

# Laparoscope combined with ilues tube treat acute adhesive intestinal ileus

Yang Dong<sup>a</sup>, Jianfeng Shi<sup>b</sup>, Xiaosun Liu<sup>a</sup>, Chunhui Shou<sup>a</sup>, Qing Zhang<sup>a</sup>, Jiren Yu<sup>a\*</sup>

## ABSTRACT

Here, we explore the feasibility, safety and treatment experience of laparoscopic combined with ilues tube treatment of ASBO. From January 2014 to December 2018, 23 patients with a diagnosis of ASBO and received laparoscopy combined with ilues tube treatment. A total of 23 patients were enrolled in the study and treated as follows: All patients were treated with ileus tube before surgery. Patients with unrelieved ileus after conservative treatment undergo surgery. 16 patients underwent laparoscopic enterolysis. 5 patients underwent laparoscopy-assisted partial small bowel resection for various reasons, and 2 cases were converted to open surgery because of the severe adhesions on the intestinal wall. The average postoperative anal exhaust time was  $3.09 \pm 1.41$  days and the time to start food uptake was  $4.48 \pm 1.95$  days. The postoperative visual analog score for pain showed 21 cases of Grade 1-3 and only 2 cases above grade 4. None of the patients experienced surgical complications. The symptoms of the patients before surgery disappeared without recurrence in all cases except for one patient who still had symptoms 6 months post-surgery. All patients were followed up for 1 year after the operation. The laparoscopy surgery combined with ilues tube treatment of adhesive intestinal obstruction is feasible and highly beneficial.

**Keywords:** laparoscopy; ilues tube; adhesive intestinal obstruction

## INTRODUCTION

Adhesive small bowel obstruction (ASBO) is one of the leading causes of surgical emergencies. A severe case of adhesive ileus can generate fiber bands which hinder the movement of the intestine and cause abdominal distension as well as pain, eventually leading to intestinal necrosis. The obstruction was classified into one of five categories: general adhesions, local adhesions, obstructing band, tumor or other (hernia, Crohn's disease, foreign body) [1, 2]. Incomplete intestinal obstruction caused by adhesion is often treated conservatively. However, this cannot completely eradicate the disease. Patients may eventually suffer from intestinal strangulation, and some patients are prone to recurrence after conservative treatment. In the UK, small bowel obstruction was the indication for 51% of all emergency laparotomies [3, 4].

Laparoscopy is considered the gold standard in many surgical procedures, particular appendectomy and cholecystectomy. However, it is

rarely used on patients with adhesive ileus. Laparoscopic enterolysis has the advantage of being minimally invasive, having a wide exploration range and displaying a low recurrence rate. It has been widely welcomed and recognized and has achieved good results [5, 6]. Nevertheless, the adoption of laparoscopic enterolysis for SBO has been slow, mainly due to concern for iatrogenic bowel injury and working space issues related to bowel distension [7, 8]. Consequently, laparoscopic surgery should be selected when the patient's condition is stable, intestinal effusion is reduced, and intestinal dilatation subsides, so as to reduce the possibility of pneumoperitoneum and intestinal injury during surgery.

All of the above-mentioned factors give rise to a question of whether laparoscopic combined with ilues tube release of adhesion in acute adhesive ileus will be effective and safe. Therefore, we designed the current study to evaluate the laparoscopic surgery for the treatment of ASBO. We proposed that the laparoscopic method is a feasible option for the ASBO and achieves significant outcomes in patients.

## MATERIALS AND METHODS

<sup>a</sup>The First Affiliated Hospital, Zhejiang University School of Medicine.

<sup>b</sup>Tongde Hospital Zhejiang Province, Zhejiang University, Hangzhou, China

\*Corresponding author: Jiren Yu, E-mail: yujr0909@zju.edu.cn

## Subjects

The current study enrolled the patients who were willingly admitted for laparoscope combined with ilues tube treatment of adhesive ileus in our hospital between January 1, 2014, and December 31, 2018.

The inclusion criteria include patients who are suffering from typical symptoms of ASBO such as abdominal pain, vomiting, hyperperistalsis, hyperactive bowel sounds, and have stopped passing gas. Written informed consent was obtained from all the patients or their family members for enrollment in the study. All measurement data are presented as mean  $\pm$  standard deviation, whereas all count data are presented as percentages. Statistical analysis was carried out using SPSS 20.0 software.

## Process of diagnosis and treatment

The complete medical histories of all patients were collected. Patients were subjected to physical examinations, laboratory blood tests and imaging studies, which collectively led to a diagnosis of adhesive ileus. Through a horizontal CT scan of the entire abdomen, the site, type and cause of the adhesive ileus were determined. For mild cases of adhesive ileus without strangulation or complete obstruction, as well as for those without serious systemic complications, the patients were treated with symptomatic treatment consisting of fasting, ileus tube gastrointestinal decompression, rehydration, and antispasmodic and anti-infective medications. As the symptoms of adhesive ileus improved, the patients underwent another abdominal CT or gastrointestinal contrast imaging to assess the condition of the adhesive ileus. If the adhesive ileus was relieved, the patients would be considered for discharge. If the conservative treatment did not significantly relieve the condition of adhesive ileus, the patients were offered the possibility of surgery (elective). For adhesive ileus associated with strangulation or sudden, severe and sustained abdominal pain that could not be alleviated, or if obvious signs of peritonitis and poor general condition occurred, the patients were subjected to emergency surgery.

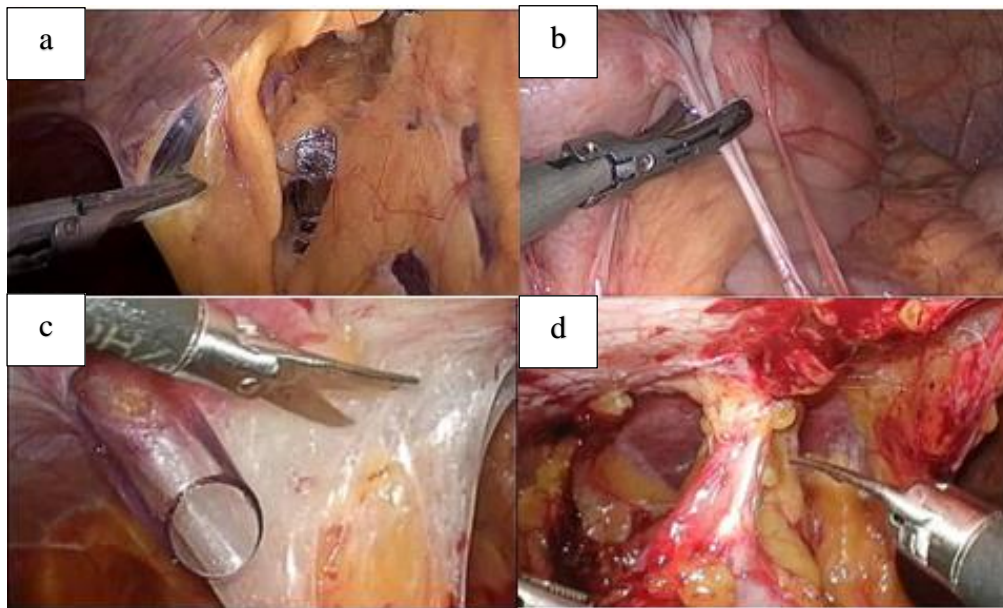
## Surgical methods

The channel of pneumoperitoneum was established by directly inserting a puncture outfit without pneumoperitoneum needle. While establishing the pneumoperitoneum, the pressure setting should not be too high, to avoid tearing of intra-abdominal adhesions and causing damage to

bowel organs. Through laparoscopic exploration, the position of abdominal adhesions can be clearly ascertained. The remaining surgical manipulations during the operation could, therefore, be carried out according to the actual positions.

If the bowel is severely dilated, it is recommended to find the ileocecal area first and probing from the distal to the proximal end of the obstruction. For intraperitoneal adhesions, an ultrasonic knife was first used to release the abdominal adhesions, to ensure a right field of vision. Once the adhesions, between intestines and the incision, on the abdominal wall were separated and loosened, the surgery was performed close to the abdominal wall (Fig. a-b). In case of separation was difficult, the peritoneum was damaged slightly to avoid bowel injury. In addition, electric hooks were not used to avoid bowel injury. After the abdominal adhesions were loosened, the ileocecal part was grasped by a pair of tongs, and all major adhesions starting from the end of ileum to the duodenal suspensory were detected and separated. When the main abdominal lesions near the scars on the abdominal wall were examined, other parts of the abdomen were checked at the same time to avoid any overlooked adhesions. In the case of intestinal incarceration, the necrotic bowel was retained for 5 to 10 minutes to determine whether its vitality and movement had improved. A small incision was made in its adjacent area, and partial laparoscopic resection and anastomosis were performed with the aid of laparoscopy (Fig. c-d).

For anastomosis, we used the lateral approach with linear cutter reloads. Since the linear cutter reloads had a certain margin of anastomotic leak, we routinely used a 3-0 thread to discontinuously and vertically suture the intestinal muscle layer in an inverted fashion to consolidate the site of anastomosis. During suturing, adequate suture tension was applied so that the muscle layers on both sides of the stump were aligned and closed, while at the same time tissue cutting and ischemia were also avoided to ensure the greatest degree of intestinal healing. Subsequently, the abdominal cavity was checked again for any adhesions or active bleeding before the surgical site was rinsed and the water was aspirated. Finally, a drainage tube was placed into the abdomen, and the abdominal incision was closed. After the surgery, the patient is extubated, transferred to the postanesthesia care unit and monitored. The patients were constantly monitored by attending for any complication.



**Figure (a-b)** Display of the use of an ultrasonic scalpel to release the obstructing band and adhesion of omentum to the peritoneum. **Figure (c-d)** Display showing the use of cold scissors to avoid any use of energy-based dissection, either monopolar or bipolar, wherever there may be a bowel.

## RESULTS

A total of 23 patients, including 17 males and 6 females were enrolled in the study (Table 1). The average age of the patients was  $52.9 \pm 15.9$  years, and the majority were male (Table 1). Twenty patients had a history of previous abdominal surgery, and 21 patients with ASA1 and ASA2 scores

totally, and two cases were not scored. The average duration of surgery was  $147.35 \pm 80.99$  minutes with an average amount of  $30.22 \pm 32.94$  ml bleeding that occurred in surgery. Sixteen patients underwent laparoscopic enterolysis. Five patients underwent laparoscopy aided enterolysis and partial bowel resection. In addition, 2 cases were converted to open surgery.

**Table 1. General characteristics and surgical information of the 23 patients**

Indicator		Value
Sex	Male	17(73.9%)
	Female	6(26.1%)
Age (years)		$52.9 \pm 15.9$
Previous abdominal surgery	No	3(13%)
	Yes	20(87%)
ASA (American Society of Anesthesiologists)	No	2(8.7%)
	Grade 1	11(47.8%)
	Grade 2	10(43.5%)
Surgery duration (minutes)		$147.35 \pm 80.99$
Bleeding volume (ml)		$30.22 \pm 32.94$
Type of surgery	Laparoscopic enterolysis	16(69.6%)
	Laparoscopy aided enterolysis + partial bowel resection	5(21.7%)
	Converted to open	2(8.7%)

The mean postoperative anal exhaust time was  $3.09 \pm 1.41$  days, and the time to start food uptake was  $4.47 \pm 1.95$  days (Table 2). Postoperative visual analog score (VAS) pain score showed that 21 cases in Grade 1-3 and just 2 cases above grade 4 (Table

2). Duration of postoperative hospital stay is  $8.04 \pm 4.92$  days (Table 2). Two patients had a fever for 3 days or more; However, none of the patients endured surgical complications. All symptoms before surgery disappeared without recurrence

during 1 year of follow-up for all patients except

one, who still had symptoms 6 months post-surgery.

**Table 2. Postoperative conditions of the 23 patients**

Indicator	Value
Anal exhaust time (days)	3.09±1.41
Time to start food uptake (days)	4.47±1.95
VAS pain score at the site of incision	
Grade 1-3	21 (91.3%)
Grade 4 and above	2 (8.7%)
Duration of postoperative hospital stay (days)	8.04±4.92
Over 3 days of postoperative fever	2 (8.7%)
Postoperative complications	0 (0)
Relapse	1(4.3%)

## DISCUSSION

Despite the continuous improvement of surgical techniques in recent years, the incidence of postoperative adhesive ileus has not decreased significantly. However, the formation of adhesive girdles is a complicated process associated with the repair of peritoneal tissues, and the underlying mechanisms remain unclear. Laparoscopy may provide benefits for some patients with ASBO, but surgeons should carefully select candidates for laparoscopic treatment. At present, there is no absolute contraindication or indication for laparoscopic intestinal adhesions. The predictive factors for the success of laparoscopic enterolysis treatment of ASBO are sufficient experience in laparoscopic surgery, a history of less than two laparotomy surgeries, and expecting a single adhesive band [9, 10]. Extremely dilated loops and complex adhesions may increase the risk of serious complications such as enterotomy and delayed diagnosis of perforation. Therefore, preoperative assessment is particularly important.

If the patient cannot be treated with laparoscopic surgery, it is necessary to switch to laparotomy in a timely and accurate fashion so as to improve the prognosis. However, in the authors' opinion, the surgical contraindications for laparoscopic enterolysis in the treatment of adhesive ileus should be broader. For example, extensive adhesions in the abdominal cavity, intestinal necrosis and intestinal dilatation are factors determining the necessity to switch from laparoscope to laparotomy. However, they are currently not classified as contraindications for laparoscopic surgery. In addition, there are some challenges involved in the assessment of patient conditions as it is not certain whether the above situations can be discovered prior to surgery. Although feasible, this was not the case in our material, as the presence of bowel diameters >4 cm did not predict the necessity for intraoperative

conversion [11, 12]. On the other hand, in a preoperative CT assessment, the diameter of the intestine can be used as a safety indicator to determine whether a laparoscopic examination is necessary.

For patients with severe intestinal edema and without strangulation, bowel ischemia, or peritonitis, conservative treatment should be considered first. Conservative treatment within 3 days is safe [9]. Gastrointestinal decompression is one of the most important means of conservative treatment of adhesive ileus. It is intended to provide symptomatic relief and potentially decrease the need for surgery [13]. Gastrointestinal decompression is cited as part of the standard treatment in the Bologna guidelines. It can reduce the pressure in the gastrointestinal tract to reduce abdominal distension, reduce the bacteria and toxins in the intestinal lumen, and improve the blood circulation in the gastrointestinal wall to improve the local lesions and general condition. However, the common nasogastric tube can only reduce the pressure in the stomach, as it cannot fully drain the intestinal contents. Due to the gravitational force of the water bladder on the anterior segment and proximal intestinal peristalsis, the ileus tube can reach the proximal end of the obstruction site, and effectively reduce the pressure and intestinal edema, and facilitate the recovery of blood circulation in the intestine. The ileus tube is widely used, and non-operative management is successful in 40% to 70% of clinically stable patients with acute intestinal obstruction and is associated with shorter initial hospitalization [14, 15].

Surgery was traditionally chosen as the primary method to treat adhesive ileus when conservative treatment was ineffective. A potential problem in treating patients with adhesive ileus is the risk of

future adhesions as a result of surgery. All clinical

studies and most experimental studies showed that laparoscopic surgery results in fewer adhesions than open surgery and therefore could significantly reduce the incidence of adhesive ileus in the small intestine. Such observations make laparoscopic enterolysis a promising alternative therapy for adhesive ileus in the small intestine [16-18]. Although many reports have demonstrated the feasibility and safety of laparoscopic surgery when performed by experienced laparoscopic surgeons, it remains to be seen whether this technique can be recommended as a standard treatment for patients with adhesive ileus. We are waiting for the result of laparoscopic versus open enterolysis for small bowel obstruction—a multicenter, prospective, randomized, controlled trial that is currently ongoing [19, 20].

Although laparoscopic treatment has obvious advantages in the treatment of adhesive ileus, it also presents a risk of intestinal damage, especially in patients with severe abdominal distension. Nevertheless, we believe that the skillful use of an ultrasonic scalpel, coupled with the preoperative assessment of intestinal edema, can, to a large extent, prevent the occurrence of surgery-related thermal and mechanical damages to the intestine. During surgery, we found that almost all patients were suffering from band-like adhesions between the omentum and abdominal wall. Although such types of mild adhesions can be treated with laparoscopic enterolysis, patients with severe adhesions or extensive bowel adhesions must be transferred to laparotomy, and if necessary, subjected to laparoscopy-assisted partial resection of the small intestine. During emergency surgery, since the patients suffer from prolonged intestinal dilatation and subsequent intestinal wall fragility due to its expansion [21], the procedure should be conducted with high precision to avoid injury to the bowel caused by intestinal stretching. In the case of one patient who had developed adhesive ileus due to colon tumor recurrence, laparoscopic surgery was chosen to loosen the adherent intestines. Subsequently, jejunostomy was performed so that the patient could receive chemotherapy as soon as the symptoms of adhesive ileus were relieved, thus further underscoring the advantages of minimally invasive surgery. Laparoscopic surgery also has several disadvantages, such as it can take longer to perform than open surgery. The longer the duration of anaesthesia can raise the risk of complications. Often symptoms do not manifest spontaneously but arise within a few days or a few weeks following surgery. Problems that can develop from

laparoscopy include hernia, internal bleeding, injury to blood vessels or other organs, such as liver, bowel bladder, or urethra [22].

Because most changes are due to technological problems and the failure to determine the cause of the obstruction, it is reasonable to assume that patients with single adhesion and/or internal hernia without need for resection would be the best candidates for laparoscopy. Further specific studies are now required to classify risk factors related to a higher likelihood for the detection of single adhesions and/or internal hernias, and to evaluate risk factors for conversion.

Our current study has limitations. Our study has a selection bias and the study group is very limited. This bias may affect the outcomes compared to other approaches, and so prospective randomized studies are required to verify the results obtained in the current study.

## CONCLUSION

We found laparoscopic surgery for the treatment of ASBO to be effective under skilled surgery. Under ileus tube treatment of adhesive ileus, the severity of intestinal dilatation is reduced, accompanied by a reduction in intestinal wall edema and improved blood circulation. Under such conditions, surgery will tend to achieve good results.

## REFERENCE

- [1] Bailey, I., et al., Laparoscopic management of acute small bowel obstruction. 1998. **85**(1): p. 84-87.
- [2] Sebastian-Valverde, E., et al., The role of the laparoscopic approach in the surgical management of acute adhesive small bowel obstruction. *BMC Surgery*, 2019. **19**(1): p. 40.
- [3] Odor, P.M. and M.P.J.P.M. Grocott, From NELA to EPOCH and beyond: enhancing the evidence base for emergency laparotomy. 2016. **5**(1): p. 1-4.
- [4] Ho, Y.M., et al., Benchmarking against the National Emergency Laparotomy Audit recommendations. *ANZ J Surg*, 2018. **88**(5): p. 428-433.
- [5] Nagle, A., et al., Laparoscopic adhesiolysis for small bowel obstruction. *The American journal of surgery*, 2004. **187**(4): p. 464-470.
- [6] Mazzetti, C.H., et al., Early laparoscopic adhesiolysis for small bowel obstruction: retrospective study of main advantages. *Surg Endosc*, 2018. **32**(6): p. 2781-2792.
- [7] Ghosheh, B. and J.R. Salameh, Laparoscopic approach to acute small bowel

- obstruction: review of 1061 cases. *Surgical endoscopy*, 2007. **21**(11): p. 1945-1949.
- [8] Albatanony, A., M. El Meligy, and M. Dorbok, The role of laparoscopic adhesiolysis in the treatment of patients with recurrent, adhesive intestinal obstruction *Menoufia Medical Journal*. 2019. **32**(2): p. 499-505.
- [9] Zanghi, G., et al., Laparoscopic surgery in acute small bowel obstruction. Our experience. *Il giornale di chirurgia*, 2012. **33**(1/2): p. 38-40.
- [10] Kim, S.M., et al., Safety and Feasibility of Laparoscopic Surgery for Small Bowel Obstruction. *Journal of Minimally Invasive Surgery*, 2018. **21**(2): p. 75-81.
- [11] Zerey, M., et al., Laparoscopic management of adhesive small bowel obstruction. *The American Surgeon*, 2007. **73**(8): p. 773-779.
- [12] Hackenberg, T., et al., Laparoscopic versus Open Surgery for Acute Adhesive Small-Bowel Obstruction: A Propensity Score-Matched Analysis. *Scand J Surg*, 2017. **106**(1): p. 28-33.
- [13] ten Broek, R.P.G., 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 Journal of Emergency Surgery*, 2018. **13**(1): p. 24.
- [14] Grafen, F.C., et al., Management of acute small bowel obstruction from intestinal adhesions: indications for laparoscopic surgery in a community teaching hospital. *Langenbeck's archives of surgery*, 2010. **395**(1): p. 57.
- [15] Vassiliu, P., et al., Successful management of adhesion related small bowel ischemia without intestinal resection: A case report and review of literature. *World Journal of Gastrointestinal Pathophysiology*, 2019. **10**(2): p. 29.
- [16] Diaz, J.J., et al., Guidelines for management of small bowel obstruction. *The Journal of trauma*, 2008. **64**(6): p. 1651-1664.
- [17] Catena, F., et al., Bowel obstruction: a narrative review for all physicians. *World Journal of Emergency Surgery*, 2019. **14**(1): p. 1-8.
- [18] Ten Broek, R.P.G., 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 Journal of Emergency Surgery*, 2018. **13**(1): p. 24.
- [19] Leung, A.M. and H. Vu, Factors predicting need for and delay in surgery in small bowel obstruction. *The American Surgeon*, 2012. **78**(4): p. 403-407.
- [20] Thornblade, L.W., et al., The safety of expectant management for adhesive small bowel obstruction: a systematic review. *Journal of Gastrointestinal Surgery*, 2019. **23**(4): p. 846-859.
- [21] Farndon, J.R., Surgical treatment: Evidence-based and problem-oriented. Postoperative complications of parathyroidectomy. 2018.
- [22] Nezhat, C., et al., Operative laparoscopy: redefining the limits. *JSL: Journal of the Society of Laparoendoscopic Surgeons*, 1997. **1**(3): p. 213-216