THE USA JOURNALS
THE AMERICAN JOURNAL OF MEDICAL SCIENCES AND PHARMACEUTICAL RESEARCH
(ISSN – 2689-1026)
VOLUME 06 ISSUE07

PUBLISHED DATE: - 31-07-2024
DOI: - https://doi.org/10.37547/TAJMSPR/Volume06Issue07-08 **PAGE NO.: - 62-67**

RESEARCH ARTICLE **Open Access**

DIAGNOSIS AND SURGICAL TREATMENT OF ADHESIVE OBSTRUCTION OF THE SMALL INTESTINE USING MODERN METHODS (LITERATURE REVIEW)

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Abstract
Small bowel adhesions are quite common after abdominal surgery, which makes this problem significant for medical practice. The obstruction can lead to serious complications such as intestinal necrosis, peritonitis and others, which requires surgical intervention. In recent years, there has been an active introduction of innovative treatment methods such as laparoscopy, endoscopic approaches and the use of drugs to prevent adhesions. Thus, the topic of diagnosis and treatment of adhesive small intestinal obstruction remains relevant and requires constant attention from the medical community to improve treatment results and reduce complications in patients.

Keywords Minimally invasive surgery, recurrent obstruction, conservative treatment, postoperative complications, endoscopic methods.

INTRODUCTION

At present, abdominal adhesions complicated by acute intestinal obstruction is one of the most difficult problems in medical practice both in terms of diagnosis and treatment. This is due to the pronounced clinical symptoms and high mortality rate.

Adhesive small intestinal obstruction (ASTI) is a pathologic condition in which there is a complete cessation or significant impairment of the passage of intestinal contents due to the formation of adhesions in the abdominal cavity.

To date, adhesive small intestinal obstruction (ASI) is the leading cause of acute small intestinal obstruction, accounting for up to 85% of cases according to literature data [1-5]. The main causes of SCCI are peritoneal adhesions formed after previous surgical interventions [3,6-9], especially those performed as an emergency, inflammatory diseases of the abdominal cavity and pelvis, as well as extragenital endometriosis and somatic constitution [6,10,11,12].

The basis of the pathogenesis of SCCN is dystrophic processes in the peritoneum, which lead to sloughing of mesothelial cells, release of fibrin-rich exudate, and formation of fibrinous adhesions [10,13-15]. A key aspect in the formation of peritoneal adhesions is the suppression of fibrinolysis against the background of ischemia during peritoneal trauma [11,14,16], which is also

observed during laparoscopic surgeries due to the exposure of the carboxyperitoneum to the peritoneum [17,18].

Currently, both conservative and operative approaches are used to treat patients with STCN. Despite the many studies on CTCN, there remains considerable uncertainty regarding the optimal algorithm for the management of these patients due to discrepancies in the data and results of different international and domestic surgical clinics [19,20]. Thus, the issue of treatment tactics in STCN is still not definitively resolved and continues to be actively discussed in medical circles both in our country and abroad.

Some authors prefer to use the possibilities of conservative treatment, while other researchers support the need for surgical interventions. However, all agree that treatment should be differentiated depending on the form and severity of intestinal obstruction.

According to the literature, adhesive small bowel obstruction can be successfully resolved with conservative therapy in 70-80% of cases, whereas about 30% of patients require surgical intervention. Although most cases can be resolved conservatively, delaying surgery for SCCN significantly increases the risk of intestinal ischemia and necrosis, which may subsequently require bowel resection.

In 2016, a study was conducted to identify clinical factors of tactical importance in patients with CTCN that may help in determining indications for conservative treatment or surgery. After comparing two groups of patients, the authors concluded that abrupt thickening of the intestinal wall, the presence of free fluid in the abdominal cavity, edema of the small intestinal mesentery, and the presence of a "transition point" (a place that prevents the passage of contents through the gastrointestinal tract) on CT scan, as well as signs of peritonitis (intestinal pneumatosis, gas in the abdominal cavity) are reliable criteria indicating the need for emergency surgical intervention [15].

According to a meta-analysis of studies comparing two groups of STCN patients operated and treated conservatively, published in 2017, it was concluded that surgical intervention should be mandatory in the presence of intestinal ischemia. However, the optimal duration of conservative therapy and the time required to decide on surgery remain controversial issues [17].

Thus, surgical tactics for the treatment of SCCN is the main one in some cases. However, the choice of surgical technique for patients in this category remains a matter of debate.

Adhesiolysis using laparotomy access is a standard surgical intervention for SCCN used in most clinics worldwide [18,19]. However, the high rate of postoperative complications and recurrences requires the search for new, more optimal techniques, both in terms of prognosis for patients and health care costs. Currently, the technique of laparoscopic intervention is widely used, which helps to minimize surgical trauma and, consequently, reduces the likelihood of adhesion development in the future [9,10]. It is believed that there is a greater risk of iatrogenic bowel injury with laparoscopic intervention compared to laparotomy. Behman R. and colleagues evaluated laparoscopic adhesiolysis for STCN with this approach in mind [3]. Multivariate analysis showed a hazard ratio of 1.6 (95% CI 1.4-1.9). However, significant benefits from the widespread use of the laparoscopic technique in the management of patients with STCN were identified: significantly lower 30-day mortality (3.9% vs. 7.2%, $p<0.0001$), incidence of major complications (10.8% vs. 15.0%, $p= 0.003$), shorter median length of hospitalization (7 bed days, range: 5-13, vs. 10 days, range: 6-16, $p<0.0001$) and shorter postoperative period (6 days, range: 4-9, vs. 8 days, range: 5-12, $p<0.0001$). These data support the advantages of laparoscopic techniques over traditional methods [3].

There are also data reflecting the negative sides of the laparoscopic method. In particular, laparoscopic access has been found to significantly increase operative time, which may lead to hidden damage to the mesothelial layer due to exposure to pneumoperitoneum, hypoxia, and desiccation [31-33]. This explains why there is no difference

between laparotomy and laparoscopy in the incidence of adhesions in the long term.

To date, there are a number of recommendations to prevent and reduce the risks of laparoscopy complications. One of the main recommendations includes humidifying and maintaining the temperature of the insufflation gas mixture to 30°C, with decreased flow rate and reduced insufflation pressure, and replacing pure CO2 with a mixture consisting of 86% CO2, 10% NO2, and 4% O2 [31]. Early access conversion is also widely recommended [3,13].

In addition, according to the opinion of both foreign and domestic authors, there is a certain category of patients for whom it is possible to perform laparoscopic adhesiolysis, especially if it is the first manifestation of SCCN or there is a localized adhesion process. In other cases, the use of laparotomy access for access to the abdominal cavity is recommended [10,15,19].

Thus, based on the analysis of data from various studies, several contraindications to the use of the laparoscopic method for the diagnosis and treatment of STCN can be identified:

1) Severe general somatic condition that does not allow maintaining prolonged increased intra-abdominal pressure.

2) A pronounced (more than 4 cm) general dilation of small intestine loops according to instrumental studies, requiring complete intubation of the small intestine.

3) Presence of signs of peritonitis.

4) Presence of dense and large inflammatory infiltrates in the abdominal cavity.

5) History of large volumes of previous surgeries.

6) Presence of intestinal fistulas and more than two previous laparotomies in the history [5,9].

Absolute contraindications for laparoscopic intervention in STCN are hemodynamic instability or cardiopulmonary insufficiency [9], as well as the inability to create an adequate working space in the abdominal cavity, which is associated with the formation of pneumoperitoneum [8]. The other factors limiting the use of laparoscopy are relative and should be evaluated in each specific case, taking into account the experience and skills of the surgeon.

Currently, the method of laparoscopic treatment of adhesive small intestinal obstruction is slowly being introduced into the practice of hospital surgical departments. Possible reasons for this may include the lack of generally accepted patient selection criteria and lack of experience among surgeons on duty in medical facilities. However, there are objective factors that support the continued adoption and spread of laparoscopic surgery, including its advantages in the treatment of adhesive small bowel obstruction. These benefits include reduced 30-day mortality rates and the incidence of serious complications such as wound infections and cardiovascular complications, as well as a reduction in the length of time patients spend in the hospital after surgery.

One of the main arguments in favor of expanding laparoscopic surgery is its ability to significantly reduce the incidence of severe postoperative complications and improve the overall prognosis for patients with STCN. In particular, the use of laparoscopy is accompanied by a reduced risk of wound infections and cardiovascular complications, which contributes to a faster postoperative recovery and shorter hospital stay. These factors reflect not only clinical benefits, but also economic feasibility, given the reduced costs of long-term treatment and rehabilitation of patients.

The need to establish clear criteria for patient selection for laparoscopic intervention remains a pressing issue that requires a concerted effort between the medical community and surgeons. It is important to develop training programs and necessary certification to ensure a high level of professionalism in the use of this technique. With the right approach, laparoscopic surgery can become the standard of care for most patients with CTCN, providing them with the most effective and safe intervention possible.

For successful introduction of laparoscopic surgery into practice, it is necessary to pay attention to the

training of young specialists and advanced training of experienced surgeons. This will expand the pool of specialists capable of performing complex laparoscopic surgeries, including adhesiolysis for SCCN. In addition, it is important to continue research aimed at evaluating the long-term results of treatment using laparoscopic techniques, which will help to clarify the indications and contraindications for this technique.

Attention should also be paid to the establishment of specialized centers and training programs aimed at the development of laparoscopic surgery in the context of the treatment of adhesive small intestinal obstruction. This will allow standardization of procedures and increase the level of safety and efficiency of operations.

Ultimately, successful implementation of laparoscopic surgery for SCCN requires a comprehensive approach that includes education, research, harmonization of medical standards, and modern technology. This will improve patient outcomes, reduce health care costs, and increase satisfaction for both health care providers and patients.

To continue to make progress in the treatment of adhesive small intestinal obstruction (ASTCI), it is necessary to actively develop and implement advanced technologies to reduce risks and improve surgical outcomes. It is important to continue research aimed at optimizing laparoscopic adhesiolysis techniques, improving methods for assessing and predicting postoperative complications, and developing innovative approaches to rehabilitation after surgical treatment.

At the same time, it is necessary to pay attention to the training and certification of surgeons in the field of laparoscopic surgery, creation of international standards and recommendations on the use of this technique in medical practice. This will help to ensure

In addition, it is important to actively develop interdisciplinary collaboration between surgeons, gastroenterologists, anesthesiologists, and other specialists, which promotes a comprehensive approach to the treatment of patients with SCCN and improves medical safety.

Thus, further improvement of STCN treatment requires not only technical innovations and scientific research, but also organizational efforts to disseminate best practices and standards in the surgical community. This will improve treatment outcomes, reduce complication rates, and improve patients' quality of life.

To successfully advance the treatment of adhesive small intestinal obstruction (AEO), it is also important to pay attention to the following aspects:

1. innovation in medical technology**: Continuous introduction of new medical technologies, such as robotic surgery and the use of specialized instruments for minimally invasive interventions, can significantly improve surgical outcomes and shorten the rehabilitation period for patients.

2. Development of personalized approaches**: It is important to develop methods that allow personalization of treatment depending on the clinical characteristics of patients and the nature of the disease. This includes choosing the optimal timing and type of surgical intervention adapted to the specifics of each clinical case.

3. education and training of professionals**: The need for advanced training of surgeons and nurses in laparoscopic and laparotomy surgery. This includes both learning the latest techniques and methods and training in the management of complications and postoperative care.

4. Interdisciplinary Collaboration**: Collaboration with other specialists such as oncologists, gastroenterologists and infectious disease specialists is essential for a comprehensive approach to the management of patients with STCN. This helps to improve diagnosis, treatment selection and postoperative recovery.

5. Standardization of treatment protocols and quality management**: The development and implementation of standards and protocols for the treatment of SCCN at national and international levels helps to increase uniformity in treatment approaches and improve treatment outcomes.

Thus, further development in the treatment of SCCN requires an integrated approach that includes technological innovation, specialist education, interdisciplinary collaboration and standardization of practices to improve treatment outcomes and patient quality of life.

Innovations in the treatment of adhesive small intestinal obstruction (STCN) continue to evolve to improve outcomes and reduce risks for patients:

6. Research and clinical trials**: Large multicenter studies and clinical trials are needed to further define optimal treatment strategies for SCCN. This will clarify the efficacy of new techniques and technologies as well as identify potential undesirable effects.

7. Development of new drug and technology approaches**: The introduction of new medications, such as anti-adhesion agents or drug prophylaxis, that may reduce adhesion formation and improve treatment outcomes without the need for surgery.

8. Improving postoperative care and rehabilitation**: Develop and implement optimal postoperative care and rehabilitation programs to accelerate recovery of bowel function, prevent complications, and shorten hospital stays.

9. Information technologies and telemedicine**: Implementation of information technology and telemedicine solutions for remote monitoring of patients' condition after surgery, consultations with experts from other medical institutions, which facilitates prompt resolution of issues and improvement of treatment quality.

10. Patient education and improvement of medical literacy**: Educating patients and their relatives about the features of the disease, treatment methods, possible complications and how to prevent them. This helps patients make better informed decisions and improve adherence to medical recommendations.

CONCLUSIONS

Thus, continuous improvement in the field of STCN treatment requires not only technical development and introduction of new methods, but also a comprehensive approach to improve the entire treatment process, from diagnosis and surgical intervention to postoperative care and rehabilitation of patients.

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