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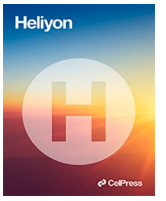

Review article

Keys to successful laparoscopic adhesiolysis for adhesive small bowel obstruction: A scoping review

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ABSTRACT

Background: Adhesive small bowel obstruction (ASBO) is a common acute abdominal complication. Although non-surgical treatment is the primary treatment approach, more and more studies show that surgical treatment can reduce the incidence rate. Laparoscopic adhesiolysis (LA) has many advantages of minimally invasive surgery.But not all patients with ASBO are suitable for LA.

Objective: The aim of this scoping review was to summarize the keys to successful LA by analyzing the extensive literature.

Methods: A literature search was conducted in PubMed for articles on laparoscopic treatment of ASBO published between January 2000 and February 2024. This scoping review followed the framework suggested by Arksey and O'Malley for a scoping review.

Results: By analyzing the included studies we found that LA does have many advantages and can be performed safely. However, the prerequisite is to select patients with simple adhesions whenever possible and to focus on reasonable intraoperative measures. To improve the success rate of LA, we summarized the following characteristics of patients: no contraindications related to pneumoperitoneum, few previous abdominal operations ($\leq$2), no pregnancy, bowel dilatation $<$ 4 cm in diameter, simple adhesions, no diffuse peritonitis, no history of abdominal radiotherapy, $<$24 h of ASBO, limited previous abdominal surgery (appendix, cholecystectomy), no bowel strangulation ischemia, and bowel necrosis or bowel resection required for other reasons. In addition, we also summarized reasonable intraoperative measures.

Conclusions: Laparoscopic adhesiolysis has many advantages.Specific patients can benefit from LA. This scoping review Summarized the conditions for patient screening and reasonable intraoperative measures with the aim of providing a reference for surgeons, thereby ensuring that more patients benefit from LA.

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1. Introduction

Small bowel obstruction (SBO) is a common surgical emergency, with adhesive small bowel obstruction (ASBO), the most common type, accounting for approximately 60 % of cases [1–3]. ASBO is a mechanical obstruction of the bowel caused by adhesions of small intestine [1,4]. Notably, 67%–93 % of intestinal adhesions result from previous abdominal and pelvic surgeries [5–7].

When the patient presents with Symptoms and signs of mechanical intestinal obstruction (e.g. abdominal pain, distention, nausea, vomiting with or without anal cessation, and defecation), distended and dilated small bowel loops with air-fluid planes on abdominal X-ray, and a history of abdominal or pelvic surgery, the diagnosis should consider ASBO [1,8]. However, other non-adherent causes of mechanical SBO (tumors and hernias) should be excluded [9]. The differential diagnosis of ASBO can be made with the help of imaging modalities, among which computerized tomography (CT) demonstrates good clinical value in the diagnosis and differential diagnosis of the condition [1,10–12].

Although conservative treatment can relieve the symptoms of intestinal obstruction in most patients with ASBO, they have to face the problem of recurrence; more and more studies have shown that surgical treatment of ASBO can reduce the recurrence rate [13–15]. In particular, laparoscopic surgery has more advantages [2,16–18]. Laparoscopic surgery has the advantages of minimally invasive surgery and has been increasingly used to treat adhesive small intestinal obstruction, but not all patients are suitable for laparoscopic surgery. Therefore, it is necessary to screen patients.

1.1. Purpose

This scoping review's aim is to summarize research findings.We conducted in-depth analysis of the included studies: 1) analyzing the reasons for conversion to open surgery during Laparoscopic adhesiolysis; 2)analyzing the inclusion and exclusion criteria and study results of all studies to determine the clinical characteristics of patients suitable for laparoscopic surgery; 3)summarizing the surgical procedures that require attention during Laparoscopic adhesiolysis.

2. Methods

This scoping review followed the guidelines of Arksey and O'Malley scoping review methodology and included the following steps: identify the research question; identify the relevant studies; selection of the study; charting the data; collating, summarizing, and reporting results [19].

2.1. Identify the research question

The research question of the current scoping review was: Which patients with adhesive small intestinal obstruction are suitable for laparoscopic surgery? How to reduce and prevent the occurrence of small intestine adhesion after laparoscopic surgery?

2.2. Identify the relevant studies

This scoping review searched the PubMed database for literature on laparoscopic surgery for ASBO from January 2000 to February 2024 using the search terms "adhesive small bowel obstruction," "laparoscopic surgery," and "laparoscopic adhesiolysis." Conjunctions like 'AND' and 'OR' were used to combine search terms.

2.3. Selection of the study

Articles published in English were assessed according to the eligibility criteria. Inclusion criteria:screening articles on laparoscopic surgery for ASBO by reading the title and abstract. Exclusion criteria:case reports, review articles, comment articles and systematic reviews were excluded.If patients with non adhesive small bowel obstruction are included in the study, this study is excluded. All studies included were clinical trials, and all patients were diagnosed with adhesive small bowel obstruction. Laparoscopic surgery is

Table 1
Summary of reasons for conversion.

Serial number	Reasons for conversion	References
1	Complex adhesions	[3,17,20–36]
2	Exposure of deficiencies	[17,22,29,37]
3	Significant dilatation of the intestine	[26,30,38]
4	Intestinal injury	[17,20,26,28,30,31,34,38,39]
5	Necrosis of the bowel or need for bowel resection for other reasons	[3,16,17,20,21,24–26,34,37,39,40]
6	Ischemia of the intestine	[17,30,38]
7	Unable to determine small bowel viability	[24,25]
8	No adhesion zone could be detected	[16,20]
9	Non-medical intestinal perforation	[20]
10	Hemorrhage	[3,39]

considered successful if there is no conversion to open surgery, even with auxiliary small incision.

2.4. Charting the data

Researchers conduct a detailed analysis of the included studies.Collect the following information by reading the full text: ①Collect the reasons for the conversion of laparoscopic adhesiolysis, and calculate the number and proportion of patients with various reasons. The specific information is shown in Table 1 and Fig. 2.②Summarize the inclusion and exclusion criteria in all studies. All studies are classified according to randomized controlled trials, non randomized controlled trials, and cohort studies(Table 2). ③Summarize the surgical procedures that need to be emphasized in laparoscopic adhesiolysis. We provided a descriptive description of this information.

2.5. Collating, summarizing, and reporting results

This scope review integrated all relevant information from the research, creating Tables 1 and 2, and Fig. 2, and reported the results in a narrative manner in conjunction with the research findings.

3. Results

As detailed in Fig. 1, 582 literature were found using our keywords in the PubMed database. After the removal of unrelated literature, 147 literature were fully assessed for eligibility. After applying our exclusion criteria, 43 studies were included. 24 out of all studies have established inclusion and exclusion criteria. Seven studies did not screen patients, but proposed some surgical measures that should be noted. 12 studies lack specific relevant information. This scope review divides the results into three parts and presents them in narrative form.

3.1. Analysis of the reasons for the conversion of laparoscopic adhesiolysis

The transition from laparoscopic adhesiolysis to open surgery is a focus of attention for many researchers. In 43 studies, 265 patients were reported with specific reasons for conversion.We counted patients with specific reasons for conversion in the included studies (Table 1,Fig. 2). We have summarized 10 reasons for conversion(Table 1). In Fig. 2, we have calculated the proportion of patients with various conversion reasons. Based on the data in Fig. 2, we found that complex adhesions, excessive intestinal dilation, intestinal injury, intestinal necrosis, and the need for intestinal resection are the main reasons for conversion.We aimed to provide a reference for clinicians in the selection of conversion when complex intraoperative adhesions, bowel injury, need for bowel resection,

Table 2
Summary of inclusion and exclusion criteria.

Filter criteria	Type of trial		
	RCT	NRCT	Cohort study
Inclusion criteria			
No relief with conservative treatment for 24 h	[20]	[39]	
First episode of ASBO		[41]	
≤2 history of abdominal surgery			[27]
CT findings with identifiable single band adhesions		[40]	[35,42,43]
Recurrent ASBO			[27,28,31]
Exclusion criteria			
Hemodynamic instability, infectious shock, severe cardiac and pulmonary co-morbidity		[36,37,39,44–47]	[38,42]
Pregnancy	[20]	[21]	
Significant dilatation of the intestine (or≥4 cm in diameter)		[36,37]	[29,30,35,38]
Conservative treatment for more than 1 week	[20]		
Abdominal surgery (within 30 days)	[20]	[16]	
Known or suspected complex adhesions	[20]	[37,45]	[31,38,42]
≥3 open abdominal surgeries	[20]	[45]	[27,38,42]
History of open abdominal aorta or iliac artery surgery	[20]		
History of open surgery for endometriosis	[20]	[16]	
History of open surgery for Crohn's disease	[20]		
History of abdominal radiotherapy	[20]	[41]	[28,38]
Diffuse peritonitis	[20]	[16,44]	[27,30,31,42]
Intestinal perforation		[41,48]	[42]
Intestinal strangulation	[20]	[23]	
Intestinal necrosis		[37]	[42]
Intestinal ischemia		[48]	[38,43]
Need for bowel resection		[3,47,48]	
Combined abdominal malignancy	[20]	[21,46]	[27,28]
Other concurrent abdominal surgery		[47]	
Intestinal obstruction due to non-adhesive causes (hernias, tumors, etc.)	[20]	[3,16,21,37,39,41,45,46,48]	[27,28,30,42]

RCT, Randomized controlled trial; NRCT, Non-randomized controlled trials.

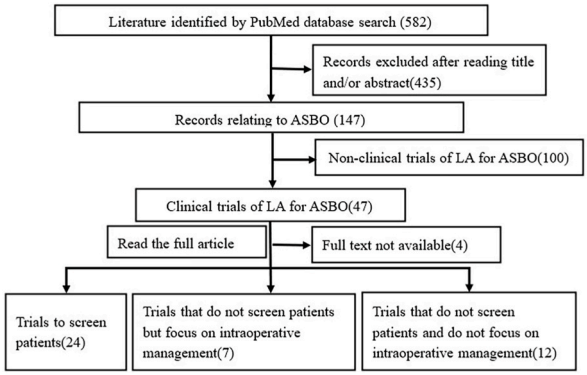

Fig. 1. Flow chart of the literature screening process.

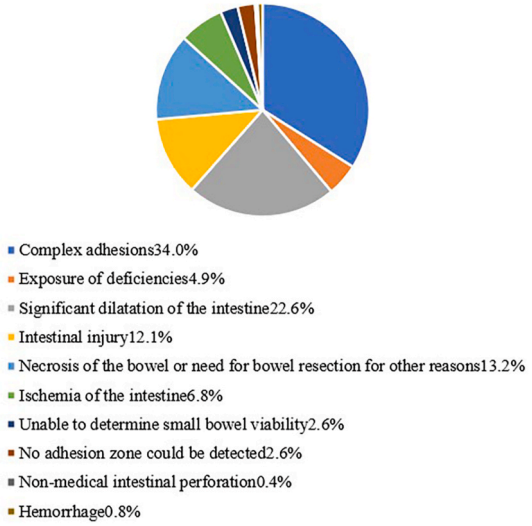

Fig. 2. Percentage of reasons for conversion.

significant bowel dilatation,and ischemic necrosis of the bowel are identified to avoid increased complication rates.

3.2. Clinical feature analysis

LA has many advantages, but associated iatrogenic intestinal damage and a high conversion rate limit its use. However, a series of retrospective studies and more recent randomized controlled studies suggest that LA can be used safely and can improve the prognosis of some patients with ASBO [20,49–51]. Specific patients could benefit from LA. In order to clarify the clinical characteristics of patients suitable for laparoscopic adhesiolysis, we summarized the inclusion and exclusion criteria of 24 studies (Table 2). All studies are classified according to randomized controlled trials, non randomized controlled trials, and cohort studies. From Table 2, we found that there was only one high-quality randomized controlled trial. Comparing with Table 1, it is not difficult to find that many exclusion criteria and conversion reasons are consistent. Based on the research results, we have analyzed various clinical features.

LA is suitable for patients with no contraindications owing to pneumoperitoneum. In the guidelines for the management of ASBO published by the World Society of Emergency Surgery, contraindications to laparoscopic access are only related to the establishment of pneumoperitoneum, such as hemodynamic instability or cardiopulmonary insufficiency [8,52].

LA is more suitable for patients with a low number of previous abdominal operations. One study included patients with a history of $\leq$ two previous abdominal surgeries, with a conversion rate of 8.7 % [26]; five studies excluded patients with $\geq$ three previous open surgeries, with conversion rates of 25 %, 0 %, 3.6 %,40.4 % and 8.7 % [19,26,37,41,44], and there was no increase in the complication rate in these studies. Some studies have found a corresponding rise in the severity of abdominal adhesions with the increase in the number of abdominal surgeries [22,53]. The number of previous cesarean sections is identified as a risk factor for intraoperative complications and an increased risk of intestinal injury when performing the LA [24]. Levard et al. found that patients with a history of one or two abdominal surgical interventions had a significantly higher success rate for LA than those with more than two abdominal surgical interventions (56 % vs 37 %; $p < 0.05$) [54].

LA is more suitable for patients with simple adhesions. To include as many patients as possible with simple adhesions, as shown in Table 2, a number of studies excluded patients with a previous abdominal surgery (within 30 days), known or suspected complex adhesions, history of ≥ three open abdominal surgeries/multiple, history of open abdominal aortic or iliac artery surgery, history of open endometriosis surgery, history of open Crohn's disease surgery, and history of abdominal radiotherapy. As shown in Table 1, the most common reason for conversion of LA to OA was complex adhesions, accounting for more than 30 %. Enric et al. found that the proportion of complex adhesions in the conversion group was higher [55].Six studies excluded patients with suspected or known extensive, dense adhesions from previous surgery, with conversion rates of 25 %, 21.4 %,29.4 %, 0 %, 40.4%and 3.6 % [20,31,37,38,42,45]. Four studies included patients with simple adhesions via a CT of the abdomen, with conversion rates of 0.7 %,12.5 %, 3.6 %, and 6.7 % [34,39,41,42]. Several studies have shown that LA is more suitable for patients with simple adhesions and that complex adhesions predict conversion from LA to OA [22,26,29,53,54]. The only prospective randomized controlled trial, which established strict nadir criteria and selected patients with simple adhesions for surgery whenever possible, concluded that LA was not inferior to OA and that patients who underwent LA benefited from the advantages of minimally invasive surgery [20].

LA is more suitable for patients without a history of abdominal radiotherapy. Radiotherapy mainly leads to vascular damage such as microvascular destruction, intravascular thrombosis and intimal fibrosis, and ischaemic changes due to vascular disease including submucosal fibrosis, abscess formation, and fibrosis at the site of adhesions. Early damage is reversible; however, late damage is irreversible and can lead to severe adhesions and intestinal strictures. Its severity is directly related to the extent of the treated area, the fractionated dose, and the total radiation dose [21,56].Surgical treatment of intestinal obstruction following radiotherapy is, therefore, extremely difficult and has high morbidity [57,58]. Nakamura et al. showed that radiotherapy was an independent risk factor for the conversion of LA to OA [59].

LA is more suitable for patients without diffuse peritonitis. Intestinal perforation not only leads to diffuse peritonitis but also requires intestinal repair, and this group of patients is not suitable for LA. Seven studies excluded patients with diffuse peritonitis, with conversion rates of 25 %, 24 %, 3.6 %, 8.7 %, 1.97 %, 20 %, and 17.6 %, respectively [16,20,27,30,31,42,60]. Diffuse peritonitis is a contraindication to non-operative treatment and is not an absolute contraindication to LA. However, LA in such patients leads to increased operative difficulty, and Benoist et al. and Suter et al. found a significant correlation between conversion and peritonitis [61,62]. Borzellino et al. attributed the reduced conversion rate to the exclusion of patients with peritonitis and massive small bowel dilatation [30].

LA is more suitable for patients with some space for maneuver. Patients with pregnancy or significant bowel dilatation should be excluded. In pregnant patients, as the fetus develops, the enlarged uterus squeezes the intestine upwards, reducing abdominal space; in addition, this group of patients is at significant risk of fetal loss and maternal death, with 91 % of pregnancies treated surgically and 14 % of fetal losses in one study [63]. Three studies excluded patients with significantly dilated intestines (≥4 cm in diameter) and conversion rates were close to those of randomized controlled trials, at 29 %, 18.7 %, and 12.1 % [29,30,37]. Suter et al. showed that the bowel diameter over 4 cm ($p = 0.02$) were predictors of conversion from LA to OA [62]. A study have shown that preoperative CT scans showing a small bowel diameter of ≥4 cm are significantly associated with an increased incidence of iatrogenic injury (50.6 % vs. 35.3 %, $P = 0.021$) [17]. Table 1 shows that significant bowel dilatation is one of the main reasons for the conversion.

LA is more suitable for patients within 24 h of ASBO onset. Most surgeons recommend conservative treatment as the first treatment approach for patients with ASBO without clinical features of intestinal strangulation; however, in a significant number of cases, the obstruction does not resolve after conservative treatment and these patients end up undergoing OA with unsatisfactory results, as delayed surgery leads to increased morbidity and mortality, in addition to longer hospital stays and higher hospital costs [44,64–66]. Levard et al. found a higher success rate for LA performed within 24 h ($p < 0.001$) [54]. Farinella et al. concluded that the development of ASBO occurred within 24 h of small bowel dilatation and a lower degree of bowel wall edema, with a relatively good view [53]. Early surgical intervention for patients with ASBO reduces the incidence of local and systemic complications, and shortens the length of hospital stay [21,67]. The probability of surgical resection of the intestine increases by 20 % for each day of delay, so the conservative trial period for ASBO should not exceed 3 days [68].

LA is more suitable for patients without intestinal strangulation, ischemia, intestinal necrosis, or other conditions requiring bowel resection. As shown in Fig. 2, intestinal strangulation ischemia, intestinal necrosis, or the need for bowel resection was one of the main causes of conversion. Preoperative CT can be a good indicator of intestinal strangulation and ischemia, and if intestinal ischemia or necrosis is highly suspected, urgent open surgery is required [69–71].In patients requiring bowel resection for other reasons, many studies have tried 3–5 cm adjuvant small incision resections to avoid larger abdominal incisions where possible [25,27–29,32,72].

LA is more suitable for procedures with a more limited scope of previous abdominal surgery, such as appendectomy and cholecystectomy. A multicenter retrospective study showed that the success rate of LA was significantly higher in patients who had previously undergone only appendectomy (67/94; 71 %) than in those who had previously undergone other procedures (33 %; $p < 0.001$) [54]. This conclusion is also supported by Farinella [53] that successfully performed LA in patients who had previously undergone only appendectomy or cholecystectomy [21]. Furthermore, Zerey suggested that the limited scope of previous abdominal surgeries was a factor in the success of LA [30,72].

3.3. Focusing on intraoperative management: injury reduction and recurrence prevention

In addition to screening for eligible patients, surgery is also a critical aspect. All of the included studies, seven studies did not screen patients but clearly suggested management measures that should be focused on intraoperatively [24–26,32,33,59,73]. Patients were screened in 21 studies, of which 11 indicated that the focus should be on intraoperative management.

The choice of surgeon should be made before the procedure, and the surgeon should have proven laparoscopic skills and experience

if possible [20,39].

First, the location of the first entry and method of entry need to be determined. Most studies recommend a location away from previous abdominal surgical incisions or in the left upper quadrant of the abdomen [25,27,45,60,72]. Some researchers suggest that the first surgical approach should be at least 5 cm away from the previous surgical incision, this way, adhesion points can be kept as far away as possible and intestinal damage can be reduced [27,45]. With regard to the mode of access to the first port, most studies suggest that it is safer to use the Hasson method of direct visual access to the abdomen to create a pneumoperitoneum [21,42,74,75].

During exploration, the priority is to start with the collapsed small bowel distal to the obstruction or retrograde exploration from the ileocecal region [22,26,42,76]. The procedure is performed by grasping the mesentery as far as possible during the operation to reduce the grasping of dilated, edematous intestinal tubes [27,42]. In terms of device use, thermal cautery should be reduced, the use of cold scissors increased, and non-invasive grasping hands should be used [42,45]. For areas with minor bleeding, try compression to stop the bleeding [42]. During surgery, not all adhesions should be released; instead, only those that cause intestinal obstruction should be released if possible, thereby reducing intraoperative tissue damage [28].

In many studies, when bowel resection had to be performed, a 3–5 cm auxiliary incision was made to remove the bowel to avoid a large abdominal incision [25,27–29,32,72].

Pus, secretions, and blood clots can be cleared promptly during the operation. The greater omentum can be placed between the intestine and the abdominal incision before closure to avoid adhesions of the intestine and abdominal wall incision [45].

The barrier method is to cover the traumatized tissues in the abdominal cavity with an anti-adhesive substance, which isolates the damaged tissues from the surrounding tissues until the tissue cells heal, thereby preventing the formation of fibrous adhesion bridges between adjacent tissues and organs, ultimately reducing the formation of adhesions [77–79]. Furthermore, intraoperative application of anti-adhesive substances has been reported to be effective in reducing the incidence of ASBO [77–79]. In a randomized trial of an anti-adhesion substance in patients undergoing surgery for ASBO, after a mean follow-up of 41.4 months, the rate of recurrence of ASBO was 2.19 % in the 4 % ecodextrin group compared to 11.11 % in the control group (no 4 % ecodextrin) [79].

The LA is less traumatic for the patient, who recovers quickly and gets out of bed earlier; in addition, it promotes gastrointestinal peristalsis earlier and reduces fibrin deposition [45].

These management measures consider the mechanism of intestinal adhesions as their starting point. Organization injury caused by surgery, as well as foreign body residues such as intestinal contents, sutures, gauze particles, or glove dusting powder during surgery, can cause the release of high levels of inflammatory mediators; inflammatory mediators stimulate mesothelial cells to produce fibrinolytic enzyme activator inhibitor, and fibrin is deposited on the surface of the peritoneum and organs because it cannot be degraded in time, and when a large amount of fibrin is deposited and fibrinolysis is impaired, intestinal adhesions are likely [46,67,80–82].

4. Discussion

4.1. Surgical treatment of ASBO

The surgical treatment of ASBO may involve open or laparoscopic surgery. However, ASBO was initially considered a contraindication to laparoscopic surgery [83] because of highly dilated bowel and complex adhesions, which can lead to restricted visualization, narrow operating space, difficult intra-abdominal manipulation, and a high risk of iatrogenic bowel injury; therefore, laparoscopic surgery for ASBO is controversial [20,84].

With the continuous development of laparoscopic equipment and improvements in surgeons' laparoscopic techniques, many surgeons have attempted and succeeded in treating ASBO with laparoscopic surgery [21,51]. As a result, there is an increasing recognition of the therapeutic value of laparoscopic surgery among surgeons [46,85]. With a rise of 1.8 % annually in the United States from 2001 to 2011 in the surgical management of ASBO, whereas the proportion of laparoscopic procedures increased by 8.9 % per year and that of open procedures decreased by 0.6 % per year [46]. The latest international consensus indicates that laparoscopic surgery can be the preferred approach for emergency abdominal surgery [86].

4.2. Advantages and limitations of LA

Laparoscopic adhesiolysis (LA) offers many advantages of minimally invasive surgery. In recent years, several studies have reported the advantages of LA in the treatment of ASBO, including shorter hospital stay, faster recovery of bowel function, and fewer complications [2,16–18]. In addition, LA for ASBO has advantages over OA in terms of postoperative recurrence [13,18,22,87–89]. More non-randomized retrospective studies have produced similar results, with the following advantages of LA surgery for ASBO patients compared to open surgery [87,90–92].The only randomized controlled trial showed that patients in the LA group had a shorter hospital stay and faster recovery of bowel function compared to patients who underwent OA, with no difference in complications or bowel damage between the two groups [20].

However, laparoscopic adhesiolysis also has limitations.One of the most worrying complications of LA is iatrogenic bowel injury, which can occur during trocar insertion, separation of adhesions, or manipulation of the bowel. A study by Wullstein showed that the incidence of perforation was 26.9 % in the LA group and 13.5 % in the OA group, with perforation twice as common in LA as it was in OA, and bowel perforation was more common in patients with a history of more than two abdominal surgeries [24]. Behman et al. found that the incidence of bowel intervention (bowel resection and bowel repair) was approximately 10 % higher in patients undergoing LA than in those undergoing OA (53.5 % vs. 43.4 %) and no specific incidence of iatrogenic bowel injury was reported [93].

However, results of the only randomized controlled trial showed no difference in intestinal damage between the LA and OA groups [20].

4.3. This review is a supplement to current practice

Based on the above analysis, laparoscopic adhesiolysis has gradually become the preferred surgical method for ASBO. However, the high technical requirements of this surgery result in varying surgical outcomes due to the varying experiences of the surgeons. The increasing use of minimally invasive surgery in acute general surgical diseases.The World Society of Emergency Surgeons has reached a consensus on prioritizing the use of laparoscopy in patients who require emergency abdominal surgery [86].

This review analyzed the clinical characteristics of patients suitable for laparoscopic surgery, which can be used for preoperative screening of patients. The clinical features are as follows: no contraindications related to pneumoperitoneum, less than 2 previous abdominal surgeries ($\leq$2 times), no pregnancy, intestinal dilation diameter less than 4 cm or obvious abdominal distension, simple adhesion, no diffuse peritonitis, no history of abdominal radiation therapy, ASBO$<$24 h, limited previous abdominal surgery (appendectomy, cholecystectomy), no intestinal strangulation ischemia, intestinal necrosis or other reasons requiring intestinal resection.

At the same time, we also summarized and analyzed the reasons(complex adhesions, intestinal injuries, the need for intestinal resection, significant intestinal dilation, insufficient exposure, and intestinal ischemic necrosis during surgery) for the conversion of laparoscopic surgery. When encountering these situations during surgery, the difficulty of the surgery increases, and continuing laparoscopic surgery may increase surgical complications, so it should be switched to open surgery. Due to the increased incidence of re adhesions caused by intraoperative injuries, we have summarized many surgical techniques to minimize intraoperative injuries as much as possible.

5. Limitations

Scoping reviews' limitations are in their rigor and duration, meaning that they hold the potential for bias [94]. One limitation of our study was that the included studies were not critically appraised. The included studies only had one high-quality randomized controlled trial, lacking more reliable randomized controlled studies. Therefore, the findings of this review may have limited reliability. Our review was also limited by review only English-language studies.

6. Conclusion

Laparoscopic adhesiolysis (LA) has many advantages of minimally invasive surgery. Specific patients can benefit from LA. This review analyzes a large number of studies on LA for ASBO and establishes the conditions for patient screening and reasonable intraoperative management measures with the aim of providing a reference for surgeons in the treatment of ASBO patients using laparoscopy, thereby ensuring that more patients benefit from LA. Laparoscopic treatment for adhesive small intestinal obstruction is emerging as a trend, yet further high-quality research is imperative.

Funding information

The authors have no financial support to declare.

Ethics declarations

Review and/or approval by an ethics committee was not needed for the manuscript because it is a scoping review article.

Data availability

As this is a scoping review article, no data was used for the research described in the article.

CRediT authorship contribution statement

Yuanqi Huang: Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Ruimin Fu:** Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Dandan Liu:** Conceptualization, Formal analysis, Investigation, Methodology. **Kunming Wen:** Writing – review & editing, Methodology, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e34359.

Appendix

Appendix B
Search strategy

Retrieval steps	Search strategy	Search results
1	(Adhesive Small Bowel Obstruction AND (2000/1/1:2024/2/1[pdat])	1705
2	((Laparoscopic Adhesiolysis) OR (laparoscopic surgery) AND (2000/1/1:2024/2/1[pdat]))	143146
3	(Adhesive Small Bowel Obstruction AND (2000/1/1:2024/2/1[pdat])) AND ((Laparoscopic Adhesiolysis) OR (laparoscopic surgery) AND (2000/1/1:2024/2/1[pdat]))	582

Appendix C
Literature List

Serial Number	Operation group	Conversion rate	Intraoperative injury situation	PMID
Studies on screening patients				
1	LA:38/51; OA:49	13(25 %)	LA: 12; OA 11	30765264
2	LA:94; OA:94	*	*	35446138
3	LA:24/34; OA:24	10(29.4 %)	OA:2	32468265
4	LA:48/78; OA:184	30(38.5 %)	LA: 4; OA: 22	31014318
5	LA:3/13; OA:34	3(23 %)	*	29218668
6	LA:16; TC:46	*	*	27647979
7	LA:19/25; OA:67	6(24 %)	LA:6,OA:17	27048680
8	LA:63; OA:63	*	LA:2	26730092
9	LA:384058; OA:1065219	86413(22.5 %)	*	26463302
10	LA:919; OA:3697	*	*	24651894
11	LA:28/38; OA:64	10(26.3 %)	*	24666867
12	LA:25/28; OA:25	3(26.3 %)	*	22776364
13	LA:582/702; OA:5462	121(17.2 %)	*	18926453
14	LA:14/16; OA:13	2(12.5 %)	*	19350858
15	LA:79/83	3(3.6 %)	4	29767333
16	LA:14/15	1(6.7 %)	*	24048766
17	LA:42/46	4(8.7 %)	3	19468805
18	LA:28/31	3(9.6 %)	3	18306064
19	LA:29/33	4(12.1 %)	1	17879683
20	LA:52/65	13(20 %)	*	15026903
21	LA:28/30; OA:152	2(6.7 %)	LA:1; OA:16	37653802
22	LA:35/38; OA:51	3(7.9 %)	LA:0; OA:3	37357493
23	LA:100/168	68(40.5 %)	10	38151681
24	LA:14/17	3(17.6 %)	3	11577310
Studies that did not screen patients but focused on surgical measures				
25	LA:49; OA:18	*	*	35600058
26	LA:25/52; OA:52	27(51.9 %)	LA:14; OA:7	12945085
27	LA:21/31; OA:31	10(32 %)	*	17332956
28	LA:66/93	24(26 %)	5	19330347
29	LA:106/121	15(12.4 %)	*	28614173
30	LA:14/15	1(6.7 %)	1	24048766
31	LA:20/24	4(17 %)	*	16754000
Studies on unselected patients				
32	LA:58/109; OA:170	51(46.8 %)	*	35587296
33	LA:119/228; OA:71	109(47.8 %)	*	33682461
34	LA:673; OA:7911	*	*	28657949
35	LA:71/78; OA:78	7(8.9 %)	*	28593412
36	LA:51/83; OA:186	32(38.6 %)	LA:13; OA: 74	25480627
37	LA:1256; OA:5506	422(33.6 %)	*	24553536
38	LA:1434; OA:8185	*	*	24002917
39	LA:69/109; OA:224	40(36.7 %)	*	35469037
40	LA:133/157; OA:699	24(15.3 %)	*	30502269

(*continued on next page*)

Appendix C (*continued*)

Serial Number	Operation group	Conversion rate	Intraoperative injury situation	PMID
41	LA:3269; OA:9920	*	*	27585468
42	LA:101; OA:101	*	*	27077222
43	LA:134	21(16 %)	4	10883993

PMID: PubMed Unique Identifier; LA: laparoscopic adhesiolysis; OA: Open adhesiolysis; CT: Conservative treatment; * No relevant data available.

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