Comparative Study on the Efficacy and Safety of Emergency Surgery Versus Endoscopic Stent Placement Followed by Definitive Surgery in the Treatment of Colorectal Obstruction

Ann. Ital. Chir., 2025 96, 2: 261–268
https://doi.org/10.62713/aic.3799

Zhekang Jin[1], Xihan Jin[1], Jiying Lu[1]

[1]Department of Colorectal and Anal Surger, The Affiliated Jinhua Hospital, Zhejiang University School of Medicine, 321000 Jinhua, Zhejiang, China

AIM: Tumor-induced acute intestinal obstruction is a severe complication that poses significant threats to patient life. Emergency surgery is a widely used treatment method, but this approach has certain limitations such as high mortality and complication rates. Developments in endoscopic and minimally invasive techniques have provoked interest in postoperative definitive resection or conservative treatment following colorectal stent placement. Hence, this study aims to explore the clinical efficacy and safety of endoscopic-guided, X-ray-assisted intestinal stent placement in colorectal cancer (CRC) with acute intestinal obstruction, and to provide clinicians with viable alternative treatment options to enhance patient care.

METHODS: This study included 69 CRC patients who received treatment at the Affiliated Jinhua Hospital, Zhejiang University School of Medicine, China, between August 2017 and August 2021. The control group (n = 38) underwent emergency laparotomy with one-stage resection and stoma formation, followed by a postoperative second-stage stoma closure every 3 to 6 months. Moreover, the experimental group (n = 31) underwent endoscopic stent placement followed by definitive surgery. The differences in various indicators were compared between groups. Additionally, the 1-year and 3-year overall survival (OS) rates and disease-free survival (DFS) rates were compared between groups.

RESULTS: Successful placement of intestinal stents was achieved in all 31 patients, with acute intestinal obstruction relief within 24 to 48 hours. In the experimental group, stent placement effectively relieved intestinal obstruction, and a postoperative radical colon surgery was performed after 7 to 10 days. The experimental group had significantly lower rates of postoperative ventilator time, reduced time to oral intake, and fewer complication than the control group ($p < 0.05$). However, no significant differences were observed between groups regarding operation time, intraoperative blood loss, 1-year and 3-year OS rates, and 1-year and 3-year DFS rates ($p > 0.05$).

CONCLUSIONS: Compared to emergency surgery, combined endoscopic and X-ray-guided colonic stent placement is an effective and safer method for alleviating acute intestinal obstruction in colorectal cancer. This study provides valuable insights to clinicians in selecting treatment options.

Keywords: colorectal cancer; intestinal obstruction; endoscopic stent placement; emergency surgery

Introduction

Colorectal cancer (CRC) is the most common malignant tumor of the digestive system worldwide, ranking third in global incidence and second in mortality [1]. In China, the incidence and mortality of CRC are increasing year by year [2]. A severe complication of CRC is tumor-induced acute intestinal obstruction which poses a significant threat to patient life. Approximately 8–29% of CRC patients experience acute intestinal obstruction, and these individuals generally face a poor overall prognosis [3]. Emergency surgery (ES) has been the primary treatment approach for acute bowel obstruction caused by CRC. However, this procedure is associated with significant limitations, including high mortality and elevated complication rates. Studies have revealed that the mortality rate for ES ranges from 15–34% and the complication rate from 32–64% [3–7].

In 1995, Professor Dohmoto proposed intestinal stenting as a palliative option to alleviate symptoms and reduce the need for ostomy surgery [8]. Intestinal stent placement enables timely intestinal decompression, allowing more time to manage underlying conditions, correct electrolyte imbalances, and conduct comprehensive preoperative assessments. Additionally, this approach alleviates intestinal wall dilation and edema, facilitating the success of single-stage anastomosis in subsequent surgeries. Shifting from emergency to elective surgery reduces the likelihood of ostomy creation, thereby lowering postoperative complication and mortality rates while enhancing patients' quality of life by avoiding a colostomy [9,10].

Advancements in endoscopic and minimally invasive techniques have provoked interest in post-stent placement definitive surgery or conservative treatment for CRC. Hence, this study aims to explore the clinical efficacy and

Submitted: 10 October 2024 Revised: 12 December 2024 Accepted: 25 December 2024 Published: 10 February 2025
Correspondence to: Jiying Lu, Department of Colorectal and Anal Surger, The Affiliated Jinhua Hospital, Zhejiang University School of Medicine, 321000 Jinhua, Zhejiang, China (e-mail: Luujinying@163.com).

safety of endoscopic-guided, X-ray-assisted intestinal stent placement in CRC with acute intestinal obstruction, and to provide clinicians with viable alternative treatment options to enhance patient care.

Materials and Methods

Recruitment of Study Participants

This retrospective study included clinical data from 69 CRC patients with acute intestinal obstruction. The patients underwent either endoscopic-guided combined X-ray colonic stent placement or ES at the Affiliated Jinhua Hospital, Zhejiang University School of Medicine, between August 2017 and August 2021. Patients were divided into two groups: 31 patients who underwent endoscopic-guided combined X-ray colonic stent placement were included in the experimental group, while 38 patients who underwent ES during the same period were included in the control group. This study adhered to the principles of the Helsinki Declaration and was approved by the Ethics Committee of the Affiliated Jinhua Hospital, Zhejiang University School of Medicine [(2023) Review No. 203]. Written informed consent was obtained from each patient.

The inclusion criteria for patient selection were set as follows: (1) Patients aged 18 years or older with the ability to provide informed consent. (2) Those diagnosed with CRC based on the Guidelines for Diagnosis and Treatment of Colorectal Cancer (2023 Edition) by the Chinese National Health Commission [11]. (3) Patients diagnosed with malignant colonic obstruction by experienced clinicians (with a minimum 10 years of relevant expertise) following the criteria established by the American Clinical Trials Committee in 2007 [12]. (4) Individuals with no significant intestinal perforation or bleeding. (5) Tumor does not cause complete obstruction of the intestinal lumen. (6) Individuals with an expected survival of more than 3 months and capable of receiving relevant treatment.

Moreover, the exclusion criteria during patient recruitment were as follows: (1) Presence of widespread obstruction involving multiple sites or small bowel obstruction. (2) Evidence of gastrointestinal perforation or intestinal necrosis. (3) Severe cardiopulmonary insufficiency precluding tolerance of colonoscopy. (4) Lesions located within 4 cm of the anal verge. (5) Severe bleeding tendency or coagulation disorders. (6) Severe comorbidities such as diabetes, liver or kidney dysfunction. (7) History of severe psychological disorders or mental illness. (8) Non-compliance from the patient or family. (9) During follow-up, patients were excluded if they voluntarily withdrew, developed a new malignancy or severe comorbidity, were lost to follow-up, or if the follow-up duration was insufficient to obtain long-term outcome data. The patient recruitment flowchart is shown in Fig. 1.

Treatment Protocols

Stent Placement Procedure

Following electrolyte imbalances with fluid therapy, patients received minimal preoperative sedation. The endoscopy room nurse immediately performed a colonoscopy, identified the tumor site, and obtained a biopsy for tumor nature's confirmation.

Under X-ray fluoroscopy (RG-II-DR, Guangdong Ruijia Medical Technology Co., Ltd., Zhongshan, China), an Endo-Flex™ guidewire (GGW-10-35-260, Medi-Globe GmbH, Rohrdorf, Germany) was inserted through the narrowed proximal end of the tumor via colonoscopy. A catheter (SpyScope DS II, Boston Scientific Corporation, Marlborough, MA, USA) was introduced over the guidewire, and contrast medium was injected to observe the general condition of colorectal tumor obstruction under X-ray and assess for any tumor perforation. Based on the tumor's length, an appropriate stent (20183131815, M. I. Tech Co., Ltd., Pyeongtaek-si, Korea) was selected. Available stent sizes included 8 cm, 10 cm, and 12 cm, with a post-expansion diameter of 22 mm. The selected stent length included the tumor stricture length plus an additional 3 cm on both the proximal and distal ends of the tumor to ensure complete coverage.

Under the combined guidance of endoscopy and X-ray, the stent pusher was introduced over the guidewire to the tumor stricture. After adjustment to optimally positioned (ensuring approximately 3 cm beyond the proximal and distal ends of the tumor), the deployment trigger device was activated to release the stent (Fig. 2). After confirming complete expansion, the stent pusher and guidewire were withdrawn. To monitor potential complications such as intestinal bleeding, necrosis, or perforation following stent placement, routine X-ray imaging was performed on the second postoperative day to verify correct stent placement and adequate expansion for effective obstruction relief.

All 31 cases in the experimental group successfully underwent stent placement to relieve obstruction, without any procedure-related complications. Symptom relief and significant improvement were observed in all patients after stent placement. Within two weeks postoperatively, all patients in the experimental group underwent laparoscopic radical colorectal cancer surgery (Fig. 2A,B).

Surgical Procedure

Once obstruction symptoms were completely resolved, a repeat colonoscopy was performed to exclude concurrent pathologies, ascertain tumor staging, assess metastasis, and evaluate the patient's general condition. Following a multidisciplinary approach, all 69 enrolled patients met the predetermined inclusion and exclusion criteria.

Following stent placement, which relieved obstruction, patients in the experimental group received nutritional support and fluid replacement to enhance their overall condition. Approximately two weeks later, surgical treatment

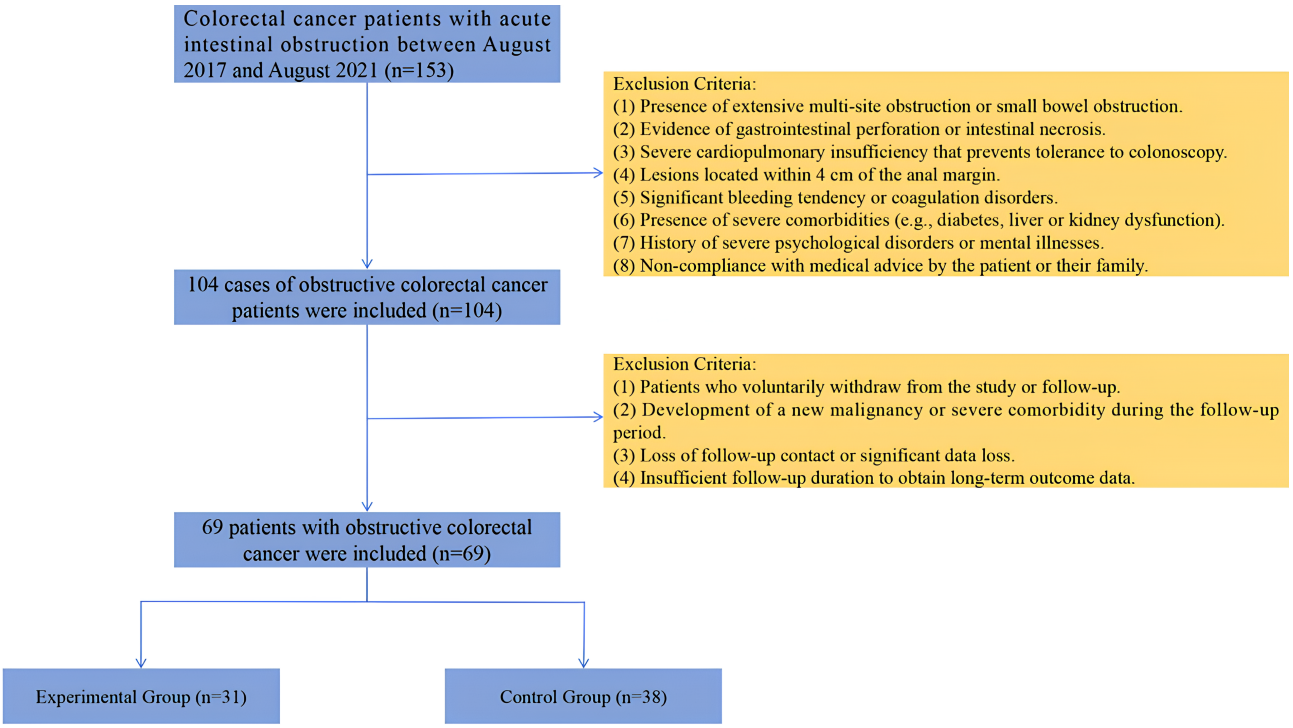

Fig. 1. A flowchart for patient recruitment.

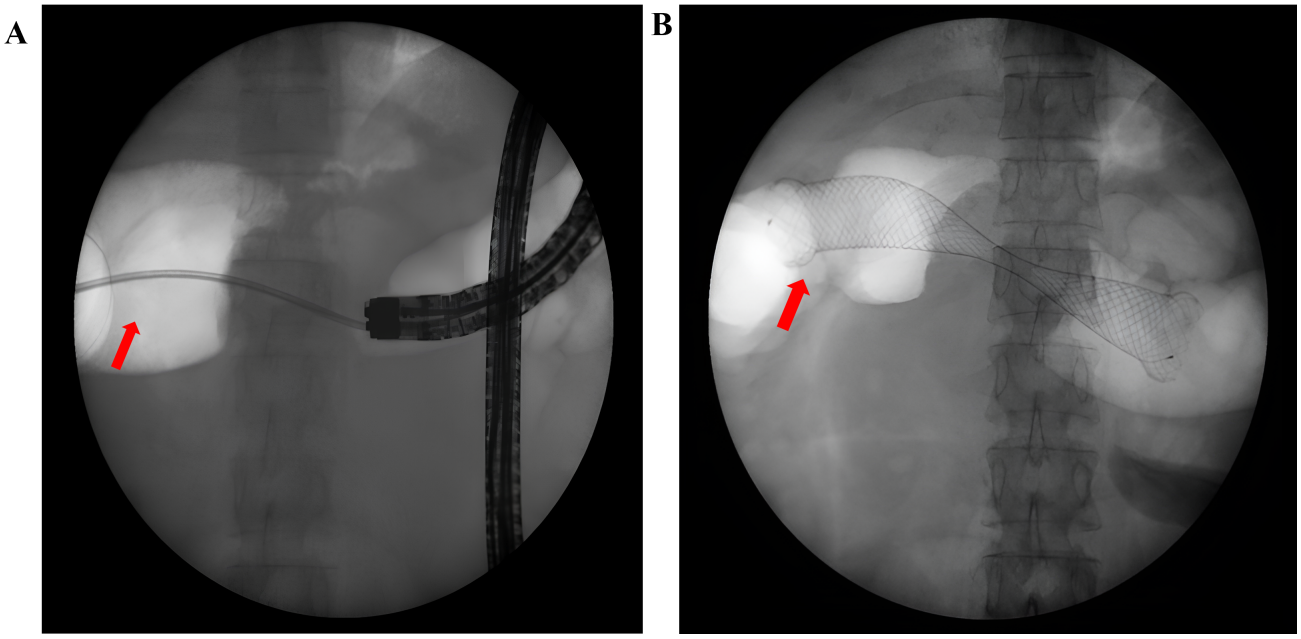

Fig. 2. Process of X-ray-guided colonic stent placement under endoscopy for treating CRC with acute intestinal obstruction. (A) The guidewire passing through the narrowed intestinal segment before stent placement. The arrow indicates the guidewire. (B) A follow-up X-ray after stent placement, demonstrating the proper positioning of the stent. The arrow indicates the stent. CRC, colorectal cancer.

was performed. The surgery timeline was based on prior clinical experience, as waiting two weeks after the surgical procedure resolves intestinal edema and improves nutritional status, which are crucial for successful anastomosis. After the surgical procedure, patients underwent bowel preparation and were placed under general anesthesia with endotracheal intubation. Furthermore, standard abdominal iodine disinfection and routine intraoperative exploration were conducted to rule out distant metastases, followed by tumor resection.

Patients in the control group received radical surgery with lymph node dissection in an emergency setting. Intraoperatively, distant metastases were ruled out. Moreover, to ensure patient safety, the surgical approach for these 38 patients in the control group included Hartmann's procedure or radical colorectal cancer with appendiceal proximal colon irrigation, appendectomy, and preventive ileostomy after colon anastomosis.

Observational Parameters

The experimental and control groups were compared for several parameters, including surgery duration, intraoperative blood loss, postoperative ventilation time, postoperative time to initiate oral intake, postoperative hospital stay, postoperative complications, and subsequent treatments. Furthermore, 1-year and 3-year overall survival (OS) and disease-free survival (DFS) rates were also compared between groups. Statistical analyses were conducted to assess significant differences in these outcomes.

OS and DFS were calculated from the date of resection surgery until recurrence, death, or the end of the follow-up period for all cases receiving subsequent resections. During the first year of follow-up, patients underwent computed tomograpgy (CT), abdominal ultrasound, chest X-ray, and blood routine examinations every 3 months, with colonoscopy performed every 6 months. For the 2–3-year follow-up duration, CT, abdominal ultrasound, chest X-ray, and blood tests were performed every 6 months, while colonoscopy was performed once a year. Each patient was followed for 3 years or until death.

Statistical Methods

Data analysis was performed using GraphPad Prism 8.0 statistical software (Graphpad software, La Jolla, CA, USA). Continuous data were presented as mean ± standard deviation ($\bar{x} \pm s$), and intergroup comparisons were performed using the *t*-test. Categorical data were presented as counts and percentages [n (%)], and intergroup comparisons were conducted using the χ^2 test or Fisher's exact test. The Shapiro-Wilk test was employed to assess the normal distribution of the data. Furthermore, OS and DFS were compared between groups using the Kaplan-Meier method. A *p*-value of <0.05 was considered statistically significant.

Results

Comparison of General Characteristics between Groups

A comparison of baseline characteristics between the experimental and control groups is shown in Table 1. From August 2017 to August 2021, 69 patients with obstructive colorectal cancer were identified. Patients were divided into the experimental group (n = 31) and the control group (n = 38). In the experimental group, there were 14 (45.16%) males and 17 (54.84%) females, with an age range of 32 to 89 years (mean age: 68.16 ± 10.31 years). Among them, 13 (41.94%) cases were classified as Tumor node metastasis classification (TNM) stage II, and 18 (58.06%) cases as TNM stage III. Furthermore, histological differentiation demonstrated 17 (54.84%) cases with high differentiation, 9 (29.03%) cases with moderate differentiation, and 5 (16.13%) cases with low differentiation.

Moreover, the control group included 21 (55.26%) males and 17 (44.74%) females, with an age range of 30 to 90 years (mean age: 66.37 ± 15.99 years). Furthermore, the control group included 17 (44.74%) patients at TNM stage II and 21 (55.26%) at TNM stage III. Histological differentiation revealed 17 (44.74%) cases with high differentiation, 14 (36.84%) with moderate differentiation, and 7 (18.42%) with low differentiation. However, statistical analysis showed no significant differences in these characteristics between groups ($p > 0.05$).

Comparison of Postoperative Recovery between Groups

There were no significant differences between the experimental and control groups regarding surgery duration and intraoperative blood loss ($p > 0.05$). However, the control group had significantly longer postoperative ventilation time ($p = 0.001$), delayed initiation of oral intake ($p = 0.007$), and longer hospital stays compared to the experimental group ($p = 0.001$) (Table 2).

Comparison of Postoperative Complications between Groups

The control group had 7 cases of postoperative hypoproteinemia, 2 cases of pulmonary infection, 5 cases of wound infection, and 2 cases of intra-abdominal infection. In the experimental group, there was 1 case each of postoperative hypoproteinemia, intra-abdominal infection, and anastomotic fistula. However, no cases of anastomotic bleeding were observed in either group. Statistical analysis revealed a significant difference in the total number of postoperative complications between groups ($p = 0.003$) (Table 3).

Comparison of Postoperative Treatment between Groups

Both groups received postoperative CapeOX chemotherapy regimen, lasting approximately 6 months and consisting of 8 cycles administered every 3 weeks. For patients experiencing recurrence after surgery, a multidisciplinary assessment was conducted. Patients eligible for repeat surgery underwent surgical resection, while those who were ineligible received alternative treatments, including radiotherapy, chemotherapy, ablation, and interventional therapy. Furthermore, patients who were unable to tolerate systemic or localized treatments received supportive care for advanced-stage cancer.

Comparison of 1-year and 3-year Overall Survival Rates between Groups

Comparing the 1-year and 3-year OS rates between groups demonstrated that the control groups had a 1-year OS rate of 68.42% (26/38) and a 3-year OS rate of 43.74% (17/38).

Table 1. Comparison of general characteristics between groups.

Observational variables	Experimental group (n = 31)	Control group (n = 38)	χ^2/t	*p*-value
Gender			0.697	0.404
Male	14 (45.16%)	21 (55.26%)		
Female	17 (54.84%)	17 (44.74%)		
Age	68.16 ± 10.31	66.37 ± 15.99	0.538	0.592
Lesion location			0.304	0.990
Ascending colon	3 (9.68%)	4 (10.53%)		
Transverse colon	2 (6.45%)	3 (7.89%)		
Descending colon	6 (19.35%)	6 (15.79%)		
Sigmoid colon	11 (35.48%)	15 (39.47%)		
Rectum	9 (29.03%)	10 (26.32%)		
Clinical TNM staging			0.055	0.815
II stage	13 (41.94%)	17 (44.74%)		
III stage	18 (58.06%)	21 (55.26%)		
Differentiation degree			0.718	0.699
Well-differentiated	17 (54.84%)	17 (44.74%)		
Moderately-differentiated	9 (29.03%)	14 (36.84%)		
Poorly-differentiated	5 (16.13%)	7 (18.42%)		

TNM, Tumor node metastasis classification.

Table 2. Comparison of postoperative recovery between the experimental and control groups.

Groups	Control group (n = 38)	Experimental group (n = 31)	χ^2/t	*p*-value
Number of cases with primary resection and anastomosis	37 (97%)	0 (0%)	-	0.000
Surgery duration (min)	167.29 ± 12.03	166.37 ± 9.88	0.341	0.736
Intraoperative blood loss (mL)	74.13 ± 17.90	73.55 ± 14.78	0.145	0.886
Postoperative ventilation time (d)	5.58 ± 1.06	4.61 ± 1.17	3.609	0.001
Postoperative time to initiate oral intake (d)	5.96 ± 1.04	5.22 ± 1.18	2.767	0.007
Postoperative hospital stay (d)	9.64 ± 1.20	8.56 ± 1.24	3.664	0.001

In the experimental group, the 1-year OS rate was 70.97% (22/31), and the 3-year OS rate was 51.61% (16/31). Statistical analysis revealed no significant differences in the 1-year and 3-year OS rates between groups ($p > 0.05$) (Table 4 and **Supplementary Fig. 1**).

Comparison of 1-year and 3-year Disease-Free Survival Rates between Groups

Analyses of the 1-year and 3-year DFS rates between groups revealed a 1-year DFS rate in the control group of 57.89% (22/38) and a 3-year DFS rate of 34.21% (13/38). In the experimental group, the 1-year DFS rate was 58.06% (18/31), and the 3-year DFS rate was 38.71% (12/31). Statistical comparison showed no significant differences in the 1-year and 3-year DFS rates between groups ($p > 0.05$) (Table 5 and **Supplementary Fig. 1**).

Discussion

According to the latest global cancer statistics, in 2022, colorectal cancer (CRC) ranks third worldwide in terms of new cases (9.6%) and second in terms of mortality (9.3%) [1]. China is a high-incidence country for CRC, accounting for approximately 18.6% of global cases and 20.1% of CRC-related deaths. The latest report from the National Cancer Center of China indicates that in 2022, CRC was the second in terms of new cases (51.71%), ranking second among males and fourth among females [13]. Many CRC patients experience acute colonic obstruction, making colorectal tumors a leading cause of surgical emergencies [14]. While ES can effectively cure obstruction, often through permanent stoma, it is correlated with high rates of mortality and complications [15]. In contrast, self-expanding metal stents have been proven to be a safe, simple, and effective palliative treatment with an acceptable complication rate [16]. Although study has evaluated the use of stent placement as a palliative strategy or a bridge to surgery, results vary and often lack significant differences [17]. Therefore, the exact role of stent surgery remains unclear.

Previously, we commonly performed palliative surgeries to relieve obstruction in CRC patients, aiming to prevent life-threatening complications such as intestinal perforation. However, a new treatment modality has been introduced, using endoscopic stent placement to restore intestinal patency in patients with obstruction. After improve-

Table 3. Comparison of postoperative complications between the experimental and control groups.

Observational variables	Experimental group (n = 31)	Control group (n = 38)	χ^2	*p*-value
Number of cases	31 (100%)	38 (100%)		
Hypoalbuminemia	1 (3.23%)	7 (18.42%)		
Pulmonary infection	0 (0%)	2 (5.26%)		
Wound infection	0 (0%)	5 (13.16%)		
Intra-abdominal infection	1 (3.23%)	2 (5.26%)		
Anastomotic leakage	1 (3.23%)	0 (0%)		
Anastomotic hemorrhage	0 (0%)	0 (0%)		
Total incidence of complications	3 (9.68%)	16 (42.11%)	8.997	0.003

Table 4. Comparison of 1-year and 3-year overall survival rates between the experimental and control groups.

Variable	Experimental group, n (%)	Control group, n (%)	χ^2	*p*-value
Overall survival rate				
1 year	22 (70.97%)	26 (68.42%)	0.052	0.819
3 years	16 (51.61%)	17 (43.74%)	0.324	0.570

Table 5. Comparison of 1-year and 3-year disease-free survival rates between the experimental and control groups.

Variable	Experimental group, n (%)	Control group, n (%)	χ^2	*p*-value
Disease-free survival rate				
1 year	18 (58.06%)	22 (57.89%)	0.000	0.989
3 years	12 (38.71%)	13 (34.21%)	0.150	0.699

ment in nutritional status, these patients undergo scheduled surgery. At our institution, endoscopic stent placement has been successfully employed to relieve obstruction, provide palliative treatment options for advanced-stage patients, improve their quality of life, and serve as a transitional therapy before radical surgery [18].

Stent placement improved the overall condition of patients and allowed for a comprehensive disease assessment. Approximately 1–2 weeks after stent placement, patients undergo radical colorectal cancer surgery with lymph node dissection. The results from this study showed that the anastomotic leak rate in the experimental group was significantly higher than that in the control group. The experimental group exhibited shorter postoperative ventilation time, faster resumption of oral intake, and reduced length of hospital stays compared to the control group. Although OS and DFS were better in the experimental group than the control group, the differences were not statistically significant.

Similar to recent meta-analyses, endoscopic stent placement offers several advantages over open surgery, including decreased blood loss, fewer postoperative complications, and shorter hospital stays [17]. Furthermore, endoscopic stent placement is minimally invasive, reducing surgical trauma, enabling faster recovery, and effectively improving the quality of life of patients [19]. A prospective study further reported the efficacy of endoscopic stent placement for stage III colorectal cancer patients. For stage IV patients, endoscopic stent placement provides an interval to better prepare for resection of liver metastases following synchronous colon and liver resections, potentially improving survival rates [20]. Multiple studies have demonstrated that colonic stenting in patients with colon cancer is associated with lower average costs compared to ES while providing superior clinical outcomes [21].

Research has shown that combining endoscopic and X-ray fluoroscopy-guided stent implantation with laparoscopic surgery is more minimally invasive, safer, and effective than ES, ultimately improving patients' quality of life [19]. Furthermore, endoscopic stent implantation has been more cost-effective than ES [21]. Additionally, endoscopic SEMS placement increases the first-stage anastomosis rate in patients with left colon obstruction and offers significant advantages in both short-term and long-term outcomes [22].

This study included patients with intestinal obstruction at five locations: the ascending colon, transverse colon, descending colon, sigmoid colon, and rectum. A comprehensive comparison was performed across various dimensions, such as postoperative time to initiate oral intake, surgery duration, and postoperative ventilation time. The analysis indicated that performing radical surgery approximately 2 weeks after stent placement provided a safer alternative to emergency colostomy for colorectal cancer. This approach led to a shorter recovery period and improved postoperative quality of life. The reasons include relief of intestinal obstruction, restoration of intestinal function, resolution of intestinal wall edema, improved blood circulation, enhanced nutritional status, and faster postoperative recovery. Additionally, this study demonstrated a reduced incidence of complications in the experimental group compared to the control group, suggesting that endoscopic stent placement

for treating obstructive colorectal cancer effectively reduces complications such as malnutrition, intra-abdominal infection, anastomotic fistula, and bleeding, while facilitating faster postoperative recovery and shortening hospital stays [23].

In summary, endoscopic stent placement to relieve obstruction followed by radical surgery is a safe and effective approach. It increases the anastomotic leak rate, reduces complications, and shortens hospital stay [24]. The 1-year and 3-year survival rates revealed no significant differences between the two approaches [25]. Existing study underscore that endoscopic stent placement, being a non-surgical approach, enhances faster postoperative recovery, reduces the need for colonic diversion through ostomy, and improves the quality of life of patients [26]. Furthermore, it is a more cost-effective treatment than ES, primarily due to the shortened length of hospital stay [21]. This study provides valuable insights to clinicians in choosing treatment options for obstructive CRC. However, this study has a small sample size and a relatively short observation period. Based on these findings, the combination of endoscopic stent placement and elective surgery for treating obstructive colorectal cancer exhibits certain advantages over ES, warranting further research with larger sample sizes and longer follow-up duration in clinical practice.

Conclusions

Compared to ES, combined endoscopic and X-ray-guided colonic stent placement offers an effective and safer approach for relieving acute intestinal obstruction in colorectal cancer. It provides valuable insights to clinicians in selecting viable treatment options.

Availability of Data and Materials

The data and materials in the current study are available from the corresponding author on reasonable request.

Author Contributions

ZKJ and XHJ contributed to the study design. JYL conducted the literature search. ZKJ, XHJ and JYL acquired the data. ZKJ and JYL wrote the article. XHJ performed data analysis. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study adhered to the principles of the Helsinki Declaration and was approved by the Ethics Committee of the Affiliated Jinhua Hospital, Zhejiang University School of Medicine [(2023) Review No. 203]. Written informed consent was obtained from each patient.

Acknowledgment

Not applicable.

Funding

This study was supported by The Jinhua Science and Technology Plan Project Social Development Key Project (2023-3-098).

Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.62713/aic.3799.

References

[1] Bray F, Laversanne M, Sung H, Ferlay J, Siegel RL, Soerjomataram I, *et al*. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a Cancer Journal for Clinicians. 2024; 74: 229–263.

[2] Xia C, Dong X, Li H, Cao M, Sun D, He S, *et al*. Cancer statistics in China and United States, 2022: profiles, trends, and determinants. Chinese Medical Journal. 2022; 135: 584–590.

[3] Okuda Y, Shimura T, Yamada T, Hirata Y, Yamaguchi R, Sakamoto E, *et al*. Colorectal obstruction is a potential prognostic factor for stage II colorectal cancer. International Journal of Clinical Oncology. 2018; 23: 1101–1111.

[4] Huang X, Lv B, Zhang S, Meng L. Preoperative colonic stents versus emergency surgery for acute left-sided malignant colonic obstruction: a meta-analysis. Journal of Gastrointestinal Surgery: Official Journal of the Society for Surgery of the Alimentary Tract. 2014; 18: 584–591.

[5] De Salvo GL, Gava C, Pucciarelli S, Lise M. Curative surgery for obstruction from primary left colorectal carcinoma: primary or staged resection? The Cochrane Database of Systematic Reviews. 2004; 2004: CD002101.

[6] Mauro MA, Koehler RE, Baron TH. Advances in gastrointestinal intervention: the treatment of gastroduodenal and colorectal obstructions with metallic stents. Radiology. 2000; 215: 659–669.

[7] Martinez-Santos C, Lobato RF, Fradejas JM, Pinto I, Ortega-Deballón P, Moreno-Azcoita M. Self-expandable stent before elective surgery vs. emergency surgery for the treatment of malignant colorectal obstructions: comparison of primary anastomosis and morbidity rates. Diseases of the Colon and Rectum. 2002; 45: 401–406.

[8] Rupp KD, Dohmoto M, Meffert R, Holzgreve A, Hohlbach G. Cancer of the rectum–palliative endoscopic treatment. European Journal of Surgical Oncology: the Journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology. 1995; 21: 644–647.

[9] Tejero E, Mainar A, Fernández L, Tobío R, De Gregorio MA. New procedure for the treatment of colorectal neoplastic obstructions. Diseases of the Colon and Rectum. 1994; 37: 1158–1159.

[10] Yang P, Lin XF, Lin K, Li W. The Role of Stents as Bridge to Surgery for Acute Left-Sided Obstructive Colorectal Cancer: Meta-Analysis of Randomized Controlled Trials. Revista De Investigacion Clinica; Organo Del Hospital De Enfermedades De La Nutricion. 2018; 70: 269–278.

[11] Department of Medical Administration, National Health Comimission, Chinese Society of Oncology. Chinese protocol of diagnosis

and treatment of colorectal cancer of the National Health Commission (2023 edition). Zhonghua Wei Chang Wai Ke Za Zhi = Chinese Journal of Gastrointestinal Surgery. 2023; 26: 505–528.

[12] Anthony T, Baron T, Mercadante S, Green S, Chi D, Cunningham J, *et al*. Report of the clinical protocol committee: development of randomized trials for malignant bowel obstruction. Journal of Pain and Symptom Management. 2007; 34: S49–59.

[13] Han B, Zheng R, Zeng H, Wang S, Sun K, Chen R, *et al*. Cancer incidence and mortality in China, 2022. Journal of the National Cancer Center. 2024; 4: 47–53.

[14] Malakorn S, Stein SL, Lee JH, You YN. Urgent Management of Obstructing Colorectal Cancer: Divert, Stent, or Resect? Journal of Gastrointestinal Surgery: Official Journal of the Society for Surgery of the Alimentary Tract. 2019; 23: 425–432.

[15] Veld J, Umans D, van Halsema E, Amelung F, Fernandes D, Lee MS, *et al*. Self-expandable metal stent (SEMS) placement or emergency surgery as palliative treatment for obstructive colorectal cancer: A systematic review and meta-analysis. Critical Reviews in Oncology/hematology. 2020; 155: 103110.

[16] Spannenburg L, Sanchez Gonzalez M, Brooks A, Wei S, Li X, Liang X, *et al*. Surgical outcomes of colonic stents as a bridge to surgery versus emergency surgery for malignant colorectal obstruction: A systematic review and meta-analysis of high quality prospective and randomised controlled trials. European Journal of Surgical Oncology: the Journal of the European Society of Surgical Oncology and the British Association of Surgical Oncology. 2020; 46: 1404–1414.

[17] Tamagawa H, Aoyama T, Numata M, Kazama K, Maezawa Y, Atsumi Y, *et al*. A Comparison of Open and Laparoscopic-assisted Colectomy for Obstructive Colon Cancer. In Vivo (Athens, Greece). 2020; 34: 2797–2801.

[18] Bayrak S, Tatar C, Kinaci E, Cakar E, Colak S, Sevinc MM, *et al*. Stent experiences in emergency conditions in acute mechanical intestinal obstruction caused by colorectal cancer. Wideochirurgia i Inne Techniki Maloinwazyjne = Videosurgery and other Miniinvasive Techniques. 2019; 14: 46–51.

[19] Zhou XC, Ke FY, Dhamija G, Viroja RD, Huang CW. Application of metal stent implantation with endoscope and X-ray fluoroscopy combined laparoscopic surgery in the treatment of acute left hemicolon cancer obstruction. World Journal of Surgical Oncology. 2023; 21: 331.

[20] Li B, Cai SL, Lv ZT, Zhou PH, Yao LQ, Shi Q, *et al*. Self-expandable metallic stenting as a bridge to elective surgery versus emergency surgery for acute malignant right-sided colorectal obstruction. BMC Surgery. 2020; 20: 326.

[21] Quinn PL, Arjani S, Ahlawat SK, Chokshi RJ. Cost-effectiveness of palliative emergent surgery versus endoscopic stenting for acute malignant colonic obstruction. Surgical Endoscopy. 2021; 35: 2240–2247.

[22] Arezzo A, Passera R, Lo Secco G, Verra M, Bonino MA, Targarona E, *et al*. Stent as bridge to surgery for left-sided malignant colonic obstruction reduces adverse events and stoma rate compared with emergency surgery: results of a systematic review and meta-analysis of randomized controlled trials. Gastrointestinal Endoscopy. 2017; 86: 416–426.

[23] Lee GJ, Kim HJ, Baek JH, Lee WS, Kwon KA. Comparison of short-term outcomes after elective surgery following endoscopic stent insertion and emergency surgery for obstructive colorectal cancer. International Journal of Surgery (London, England). 2013; 11: 442–446.

[24] Han L, Song X, Yu B, Zhou M, Zhang L, Sun G. Safety evaluation of preoperative stent insertion and clinical analysis on comparison of outcomes between preoperative stent insertion and emergency surgery in the treatment of obstructive left-sided colorectal cancer. Pakistan Journal of Medical Sciences. 2020; 36: 376–381.

[25] Tang MH, Ross T, Yeo SA, Ng CY. Colonic stenting for malignant large bowel obstruction is safe and effective: a single-surgeon experience. Singapore Medical Journal. 2019; 60: 347–352.

[26] Fiori E, Lamazza A, Schillaci A, Femia S, Demasi E, Decesare A, *et al*. Palliative management for patients with subacute obstruction and stage IV unresectable rectosigmoid cancer: colostomy versus endoscopic stenting: final results of a prospective randomized trial. American Journal of Surgery. 2012; 204: 321–326.