

Does Laparoscopic Adhesiolysis Decrease the Risk of Recurrence in Small Bowel Obstruction and Who Benefits the Most from Laparoscopic Approach? A literature Review

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ABSTRACT

Adhesions are usual sequelae of almost all abdominal surgery and their incidence increases with multiple explorations. One of the most common reasons of emergency general surgery is Small bowel obstruction due to adhesions (ASBO). The patients usually have classic signs and symptoms of intestinal occlusion and many will be treated by non-operative measures and ingestion of a water-soluble contrast medium. Some patients may not respond to conservative measures and will need surgical exploration and around 46% will end up in further episodes of intestinal obstruction. Laparoscopy has been utilized in these cases recently in contrast to the earlier belief that rendered it relatively contraindicated in the past. Laparoscopy has been advantageous in causing less pain, early mobilisation and fast return of the bowel the function, along with low incidence of further adhesion formation, thus fewer recurrence rates of small bowel obstruction. We carried out a non-systemic search of the available literature (Pub Med, Google Scholar) to determine whether laparoscopic adhesiolysis decreases the risk of recurrence in patients with small bowel obstruction or not and to see which patients are suitable for laparoscopic adhesiolysis. We concluded that each patient should be individualised as this approach allows many patients with possible benefits from minimally invasive surgery. However, randomised control trails are needed to properly delineate the benefits of laparoscopic adhesiolysis over the conventional open procedures in the form of long-term outcomes and recurrence rate.

Key Words: Acute small bowel obstruction (ASBO), laparoscopic adhesiolysis (LA), Open adhesiolysis (OA)

INTRODUCTION

Among the commonest causes of small bowel obstruction, post abdominal surgery adhesions are of prime importance and laparoscopic adhesiolysis (LA) is gaining popularity as compared to conventional open explorations. Conservative/non-operative approaches may be used to treat certain cases of adhesive small bowel obstruction (ASBO), like nil by mouth and ingesting water-soluble contrast, but many would ultimately require operative treatment.¹

Laparotomy and open adhesiolysis have been the traditional way used for a long time. However, more adhesions result after open procedures and it has been estimated that 46% of the patients with open adhesiolysis may end up with further episodes of small bowel obstruction in the future.² On the other hand, laparoscopy can look up the adhesions that would not have been mentioned by imaging studies. Thus, laparoscopic adhesiolysis is advantageous and has become well recognized and extensive literature is widely available.³⁻⁵

Earlier, laparoscopic exploration was thought to be contraindicated in cases of adhesive intestinal obstruction. However, recent evidence has clearly shown the safety and effectiveness of minimally invasive surgery. Major advantages such as less pain after surgery, reduced hospital stay and less postoperative analgesic need, early recovery, faster small bowel motility and function, decreased morbidity, and most importantly, lesser chances of further adhesion formation, thus, fewer recurrence rates of ASBO.⁶⁻⁸

We searched the literature to determine whether laparoscopic adhesiolysis decreases the risk of recurrence in patients with small bowel obstruction or not and to see which patients are suitable for LA.

ADHESIOLYSIS FOR SBO

Patient preparation

The preparation of the patients is the same as for open surgery, including electrolyte and acid-base correction, adequate fluid resuscitation, and placement of Foley catheter to monitor the fluid response. Intravenous antibiotics are usually given at the anaesthesia induction or started earlier if there is any indication. The stomach is decompressed with Ryle's tube to reduce the risk of aspiration. The potential for the risk of bowel injury and the possibility of conversion to open procedure should always be described while informed consent is being taken.

Access to abdominal cavity and insufflation

The placement of the first laparoscopic trocar and establishment of pneumoperitoneum is of utmost importance owing to the presence of multiple surgical scars in the abdomen and it must be carried out with extreme precautions. Ideally, the entry of the first trocar should at least be 5-10cm away from any scar. In cases of previous midline scar, the left upper quadrant (Palmar point) may be a safer point of entry. The Hasson (open) technique is favored as it is distinctively a better method to gain approach to the abdominal cavity, particularly when dilated bowel or adhesions are anticipated.⁹ However, blind access by Veres's needle has been reported in a small series of 16 patients by Sato et al¹⁰ without any complications. Blind Veress needle entry

has been associated with higher rates of intestinal and vascular injuries even in patients without any prior abdominal surgery as shown in many other publications, stressing the safety of open technique entry.¹¹⁻¹³ A safer method of close entry can be utilized by ultrasound guidance.¹⁴

Placement of trocars

After the insertion of the first trocar and pneumoperitoneum and if the space is sufficient for visualization, additional 5 mm ports can be inserted. Typically, 3-4 ports are required to complete the procedure, but additional ports may be added as needed. The principles of triangulation of the laparoscopic instruments should be kept in mind to facilitate the procedure.

Intraoperative findings

Many factors contribute and determine the risk of conversion intraoperatively. Early recognition is of prime importance to deciding for conversion and reducing operating time and morbidity. Table 1 outlines some of the important operative findings and table 2 shows reasons for conversion in some studies.

Table 1. Operative Findings in Selected Studies

Isolated band ¹⁵	30-60%
Adhesions + more than one band ¹⁵	31-43%
Internal hernia or peritoneal pouch ^{11'15}	2-8%
Adhesions + stricture ^{11'15'16}	45
Malignancy ^{11'12'15}	0-3.6%
Other (Meckel's, intussusception, Ch. appendicitis etc.) ^{11'16}	5%
Abbreviation: Ch., Chronic	

Nordin et al¹⁷ divided the conversion into reactive ones secondary to intraoperative complications (77%) and remaining preemptive conversions (23%) because of inadequate working space or tough adhesions. In a study of 78 patients by Yao et al¹⁸, 7 patients were converted to open from the laparoscopic approach. Six patients had dense/matted adhesions. Only one was converted because of narrow working space after pneumoperitoneum.

Other etiologies can be found when exploring for ASBO like internal herniation, intussusception of the small or large bowel, inguinal hernia, inflammatory bowel disease (IBD), malignancy, and obstruction secondary to gallstone. One should be wary to deal with these unusual causes as many would end up in conversion to either a conventional or mini-laparotomy.

Table 2. Reasons for Conversion in Selected Studies

Inadequate visibility/ access ^{11'12'18}	20%–49%
Bowel necrosis or perforation ^{11'12'17}	19%–23%
Neoplasm or suspicion of neoplasm ^{11'12'17}	3%–25%
Iatrogenic perforation ^{11'12'17}	3%–25%
Dense/matted adhesions ^{11'17'18}	14%–50%
Technical difficulties ^{11'17}	6%
Others ¹⁷	6.7%

Dissection of adhesions

Adhesions involving the abdominal wall are released initially by sharp dissection through recognizing the bloodless plane seen as a white line where the peritoneum of the abdominal wall meets the adhesions. It is better to use energy sources sparingly as the heat produced can damage the adjacent bowel resulting in thermal insult and perforation later on. To avoid inadvertent intestine damage, the cautery must be used with caution, so the blunt and sharp dissection under direct vision is preferred.

In cases of a single adhesive band, transection of a single obstructive band separating the proximally dilated and distally collapsed bowel allows free passage of intestinal content and usually resolves the obstruction. However, this may not be the case in most patients, and in those a systematic laparoscopic inspection of the empty intestine backward from the ileocecal valve toward the ligament of Treitz is carried out until a reason of pathology is seen.¹⁹ Lysis of all visible adhesions should be done and in cases where there remains doubt regarding the point of obstruction, it should be converted to open surgery to deal with remaining adhesions. Sometimes, adjusting the camera angle can help to make the anatomy clear and the same goes true for putting extra trocars to manipulate the intestine with proper accessibility. As facial closure of 5 mm port is not necessary, employing extra ports does not result in delaying the procedure, the possibility of incisional hernia and probably less morbidity if it can avoid the conversion into laparotomy. It is critical to run the entire bowel twice to avoid missing any enterotomies or serosal tears that can be managed with sutures or clips, and minor bleeding that can be managed with prudent cautery. Furthermore, mini-laparotomy can be performed in any doubtful condition for direct visualization of the bowel.

DISCUSSION

A. who would benefit most from the laparoscopic approach?

There are many beneficial effects of laparoscopic adhesiolysis but successful results can be achieved by proper selection of the patients and astute clinical acumen. What should be the selection criteria, it is still debatable. The recommendations from a panel of experts in a recent conference showed that the conditions that are contraindicated for the establishment of pneumoperitoneum like hemodynamic instability or cardiopulmonary impairment are the only definite exclusion benchmark for laparoscopy.²⁰ All other contraindications are relative and should be assessed on an individual basis, considering the surgeon's expertise in advanced laparoscopy. There are no established criteria that disclose which individuals will benefit more from laparoscopic adhesiolysis. However, multiple factors can predict a successful outcome. Table 3 shows what factors will predict success and contraindications to laparoscopy for ASBO.

Patients of SBO without signs and symptoms of peritonitis are considered for laparoscopic exploration provided the non-operative treatment is ineffective.²¹ Important considerations to be taken into account in these patients are the diameter of the intestine, the extent of the abdominal distension, and the site of obstruction (ie jejunum or ileum). A plain X-ray of the abdomen can determine the diameter of the bowel and Suter et al¹¹ concluded an increased rate of conversions from 55% versus 32%(P 0.02). if the bowel diameter was more than 4 cm. Early intervention by laparoscopy within 24 hours from the onset of symptoms can predict the rate of conversion as the bowel is less distended,^{22, 23} and this makes laparoscopic exploration easy. Therefore, if the X-ray shows a bowel diameter of (> 4 cm) small bowel, many consider it an absolute contraindication for laparoscopy.^{21,22,24,25} CT scan can provide additional information about the site of intestinal occlusion by demonstrating the transition point and can differentiate absolute from incomplete obstruction. If the obstruction involves distal segments of the small bowel and complete, more are the chances of intraoperative complications and conversion to open surgery. Another factor that may predict the unsuccessful laparoscopic treatment is the failure of abdominal distension to be relieved after nasogastric tube insertion.²⁵

Certain factors are associated with successful laparoscopic adhesiolysis like ≤ 2 number of previous laparotomies, however, it may not be a predictor of conversion to open surgery as it is dependent on the site (midline or paramedian) and type of earlier surgery, non-median previous upper abdominal incision, adhesions secondary to open appendectomy, institution of early laparoscopic intervention before 24 hours of the onset of symptom, no signs of peritonitis, transition point outside the pelvis and incomplete intestinal obstruction and very important is the experience of the surgeon.^{11,22,24-30} The selection of the patient should be made carefully as laparoscopy might provide some benefits. In the wake of over distended bowel, it may be fraught with an increased risk of moribund complications like enterotomies and perforations that might be diagnosed after some time.^{31,32} A recent population-based study, found an increased incidence of bowel resections from 53.5 versus 43.4% than in open surgery.³³ Another area of difficulty for laparoscopic surgery is the ASBO developing in the post irradiated abdomen.³⁴ However, almost 8.7 % of the rate of conversion to open surgery is seen in patients with non-resolving partial or incomplete obstruction (after a negative Gastrografin challenge test) and longstanding symptoms of obstruction.²³

The Bologna Guidelines recommend the following criteria for successful laparoscopic management of intestinal obstruction secondary to peritoneal adhesions: adequate surgeon experience, at most two previous laparotomies, and a likely suspicion of a single adhesion band causing obstruction.¹

Some of the absolute contraindications to laparoscopic adhesiolysis include small bowel dilatation of >4cm on abdominal X-ray film and signs of frank peritonitis on physical examination of the abdomen.^{11,21,22,24,30,31} Among the relative contraindications following are included >2 previous laparotomies and multiple adhesions.^{3,11,18,27} However, the number of previous abdominal surgeries is not a harbinger of conversion as the site/s and category of earlier incision is more important (like median or lateral).²⁰ Many surgeons can perform laparoscopic ileocaecal resection for Crohn's obstructive disease in an emergency, though some consider it a contraindication.³⁵

Some patients with fever (38°C), leucocytosis $> 11000 / \text{mm}^3$, signs of peritonitis, and intestinal distention may be evaluated laparoscopically, but, early conversion to conventional laparotomy where intestinal necrosis or massive adhesions are encountered should be the priority.^{34,36} SAGES guidelines also recommend the contraindications of laparoscopic adhesiolysis are distended bowel that resists safe peritoneal entry and adequate working space, frank peritonitis needing resection of the intestine, unstable patient, and relative contraindication to pneumoperitoneum due to comorbid conditions.²⁹

Table 3. Small Bowel Obstruction: Success Predictors and Contraindications to Laparoscopy

Predictor of Successful Laparoscopic Adhesiolysis	Contraindications to Laparoscopic Adhesiolysis
Less than two previous abdominal surgeries Previous incision in upper abdomen	Abdominal distension that makes it difficult to enter the peritoneal cavity safely.
Appendectomy as only previous surgery	Peritonitis with need of bowel resection
Extra pelvic transition point Bowel dilatation $< 4\text{cm}$ Partial bowel obstruction Expert laparoscopic surgeon	Hemodynamically unstable patient Due to comorbid conditions, patients are unable to tolerate pneumoperitoneum.

There are few studies comparing long-term outcomes between open and laparoscopic adhesiolysis. Earlier studies showing outcomes of small bowel obstruction treated by minimal access laparoscopic surgery are listed in Table-4. Most of which were case series except by Mathieu³⁷, Yao¹⁸, and Park JH et al³⁸.

Francois et al³⁹ mentioned in his study of 50 patients in whom laparoscopic treatment was employed for small bowel adhesive obstruction, 32 were without any symptoms when followed for two years. In another study, Sato et al¹⁰ followed up their patients for 61.7 months, and found that 14 patients (87.5%) did not develop any symptoms, 2(12.5%) had recurrence of small bowel obstruction after the laparoscopic release of adhesions and only one of whom needed another surgery.

Table 4. Laparoscopic Adhesiolysis, Studies Showing Long Term Outcomes

No.	Year	Author	No. of patients	Median Follow-Up Period	Rate of Recurrence % In Lap. Surgery	Rate of Recurrence in Open Surgery
1	1994	Francois ³⁹	52	24	11.5	NA
2	2001	Sato ¹⁰	16	61.7	12.5	NA
3	2004	Borzellino ⁴⁰	65	48	12/5	NA
4	2008	Mathieu ³⁷	62	6.6	1.0	0
5	2009	Wang ²³	46	46.5	2.2	NA
6	2017	Siyuan ¹⁸	104	47	7.7	0
7	2020	Jin Hyuang ³⁸	67	36	2	16.7

Abbreviations: NA, not applicable; LAP, laparoscopic; NO, number

Borzellino et al⁴⁰ included 65 patients with a follow-up period of almost 48 months. About 15.4% had symptomatic recurrences. In another study of 62 patients, the recurrence rate was 1% in laparoscopic adhesiolysis. However, the median follow-up was only 5–6 months, which was too short to be validated.

In a series of 46 patients; Three (6.5%) suffered symptoms after the operation, two patients had persistent and recurrent pain in the abdomen while one patient developed acute SBO twice. In two patients with persistent chronic abdominal pain, incomplete release of dense and matted adhesions by laparoscopy was the possible explanation, whereas other patients developed recurrent episodes of SBO symptoms after laparotomy.²³

Yao et al¹⁸ (2017) compared laparoscopically and open matched patients for readmissions and re-operation rates. Laparoscopy was found to be related more to adhesion-related re-operation than open surgery. The authors suggested that the missing a band in laparoscopy may be the cause of recurrent SBO needing re-exploration. The patients were followed up to 47 months (range 0–106).

A most recent comparative study by Park et al³⁸ showed that LA is a feasible and more reasonable method in comparison to open adhesiolysis. It reduces the number of adhesions formed, ileus-related complications, rates of re-admission and additional surgeries.

CONCLUSION

As compared to open approach, laparoscopic adhesiolysis can be safer because of lower complications rate. It is a method of choice by skilled laparoscopic surgeons in many patients. The patient should be selected for laparoscopic exploration as the robust evidence is lacking due to the shortage of randomized controlled trials (RCT); however, each patient should be individualized. This method helps a large number of patients to benefit from minimally invasive surgery. Indeed, RCTs are needed to properly delineate the benefits of laparoscopic adhesiolysis over conventional open procedures in the form of long-term outcomes and recurrence rate.

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