBO of less than four weeks post surgery, patients with signs of strangulation or peritonitis, patients with terminal malignancy, patients showing rapid resolution of signs and symptoms of intestinal obstruction within four hours of hospital admission, patients with a known history of allergy to iodinated contrast agent, patients with asthma or atopy, patients with inflammatory bowel disease or tuberculosis, patients with a history of irradiation to the abdomen and patients who refused to participate in the trial.

Patients were treated on an inpatient basis and the diagnosis of postoperative SBO was established on the basis of clinical history, examination and abdominal radiograph findings. All the patients were blindly randomised into two groups; patients in Group A were administered the oral water soluble contrast Gastrografin® (Schering, Berlin, Germany), and patients in Group B were managed conventionally. After the clinical and radiological diagnosis of SBO was established, the patients were promptly hydrated with intravenous fluid on the basis of pulse, blood pressure, central venous pressure and urine output. Serum electrolytes and acid-base imbalance were corrected as and when required. A nasogastric tube was placed and decompression of the stomach was done by active aspiration. The presence of an allergy to the iodinated contrast agent, asthma and atopy were ruled out. In Group A patients, 60 ml of Gastrografin® was administered through a nasogastric tube in an upright position and the nasogastric tube was clamped for 2–3 hours. The patient was placed in a right lateral decubitus or propped-up position. In Group B patients, no Gastrografin® was administered. Patients in both the groups were closely monitored by repeated clinical examinations. Erect and supine abdominal radiographs were repeated after 12 hours and then subsequently when necessary.

The indications for operation were: persistence of SBO for 48 hours after admission or clinical deterioration with the persistence or worsening of radiological evidence and patients showing signs and symptoms of strangulation of bowel or peritonitis during the in-hospital course. The criteria for discharge were patients who were free from all the obstructive symptoms and signs and who were able to tolerate a normal diet. The following parameters were collected from all patients: the time interval between admission and relief of obstruction, the number of days of hospital stay and the percentage of cases requiring surgery in each group.

All statistical calculations were performed using the

**Table I. Age and gender distribution of patients in Group A and Group B.**

Variable	Group A	Group B	p-value
Mean $\pm$ SD (range) of age (years)	40.48 $\pm$ 14.96 (19–70)	43.40 $\pm$ 16.33 (19–80)	0.553
Gender (male:female)	17:4	14:6	0.441

Statistical Package for Social Sciences version 10.0 (SPSS Inc, Chicago, IL, USA). Proportions and percentages were used to summarise categorical variables while descriptive statistics, such as the mean, were used for numerical variables. The chi-square test was used to investigate the statistical significance of categorical variables while the numerical variables were compared for statistical significance using Student's unpaired *t*-test. Values were expressed as mean  $\pm$  SD, unless otherwise specified. A difference was considered to be statistically significant when the p-value was less than 0.05.

## RESULTS

A total of 41 patients were included in the study, with 21 in Group A and 20 in Group B. All patients completed the study and there were no dropouts. Both the study group and controls were age- and gender-matched (Table I). There was no significant statistical difference between the ages of the two groups ( $p = 0.553$ ). There were 17 males and four females in Group A (male to female ratio 4:1), while there were 14 males and six females in Group B (male to female ratio 2.3:1) ( $p = 0.441$ ). The most common presenting symptom was a painful abdomen (98%) and absolute constipation (98%) in both groups (Table II). Vomiting was present in 93% of cases while abdominal distension was present in only 73% of cases in both groups. The majority of the patients at presentation were haemodynamically stable (Table II). The average time from the onset of symptoms to admission was 2.95  $\pm$  1.96 days in Group A and 3.15  $\pm$  2.15 days in Group B. The difference was not statistically significant ( $p = 0.780$ ). The mean number of previous episodes of SBO was 0.81  $\pm$  0.92 in Group A and 0.9  $\pm$  1.33 in Group B ( $p = 0.801$ ) (Table II). At the time of admission, laboratory parameters like haemoglobin, total leucocyte count, serum electrolytes, renal function test and pH were evaluated in both the groups (Table III).

In Group A, 14 out of the 21 patients had relief of obstruction after administration of the contrast agent. The mean time between admission and relief of obstruction was 7.47 hours. In comparison, 18 out of the 20 patients in Group B had relief of obstruction and the time interval was 35.20 hours. The difference was statistically significant ( $p$

**Table II. Clinical characteristics of patients in Group A and Group B.**

Clinical characteristic	Group A		Group B		p-value
	Present	Absent	Present	Absent	
<b>Discrete variable</b>					
Pain	21	0	19	1	0.226
Vomiting	20	1	18	2	0.520
Constipation	20	1	20	0	0.323
Abdominal distension	18	3	12	8	0.063
<b>Numeric variable</b>					
	<b>Mean ± SD (range)</b>		<b>Mean ± SD (range)</b>		
Pulse/min	90.57 ± 7.82 (80–110)		95.60 ± 11.06 (80–120)		0.100
SBP (mmHg)	116 ± 14 (100–160)		114 ± 12 (90–136)		0.699
DBP (mmHg)	76 ± 10 (60–94)		74 ± 6 (60–84)		0.698
Days from onset of symptoms to admission	2.95 ± 1.96 (1–9)		3.15 ± 2.51 (1–10)		0.780
No. of previous surgeries	1.38 ± 0.80 (1–4)		1.45 ± 0.69 (1–3)		0.770
No. of SBO episodes in past	0.81 ± 0.92 (0–3)		0.90 ± 1.33 (0–5)		0.801

SBP: systolic blood pressure; DBP: diastolic blood pressure; SBO: small bowel obstruction

**Table III. Laboratory parameters in Group A and Group B patients.**

Variable	Group A	Group B	p-value
	Mean ± SD (range)	Mean ± SD (range)	
Hb (g/dL)	13.21 ± 2.36 (7.3–17.1)	12.33 ± 2.27 (8.8–17.0)	0.410
TLC (mm <sup>3</sup> )	9,130 ± 2,670 (4,800–15,400)	9,330 ± 3,592 (5,200–18,000)	0.841
Na (mmol/L)	137 ± 5.56 (130–150)	134 ± 5.5 (125–144)	0.142
K (mmol/L)	4.1 ± 0.56 (3.2–5.6)	4.3 ± 0.74 (3–5.8)	0.352
Urea (mg/dL)	48 ± 32 (20–140)	42 ± 21 (20–100)	0.469
Creatinine (mg/dL)	0.9 ± 0.4 (0.5–2.2)	0.9 ± 0.3 (0.4–1.8)	0.855
pH	7.35 ± 0.05 (7.26–7.4)	7.36 ± 0.06 (7.28–7.50)	0.660

< 0.001). In Group A, seven out of the 21 (33.3%) patients were operated on, while in Group B, only two out of the 20 (10%) patients were operated on, and 18 had their obstruction relieved. The difference was not statistically significant ( $p = 0.071$ ). All operated patients had complete obstruction, which was indicated by the non-passage of the oral contrast medium to the colon on abdominal radiographs and clinical worsening during observation. Patients who were managed nonoperatively in Groups A and B had a mean length of hospital stay of  $3.43 \pm 1.08$  days and  $5.33 \pm 2.95$  days, respectively. Hospital stay was shorter in Group A and this was statistically significant ( $p = 0.029$ ). Patients who underwent an operation in Group A had a mean length of hospital stay of  $11.28 \pm 1.11$  days, compared to  $9.00 \pm 1.41$  days for those in Group B.

## DISCUSSION

Postoperative SBO is a very common problem encountered in general surgery with repeated hospital admissions and significant morbidity and mortality. The most common cause of SBO in adults is adhesion.<sup>(1-4)</sup> Postoperative adhesions cause SBO in about 11% of all patients undergoing laparotomy.<sup>(3,4)</sup> The role of a water soluble

contrast agent in diagnosing adhesive SBO has been well established.<sup>(5-8)</sup> Recently, water soluble contrast agents have been used to treat postoperative adhesive SBO with inconsistent results.<sup>(9-16)</sup> There have been a number of studies that have reported the role of water soluble contrast agents in the diagnosis of postoperative SBO.<sup>(8-11)</sup> These studies established that water soluble contrast agents can diagnose partial or complete SBO. Along with this, it was also observed that the administration of a contrast agent helps in an earlier resolution of SBO and decreases the length of hospital stay, so the therapeutic role of water soluble contrast agents has been proposed in the management of postoperative SBO. However, the results have been inconsistent.<sup>(14-18)</sup> Assalia et al, in their study on 99 patients (107 episodes of adhesive SBO), showed that there was a shorter time to first bowel movement, hospital stay and the operation rate in patients who were administered an oral water soluble contrast agent.<sup>(12)</sup> Biondo et al also showed a shorter hospital stay and tolerance of early oral feed in patients administered an oral contrast agent, but their study did not show a reduction in the operation rate.<sup>(16)</sup> Both of these studies recommended the administration of a contrast agent in patients with postoperative SBO to help

in its early resolution and to decrease the length of hospital stay provided the patient is closely monitored during the hospital course.

In our study, patients were initially classified as having partial or complete postoperative SBO on the basis of abdominal radiographs on admission. They were randomly allocated into two groups, and after administration of a contrast agent in Group A, the decision for surgery was based on clinical and radiological assessments by a different observer. Patients in whom an oral contrast agent was administered had a shorter time interval between admission and relief of obstruction, and this was statistically significant ( $p < 0.001$ ). Hospital stay was studied in both groups. The length of hospital stay for patients who did not need surgery in Group A was shorter than for their counterparts in Group B, and the difference was statistically significant ( $p = 0.029$ ). This could be because contrast agent administration resulted in an earlier resolution of postoperative SBO in Group A patients, as demonstrated by the significant positive correlation between hospital stay and the time interval between admission and relief of obstruction in our study. Hospital stay for patients who needed surgery in Group A was significantly longer than that for patients in Group B ( $p < 0.043$ ). The reason for this could be the development of postoperative complications, such as chest infection and wound infection. The nature of the surgery performed was also a significant factor; e.g. patients who underwent adhesiolysis had a shorter length of hospital stay compared to patients who needed resection and end-to-end anastomosis of the small bowel.

In our study, 21% of the patients were operated on; this result is similar to that reported in most other studies.<sup>(14-18)</sup> The operation rate was higher for patients in Group A than for those in Group B. The reason for this could be that seven Group B patients, who needed the operation after 48 hours of observation, were not operated on eventually because they showed partial relief of obstruction in terms of a decrease in nasogastric tube output, occasional passage of flatus, decreased abdominal distension and improvement in the abdominal radiographs compared to the readings at the time of admission. Thus, to determine the actual differences in the operation rate between the two groups, the sample size should be larger, and a common indication for surgery has to be decided on for both groups with regard to the maximum duration of nonoperative treatment. In our study, nonoperative treatment was successful in 79% of cases, which is less than that reported by others.<sup>(16,19,20)</sup> The reason for this could be the inclusion of patients with complete SBO, along with patients with partial SBO in both groups.

Other studies have reported that appendicectomy, colorectal surgery and gynaecological surgery are the procedures that most commonly cause postoperative SBO.<sup>(1,2)</sup> Our results showed that small bowel surgery and colorectal resections were the two single operations most frequently associated with postoperative SBO (55%). Gastroduodenal surgery was the next most common cause of postoperative SBO (16.6%). The higher occurrence of postoperative SBO presenting after small bowel surgery in our study may be because of it being commonly conducted in emergency settings in this region. There was a significant correlation between the number of previous surgeries and the number of previous episodes of adhesive SBO. This is probably because the larger the number of previous surgeries done, the higher the likelihood of adhesion formation and consequently the more the episodes of adhesive SBO.

Our study demonstrated that the administration of an oral water soluble contrast agent in cases of postoperative SBO helps in an earlier resolution of intestinal obstruction and also decreases the total length of hospital stay. Another way of looking at this problem is that the contrast agent either precipitates the resolution of SBO or the need for surgery. We recommend the administration of oral water soluble contrast agents in cases of postoperative adhesive SBO after adequate resuscitation and close monitoring of the patient. However, more studies with larger sample sizes are required to determine if the administration of an oral contrast agent decreases the operation rate in cases of postoperative SBO.

## REFERENCES

1. Fuzun M, Kaymak E, Harmancioglu O, Astarcioglu K. Principal causes of mechanical bowel obstruction in surgically treated adults in western Turkey. *Br J Surg* 1991; 78:202-3.
2. Cox MR, Gunn IF, Eastman MC, Hunt RF, Heinz AW. The operative aetiology and types of adhesions causing small bowel obstruction. *Aust N Z J Surg* 1993; 63:848-52.
3. Kossi J, Salminen P, Rantala A, Laato M. Population-based study of the surgical workload and economic impact of bowel obstruction caused by postoperative adhesions *Br J Surg* 2003; 90:1441-4.
4. Menzies D, Ellis H. Intestinal obstructions from adhesions how big is the problem? *Ann R Coll Surg Engl* 1990; 72:60-3.
5. Deutsch AA, Eviatar E, Gutman H, Reiss R. Small bowel obstruction: a review of 264 cases and suggestions for management. *Postgrad Med J* 1989; 65:463-7.
6. Cox MR, Gunn IF, Eastman MC, Hunt RF, Heinz AW. The safety and duration of non-operative treatment for adhesive small bowel obstruction. *Aust N Z J Surg* 1993; 63:367-71.
7. Wilson MS, Hawkswell J, McCloy RF. Natural history of adhesional small bowel obstruction: counting the cost. *Br J Surg* 1998; 85:1294-8.
8. Thompson JS. Contrast radiography and intestinal obstruction. *Ann Surg* 2002; 236:7-8.
9. Chung CC, Meng WCS, Yu SCH, et al. A prospective study on

- the use of water-soluble contrast follow-through radiology in the management of small bowel obstruction. *Aust N Z J Surg* 1996; 66:598-601.
10. Joyce PW, Delaney PV, Gorey TF, Fitzpatrick JM. The value of water-soluble contrast radiology in the management of acute small bowel obstruction. *Ann Roy Coll Surg Engl* 1992; 74:422-5.
  11. Chen SC, Lin FY, Lee PH, et al. Water-soluble contrast study predicts the need for early surgery in adhesive small bowel obstruction. *Br J Surg* 1998; 85:1692-4.
  12. Assalia A, Scheim M, Kopelman D, et al. Therapeutic effect of oral Gastrograffin in adhesive, partial small-bowel obstruction: a prospective randomized trial. *Surgery* 1994; 115:433-7.
  13. Feigin E, Seror D, Szold A, et al. Water soluble contrast material has no therapeutic effect on postoperative small-bowel obstruction: result of a prospective, randomized clinical trial. *Am J Surg* 1996; 171:227-9.
  14. Fevang BT, Jensen D, Fevang J, et al. Upper gastrointestinal contrast study in the management of small bowel obstruction: a prospective randomized study. *Eur J Surg* 2000; 166:39-43.
  15. Choi HK, Chu KW, Law WL. Therapeutic value of gastrograffin in adhesive small bowel obstruction after unsuccessful conservative treatment: a prospective randomized trial. *Ann Surg* 2002; 236:1-6.
  16. Biondo S, Pares D, Mora L, et al. Randomized clinical study of Gastrograffin administration in patients with adhesive small bowel obstruction. *Br J Surg* 2003; 90:542-6.
  17. Wilson MS, Ellis H, Menzies D, et al. A review of management of small bowel obstruction. Members of the Surgical and Clinical Adhesions Research Study (SCAR). *Ann R Coll Surg Engl* 1999; 81:320-8.
  18. Shih SC, Jeng KS, Lin SC, et al. Adhesive small bowel obstruction: How long can patients tolerate conservative treatment? *World J Gastroenterol* 2003; 9:603-5.
  19. Bass KN, Jones B, Bulkley GB. Current management of small-bowel obstruction. *Adv Surg* 1997; 31:1-34.
  20. Landercasper J, Cogbill TH, Merry WH, Stole TT, Strutt PJ. Long-term outcome after hospitalization for small-bowel obstruction. *Arch Surg* 1993; 128:765-70.

---



**36TH.  
ANNUAL MEETING  
OF THE ISS**

---

**WASHINGTON, D.C., USA AUGUST 31-SEPTEMBER 5, 2009**

**THE INTERNATIONAL SKELETAL SOCIETY:  
ANNOUNCES THREE NEW COURSES:**

**IMAGING UPDATE 2009:  
UPPER EXTREMITY AND BONE MARROW DISEASE**

**SPORTS MEDICINE IMAGING:  
WHAT YOU NEED TO KNOW**

**BASIC ULTRASOUND HANDS-ON  
COURSE: THE JOINTS**

FOR DETAILED INFORMATION ABOUT THE REGISTRATION, SEE  
[WWW.INTERNATIONALSKELETALSOCIETY.COM](http://WWW.INTERNATIONALSKELETALSOCIETY.COM) FROM APRIL 1, 2009.

---