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Analysis of the Clinical Effectiveness of Laparoscopic Surgery in the Treatment of Intestinal Obstruction

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Abstract: *This study aims to evaluate the clinical efficacy of laparoscopic surgery for patients with intestinal obstruction and to determine its value for broader clinical applications. Ninety patients with intestinal obstruction admitted between April 2020 and April 2021 were selected for this study. They were randomly assigned into two groups: the control group, comprising 45 patients treated with conventional open surgery, and the study group, comprising 45 patients treated with laparoscopic surgery. Various surgical parameters were summarized and analyzed to evaluate the treatment outcomes. The study group exhibited significantly better overall treatment outcomes compared to the control group. They showed improvements in operative time, blood loss, treatment costs, and incision length. Additionally, the incidence of postoperative complications was lower, and the overall effectiveness of the treatment was higher in the study group, with significant differences between the two groups (P<0.05). For surgical treatment of intestinal obstruction, the introduction of laparoscopic surgery can achieve positive results. It ensures the quality of the surgery, shortens the patient's hospital stay, and reduces the likelihood of complications. Thus, this surgical approach is worthy of wider adoption.*

Keywords: *Laparoscopic Surgery, Intestinal Obstruction, Complication Rate*

1. Introduction

Intestinal obstruction is a prevalent acute abdominal condition resulting from various causes, with adhesions, neoplasms, and intestinal inflammation being the primary contributors. Manifestations include abdominal pain, constipation, and emesis. In critical cases, it may precipitate compromised mesenteric circulation and intestinal necrosis, posing a significant mortality risk. Epidemiological studies suggest a non-discriminatory incidence across demographics, encompassing pediatric, adolescent, adult, and geriatric populations. Post-surgical incidences of small bowel obstruction are noted following colorectal, gynecological, and pediatric procedures. There is a reported 10% probability of developing small bowel obstruction within three years post-colectomy, underscoring concerning recurrence rate [1]. In adults, large bowel obstruction frequently ensues from colorectal neoplasms. The predominant management of intestinal obstruction is surgical, with open and laparoscopic techniques being at the forefront. Notably, laparoscopy enhances postoperative intestinal function restoration, diminishes the duration of hospitalization, and mitigates postoperative complication rates [2].

2. Materials and Methods

2.1. Data Collection

The study involved 90 patients diagnosed with intestinal obstruction, ensuring demographic and clinical data alignment with predefined inclusion criteria. The cohort was composed of 50 males and 40 females, ranging from 30 to 70 years, with a mean age of 45.56 ±4.51 years. No statistically significant discrepancies were observed regarding disease chronicity, socioeconomic status, medical antecedents, or hypersensitivity to medications ($P > 0.05$).

Inclusion criteria encompassed individuals hospitalized at our facility with a confirmed diagnosis of intestinal obstruction, possessing exhaustive clinical records, lucid cognition, unimpaired

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communication abilities, and the capacity for active research participation.

Exclusion criteria comprised patients with pronounced cardiac, hepatic, or renal pathologies, severe psychiatric conditions, anesthetic medication, allergies, or surgical contraindications; as well as non-compliant individuals, those who retracted consent, or were transferred elsewhere.

2.2. Methodology

(1) First two groups of surgical methods

Following data verification, participants were randomly segregated into two cohorts. The ensuing 45 patients comprised the investigational group subjected to laparoscopic intervention. Surgical proceedings were meticulously documented to validate data integrity and precision.

Conventional open surgery was employed for the control group after an exhaustive patient briefing on the operative sequence and requisite collaboration. Subsequent to patient preparation, general anesthesia was administered. An abdominal midline incision provided direct access to the obstructed segment, followed by adhesiolysis via blunt or sharp dissection, and rectification of any seromuscular discontinuities. Intraoperative application of sodium hyaluronate aimed to curtail the recurrence of adhesions, a critical aspect of open surgical intervention. Perioperative vital parameters were rigorously monitored.

For the investigational group, laparoscopic surgery proceeded after comprehensive preoperative dialogue, emphasizing procedural merits and prognostic expectations to bolster patient assurance. Operative preparation entailed stringent aseptic protocols, succeeded by combined sedative anesthetic administration. Subsequent to anesthetic effectuation, the laparoscopic technique was initiated.

(2) Second, Execution of Laparoscopic Intervention:

Patients were positioned supine for the procedure. The lead surgeon, informed by the specifics of the intestinal obstruction and the principles of laparoscopic intervention, pursued aggressive therapeutic actions. Selection of trocar sites entailed creating 2 to 4 punctures of 12mm each, strategically placed based on previous abdominal surgeries to optimize surgical access while avoiding former incision sites. The primary trocar served as the observational port. Carbon dioxide insufflation was utilized to establish an artificial pneumoperitoneum, maintaining intraperitoneal pressure within a controllable range, typically between 12-20mmHg. Once the laparoscope was in place, and after ruling out additional intra-abdominal pathologies, adhesiolysis was performed laparoscopically at the obstruction site. For obstructions due to band adhesions, where conventional laparoscopic procedures may be insufficient, an ultrasonic scalpel was required for band excision. Adhesions around the intestine and abdominal wall were dissected using both blunt and sharp techniques, facilitated by a 5mm ultrasonic scalpel. Hemorrhage from the bowel wall necessitated immediate suturing, employing compression to prevent further bleeding and ensure the patient's safety. Suturing and hemostatic compression were the mainstays of hemorrhage control. Electrocoagulation was indicated for bleeding from the abdominal wall or omentum. For perforations resulting in bleeding or other significant complications, saline irrigation was performed and sodium hyaluronate applied to the affected site to mitigate the risk of recurrent intestinal obstruction.

(3) Third, Postoperative Management:

Upon completion of the laparoscopic procedure for intestinal obstruction, diligent management of the drainage system and postoperative intervention were imperative. After surgery, areas with exposed fibrous tissue due to the serosal layer defect were covered with sodium hyaluronate, chitosan, and biologic fibrin sealant to effectively preclude reobstruction. Vigilant observation for serous or sanguineous exudates at the incision site was critical; any such findings necessitated the immediate institution of a drainage system and commencement of drainage care. The postoperative inpatient phase demanded stringent oversight of protocols, including dietary regimens, anti-inflammatory treatments, and gastrointestinal decompression, as routine supportive measures to facilitate recovery. Comprehensive medication management, rehabilitation exercises, safety measures, and vital signs monitoring were integral to optimizing therapeutic outcomes.

2.3. Observational Metrics

During the therapeutic course, clinicians documented a spectrum of observational metrics for both cohorts, encompassing operative parameters such as duration, intraoperative hemorrhage, incision

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length, and time to return of bowel peristalsis, resumption of regular diet, and length of hospital stay. Treatment efficacy and complication rates were also tracked. An Excel spreadsheet was employed for statistical processing to guarantee data integrity and precision.

2.4. Statistical Analysis

Data integrity was maintained through a stringent data collection and verification process. Statistical analyses were performed using the IBM SPSS Statistics software, version 26.0, which is a robust tool for the management and analysis of medical research data. Descriptive statistics, including means, standard deviations, and ranges for continuous variables, as well as frequencies and percentages for categorical variables, were generated for all variables.

Comparative analyses of continuous variables with normal distributions were conducted using independent t-tests, while the Mann-Whitney U test was applied to those without a normal distribution. For the analysis of categorical variables, chi-square tests were employed to evaluate whether there were statistically significant differences between the two groups. For categorical variables with expected frequencies less than five in any cell, Fisher's exact test was used to provide a more precise probability estimate. A *P*-value of less than 0.05 was considered

The threshold for statistical significance.

3. Results

3.1. Comparison of Preoperative and Postoperative Clinical Indicators

The investigation revealed that clinical outcomes for patients undergoing laparoscopic surgery were significantly enhanced in comparison to the control group. A detailed analysis of operative metrics highlighted superior results for the intervention group, with significant differences ($P < 0.05$) between the two cohorts. Detailed metrics are presented below, Table 1.

Table 1: Comparison of Preoperative and Postoperative Clinical Indicators (n=90)

Index	Operation Time (min)	Intraoperative Blood Loss (ml)	Postoperative Hospital Stay (d)	Postoperative Wound Length (cm)	Postoperative Edema Duration (d)	Postoperative Pain Duration (d)
Control Group (45 cases)	83.44 ± 22.34	25.11 ± 8.03	10.54 ± 2.93	3.14 ± 0.41	5.11 ± 1.23	7.39 ± 2.01
Experimental Group (45 cases)	90.33 ± 10.46	22.46 ± 6.11	4.11 ± 1.03	2.34 ± 0.56	3.94 ± 0.96	5.22 ± 1.67
t	2.343	2.372	13.453	6.034	5.456	4.241
P	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

3.2. Comparison of Therapeutic Efficacy between Two Groups

In a comparative efficacy analysis of the two patient cohorts, the treatment arm demonstrated a significantly enhanced therapeutic response, with a profound statistical difference, $p < 0.05$. The precise efficacy metrics are delineated in the accompanying dataset, Table 2.

Table 2: Comparison of therapeutic efficacy between two groups (n, %)

Category	Partial Remission	Stable	Progression	Effective Rate
Control Group (45 cases)	21	10	35	77.78%
Treatment Group (45 cases)	25	2	43	95.56%
t	6.18			
p	0.045			

3.3. Comparison of Side Effects between Two Groups

An examination of postoperative complications across both cohorts revealed a statistically lower incidence rate within the treatment arm compared to the control group, $p < 0.05$. Detailed complication rates are explicated in the subsequent dataset, Table 3.

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Table 3: Comparison of side effects between two groups (n, %)

Category	Bone Marrow Suppression	Nausea	Liver Function Abnormalities	Other Side Effects	Incidence of Side Effects
Control Group (45 cases)	2	2	0	2	11 (24.44%)
Treatment Group (45 cases)	1	0	1	0	3 (6.67%)
p	0.042				

Note: Due to the small sample inspection volume, Fisher Accurate Inspection was selected.

4. Discussion

Intestinal obstruction, a critical condition disrupting the normal flow of intestinal contents, can be due to a variety of causes such as mechanical blockage of adhesions, hernias, tumors, or being functional, as in the ileus where peristalsis is diminished or absent without an actual physical blockage [3]. The clinical manifestation of this pathology is characterized by a triad of abdominal pain, which is often colicky in nature due to peristaltic waves attempting to overcome the obstruction, vomiting that may relieve abdominal pain temporarily, and constipation or failure to pass gas or stool. The absence of these contents' transit through the digestive system can quickly lead to complications [4].

The pathophysiology behind intestinal obstruction starts with the accumulation of gases and fluids within the lumen proximal to the obstruction, causing distention of the intestinal wall. This distention can initially stimulate more vigorous peristalsis, exacerbating symptoms. However, persistent distention leads to impaired venous return from the bowel wall, causing edema, increased intraluminal pressure, and eventually, arterial compromise [5]. If left untreated, this ischemia can lead to bowel wall necrosis and perforation, which releases bacteria and endotoxins into the peritoneal cavity, causing peritonitis and sepsis, both of which can be fatal [6].

The systemic implications of intestinal obstruction include dehydration and electrolyte imbalance [7]. As the bowel content accumulates, water and electrolytes are sequestered within the intestine, which combined with vomiting and decreased oral intake, can lead to hypovolemia and shock. Monitoring and correcting these imbalances is crucial in the acute management of these patients [8].

In regard to the surgical management of intestinal obstruction, the paradigm has shifted towards minimally invasive techniques, with laparoscopic surgery becoming increasingly prevalent [9]. This approach, through small incisions, utilizes specialized equipment and cameras to visualize and operate on the intestines. The advantages over conventional laparotomy are manifold. First, it reduces the physical trauma of surgery, diminishing postoperative pain and the need for analgesics. This less invasive nature contributes to a quicker recovery and shorter hospital stays [10], which has positive implications for healthcare resource utilization and overall costs.

Furthermore, laparoscopic surgery minimizes the risk of postoperative complications such as wound infections [11], which is significant given the compromised state of patients with intestinal obstruction. The reduced exposure of internal tissues to the external environment during laparoscopic procedures decreases the incidence of postoperative adhesions, which is a common cause of recurrent bowel obstruction [12].

Another essential aspect is the reduced inflammatory response associated with laparoscopic surgery. This is of particular importance in already compromised patients, where an exaggerated systemic inflammatory response can precipitate further complications.

Research comparing laparoscopic and laparotomy procedures for intestinal obstruction reveals that laparoscopic methods not only reduce the physical burden of surgery but also enhance overall patient outcomes [13]. This is reflected in shorter hospital stays, reduced complication rates, and improved postoperative recovery. Moreover, laparoscopic surgery has been associated with a lower rate of short-term morbidity and improved quality of life post-surgery.

It's important to note, however, that laparoscopic surgery may not be suitable for all patients with intestinal obstruction [14]. The decision to use this technique should be based on individual patient characteristics, the cause and location of the obstruction, the patient's overall health and surgical history, and the surgeon's expertise.

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5. Conclusions

In conclusion, the clinical landscape of managing intestinal obstruction is evolving with laparoscopic techniques playing an increasingly prominent role. The evidence suggests that when appropriately selected and executed, laparoscopic surgery can be a safer and more effective approach compared to conventional laparotomy, leading to improved therapeutic outcomes in the management of intestinal obstruction [15]. The strategic employment of these minimally invasive techniques, therefore, should be considered as part of a modern, patient-centered approach to surgical care.

References

[1] Krielen P, Di Saverio S, Ten Broek R, et al. Laparoscopic versus open approach for adhesive small bowel obstruction, a systematic review and meta-analysis of short term outcomes. Journal of Trauma and Acute Care Surgery, 2020, 88(6): 866-874.

[2] Quah G S, Eslick G D, Cox M R. Laparoscopic versus open surgery for adhesional small bowel obstruction: a systematic review and meta-analysis of case–control studies. Surgical endoscopy, 2019, 33: 3209-3217.

[3] Sallinen V, Di Saverio S, Haukijärvi E, et al. Laparoscopic versus open adhesiolysis for adhesive small bowel obstruction (LASSO): an international, multicentre, randomised, open-label trial. The Lancet gastroenterology & hepatology, 2019, 4(4): 278-286.

[4] Cui N, Liu J, Tan H. Comparison of laparoscopic surgery versus traditional laparotomy for the treatment of emergency patients. Journal of International Medical Research, 2020, 48(3): 1988-1991.

[5] Håkanson C A, Fredriksson F, Lilja H E. Adhesive small bowel obstruction after appendectomy in children–Laparoscopic versus open approach. Journal of pediatric surgery, 2020, 55(11): 2419-2424.

[6] Lima M, Di Salvo N, Cordola C, et al. Laparoscopy-assisted versus open surgery in treating intestinal atresia: single center experience. Journal of Investigative Surgery, 2021, 34(8): 842-847.

[7] Rondelli F, Gemini A, Cerasari S, et al. Laparoscopic vs. open loop ileostomy reversal: a meta-analysis of randomized and non-randomized studies. Langenbeck's Archives of Surgery, 2023, 408(1): 329.

[8] Stenberg E, Ottosson J, Szabo E, et al. Comparing techniques for mesenteric defects closure in laparoscopic gastric bypass surgery—a register-based cohort study. Obesity Surgery, 2019, 29: 1229-1235.

[9] Assali S, Mourany J, Jones B, et al. Technical approach to laparoscopic examination of the small bowel in gallstone ileus. Case Reports in Surgery, 2020, 20-32.

[10] Krielen P, Stommel M W J, Pargmae P, et al. Adhesion-related readmissions after open and laparoscopic surgery: a retrospective cohort study (SCAR update). The Lancet, 2020, 395(10217): 33-41.

[11] Zhang J, Xu X, Wang X, et al. Laparoscopic versus open repair of congenital duodenal obstruction: a systematic review and meta-analysis. Pediatric Surgery International, 2022, 38(11): 1507-1515.

[12] Moghadamyeghaneh Z, Talus H, Ballantyne G, et al. Short-term outcomes of laparoscopic approach to colonic obstruction for colon cancer. Surgical endoscopy, 2021, 35: 2986-2996.

[13] Foss N B, Kehlet H. Challenges in optimising recovery after emergency laparotomy. Anaesthesia, 2020, 75: 83-89.

[14] Detz D J, Podrat J L, Castro J C M, et al. Small bowel obstruction. Current problems in surgery, 2021, 58(7): 100893.

[15] Sebastian-Valverde E, Poves I, Membrilla-Fernández E, et al. The role of the laparoscopic approach in the surgical management of acute adhesive small bowel obstruction. BMC surgery, 2019, 19(1): 1-7.