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BRIEF ARTICLE

Decompression of the small bowel by endoscopic long-tube placement

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Abstract

AIM: To investigate and compare the decompression effect on small bowel obstruction of a long tube inserted using either endoscopic or fluoroscopic placement.

METHODS: Seventy-eight patients with small bowel obstruction requiring decompression were enrolled in the study and divided into two groups. Intubation of a long tube was guided by fluoroscopy in one group and by endoscopy in the other. The duration of the procedure and the success rate for each group were evaluated.

RESULTS: A statistically significant difference in the mean duration of the procedure was found between the fluoroscopic group (32.6 ± 14.6 min) and the endoscopic group (16.5 ± 7.8 min) among the cases classified as successful ($P < 0.05$). The success rate was significantly different between the groups: 88.6% in the fluoroscopic group and 100% in the endoscopic group ($P < 0.05$).

CONCLUSION: For patients with adhesive small bowel obstruction, long-tube decompression is recommended and long-tube insertion by endoscopy was superior to fluoroscopic placement.

Key words: Long-tube insertion; Small bowel obstruction; Decompression; Gastroscope; Fluoroscopic guidance

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INTRODUCTION

Small bowel obstruction (SBO) is a major cause of morbidity and financial expenditure in hospitals worldwide. The etiology of SBO has changed in recent decades; whereas SBO was once predominantly due to hernias, it is now largely a result of adhesions[1-3]. It has been reported that about 50% to 80% of SBOs are caused by adhesions, mostly postoperative, with a minority being secondary to peritonitis[4-6]. Patients with partial adhesive SBO are usually given conservative management, including fasting, intravenous hydration, and decompression with a nasogastric tube[7]. Unfortunately, such treatments are successful in only 40% of cases[8]. Recently, clinical application of a long tube to decompress the obstructed intestine by aspirating the intestinal contents has achieved favorable outcomes[9]. However, because the procedure involves fluoroscopy, it is difficult to intubate a long tube

into the small bowel, which results in a protracted procedure, severe patient distress, increased x-ray exposure, and a low success rate. In this report, we describe our experience using an endoscopic technique to place a long tube into the small bowel, and evaluate the efficacy of the long tube to achieve decompression for treatment of SBO.

MATERIALS AND METHODS

Patients

From April 2004 to August 2010, 78 patients with clinical and radiographic evidence of SBO were enrolled in this study (44 male and 34 female, age 20 to 94 years, average 58.6 years). None of the patients had contraindications for long-tube decompression, such as strangulation obstruction, incarcerated hernias, radiation enteritis, and peritonitis. The presenting manifestations were abdominal pain in 75 cases (96.2%), distension in 63 cases (80.8%), constipation in 47 cases (60.3%), and nausea and vomiting in 39 cases (50%). The study was conducted in compliance with the Helsinki Declaration and in accordance with local legislation, and was approved by the Ethics Committee of First Affiliated Hospital, Dalian Medical University. Written informed consent was obtained from all patients or their relatives before the study. The patients were divided into two groups: group A (n = 35), in which the procedure was performed under fluoroscopy; group B (n = 43), in which the procedure was performed with the assistance of gastroscopy.

Instruments

A hydrophilic long tube (Create Medic, Tokyo, Japan) was used. It has an outer diameter of 16F, a working length of 3000 mm, an anterior balloon and a posterior balloon at its tip, a guidewire channel, and an injection channel with an anti-reflux valve. In addition to the tip hole, there are 8 side holes near the distal end of the tube. The guidewire was 1.24 mm in diameter and 3500 mm long (Create Medic). An endoscope (GIF Q260J; Olympus, Tokyo, Japan) was used in group B.

Procedures

Tetracaine jelly was applied to the long tube to lessen both patient discomfort and the friction between the tube and the endoscope. In order to advance the long tube more easily, a guidewire was inserted into the tube to make it more rigid. The nasogastric tube was removed and a long tube was gently inserted through the nose and esophagus into the stomach. In group B, along with the long tube, an endoscope was also inserted through the mouth and esophagus into the stomach, with the patient in the left lateral decubitus position. The guidewire was placed 2 cm above the tip of the long tube so that it could be grasped easily by the biopsy forceps. The scope and tube were passed through the pylorus and advanced as far as possible (Figure 1A). Then the anterior balloon was fully inflated by injecting 20 ml of distilled water

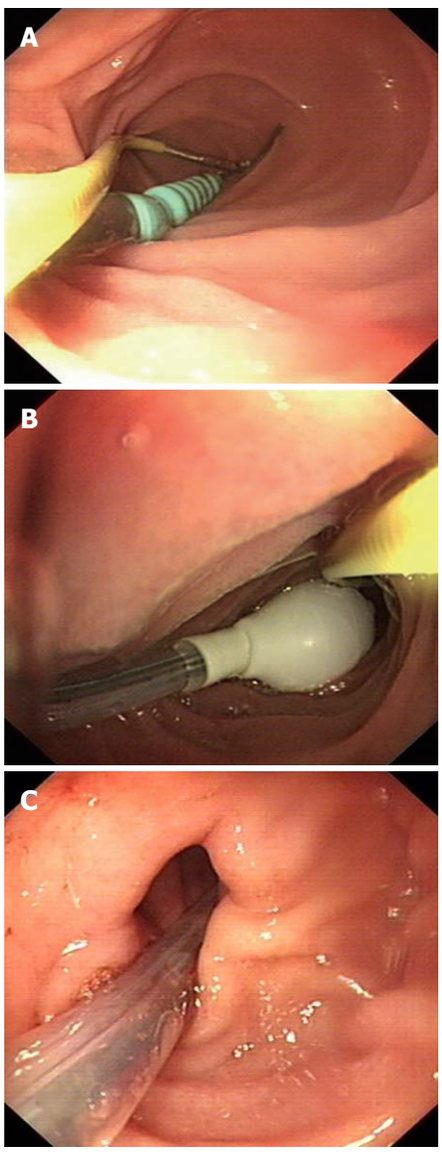

Figure 1 Endoscopic progress of a long-tube insertion. A: The guidewire was grasped with biopsy forceps and the scope and tube were passed through the pylorus to reach the duodenojejunal flexure; B: The anterior balloon was inflated to engage the wall of the bowel; C: The guidewire was released and the scope was withdrawn while maintaining the long tube in the small bowel.

to engage the wall of the bowel (Figure 1B), the biopsy forceps and the guidewire was released and the scope was withdrawn while maintaining the long tube in the small bowel (Figure 1C). The tube was advanced through the nose 5 cm per hour by gastrointestinal peristalsis. In group A, the long tube was inserted under fluoroscopic guidance. Postural change of the patients and transabdominal manipulation were frequently used to facilitate passage of the tube through the pyloric ring. After the long tube had reached the descending part of the duodenum, the anterior balloon was fully inflated to engage the wall of the bowel, as described above. Successful intubation was defined as insertion of the long tube into the descending part of the duodenum. The time required for the tube-insertion procedure was determined for the 2 groups. In group A, it was regarded as a failure for

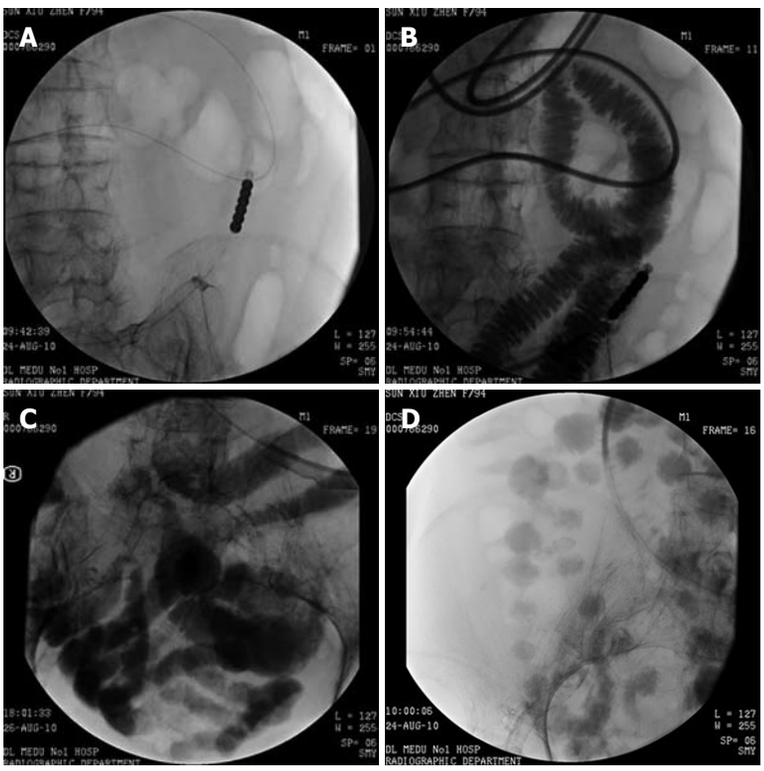

Figure 2 Abdominal flat plate images after long tube insertion. A: Location of the long tube; B: Jejunum after ingestion of contrast medium through the long tube; C: Ileum; D: Colon, showing complete relief of the small bowel obstruction after insertion of the long tube.

Table 1 Demographic characteristics of 78 patients with small-bowel obstruction

	Group A (n = 35)	Group B (n = 43)
Gender: male to female	20:15	24:19
Age (yr)		
mean (SD)	55.6 (16.4)	56.5 (17.4)
Median (range)	57.4 (20-83)	59.3 (22-94)
Symptoms		
Abdominal pain	34	41
Distension	29	34
Constipation	22	25
Nausea/vomiting	18	21

fluoroscopy-guided intubation if endoscopic assistance was required. During the procedure, vital signs and O_2 saturation were monitored if necessary. After insertion of the long tube, intermittent continuous suction was performed to reduce intraluminal pressure in the small bowel, and fluid and electrolyte deficits were corrected. Abdominal flat plate images were taken daily to evaluate the progress of the tube and the degree of decompression (Figure 2A). In some cases, water-soluble contrast medium was given through the long tube to determine the cause of the SBO, whether the obstruction was partial or complete, and whether it was completely relieved by this nonsurgical treatment (Figure 2B-D).

Statistical analysis

Data analysis was performed using SPSS 10.0 software (Chicago, IL, United States). Analysis of variance (ANOVA) or Wilcoxon statistical methods were used to determine statistical significance. All measurements in this study were expressed as mean ± SD. $P < 0.05$ was considered statistically significant.

RESULTS

There was no statistically significant difference in the mean age, male-to-female ratio, and causes of bowel obstruction between the 2 groups (Table 1). The time required for placement of the long tube in the descending part of the duodenum in groups A and B was 32.6 ± 14.6 min and 16.5 ± 7.8 min, respectively ($P < 0.05$). The success rate of intubation was 88.6% in group A and 100% in group B ($P < 0.05$). Four intubations in group A failed under the guidance of fluoroscopy but were completed with the assistance of endoscopy; all 4 of these patients were male. No severe complications relevant to the procedure occurred in either group.

The obstructive symptoms of most patients were relieved within 3 d. Suction was discontinued and the balloon was aspirated when the patient had flatus. If the clinical and radiographic signs remained stable, oral intake was initiated. As the oral intake changed to full liquids, the tube was removed. Sixty-eight cases (87.2%) had complete remission. Patients who required operative intervention were defined as treatment failures. All 10 such cases (12.8%) in our study underwent laparotomy. Among them, 7 cases (9.0%) had neoplasms in the small

Table 2 Characteristics of patients with small bowel obstruction who underwent surgery

	Group A (*n* = 35)	Group B (*n* = 43)
Etiology		
Postoperative adhesion	26	31
Neoplasm	3	4
Inflammatory bowel disease	2	3
Unknown	4	5
Surgery needed	5	5
Surgical method		
Bowel resection	3	4
Adhesiolysis	2	1

bowel and received bowel resections. The other 3 cases (3.8%) failed to respond to long-tube decompression because of the complete SBO and underwent adhesiolysis (Table 2).

DISCUSSION

As one of the major causes of hospitalization and surgical consultation, SBO can come from many causes[10]. It used to be a fatal condition, with mortality as high as 50%. Since 1933, when Wangsteen used a long tube to decompress the obstructed intestine and achieved favorable results, this method has been widely used in clinical practice with improved technique[11-14]. Various long tubes have been developed for this purpose[15,16] which resulted in a remarkable reduction in mortality from bowel obstruction[9,17]. Studies[15,18] demonstrated that the decompression effect achieved with a long tube is superior to that of a nasogastric tube for the treatment of obstruction because a long tube can automatically pass into the deeper portion of the intestine by balloon transport, come closer to the obstruction and reduce the intraluminal pressure more effectively. However, because insertion of a long tube has traditionally been performed under the guidance of fluoroscopy, it is difficult to insert a long tube blindly into the small bowel, and this has many drawbacks such as prolonged procedural time, severe patient distress, and increased X-ray exposure. But direct observation by endoscopy makes it much easier and quicker to guide the tube through the pyloric ring[19]. However, the long tube is easily disturbed when the endoscope is withdrawn because of the strong friction between the tube and the endoscope. To avoid this in our studies, we fully inflated the anterior balloon to engage the wall of the bowel before withdrawing the endoscope. By using this method we improved both the success rate and the time required for tube placement. Because the entire procedure was performed by endoscopy, fluoroscopy was only used to confirm the position of the tube, thus improving the safety for both the medical staff and patients.

Postoperative adhesion is the major cause of SBO[2,3], and adhesive SBO can be a complication of any abdominal surgery[20-24]. Long-tube decompression can aspirate the intestinal contents, decrease edema of the bowel wall[25], enhance bowel motility, and prevent bacterial translocation[26]. Long-tube decompression successfully relieves the obstructive symptoms in most patients with SBO[9], especially adhesive obstructions, and may ultimately help to avoid abdominal operations in the majority of patients[2].

Long-tube decompression achieved favorable outcomes, including reduced edema, improved circulation of the involved intestine, and correction of intestinal kinking, so that both normal size and function are restored in the distended loops of the bowel[9]. In our study, most patients with SBO were relieved of the obstruction within 72 h, and about 87.2% of the patients experienced full recovery following long-tube decompression and without the need for surgical intervention, which is consistent with other reports[9]. Moreover, no serious complications were found during the long-tube decompression treatment, which is also similar to other studies.

Although most SBOs can be resolved with tube decompression alone, surgical treatment may be required in some patients[27] because of neoplasm or strangulation. For adhesive SBO, if ileus persists more than 3 d after insertion of a long tube, or the drainage volume is still > 500 mL on day 3, surgery should be recommended to replace the conservative management[28-30].

In our study, 10 cases underwent laparotomy. Among them, 7 cases received bowel resection because of neoplasms and 3 cases underwent adhesiolysis due to complete and multiple-site obstructions. However, even for those patients receiving laparotomy, long-tube decompression should be done before surgery to prevent the occurrence of perforation.

In conclusion, decompression with a long tube should be considered for all patients with clinical and radiographic evidence of SBO but without a strangulation obstruction or other contraindications. Long-tube insertion facilitated by endoscopy is superior to the conventional fluoroscopic method for SBO, as evidenced by the procedural success rate and time required.

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COMMENTS

Background

Small bowel obstruction (SBO) is still one of the major causes of morbidity and financial expenditure in hospitals around the world. It has been reported that about 50%-80% of small bowel obstruction are caused by adhesions, mostly postoperative. Patients with partial adhesive small-bowel obstruction are usually given conservative management including fasting, intravenous hydration, and decompression with a nasogastric tube. But such treatment was successful only in 40% of all cases.

Research frontiers

Recently, a long tube has been applied clinically to decompress the obstructed

intestine by aspirating the intestinal contents and achieved favorable outcomes. However, because the procedure used to be performed under fluoroscopy, it was difficult to incubate a long tube into the small bowel, which resulted in long procedure time, severe patient distress, increased X-ray exposure and low success rate.

Innovations and breakthroughs

In this study, we introduced an easy technique to place a long tube assisted by endoscopy which was effective to relieve the small bowel obstruction. Compared with conventional method under fluoroscopy, the new method has advantage of less procedure time and high success rate.

Applications

The study shows that decompression with a long tube should be considered for all patients with clinical and radiographic evidence of small bowel obstruction but without a strangulation obstruction or other contraindications. And long-tube insertion facilitated by endoscopy is superior to the conventional fluoroscopic method for small bowel obstruction according to procedural success and time required.

Terminology

SBO: Small bowel obstruction involves a partial or complete blockage of the bowel that results in the failure of the intestinal contents to pass through, mostly caused by adhesion. It can be divided into simple and strangulation obstruction according to whether the vascular supply to intestinal wall is compromised.

Peer review

This is a good descriptive study in which authors describe their experience using an endoscopic technique to place a long tube into the small bowel, and evaluate the efficacy of the long tube to achieve decompression for treatment of SBO. The results suggest that long-tube decompression is recommended for patients with adhesive small bowel obstruction, and long-tube insertion by endoscopy was superior to fluoroscopic placement.

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