Laparoscopic Treatment of Intestinal Obstruction

Jae Hun Hur, M.D., Byeonghun Oh, M.D., Eunyoung Kim, M.D., Eun Jung Ahn, M.D., Ph.D., Sei-Hyeog Park, M.D., Jong-Min Park, M.D.
Department of Surgery, National Medical Center, Seoul, Korea

Purpose: Open adhesiolysis has been the favored approach regarding surgical management of intestinal obstruction. Following the development of laparoscopic devices and necessary surgical techniques, laparoscopic treatment of intestinal obstruction and adhesion has been tried in highly selected cases. Our study was designed to investigate laparoscopic adhesiolysis to treat intestinal obstruction.

Methods: The clinicopathologic data and surgical outcomes of 14 patients who underwent emergency laparoscopy between January 2007 and April 2015 were retrospectively reviewed.

Results: Five patients had a history of abdominal surgery, and twelve patients had adhesive intestinal obstruction. The causes of adhesive intestinal obstruction included tuberculous peritonitis, periappendiceal abscess, serosal fibrosis and chronic inflammation of intestine, gastric volvulus by fibrotic band. Two patients had non-adhesive intestinal obstruction, caused by intussusception and small bowel ulcer with stricture. The mean surgical time was 98.5 minutes, with mean blood loss of 35 ml. One case was converted to open surgery (7.1%). The mean postoperative hospital stay was 6.5 days. The mean time to oral intake was 3.4 days. There were no postoperative complications or deaths.

Conclusion: When the patients are selected carefully in accordance with the guidelines, in our experience laparoscopic adhesiolysis is safe and feasible. (J Acute Care Surg 2016;6:23-28)

Key Words: Intestinal obstruction, Laparoscopy, Adhesion

Introduction

Open adhesiolysis was the favored approach regarding surgical management of intestinal obstruction before being accepted laparoscopic adhesiolysis widely. Despite the technical difficulties, laparoscopic adhesiolysis in the treatment for intestinal obstruction has been widely accepted as safe and feasible in recent years due to development of surgical techniques and devices. Laparoscopic adhesiolysis has many advantages such as less invasiveness, short hospital day, lesser pain, better cosmetics, and lower incidence of postoperative complication [1]. Our study was designed to investigate the role of laparoscopic adhesiolysis in the treatment of patients with spontaneous and postoperative abdominal pain or recurrent intestinal obstruction, not attributed to other obvious pathology.

Methods

Patients

We retrospectively reviewed the database of 14 patients who underwent laparoscopic adhesiolysis between January 2007 and April 2015. All patients were hospitalized via emergency room.
Table 1. Indications of laparoscopic approach

| Common indication                              |
|-----------------------------------------------|
| 1. Hemodynamic stability and ability of the patient to tolerate a laparotomy |
| 2. No malignancy                              |
| 3. No history of previous radiotherapy         |
| 4. No portal hypertension                      |
| Not resolving with non-operative therapy       |
| 1. Without signs of generalized peritonitis or Intestinal perforation or ischemia or sepsis |
| 2. Less than two abdominal procedures and operations in conjunction with adhesiolysis |
| 3. No recent abdominal operation within 30 days |
| Resolving with non-operative therapy           |
| 1. History of recurrent bowel obstruction      |
| 2. Chronic small bowel obstruction demonstrated by contrast study, having focal transitional zones on abdominal computed tomography images |

Surgical techniques

Patients were placed in the supine position, and the operator was standing in distant part of the obstruction lesion. The scopist was positioned on the counter part of the operator. After general anesthesia, Camera trocar was inserted using open access technique in distant part of the obstruction lesion or operation scar for avoiding the bowel injury. The intra-peritoneal pressure was maintained as 11 to 13 mmHg. The position of the patient was changed according to the location of the obstruction lesion, such as the Trendelenburg or reverse Trendelenburg position with the right or left tilting and two or three additional trocars were inserted.

After the full inspection of the intra-abdominal cavity, we tried to find the obstruction point and minimize bowel injury using atraumatic forceps whenever bowel grasping. For adhesiolysis and dissection of tissue, the hook-type dissector with mono-polar coagulation or ultrasonic device was used. We manipulated carefully as possible in order to reduce tissue damage. Anti-adhesive materials were applied in intra-peritoneal cavity at the end of operation.

Postoperative management

Preoperatively inserted nasogastric tube for bowel decompression was removed at the beginning to be visualized the colon gas with improving ileus on simple radiography and then we started sips of water. Without further complications,
patients were discharged after tolerance of a soft diet for two more days.

**Results**

Total patients of intestinal obstruction were 35 patients. Of these, 21 patients who didn’t meet the criteria of laparoscopic adhesiolysis got open procedure. Fourteen patients underwent laparoscopic adhesiolysis. All operations were completed by one surgeon experienced in laparoscopy, at our center under general anesthesia. Patients’ characteristics are shown in Table 2, 3. Patients comprised 12 males and two female, with a mean age of 60.1±14.75 years (range, 24 to 81 years). All patients’ body mass index were under 30. Five patients had prior abdominal operations. six patients had co-morbidity including diabetes mellitus, hypertension. old pulmonary tuberculosis, chronic obstructive disease, bronchiectasis, cardiac ischemia. The others didn’t have co-morbidity.

Preoperatively, some patients were worked up extensively with a abdominal-pelvic CT. This study was obtained to get the information of focal transitional zones and rule out obvious intra-abdominal/visceral pathology that would explain the patients’ abdominal pain, intestinal obstruction, or both. Only when there were no obvious intra-abdominal/visceral pathology (ex., Cancer, etc.) and focal transitional zones were found in CT images, the patients were considered for laparoscopic adhesiolysis.

Surgical outcomes and postoperative courses were summerized in Table 4. The mean operation time was 98.5 minutes and there was no emergency situation and one case which converted to mini laparotomy for resection of strictured intestine during operation. The patients were discharged from five days to 14 days following their operations. The mean postoperative hospital day was 6.5 days. There were no postoperative complications and deaths. Postoperatively, all patients had complete resolution of their symptoms (overall 100% response to adhesiolysis). The mean time to oral intake is 3.4 days, respectively. The patient who had recurrent episode of intestinal obstruction after operation was one. Recurrent rate of intestinal obstruction was 7.1%. The mean follow-up duration was 5.3 months.

The causes of adhesive intestinal obstruction included tuberculous peritonitis, periappendiceal abscess, serosal fibrosis and chronic inflammation of intestine, gastric volvulus by fibrotic band. Two patients were non-adhesive intestinal obstruction. The causes of non-adhesive intestinal obstruction were intussusception which was due to trichuriasis infestation and small bowel stricture which was occurred by non-specific small bowel ulcer.

**Discussion**

Major abdominal operations often result in random and unpredictable intra-abdominal adhesions. Intra-abdominal adhesions are strands or membranes of fibrous tissue that can be attached to the various intra-abdominal organs, gluing them strongly together [2]. It may result in symptomatic intestinal obstruction [3]. In addition, intestinal obstruction also can be occurred because of unknown reasons. Abdominal adhesions pose a significant health problem with major adverse effects on quality of life, use of health care resources, and financial costs. Incidence rates for abdominal adhesions have been estimated to be as high as 94 [4]–95% [5] after laparotomies [2], and rates of symptomatic small bowel obstruction were known to be 49–74% [2].

Laparoscopic adhesiolysis appears to be a good method with which to evaluate patients with symptoms of recurrent abdominal pain after previous operation and after sufficient exclusion of other organic or functional disorders [6]. Also Laparoscopic adhesiolysis has been shown to be safe and feasible in highly selective cases [1]. In highly selected patients, laparoscopic adhesiolysis offers the advantages of decreased length of stay, faster return to full activity, and decreased morbidity [1]. At our institution, the indication of laparoscopic adhesiolysis was limited to the patients with an adhesive intestinal obstruction or
Table 3. Characteristics of each patients

| Patient No. | Age (y) | Sex | Comorbidity | ASA score | Previous no. of operation | Causes | Clinical diagnosis | History of operation | Duration from previous operation to onset (y) | Open conversion | Hospitalization period (d) | Recurrent episode of obstruction |
|-------------|---------|-----|-------------|-----------|---------------------------|--------|-------------------|----------------------|---------------------------------|----------------|--------------------------|-----------------------------|
| 1           | 24      | Male | -           | 1         | 0                         | Non-adhesion | Trichuris trichiura | -                    | -                               | -              | 6                        | -                           |
| 2           | 62      | Male | -           | 2         | 1                         | Adhesion     | Total gastrectomy    | -                    | 6                               | -              | 7                        | -                           |
| 3           | 57      | Male | DM, HTN, old Tbc, COPD, bronchiectasis | 3         | 0                         | Adhesion     | Tbc, peritonitis     | -                    | -                               | -              | 6                        | -                           |
| 4           | 62      | Male | -           | 1         | 1                         | Adhesion     | Subtotal gastrectomy | -                    | 2                               | -              | 8                        | -                           |
| 5           | 81      | Male | HTN, DM    | 3         | 0                         | Adhesion     | Periappendiceal abscess | -                    | -                               | -              | 7                        | -                           |
| 6           | 81      | Male | -           | 1         | 0                         | Adhesion     | Serosal fibrosis and chronic inflammation of intestine | -                    | -                               | -              | 6                        | -                           |
| 7           | 75      | Male | CAD        | 3         | 0                         | Adhesion     | Serosal fibrosis and chronic inflammation of intestine | -                    | -                               | -              | 5                        | -                           |
| 8           | 64      | Male | Old Tbc    | 2         | 0                         | Adhesion     | Serosal fibrosis and chronic inflammation of intestine | -                    | -                               | -              | 5                        | -                           |
| 9           | 39      | Male | -           | 1         | 1                         | Adhesion     | Appendectomy         | 1                    | -                               | -              | 6                        | -                           |
| 10          | 61      | Female | -         | 1         | 1                         | Adhesion     | Hysterectomy         | 7                    | +                               | 12             | -                        | -                           |
| 11          | 57      | Female | -          | 1         | 0                         | Non-adhesion | Ulcer with small intestine | -                    | -                               | -              | 5                        | -                           |
| 12          | 54      | Male | DM         | 3         | 0                         | Adhesion     | Serosal fibrosis and chronic inflammation of intestine | -                    | -                               | -              | 6                        | +                           |
| 13          | 75      | Male | -           | 1         | 1                         | Adhesion     | Gastrostomy          | 10                   | -                               | -              | 6                        | -                           |
| 14          | 50      | Male | DM         | 2         | 0                         | Adhesion     | Gastric volvulus by fibrotic band | -                    | -                               | -              | 6                        | -                           |

ASA: American Society of Anesthesiologist, DM: diabetes mellitus, HTN: hypertension, Tbc: tuberculosis, COPD: chronic obstructive pulmonary disease, CAD: coronary artery disease.
Table 4. Surgical outcomes and postoperative courses

| Variable                              | Result value |
|---------------------------------------|--------------|
| Method of operative procedure         |              |
| Adhesiolysis (n)                      | 13           |
| Adhesiolysis+bowel resection (n)      | 1            |
| Surgical outcome                      |              |
| Open conversion (n)                   | 1            |
| Mean operation time (min)             | 98.5         |
| Blood loss (ml)                       | 35           |
| Intra-operative complication (n)      | 0            |
| Postoperative complication (n)        | 0            |
| Mortality (n)                         | 0            |
| Postoperative course                  |              |
| Mean time to oral intake (d)          | 3.4          |
| Mean postoperative hospital stay (d)  | 6.5          |
| Recurrent episode of intestinal obstruction (n) | 1 |
| Rate of recurrent intestinal obstruction (%) | 7.1       |
| Mean follow-up (mo)                   | 5.3          |

non-adhesive intestinal obstruction not resolving with non-operative therapy, but without signs of peritonitis or intestinal perforation or ischemia or sepsis. If malignancy was not suspicious, laparoscopic adhesiolysis was undergone. The patients with resolved intestinal obstruction but with history of recurrent, chronic small bowel obstruction demonstrated by contrast study, having focal transitional zones on abdominal CT images were indicated to laparoscopic adhesiolysis. When the cause of obstruction was a single band, laparoscopic adhesiolysis was successful 100% of the time [7]. The patients who had twice or more abdominal procedures and operations in conjunction with adhesiolysis, recent abdominal operation within 30 days were excluded from the study.

The mean operation time was 98.5 minutes and there was no emergency situation and one case which conversed to laparotomy for resection of strictured intestine during operation in our study. In other literatures, operative times range from 58 to 108 minutes for laparoscopic cases and up to 208 minutes for cases that are converted to a laparotomy [8,9]. So the patients who need a short operation time (ex. pulmonary co-morbidity, etc.) were favored to laparoscopic adhesiolysis. In our study, patients were discharged from five days to 14 days following their operations. The mean postoperative hospital day was 7.5, respectively. Nagle et al.[1] reported hospital length of stay in most series was four to six days for the laparoscopic group and around 12 days for the laparotomy group.

Laparoscopic adhesiolysis had low postoperative complication rate and mortality rate. Levard et al.[10] reported the incidence of postoperative complications to be 1.2% in the laparoscopic group compared with 10% in the laparotomy group (p < 0.001). The reported mortality ranges from 0~3% [1]. No postoperative complications and deaths were occurred in our study.

The mean time to oral intake is 3.4 days. In accordance of Zerey et al.[11], intestinal function returned in 2.5 days. So it was good to start a meal on postoperative three days after laparoscopic adhesiolysis.

All patients had complete resolution of their symptoms after surgery (overall 100% response to adhesiolysis). The patient who had recurrent episode of intestinal obstruction after operation was one. Recurrent rate of intestinal obstruction was 7.1%. Navez et al.[7] reported that 85% of the patients (29 of 34) treated laparoscopically were asymptomatic with a mean follow-up of 46 months. The series with the longest follow-up (mean, 61.7 months) reported 87.5% of the patients (14 of 16) treated laparoscopically were asymptomatic [12]. Furthermore, Khaitan et al.[13] have described a new technique of applying Seprafilm laparoscopically, which could further decrease the recurrence of adhesive intestinal obstruction. However, some authors have criticized the laparoscopic approach, stating that a suboptimal intra-operative evaluation of the patient and incomplete lysis of adhesions are performed, resulting in higher reoperation rates [14,15]. But, this was not our experience. Mean follow-up was 5.3 months. The largest series is a multicenter study of 308 patients, but the data are retrospective and the follow-up is only 1.6 months [10].

It is important to recognize several limitations of this study. First, the cases of laparoscopic adhesiolysis were small. The patients suitable for the indication of laparoscopic adhesiolysis were two to three person per one year. Therefore, multicentre participation was necessary for extracting better outcome. Second, the long-term results regarding recurrence are limited due to loss of follow-up. Third, cost analysis has not been addressed in our study. Fourth, there were not results compared laparoscopic adhesiolysis with open adhesiolysis in our study. Fifth, this report
may have errors of retrospective studies. Therefore, these limitations might have influenced outcomes.

Despite of these limitations, our study remained that laparoscopic adhesiolysis has been shown to be safe and feasible. Laparoscopic adhesiolysis offers the advantages of decreased length of stay, faster return to full activity, and decreased morbidity too. However careful patient selection is necessary and laparoscopic adhesiolysis must be undergone in highly selected cases.

References

1. Nagle A, Ujiki M, Denham W, Murayama K. Laparoscopic adhesiolysis for small bowel obstruction. Am J Surg 2004;187:464-70.

2. Catena F, Di Saverio S, Kelly MD, Biffl WL, Ansaloni L, Mandalà V, et al. Bologna guidelines for diagnosis and management of adhesive small bowel obstruction (ASBO): 2010 evidence-based guidelines of the World Society of Emergency Surgery. World J Emerg Surg 2011;6:5.

3. Kavic SM, Kavic SM. Adhesions and adhesiolysis: the role of laparoscopy. JSLS 2002;6:99-109.

4. Menzies D. Peritoneal adhesions. Incidence, cause, and prevention. Surg Annu 1992;24 Pt 1:27-45.

5. Luijendijk RW, de Lange DC, Wauters CC, Hop WC, Duron JJ, Pailler JL, et al. Foreign material in postoperative adhesions. Ann Surg 1996;223:242-8.

6. Freys SM, Fuchs KH, Heimbucher J, Thiede A. Laparoscopic adhesiolysis. Surg Endosc 1994;8:1202-7.

7. Navez B, Arimont JM, Guiot P. Laparoscopic approach in acute small bowel obstruction. A review of 68 patients. Hepatogastroenterology 1998;45:2146-50.

8. Al-Mulhim AA. Laparoscopic management of acute small bowel obstruction. Experience from a Saudi teaching hospital. Surg Endosc 2000;14:157-60.

9. Léon EL, Metzger A, Tsiotos GG, Schlinkert RT, Sarr MG. Laparoscopic management of small bowel obstruction: indications and outcome. J Gastrointest Surg 1998;2:132-40.

10. Levad H, Boudet MJ, Miska S, Molkhou JM, Hay JM, Laborde Y, et al; French Association for Surgical Research. Laparoscopic treatment of acute small bowel obstruction: a multicentre retrospective study. ANZ J Surg 2001;71:641-6.

11. Zerey M, Sechrist CW, Kercher KW, Sing RF, Matthews BD, Heniford BT. The laparoscopic management of small-bowel obstruction. Am J Surg 2007;194:882-7; discussion 887-8.

12. Sato Y, Ido K, Kumagai M, Isodi N, Hozumi M, Nagamine N, et al. Laparoscopic adhesiolysis for recurrent small bowel obstruction: long-term follow-up. Gastrointest Endosc 2001;54:476-9.

13. Khaitan E, Scholz S, Richards WO. Laparoscopic adhesiolysis and placement of Seprafilm: a new technique and novel approach to patients with intractable abdominal pain. J Laparoendosc Adv Surg Tech A 2002;12:241-7.

14. Franklin ME Jr, Dorman JP, Pharand D. Laparoscopic surgery in acute small bowel obstruction. Surg Laparosc Endosc 1994;4:289-96.

15. François Y, Mouret P, Vignal J. Obstruction of the small intestine and celioscopic viscerolysis. Ann Chir 1994;48:165-8.