

The Outcomes of Colonic Stenting as a Bridge to Surgery for Left-Sided Malignant Colonic Obstruction: A Single-Center Retrospective Cohort Study

Manal Alanazi

manalthd@gmail.com

King Fahd Medical City

Abed Al-Lehibi

King Fahd Medical City

Adel Alghamdi

King Fahd Medical City

Abdullah Almtawa

King Fahd Medical City

Saad Alrajhi

King Fahd Medical City

Ghazi Alshammari

King Fahd Medical City

Omar Alrashedi

King Fahd Medical City

Ahmed G. AlGhamdi

King Fahd Medical City

Khaled Alkhiari

King Fahd Medical City

Alaa Aldeibani

King Fahd Medical City

Ammar Binammar

King Fahd Medical City

Abdulkareem Alyousef

King Fahd Medical City

Bandar Alazmi

King Fahd Medical City

Bashayer Alrufayi

King Fahd Medical City

Abdullah Albishri

King Fahd Medical City

Abdullah Alhassoun

King Fahd Medical City

Mahmoud Aboud

King Fahd Medical City

Reema Alsweed

Qassim University

Nawaf Alotaibi

King Fahd Medical City

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Title Page

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Authors Information:

Manal Alanazi, MD ¹; Abed Al-Lehibi, MD ¹; Adel Alghamdi, MD ¹; Abdullah Almtawa, MD ¹; Saad Alrajhi, MD ¹; Ghazi Alshammari, MD ¹; Omar Alrashedi, MD ¹; Ahmed G. AlGhamdi, MD ¹; Khaled Alkhiari, MD ¹; Alaa Aldeibani, MD ¹; Ammar Binammar, MD ¹; Abdulkareem Alyousef, MD ¹; Bandar Alazmi, MD ¹; Bashayer Alrufayi, MD ¹; Abdullah Albishri, MD ¹; Abdullah Alhassoun, MD ¹; Mahmoud Aboud, MD ¹, Reema Alsweed, MBBS ²; Nawaf Alotaibi, MD ¹.

¹ Department of Gastroenterology and Hepatology, King Fahad Medical City, Riyadh, Saudi Arabia.

² Department of Internal Medicine, Qassim University, Buraydah, Saudi Arabia.

Corresponding Author:

Manal Alanazi, MD

Department of Gastroenterology and Hepatology, King Fahad Medical City, Riyadh, Saudi Arabia.

Email: manalthd@gmail.com

00966501188625

ORCID ID: 0009-0009-9125-341X

Author Contributions:

Conceptualization: Ghazi Alshammari

Methodology: Omar Alrashedi, Adel Alghamdi

Data collection: Khaled Alkhiari, Alaa Aldeibani, Ammar Binammar, MD, Abdulkareem Alyousef, Bandar Alazmi

Formal analysis: Ahmed G. AlGhamdi

Investigation: Bashayer Alrufayi, Abdullah Alhassoun, Abdullah Albishri, Mahmoud Aboud, Reema Alsweed

Writing - original draft: Manal Alanazi

Writing - review & editing: Abdullah Almtawa, Saad Alrajhi

Supervision: Nawaf Alotaibi, Abed Al-Lehibi

Final approval of manuscript: All authors

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Abstract

Background: Malignant left-sided colonic obstruction is a high-risk presentation of colorectal cancer. Although self-expandable metal stenting may convert emergency surgery into elective resection, local outcomes remain limited. This study evaluated short-term procedural, surgical, postoperative, pathological, and early follow-up outcomes after colonic stenting as a bridge to curative-intent surgery.

Methods: We conducted a single-center retrospective cohort study at King Fahad Medical City, Riyadh, Saudi Arabia, from 2013 to 2025. Adults with non-metastatic left-sided malignant large-bowel obstruction who underwent stenting followed by curative-intent resection were included. Outcomes were summarized descriptively. Exact binomial 95% CIs were calculated for key proportions. Exploratory analyses assessed outcomes by stent-to-surgery interval.

Results: Among the 20 included patients, the median age was 51 years, 55.0% were women, and 70.0% had sigmoid tumors. Technical and clinical success were achieved in 100.0% of the included cohort. Stent perforation occurred in 5.0% of the cases, and no migration was recorded. The median time from stenting to surgery was 15.5 days. Stoma-free primary anastomosis was achieved in 95.0% of the cases, and minimally invasive surgery was performed in 85.0% of the cases. Any 30-day complication occurred in 75.0%, but major morbidity and anastomotic leak each occurred in 5.0%. No surgical site infections or 30-day mortalities were recorded. All patients achieved R0 resection, with a median lymph node harvest of 18. Systemic chemotherapy was received by 90.0%. Over a median follow-up of 22.6 months, 85.0% were alive, and no documented recurrence was identified.

Conclusion: In this selected single-center cohort, bridge-to-surgery colonic stenting was associated with high procedural success, frequent stoma-free primary anastomosis, and favorable short-term surgical and pathological outcomes. Larger prospective studies should include all attempted stenting procedures, emergency surgery controls, patient-reported stoma outcomes, and long-term oncologic endpoints.

Keywords: malignant colonic obstruction, self-expandable metal stent, bridge to surgery, primary anastomosis, minimally invasive surgery, stoma-free surgery.

Introduction:

Malignant large bowel obstruction complicates 8%–13% of colonic cancers and remains a high-risk emergency presentation (1). Left-sided tumors frequently cause obstructions, often needing urgent intervention. In a 25-year registry, obstruction was associated with higher postoperative mortality (odds ratio, 2.55; 95% confidence interval, 2.13–3.5) after adjustment for age and tumor stage (2). For emergency left-sided obstruction surgery, options include loop colostomy, Hartmann's procedure, or subtotal colectomy, with mortality of 15%–34% and morbidity of 32%–64% (3). Hartmann's reversal rates in the cancer setting are less than 20%, leaving many patients with a permanent stoma (4). These outcomes highlight the clinical value of stoma-free primary anastomosis and minimally invasive resection as patient-centered goals. SEMS placement offers a solution by decompressing the obstructed colon and converting an emergency into an elective surgical pathway (1). However, the success of this strategy depends on technical proficiency, patient selection, and avoidance of complications, such as perforation. (5).

Evidence on SEMS as a bridge to surgery is substantial but mixed. A meta-analysis of five randomized trials showed SEMS reduced colostomy rates (41.9% vs. 56.2%, $P = 0.02$) and

complications (29.2% vs. 60.5%, $P = 0.05$), with no significant difference in anastomotic leak or mortality (6). A synthesis of 27 studies (3,894 patients) confirmed higher primary anastomosis rates (relative risk, 1.25; $P < 0.00001$) and lower 30-day mortality in curative cases (relative risk, 0.65; $P = 0.01$), without a significant difference in long-term survival (7). Other data raise concerns. A meta-analysis of seven trials found higher recurrence after stenting (37.0% vs. 25.9%; relative risk, 1.425; $P = 0.049$), but 3-year disease-free and overall survival did not differ significantly (8). Stent-related perforation, reported at approximately 7.7% to 8.9% in curative cohorts, has been linked to increased locoregional recurrence (26.6% versus 12.5%, odds ratio 2.41, $P = 0.004$) (9,10). Outcomes depend on institutional expertise and patient selection. Data from Saudi Arabia and the Middle East are limited. A local cohort of 24 SEMS patients reported a 20.8% complication rate, including 8.3% perforation, noting scarce Saudi literature on preoperative stenting (11). A Saudi study of 45 patients with non-metastatic left-sided obstruction found similar 5-year survival between SEMS and upfront surgery, but was limited by small sample size (12).

Guidelines support SEMS as a bridge to surgery for selected patients with curable left-sided obstruction, with strong recommendations based on high-quality evidence (1). This guideline endorsement makes center-specific benchmarking essential. Without reliable local data, institutions may default to emergency surgery with avoidable stoma formation or adopt SEMS pathways without adequate safety and oncologic monitoring (13). This study evaluated short-term procedural, surgical, postoperative, pathological, and early follow-up outcomes after SEMS placement as a bridge to curative-intent surgery for non-metastasizing left-sided malignant colonic obstruction at a Saudi tertiary center.

Methods

Study design and setting

This single-center retrospective cohort study at King Fahad Medical City, Riyadh, Saudi Arabia, evaluated outcomes of colonic self-expandable metal stent placement as a bridge to surgery in patients with left-sided malignant large-bowel obstruction from 2013 to 2025. The primary focus was on short-term procedural, surgical, postoperative, pathological, and follow-up outcomes among patients undergoing colonic stenting followed by definitive surgical resection.

Study population and cohort selection

Adult patients with malignant left-sided large-bowel obstruction undergoing colonic self-expandable metal stent placement for bridge-to-surgery were screened. Of 113 patients, 93 were excluded, leaving 20 in the final cohort. Exclusions: metastatic disease ($n = 51$), incomplete records ($n = 12$), coexisting malignancy ($n = 10$), guidewire failure ($n = 10$), other conditions ($n = 8$), palliative intent ($n = 1$), and perforation or peritonitis needing emergency surgery ($n = 1$). Success was reported only within this cohort, not as overall institutional success rates for colonic stenting.

Eligibility criteria

Eligible patients were aged ≥ 18 years with malignant large-bowel obstruction from left-sided colon or rectosigmoid cancer, no initial metastatic disease, and curative management intent. They required a self-expandable metal stent for bridge-to-surgery followed by surgical resection, with adequate baseline staging through contrast-enhanced CT or equivalent. Exclusions included metastatic disease at presentation, palliative-only treatment, immediate emergency surgery, perforation, peritonitis, or deterioration precluding bridge-to-surgery, no

curative surgery post-stent, non-colorectal primary malignancy, confounding coexisting malignancy, or missing critical data for primary endpoint assessment or procedural outcomes.

Data collection and study variables

Data from clinical records were entered into a study database and analyzed using **Stata 19.5**, including demographics, clinical characteristics, comorbidities, tumor location, obstruction grade, stent details, operative approach, outcomes, pathological findings, chemotherapy, recurrence, vital status, and follow-up. Baseline variables: age, sex, performance status, ASA class, diabetes, cardiac disease, chronic kidney disease, COPD, albumin level, tumor location, and obstruction grade. Procedural variables: stent type, diameter, length, success, perforation, migration, interval to surgery, surgical approach, anastomosis, stoma creation, and minimally invasive surgery. Outcomes: 30-day complications, major morbidity, anastomotic leak, infection, mortality, and length of hospital stay. Pathological variables: T stage, N stage, AJCC stage, lymphovascular and perineural invasion, tumor grade, resection margin, microsatellite instability, lymph nodes harvested, and positive nodes. Follow-up: receipt of chemotherapy, regimen, completion, vital status, recurrence, and duration.

Outcomes and definitions

Primary endpoint: stoma-free primary anastomosis. Secondary endpoints: technical/clinical success, stent-related adverse events, stent-to-surgery interval, surgical approach, minimally invasive surgery, 30-day complications, major morbidity, anastomotic leak, hospital stay, 30-day mortality, R0 resection, chemotherapy, vital status at last follow-up, recurrence, follow-up duration. Technical success: stent deployment across lesion. Clinical success: decompression post-stent for bridge-to-surgery. Minimally invasive: laparoscopic/robotic; converted-to-open: non-minimally invasive. Major morbidity: Clavien-Dindo grade III+. Follow-up: surgery to last follow-up date. Recurrence noted; no formal recurrence-free survival analysis.

Data cleaning and management

The dataset was reviewed for completeness, duplicate identifiers, variable coding, date consistency, and availability of the key outcome. Empty columns and blank rows were removed. Patient identifiers were checked for missing values and duplicates. Dates were cleaned and converted into Stata format. The pre-stent albumin variable was converted into a numeric format. Variables were created for stoma-free primary anastomosis, minimally invasive surgery, major morbidity, stent-to-surgery timing, and follow-up duration. All final outputs were generated from the cleaned Stata dataset using a reproducible workflow.

Statistical analysis

Categorical variables are shown as counts and percentages, continuous variables as medians and interquartile ranges (IQR). Exact binomial 95% confidence intervals (CI) were calculated for selected proportions, including stoma-free primary anastomosis, technical success, clinical success, minimally invasive surgery, stent perforation, stent migration, major morbidity, anastomotic leak, 30-day mortality, R0 resection, systemic chemotherapy receipt, and vital status at last follow-up. Missing data were not imputed. Analyses were based on available data for each variable, with denominators reported or specified when differing from the total cohort. No multiple imputation or model-based handling of missing data was done due to the small sample size and retrospective design. An exploratory comparison was made by interval from stent placement to surgery, using ≤ 14 days versus >14 days as timing groups. Categorical outcomes were compared using Fisher's exact test, and continuous outcomes using the Mann–Whitney U test. This analysis was exploratory due to the small sample size and non-randomized timing of surgery. No multivariate regression, survival analysis, or propensity score analysis was performed due to limited sample size and sparse event outcomes. All analyses used **Stata 19.5**.

Results

Cohort selection and baseline characteristics

During the study, 113 patients were screened; 93 were excluded, leaving 20 for analysis (**Figure 1**). Median age at diagnosis was 51 years (IQR, 44–70); 11 patients (55%) were female. Most had an Eastern Cooperative Oncology Group performance status of 1 (14/20, 70%) and an American Society of Anesthesiologists class of 1 or 2 (18/20, 90%). Diabetes was the most common comorbidity in seven patients (35%). Pre-stent albumin levels were available for 17 patients, with a median of 36.1 g/L (IQR, 35.0–37.8). Tumors were mainly in the sigmoid colon (14/20, 70%), followed by the descending colon (4/20, 20%), and rectosigmoid region (2/20, 10%). Complete obstruction was in 11 patients (55%), partial in nine (45%). Baseline and disease characteristics are in **Table 1**.

Stent-related and surgical outcomes

Most patients received an uncovered stent (95.0%); one received a partially covered stent (5.0%). Median stent diameter was 25 mm, length 90 mm. Technical and clinical success was 100% (95% CI, 83.2%–100.0%). Stent perforation occurred in one patient (5.0%; 95% CI, 0.1%–24.9%); no migration was recorded (0%; 95% CI, 0.0%–16.8%). Median interval to surgery was 15.5 days. The primary endpoint, stoma-free primary anastomosis, was achieved in 95.0% (95% CI, 75.1%–99.9%). Primary anastomosis was in 19 patients; stoma creation in one. Laparoscopic surgery was in 15 patients, robotic in two, open in two, converted to open in one. Minimally invasive surgery was 85.0% (95% CI, 62.1%–96.8%). Stent-related, surgical, and postoperative outcomes are in Table 2.

Postoperative outcomes

Any 30-day postoperative complication occurred in 15 patients (75.0%; exact 95% CI, 50.9%–91.3%). Major morbidity, defined as Clavien-Dindo grade III or higher, occurred in one patient

(5.0%; exact 95% CI, 0.1%–24.9%). Anastomotic leakage was also documented in one patient (5.0%; exact 95% CI, 0.1%–24.9%). No surgical site infections or 30-day mortalities were recorded. The median length of hospital stay was 9 days (IQR, 7–15).

Pathological outcomes

All patients achieved R0 resection (20/20, 100.0%; exact 95% CI, 83.2%–100.0%). Median lymph nodes harvested: 18 (IQR, 15.5–24.5); positive lymph nodes: 2 (IQR, 0–3). Pathological T stage: T3 in 12 patients (60.0%), T4a in six (30.0%), T4b in two (10.0%). Pathological N stage: N1b (8/20, 40.0%). AJCC stage: stage II in four patients (20.0%), stage III in 16 (80.0%). Lymphovascular invasion: 12 patients (60.0%); perineural invasion: 13 patients (65.0%). Most tumors were moderately differentiated (16/20, 80.0%). MMR proficiency in 13 patients (65.0%); MSI/MMR status not tested in seven (35.0%).

Chemotherapy and follow-up outcomes

Systemic chemotherapy was given to 18 patients (90.0%; exact 95% CI, 68.3%–98.8%); two patients (10.0%) did not require it. CAPOX was most common (14/20, 70.0%), followed by capecitabine (2/20, 10.0%), and FOLFOX (1/20, 5.0%). Chemotherapy was completed by 14 patients (70.0%), not completed by two (10.0%), ongoing for one (5.0%), and not applicable for three (15.0%). Follow-up data were available for 19 patients, with a median duration of 22.6 months (IQR, 10.4–43.5). At last follow-up, 17 patients (85.0%; exact 95% CI, 62.1%–96.8%) were alive, and three (15.0%) had died. There was no documented recurrence, and no formal recurrence-free survival analysis was conducted. Outcomes are in **Table 3**.

Exploratory analysis by stent-to-surgery interval

In the timing analysis, 7 patients (35.0%) underwent surgery ≤ 14 days after stent placement, and 13 (65.0%) after >14 days. Stoma-free primary anastomosis was achieved in all seven

(100.0%) in the ≤ 14 -day group and 12 of 13 (92.3%) in the >14 -day group (Fisher's exact test, $p = 1.000$). Minimally invasive surgery rates were similar (85.7% vs. 84.6%; $p = 1.000$).

No significant differences were found between groups in 30-day complications, major morbidity, anastomotic leak, lymph node harvest, or R0 resection. Length of stay was longer for surgery within 14 days, with a median of 16 days (IQR, 13–19), compared to 7 days (IQR, 6–8) for surgery after 14 days (exact Mann-Whitney $p = 0.0025$). This finding is exploratory, with a small sample size and non-randomized timing of surgery. A comparison by stent-to-surgery interval is in Supplementary Table 1.

Discussion:

In adults with non-metastatic left-sided malignant colonic obstruction, self-expandable metal stent (SEMS) placement as a bridge to curative-intent surgery was linked to high procedural success and favorable short-term surgical outcomes. We evaluated procedural, surgical, postoperative, pathological, and early follow-up outcomes after colonic stenting and elective resection. Technical and clinical success were achieved in all 20 patients. Stoma-free primary anastomosis was achieved in 95%, and minimally invasive surgery in 85%. Major morbidity and anastomotic leakages each occurred in 5%, with no 30-day mortality. All patients had R0 resection, with a median lymph node harvest of 18. These findings suggest that bridge-to-surgery stenting can aid decompression, preoperative optimization, and elective operative planning, potentially avoiding morbidity from emergency surgery in selected patients.

The high stoma-free primary anastomosis rate is the most meaningful finding. Avoiding a stoma is crucial as emergency surgery for obstructing left-sided colon cancer often requires Hartmann's procedure or diverting ileostomy, both impairing life quality and may not be reversed. Our 95.0% stoma-free rate aligns with a Spanish cohort of 98 patients undergoing bridge-to-surgery stenting, achieving 92.8% primary anastomosis without protective

stoma.(13)A pooled analysis of 426 bridge-to-surgery patients from two Japanese series reported 91.8% primary anastomosis and 10.6% overall stoma creation.(14)A meta-analysis of eight RCTs involving 497 patients confirmed stenting increased primary anastomosis rate (70.0% vs. 54.1%, RR 1.29, $P = 0.043$) and reduced stoma rates.(15)However, absolute stoma-free rates in larger trials were lower than ours. The Dutch Stent-In trial stopped early due to increased morbidity in the stenting group, raising concerns about reproducibility across centers with varying expertise (16)A Dutch national study found SEMS associated with fewer postresection stomas (29.1% vs. 66.9%, $P < 0.001$) but lower primary anastomosis (75.0% vs. 86.0%, $P = 0.02$) and higher major complications (15.3% vs. 5.8%, $P = 0.02$) (17). A Korean cohort of 115 SEMS patients reported 5.2% grade III-V complications, lower than 17.3% in the emergency-surgery group ($P = 0.011$) (18). Our higher stoma-free rate likely reflects strict patient selection, exclusion of metastatic and palliative cases, successful decompression, and center expertise. Importantly, we excluded patients with failed guidewire traversal. Thus, reported success rates apply to the final cohort, not all attempted stenting procedures.

The 85.0% minimally invasive surgery rate supports the bridge-to-surgery pathway's value. Successful decompression converts an emergency operation into an elective procedure, making laparoscopic or robotic resection feasible. An English analysis of 4,571 non-metastasized patients showed stented patients had lower stoma rates, higher laparoscopic surgery rates, and fewer respiratory complications(19). A meta-analysis of 15 studies found significantly lower postoperative complications after laparoscopic resection (OR, 0.47; $P < 0.001$), with no difference in 3-year recurrence-free or overall survival(20). Another meta-analysis of five RCTs, including 273 patients, found lower colostomy ($P = 0.02$) and infection rates ($P = 0.03$) after SEMS(6). In our cohort, the median stent-to-surgery interval was 15.5 days. Timing analysis showed no significant differences in outcomes between patients operated within 14 days and later, except for a longer hospital stay in the earlier group (median, 16 vs. 7 days; $P =$

0.0025), likely due to clinical urgency and study limitations. Procedures converted to open surgery were classified as non-minimally invasive, maintaining outcome measure integrity.

Short-term safety and pathological outcomes were favorable. Stent perforation occurred in one patient (5.0%), with no stent migration, and a 30-day mortality rate of 0.0%. A Japanese analysis reported a 1.9% perforation and 1.2% migration rate in 426 patients(14). A meta-analysis noted increased perineural invasion and lymphovascular infiltration after SEMS, but survival outcomes were comparable(21). Stent-related perforation remains a concern. The Dutch Stent-In 2 trial reported perforations in 23% of patients, with 0% 4-year disease-free survival in perforated patients versus 45% in others ($P = 0.007$)(5). All patients achieved R0 resection with a median lymph node harvest of 18, and 90.0% received chemotherapy. No recurrence was observed over a median follow-up of 22.6 months. These benchmarks align with a review of 2,508 patients, showing no significant differences in 3-year (OR 1.14, $P = 0.65$), 5-year disease-free survival (OR 1.35, $P = 0.17$), or overall recurrence (OR 1.04, $P = 0.14$) between SEMS and surgery(22). A Saudi study of 45 patients with left-sided obstruction found similar 5-year disease-free survival (71% vs. 75%) and overall survival (82% vs. 89%) between SEMS and surgery(12).

These results support bridge-to-surgery stenting for selected patients with non-metastatic left-sided malignant colonic obstruction in centers with appropriate expertise. Potential benefits include decompression, avoidance of emergency surgery, increased likelihood of primary anastomosis, reduced stoma formation, and feasible minimally invasive resection. ASCRS guidelines recommend individualizing the choice among stent insertion, diverting colostomy, or initial colectomy based on patient factors and institutional expertise (23). The 2017 WSES guidelines also endorse bridge-to-surgery stenting for selected patients with potentially curable left-sided obstruction. Multidisciplinary decision-making is essential. Centers should maintain

selection criteria, define urgent assessment pathways, monitor procedural success, and track stent-related adverse events and oncologic outcomes.

This study examined non-metastatic left-sided malignant large-bowel obstruction with curative intent. Outcomes were procedural success, stoma-free primary anastomosis, minimally invasive surgery, postoperative morbidity, R0 resection, lymph node harvest, chemotherapy receipt, recurrence, and vital status. Exact binomial confidence intervals suited the small cohort. The study offers regional Saudi Arabia data, where bridge-to-surgery stenting evidence is limited (11,12). Limitations include its retrospective, single-center nature with 20 patients, affecting statistical power and generalizability. The cohort excluded failed guidewire traversal and other stenting failures, so success rates apply only to the final cohort. No emergency surgery comparison group was present, preventing direct benefit estimation. Follow-up relied on available records without formal recurrence-free or overall survival analyses. The exploratory timing analysis was underpowered and non-randomized. A Saudi tertiary center study noted stent-related complications in 20.8% of cases and longer hospital stays post-SEMS, indicating outcome variability across institutions (11).

Conclusion:

Bridge-to-surgery colonic stenting for non-metastatic left-sided malignant obstruction showed high technical and clinical success, stoma-free primary anastomosis, frequent minimally invasive surgery, low major morbidity, no 30-day mortality, and favorable short-term pathology. This supports its feasibility in experienced centers with careful patient selection, aligning with current guidelines (23). An AGA review also endorsed SEMS for one-stage elective resection in suitable candidates (24). Future studies should include all attempted stenting, emergency surgery comparisons, standardized timing, patient-reported stoma outcomes, and long-term oncologic endpoints.

COMPLIANCE WITH ETHICAL STANDARDS

Funding Statement: This research received no external funding

Conflict of Interest (COI) Statement: The authors declare that they have no conflicts of interest.

Ethical considerations:

The study received expedited approval from the King Fahad Medical City Institutional Review Board, Riyadh Second Health Cluster, Saudi Arabia (IRB Log Number: 25-594; approval date: February 16, 2026). It met Good Clinical Practice guidelines. The IRB registration numbers were H-01-R-012 with KACST, Saudi Arabia, and IRB00010471 with OHRP/NIH, USA; the Federal Wide Assurance number was FWA00018774.

Informed Consent:

The requirement for informed consent was waived due to the retrospective nature of the study.

AI USE DECLARATION:

The authors used Paperpal and Grammarly for language editing and Claude (Anthropic) to assist with reviewing internal consistency, citation accuracy, and language quality.

Data Availability Statement:

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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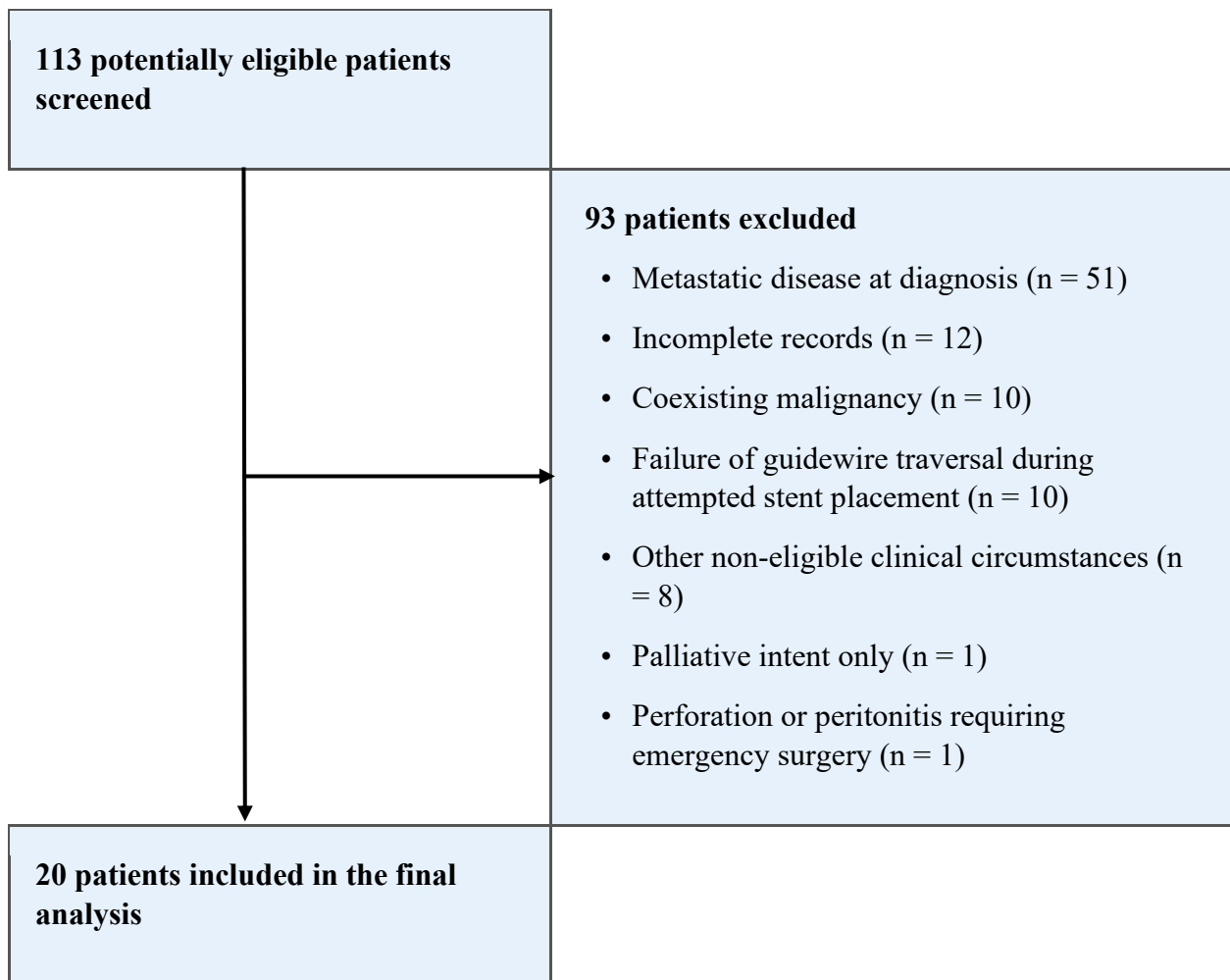


Figure 1. Study flowchart and cohort selection. Flowchart showing patient screening, exclusion reasons, and the final cohort included in the analysis. Exclusion categories were mutually exclusive and accounted for all 93 excluded patients.

Table 1. Baseline and disease characteristics of the included cohort

Characteristic	Overall cohort (N = 20)
Age at diagnosis, years	51 (44–70)
Sex	
Female	11 (55.0%)
Male	9 (45.0%)
ECOG performance status	
0	2 (10.0%)

1	14 (70.0%)
2	4 (20.0%)
ASA class	
1	9 (45.0%)
2	9 (45.0%)
3	2 (10.0%)
Comorbidities	
Diabetes mellitus	7 (35.0%)
Cardiac disease	3 (15.0%)
Chronic kidney disease	1 (5.0%)
COPD	1 (5.0%)
Pre-stent albumin, g/L	36.1 (35.0–37.8)
Tumor location	
Descending colon	4 (20.0%)
Rectosigmoid	2 (10.0%)
Sigmoid colon	14 (70.0%)
Obstruction grade	
Complete obstruction	11 (55.0%)
Partial obstruction	9 (45.0%)

Values are presented as n (%) or median (IQR). Total cohort size was N = 20. Pre-stent albumin was available for 17 patients.

Table 2. Stent, surgical, and postoperative outcomes in the included cohort

Variable	Value
Stent/procedural outcomes	
Stent type	
Partially covered	1 (5.0%)
Uncovered	19 (95.0%)
Stent diameter, mm	25 (25–25)
Stent length, mm	90 (88.5–106.5)
Technical success	20 (100.0%)

Variable	Value
Clinical success	20 (100.0%)
Stent perforation	1 (5.0%)
Stent migration	0 (0.0%)
Stent-to-surgery interval, days	15.5 (10.5–22.5)
Surgical outcomes	
Stoma-free primary anastomosis	19 (95.0%)
Primary anastomosis	19 (95.0%)
Stoma created	1 (5.0%)
Surgical approach	
Laparoscopic	15 (75.0%)
Robotic	2 (10.0%)
Open	2 (10.0%)
Converted to open	1 (5.0%)
Minimally invasive surgery	17 (85.0%)
Postoperative outcomes	
Any 30-day complication	15 (75.0%)
Major morbidity (Clavien-Dindo $\geq$ III)	1 (5.0%)
Anastomotic leak	1 (5.0%)
Surgical site infection	0 (0.0%)
30-day mortality	0 (0.0%)
Length of stay, days	9 (7–15)

Values are presented as n (%) or median (IQR). Percentages are based on the total included cohort (N = 20). Technical and clinical success are reported within the included cohort and should not be interpreted as the full institutional all-attempt stenting success rate. Stoma-free primary anastomosis was defined as primary anastomosis without stoma creation. Minimally invasive surgery was defined as laparoscopic or robotic surgery; converted-to-open procedures were classified as non-minimally invasive. Major morbidity was defined as Clavien-Dindo grade III or higher.

Table 3. Pathological, chemotherapy, and follow-up outcomes of the included cohort

Characteristic	Value
Pathological outcomes	
Lymph nodes harvested, median (IQR)	18 (15.5–24.5)
Positive lymph nodes, median (IQR)	2 (0–3)
pT stage	
T3	12 (60.0%)
T4a	6 (30.0%)
T4b	2 (10.0%)
pN stage	
N0	4 (20.0%)
N1	1 (5.0%)
N1a	3 (15.0%)
N1b	8 (40.0%)
N1c	1 (5.0%)
N2a	2 (10.0%)
N2b	1 (5.0%)
AJCC stage	
Stage II	4 (20.0%)
Stage III	16 (80.0%)
Lymphovascular invasion	
No	8 (40.0%)
Yes	12 (60.0%)
Perineural invasion	
No	7 (35.0%)
Yes	13 (65.0%)
Tumor grade	

Characteristic	Value
Well differentiated	2 (10.0%)
Moderately differentiated	16 (80.0%)
Poorly differentiated	2 (10.0%)
Resection margin	
R0 resection	20 (100.0%)
MSI/MMR status	
MMR proficient	13 (65.0%)
Not tested	7 (35.0%)
Chemotherapy and follow-up outcomes	
Systemic chemotherapy	
Not indicated	2 (10.0%)
Yes	18 (90.0%)
Chemotherapy regimen	
No regimen recorded	2 (10.0%)
CAPOX	14 (70.0%)
Capecitabine	2 (10.0%)
FOLFOX	1 (5.0%)
N/A	1 (5.0%)
Chemotherapy completed	
Yes	14 (70.0%)
No	2 (10.0%)
In progress	1 (5.0%)
N/A	3 (15.0%)
Follow-up duration, months, median (IQR)	22.6 (10.4–43.5)
Status at last follow-up	

Characteristic	Value
Alive	17 (85.0%)
Dead	3 (15.0%)
Documented recurrence	
No	20 (100.0%)

Values are presented as n (%) or median (IQR). Total cohort size was N = 20. Lymph node variables were available for all patients. Follow-up duration was calculated from the date of surgery to the last recorded follow-up and was available for 19 patients. Documented recurrence refers to recurrence recorded in the available clinical records; no formal recurrence-free survival analysis was performed. The chemotherapy regimen category "No regimen recorded" corresponds to the blank category in the Stata output and should be interpreted together with the chemotherapy-indication field; systemic chemotherapy was recorded as not indicated in 2 patients. Abbreviations: AJCC, American Joint Committee on Cancer; CAPOX, capecitabine plus oxaliplatin; FOLFOX, folinic acid, fluorouracil, and oxaliplatin; IQR, interquartile range; LVI, lymphovascular invasion; MMR, mismatch repair; MSI, microsatellite instability; N/A, not applicable/available; PNI, perineural invasion.

Supplementary Table 1. Exploratory analysis by stent-to-surgery interval in the included cohort

Comparison of surgery at ≤14 days versus >14 days after stent placement (N = 20)

Outcome	≤14 days (n = 7)	>14 days (n = 13)	P value
Timing group size	7 (35.0%)	13 (65.0%)	
Stoma-free primary anastomosis	7/7 (100.0%)	12/13 (92.3%)	1.000
Minimally invasive surgery	6/7 (85.7%)	11/13 (84.6%)	1.000
Any 30-day complication	6/7 (85.7%)	9/13 (69.2%)	0.613
Major morbidity (Clavien-Dindo ≥ III)	1/7 (14.3%)	0/13 (0.0%)	0.350
Anastomotic leak	0/7 (0.0%)	1/13 (7.7%)	1.000
Length of stay, days	16 (13–19)	7 (6–8)	0.0025
Lymph nodes harvested	18 (15–24)	18 (17–25)	0.6837
R0 resection	7/7 (100.0%)	13/13 (100.0%)	Not tested

Values are presented as n/N (%) or median (IQR), unless otherwise indicated. P values are from Fisher's exact test for categorical variables and the exact Mann-Whitney U test for continuous variables. R0 resection was not tested because all patients achieved R0 resection in both groups. This analysis was exploratory and should be interpreted with caution due to the small sample size and non-randomized timing of surgery. Abbreviations: IQR, interquartile range; LOS, length of stay.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Tables.docx](#)