

Laparoscopic Lysis of Adhesions

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Abstract

Background: Intra-abdominal adhesions constitute between 49% and 74% of the causes of small bowel obstruction. Traditionally, laparotomy and open adhesiolysis have been the treatment for patients who have failed conservative measures or when clinical and physiologic derangements suggest toxemia and/or ischemia. With the increased popularity of laparoscopy, recent promising reports indicate the feasibility and potential superiority of the minimally invasive approach to the adhesion-encased abdomen.

Methods: The purpose of this study was to assess the outcome of laparoscopic adhesiolysis and to provide technical tips that help in the success of this technique.

Results: The most important predictive factor of adhesion formation is a history of previous abdominal surgery ranging from 67%–93% in the literature. Conversely, 31% of scars from previous surgery have been free of adhesions, whereas up to 10% of patients without any prior surgical scars will have spontaneous adhesions of the bowel or omentum. Most intestinal obstructions follow open lower abdominopelvic surgeries such as colectomy, appendectomy, and hysterectomy. The most common complications associated with adhesions are small bowel obstruction (SBO) and chronic pain syndrome. The treatment of uncomplicated SBO is generally conservative, especially with incomplete obstruction and the absence of systemic toxemia, ischemia, or strangulation. When conservative treatment fails, surgical options include conventional open or minimally invasive approaches; the latter have become increasingly more popular for lysis of adhesions and the treatment of SBO. Generally, 63% of the length of a laparotomy incision is involved in adhesion formation to the abdominal wall. Furthermore, the incidence of ventral hernia after a laparotomy ranges between 11% and 20% versus the 0.02%–2.4% incidence of port site herniation. Additional benefits of the minimally invasive approaches include a decreased incidence of wound infection and postoperative pneumonia and a more rapid return of bowel function resulting in a shorter hospital stay. In long-term follow up, the success rate of laparoscopic lysis of adhesions remains between 46% and 87%. Operative times for laparoscopy range from 58 to 108 minutes; conversion rates range from 6.7% to 43%; and the incidence of intra-operative enterotomy ranges from 3% to 17.6%. The length of hospitalization is 4–6 days in most series.

Conclusions: Laparoscopic lysis of adhesions seems to be safe in the hands of well-trained laparoscopic surgeons. This technique should be mastered by the advanced laparoscopic surgeon not only for its usefulness in the pathologies discussed here but also for adhesions commonly encountered during other laparoscopic procedures.

Intra-abdominal adhesions cause small bowel obstruction in 49%–74% of cases.^{1–3} The management of intestinal obstruction is initially conservative, provided that the patient is clinically stable and without signs of systemic toxicity. Traditionally, laparotomy and adhesiolysis was the treatment of choice for patients who failed conservative measures or when clinical and physiologic derangements suggested toxemia and/or ischemia.^{4–6} However, up to one third of patients may require re-laparotomy for recurrent small bowel obstruction resulting from the formation of intra-abdominal adhesions.^{7–10} Furthermore, laparotomy increases the incidence of ventral hernia, wound infection, postoperative ileus, postoperative pain, and length of hospital stay.^{11–13}

Since the advent of minimally invasive surgery with the introduction of laparoscopic cholecystectomy in the late 1980s, the laparoscopic method continues to advance the field of general surgery. Initial contraindications to laparoscopy such as morbid obesity and previous abdominal surgery have since disappeared with increased experience and technical advances in surgical instrumentation. These advances have also led to the application of minimally invasive techniques to an increasing number and variety of procedures. Furthermore, recent promising reports indicate the feasibility and potential superiority of the minimally invasive approach to the adhesion-encased abdomen.^{11,12,14,15} Laparoscopic adhesiolysis was first described in the gynecologic literature for the treatment of chronic pelvic pain and infertility. Since then, this technique has been applied to the treatment of chronic abdominal pain in both adults and children.^{16,17}

Intra-abdominal adhesions are often well-vascularized and innervated, which may explain the relationship to some chronic abdominal pain syndromes.¹⁸ The utility of laparoscopic adhesiolysis has been reported for intractable abdominal pain in both the adult and pediatric populations.^{16,17,19–21} In these cases, the procedure is not only diagnostic but also curative. Some authors²¹ advocate the use of laparoscopy under local anesthesia to reproduce the pain and to identify the specific adhesion causing the pain. Others have concluded that, although laparoscopic adhesiolysis relieves chronic abdominal pain, it is not more beneficial than diagnostic laparoscopy alone and cannot be recommended as a treatment for adhesions in these patients.²²

Bastug *et al.*²³ reported the first case of laparoscopic adhesiolysis for small bowel obstruction. Subsequently, several case reports and multiple series have reported the success of laparoscopic adhesiolysis.^{15,24} Despite these data, laparoscopic adhesiolysis for small bowel obstruction still remains a concern for surgeons, and it has yet to gain

widespread acceptance. The purpose of this review was to assess the outcome of laparoscopic adhesiolysis and to provide technical tips for operating with this technique.

INDICATIONS

There is no single objective laboratory or radiographic parameter that is predictive of spontaneous resolution of small bowel obstruction. In general, continuous and localized pain and an increased white cell count and body temperature indicate strangulation. Imaging studies play a key role in confirming a final diagnosis, but they are often unreliable in determining severity. The diagnostic accuracy of plain films ranges between 46% and 80%.^{25–27} Despite the usefulness of contrast studies such as enteroclysis in determining the degree of obstruction,²⁸ they are not 100% accurate²⁵ and cannot predict the need for surgery. Furthermore, the thick barium utilized for enteroclysis interferes with other cross-sectional studies or angiography. Improved results have been described with computed tomography (CT), with sensitivity, specificity, and accuracy rates of 96%, 96%, and 95%, respectively.²⁸ Furthermore, CT scan may also be helpful in diagnosing a closed loop obstruction,²⁹ although it remains oversensitive compared to surgical exploration.³⁰

Because of the limitations of radiographic imaging in identifying patients with small bowel obstruction who will most benefit from adhesiolysis, careful patient selection becomes the most important aspect of successful outcome. Contraindications to the minimally invasive technique include these: (1) massive abdominal distension that precludes entry into the peritoneal space and limits adequate working space; (2) the presence of peritonitis with the need for bowel resection and bowel handling in a highly inflamed environment; (3) hemodynamic instability; (4) severe comorbid conditions such as heart and lung diseases that preclude the use of pneumoperitoneum; and (5) finally, but certainly not the least important, the surgeon's comfort level (Table 1). Balthazar *et al.*²⁹ reported several factors that have predicted successful outcome after laparoscopic adhesiolysis. These include surgeon training in advanced laparoscopic technique, bowel dilation less than 4 cm, and a partial bowel obstruction.

TECHNIQUE

One of the reasons for conversion to an open procedure is the presence of intra-abdominal adhesions. The

Table 1.
Contraindications to laparoscopy for adhesions

Massive abdominal distension: difficult entry, lack of working space
Peritonitis
Hemodynamic instability
Severe comorbid conditions: coagulopathy, heart, lung disease
Surgeon comfort level

technical ability to lyse the often well-vascularized adhesions should be a familiar skill for the advanced laparoscopic surgeon. This technique may vary based upon the type of adhesions (fine-filmy, dense vascularized, or cohesive). Filmy adhesions are the easiest to manipulate and may provide a good practice field for the inexperienced laparoscopic surgeon. The difficulty in approaching the adhesion-encased abdomen may be due to several obstacles: (1) difficulty in finding a “free area” in which to insert the ports; (2) relative lack of space because of abdominal distension; (3) bowel distension not only occupies space, but stretches the bowel wall to a thin and potentially injury-prone layer; (4) limited traction and visualization; and (5) susceptibility to serosal surface bruising with a potential for bleeding. Dense adhesions may obscure the bowel just behind this area; therefore, care should be taken when lysing fatty, opaque tissue.

Patient positioning for lysis of adhesions is similar to that of other laparoscopic procedures such as appendectomy. The patient is in the supine position with one or both arms along the side of the patient's body. As a general principle, the monitor should be aligned with the camera and the target organ. Because of the wide operating field, two monitors on each side of the patient are necessary, as is a 30- or 45-degree angle telescope. Initial access to the peritoneal cavity should be away from previous scars, because the majority of laparotomy incisions are involved with adhesion formation to the abdominal wall.⁷ In most cases, the left subcostal area seems to be a safe choice.

Access to the abdominal cavity using a Veress needle and blind insertion of the first trocar in a decompressed intestine has been proven safe.¹⁴ However, our preferences are the open Hasson technique or use of the Optiview® (Ethicon Endosurgery, Inc., Cincinnati, OH). The latter is useful in avoiding the increased risk of inadvertent bowel injury reported with the Veress needle technique.^{31,32} Two or more 10–12-mm ports should be used for flexibility of repositioning the camera. Essential instruments include atraumatic graspers, scissors with cautery capability, and the ultrasonic dissector, when

needed. As in open surgery, traction and counter-traction are the key elements for a successful procedure. If necessary, additional 5-mm ports should be used to provide wider exposure. In most instances with adequate traction and counter-traction, it is possible to identify the avascular plane of dissection. Ideally, the surgeon will control the amount of traction and counter traction to avoid bowel or solid organ injury.

Working against the camera should be avoided, as this set-up is more technically challenging and potentially dangerous. Electric energy should not be brought in proximity to the bowel, and the entire jaw of each instrument should be visible at all times. Electrocautery should be averted away from the bowel to avoid inadvertent conduction injury. It should be noted that electric intestinal injury may not be immediately recognized and can become manifest as a delayed perforation.

Adequate hemostasis is of paramount importance in laparoscopic surgery. In fact, a bloody field not only obstructs light from the camera it also makes recognition of the surgical plane more challenging. For these reasons, excessive irrigation may also be detrimental. Occasionally, because of adhesions, bleeding can originate from capsular tears of the liver and spleen as a result of excessive traction. If excessive traction to the capsule of these organs is anticipated, the adhesions should be lysed. Small capsular tears can be controlled by local pressure and topical hemostatic agents; however, deeper injuries warrant conversion to open surgery. As with open surgery, the use of nitrous oxide gas for anesthesia results in increased bowel distension and should therefore be avoided.

Laparoscopic adhesiolysis should be undertaken after resolution of repeated attacks when the intestine is not dilated. Laparoscopic surgery in the acute setting is prone to difficulties that can lead to intraoperative complications such as perforation, conversion, and serosal damage.

DISCUSSION

The most important predictive factor of adhesion formation is a history of previous abdominal surgery. In fact, in a prospective study by Menzies and Ellis¹ 93% of patients with prior laparotomy presented with intra-abdominal adhesions, whereas only 10% of those without prior abdominal surgery had adhesions. These data were confirmed in autopsy studies by Weibel and Majno,⁸ in which adhesions formed in 67% of cases with prior abdominal surgery. This high incidence of postoperative adhesions resulted in more than 400,000 laparotomies in

Table 2.
Results of laparoscopic adhesiolysis as reported in several series

Series/year	N	Operative time (min)	Conversion (%)	Bowel injury (%)	Length of stay (days)	Follow-up (months)	Reoperation (%)	Mortality (%)
Pekmezci <i>et al.</i> , 2002 ⁴¹	15	99	6.7	6.7	4	17.2	0	0
Levard <i>et al.</i> , 2001 ⁴²	308	NR	40.9	8.4	4	1.6	4.5	2.2
Sato <i>et al.</i> , 2001 ¹⁴	17	105	17.6	17.6	10.4	61.7	5.8	0
Suter <i>et al.</i> , 2000 ⁴³	83	NR	43	15.6	5.9	NR	9	2.4
Al-Mulhim, 2002 ⁴⁴	19	58	32	NR	5	27	0	0
Chosidow <i>et al.</i> , 2000 ⁴⁵	134	71.7	16	3	5.03	NR	NR	0
Strickland <i>et al.</i> , 1999 ⁴⁶	40	68	32.5	10	3.6	22	5	0
Leon <i>et al.</i> , 1998 ⁴⁷	40	108	35	7.5	2.9	12	17.5	0
Bailey <i>et al.</i> , 1998 ⁴⁸	65	64	21.5	NR	3	NR	10.8	1.8
Navez <i>et al.</i> , 1998 ³²	69	77	40	9	6.6	46	2.9	2.9
Ibrahim <i>et al.</i> , 1996 ³¹	33	NR	15	9.1	NR	NR	3	3
Overall (range)		58–208	6.7–43	3–17.6	2.9–18	1.6–61.7	0–17.5	0–3

Adapted from Nagle *et al.*⁴⁹

NR: not recorded.

the United States in 1993, as reported in the National Inpatient Profile,³³ at a total cost of \$1.1 billion and an average hospital stay of 11 days.³⁴ Conversely, although prior surgery is a major cause of adhesions, 31% of scars from previous surgery have been free of adhesions and up to 10% of patients without any prior surgical scars will have spontaneous adhesions of the bowel or omentum.³⁵

Although any abdominal procedure can result in adhesion formation, the majority of intestinal obstructions follow open lower abdominopelvic surgeries such as colectomy,^{9,36} appendectomy,³⁷ and hysterectomy.¹¹ The use of sodium hyaluronate Seprafilm (Genzyme, Cambridge, MA, USA) is reportedly useful in delaying or preventing intra-abdominal adhesions in open surgery³⁸ as well as in the laparoscopic approach.¹⁸

The most common complications associated with adhesions are small bowel obstruction (SBO) and chronic pain syndrome.^{20,22} The treatment of uncomplicated SBO is generally conservative and includes bowel rest, intravenous hydration, and nasogastric decompression. This is especially true with incomplete obstruction and the absence of systemic toxemia, ischemia, or strangulation. However, when conservative treatment fails or the patient manifests any of the above-mentioned signs, surgical options include conventional open or minimally invasive approaches.

Traditionally, laparotomy has been considered the standard of care. However, with the development of refined techniques and improved instrumentation and equipment, laparoscopy has become increasing more popular for lysis of adhesions and the treatment of SBO.¹²

In a prospective trial, Beck and colleagues⁷ reported that 63% of the length of a laparotomy incision is involved

in adhesion formation to the abdominal wall. Furthermore the incidence of ventral hernia after a laparotomy ranges between 11% and 20%^{9,39} versus the 0.02% incidence of port site herniation.⁴⁰ These data were reproduced in a retrospective analysis from the same institution and operating team; the incidence of ventral hernia after laparotomy and laparoscopy was 12.9% vs. 2.4%, respectively.¹¹ Additional benefits of the minimally invasive approach include a decreased incidence of wound infection and postoperative pneumonia. In addition, a more rapid return of bowel function resulted in a shorter hospital stay.¹²

Long-term follow up of laparoscopic lysis of adhesions is now available at up to 62 months in a study by Sato *et al.*,¹⁴ These authors reported 2 of 17 patients (12%) with recurrent SBO who required a second laparoscopic surgical intervention. The success rate of laparoscopic lysis of adhesions remains between 46% and 87%,^{10,14,15,24,31,32} with a conversion rate of 18%.¹⁴ (Table 2) shows the results of laparoscopic adhesiolysis as reported by several series.^{14,31,32,41–48} Operative times for laparoscopic cases range from 58 to 108 minutes, conversion rates range from 6.7% to 43%, and the incidence of intraoperative enterotomy ranges from 3% to 17.6%. The length of hospitalization was reportedly 4 to 6 days in most series.

CONCLUSIONS

Intra-abdominal adhesions represent a significant source of morbidity and potential mortality. The most common complications include SBO and intractable abdominal pain. The use of laparotomy predisposes to the

development of subsequent adhesions and ventral hernias. Laparoscopic lysis of adhesions seems to be safe in the hands of well-trained laparoscopic surgeons. This technique should be mastered by the advanced laparoscopic surgeon not only for its usefulness in the pathologies discussed here, but also for adhesions commonly encountered during other laparoscopic procedures.

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