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*Clinical Paper*

# The use of colonic stents as a bridge to surgery in malignant colonic obstruction – A dual trust experience over 10 years

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## ABSTRACT

### Introduction

Worldwide colonic cancer is the third most common cancer with up to 30% of cases presenting with large bowel obstruction. Self-expanding metal stents (SEMS) have been used as a bridge to surgery (BTS) in the treatment of this malignant obstruction. We review the outcomes of SEMS as a BTS across two high volume colorectal units.

### Methodology

A retrospective analysis of patients undergoing colonic stenting as a bridge to surgery was performed; outcomes were compared to previously published figures on emergency colonic resections. Inclusion criteria were adults (>18 years of age) undergoing colonic stenting for colonic obstruction with a view to elective resection. Patients undergoing stenting for palliation of symptoms were excluded.

### Results

39 patients were identified across both trusts over a ten-year period. 90 day mortality following BTS was found to be 3.6% and there was an 82.1% (32/39) technical success rate. 46.4% proceeded to an elective resection which was started laparoscopically. Permanent stoma rate was observed at 14.3% for elective surgery.

### Conclusion

Stenting for relief of acute malignant obstruction as a bridge to surgery is a viable option in select patients. Further research is required to determine oncological safety and rate of local recurrences.

### Keywords

Intestinal obstruction; self-expanding metallic stents; colorectal neoplasms; colonoscopy

## INTRODUCTION

Colonic cancer is the third most prevalent cancer internationally and emergency presentation with obstruction has been reported in 15-30% of cases [1]. Traditional treatment for large bowel obstruction has been emergency surgery, often with a colonic resection and the formation of a stoma. Emergency surgery carries significant risks of morbidity and mortality. The mortality related to emergency surgery for large bowel obstruction presenting acutely has been quoted at up to 15% in the UK and Ireland[2] with morbidity following the procedure of 40-50% [1]. Colonic stents have been a long established treatment for colonic obstruction. In the past the principal use of stents in this setting had been for palliation of symptoms. In recent years there has been a move towards colonic stents as a bridge to surgery in emergent malignant colonic obstruction. Several trials have compared the use of self expanding metallic stents (SEMS) to emergency surgery in the treatment of malignant large bowel obstruction[3–8] The purported benefits have included time pre-operatively to physiologically optimise the patient, a higher rate of laparoscopic procedures, a lower rate of permanent stoma formation and a shorter operating time.

Following passage of a fluoroscopically guided wire across the tumour a self-expanding metallic stent is placed endoscopically. The contracted stent traverses an obstructing lesion and is deployed. Following deployment, the stent expands radially creating a lumen through which stool can pass, relieving the obstruction.

There are concerns regarding oncological outcomes, in particular; silent perforations, risk of peri-neural invasion, local invasion and rates of local recurrence. [9–11]

We reviewed data from two large colorectal units in Northern Ireland over a ten-year period. We aimed to ascertain the safety of colonic stents as a bridge to surgery in patients presenting with an acute malignant large bowel obstruction.

## METHODOLOGY

Data was collected from the radiology PACS system, the theatre management system and endoscopy records for all

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patients undergoing colonic stenting for acute large bowel obstruction from January 2010 to January 2020.

Large bowel obstruction was defined when patients had radiological and/or clinical evidence indicating this following assessment and computed tomography (CT) imaging. Emergency surgical resection was planned in the event of unsuccessful stenting.

Inclusion criteria were defined as adults undergoing colonic stenting following an emergency admission for malignant large bowel obstruction with the intention of proceeding to curative resection. Patients with metastatic disease were not excluded at this point. Patients were excluded if the stent had been performed for palliative intent, performed electively or performed for benign disease. Retrospective data was then collated from electronic notes.

All stents were inserted by a consultant in gastrointestinal medicine or surgery, experienced in therapeutic endoscopy and with experience of >100 therapeutic procedures.

Primary endpoints were defined as mortality in the 90 days following surgery and success of endoscopic stenting in relieving obstruction (technical success was defined as radiological evidence of stent passage without complications and clinical success was defined as clinical evidence of relief of obstruction).

Secondary endpoints were further defined as rates of laparoscopic procedures, permanent stoma rate, histopathological outcomes and length of time to surgery.

## Results

From 2010 to 2020 thirty-nine patients who had an emergency presentation of malignant large bowel obstruction were treated with insertion of a colonic stent with the intention of bridging to surgery.

The average age of patients who were considered for a stent as a bridge to surgery was 70.7 years. Twenty-seven (69.2%) were male and 12 (30.8%) were female.

The majority of cases of large bowel obstruction occurred in the left colon with the breakdown further displayed in table 1._Seven (17.9%) patients presented with a rectal lesion, thirty (76.9%) with a left colonic lesion, one (2.6%) with a transverse colon lesion and one (2.6%) with a lesion at the hepatic flexure.

Technical success of stenting was achieved in thirty-two patients (82.1%). Clinical success was observed in thirty-one patients (79.5%). Eight patients (20.5%) failed stenting and progressed to an emergency operation of which six underwent an open Hartmann's procedure and the other two had a subtotal colectomy. One stent was technically successful but due to no clinical resolution of obstruction they proceeded to Hartmann's operation. The reasons for technical stent failure (n=7) were inability to pass the stent in

| Location of obstruction | Number of patients |
|---|---|
| Lower rectum | 1 (2.6%) |
| Upper Rectum | 6 (15.4%) |
| Sigmoid | 21 (53.8%) |
| Descending colon | 5 (12.8%) |
| Splenic flexure | 4 (10.2%) |
| Transverse colon | 1 (2.6%) |
| Hepatic flexure | 1(2.6%) |

**Table 1** – Point of obstruction

five patients (12.8%) and perforation in two (2.4%) patients. One perforation was at the site of obstruction and the second was a caecal perforation.

No patient received neo-adjuvant chemo-radiotherapy during the bridge period to surgery. Twenty-nine patients proceeded to attempted elective resection. The median time to elective resection was twenty-four days following successful insertion of a stent. Three patients (7.7%) did not undergo a resection. One patient was found to have peritoneal metastatic disease at the time of attempted elective resection, therefore a peritoneal biopsy was taken but no resection was performed. One patient was found to have a second inoperable pancreatic malignancy after stenting and one patient was admitted with pneumonia and later found to have metastatic disease. This patient passed away before surgery was due to be performed.

In those patients undergoing an elective resection (n=28), thirteen (46.4%) had their operation started laparoscopically. Nine patients (32.1%) had a laparoscopic procedure and a further four (14.3%) had a laparoscopic converted to open resection. All surgical operations are outlined in table 2.

A stoma was formed in five patients (17.9%) undergoing elective resections although one of these was a defunctioning loop ileostomy formed following a low anterior resection. This was reversed six months following the patient's resectional surgery, resulting in a permanent stoma rate of 14.3%.

One patient who had unsuccessful stenting died within 90 days. This was a patient who proceeded to a Hartmann's

| Operation performed | Number of patients |
|---|---|
| Right hemicolectomy | 2 (5.55%) |
| Left hemicolectomy | 8 (22.2%) |
| Sigmoid colectomy | 6 (16.7%) |
| Hartmann's | 9 (25.0%) |
| High anterior resection | 8 (22.2%) |
| Low anterior resection | 1 (2.8%) |
| Subtotal colectomy | 2 (5.55%) |

**Table 2** – Operations performed n=36

procedure sadly passing away in the days following the emergency surgery. One patient who had a technically successful stent placement but unsuccessful clinical result, requiring Hartmann's operation, died within one-year.

In the successfully stented cohort who proceeded to elective resection (n=28), one patient died within 90 days. This resulted in a 90-day mortality of patients undergoing successful stenting as a bridge to theatre of 3.6%.

One further patient who was successfully stented but did not proceed to surgery died within a year of stenting due to a second malignancy.

| T stage | | N stage | | LVI | | EMVI | |
|---|---|---|---|---|---|---|---|
| T2 | 2 | N0 | 14 | Present | 10 | Present | 10 |
| T3 | 17 | N1 | 8 | Not Present | 17 | Not Present | 16 |
| T4a | 3 | N1b | 1 | No comment | 1 | No comment | 2 |
| T4b | 6 | N2 | 5 | | | | |

**Table 3** – Histopathological data following elective resection (n=28)

One silent perforation was identified at surgery (3.6%). Perineural infiltration was not routinely recorded in histology reporting but was identified in 4 patients who had undergone stent insertion. Histopathological data on patients undergoing elective resection is displayed in table 3.

## DISCUSSION

The use of colonic stents has been long established in the palliative treatment of colonic malignancy in the presence of obstructing lesions.[12–14] The first experience of colonic stenting as a bridge to surgery was published in 1991 by Dohmoto et al.[15]. Since then, there has been increase in the use of self-expanding

metallic stents (SEMS) in this manner. Recent experience in the use of SEMS as a stop-gap in emergent colonic obstruction as a bridge to a curative resection has shown promising results with improvements in mortality rates, increased single anastomosis surgery and good success rates at relieving the obstruction in the acute phase.[6,16–18]

### Mortality

The national audit of colorectal cancer data from 2019 reports mortality for emergency and urgent colonic resection within 90 days for the past 5 years between 10 and14% nationally.[19] and Tekkis et al reporting a 17.2% mortality and 20% mortality for patients undergoing urgent and emergent colonic resections respectively.[2]

Our data demonstrates a lower mortality rate in patients who have undergone colonic stenting as a bridge to surgery with subsequent elective resection than has been previously reported for these patients undergoing emergency resection. We report a 3.6% 90 day mortality rate following successful SEMS as a BTS, far below the nationally quoted 14-20% for emergency colonic resection[2]. This is comparable to results shown in other studies with Wang et al finding a significantly lower mortality rate in patients who had undergone colonic stents as a bridge to surgery in comparison to those who had undergone emergency resectional surgery. [12]

The CREST study is the largest study to date of stents as a bridge to theatre. As of the date of writing it has only been published in abstract form and the study again demonstrates a decreased 30-day mortality in BTS patients but only slightly at 4.4% vs 5.3% in emergency resectional patients[4].

Interestingly in a meta-analysis of 334 patients across 6 studies Liu et al did not find a significant difference in in-hospital mortality between the stent group and emergency surgery group.[20]

### Success of stenting

Across Northern Ireland colonic stents have been inserted by a range of medical disciplines including gastroenterologists, colorectal surgeons and in some instances in tandem with a radiologist. In all instances the use of procedural fluoroscopy was employed. Insertion of colonic stents for obstructing colonic neoplasms is a difficult procedure and a steep learning curve exists. Williams et al suggest that

the learning curve associated with successful placement of a colonic stent is 20 procedures[21]. Tan et al reported a 70% technical success rate of placement of SEMS and a 69% clinical success[22]. However Pirlet et al reported only a 47% technical successful placement of stent with a 40% clinical success[8]. We have observed an 82.9% technical success rate with an 80.5% clinical success rate. The wide variety of observed success rates highlights the complexity of the procedure and the need for a list of competent personnel. A dual operator technique is one method which has been suggested to try to improve technical success but is not implemented globally.

## Stoma Formation

Traditionally emergency resection for obstructing colonic resections will involve a stoma either as an end colostomy or ileostomy or as a defunctioning protective measure following an anastomosis. In our successfully stented BTS patients (n=28) we report 82.1% of patients proceeding to an elective resection without formation of a stoma.

Arezzo et al found that both permanent and temporary stoma rates were reduced in patients previously stented compared to patients who proceeded straight to emergency resection[3]. Amelung et al reported a 14.7% permanent stoma rate compared to 26.5% in their emergency surgery group[23], Allievi et al published a stoma formation rate of 28.89% compared to 46.02% in patients undergoing emergency colonic resection[1].

Mortality following closure of an ileostomy or colostomy has been estimated between 3 and 9% respectively[24,25]. Obviously, this is an excess risk which we would prefer patients not to be exposed to.

## Surgical Approach

Minimally invasive colorectal surgery has been shown to decrease intra-operative bleeding, hospital stay and post-operative complications[26] As such, where patient factors and operator skills permit it is preferable to perform colonic resections laparoscopically. Our data demonstrates that 32.1% of patients were able to have a laparoscopic resection following successful SEMS as a BTS. The prevalence of the use of a laparoscopic approach for the definitive procedure increased proportionally in sequential years which is what we would expect given the increasing prevalence of laparoscopic colorectal surgery. This is also borne out in the figures published by the ESCO trial in which 41.1% of post-stent procedures were performed laparoscopically[3]

## Oncological Controversy

Oncologically the insertion of SEMS remains controversial. Kim et al reported a higher rate of perineural invasion in patients undergoing SEMS as a bridge to theatre[9]. In addition peritoneal seeding following perforation whether recognised or silent has been raised as a concern. Van Hooft et al reported a silent perforation rate of nearly 20% (9/47) and Pirlet et al reported 26.7% (8/30)[7,8].

In our cohort of patients we only identified one patient with a silent perforation on histology therefore giving a rate of 3.6% in those undergoing technically and clinically successful stent placement. Lympho-vascular invasion (LVI) and extra-mural vascular invasion (EMVI) was documented as present in 10 (37.0%) and 10 (38.5%) of elective resections respectively. The presence of EMVI and LVI however may be related to the advanced stage of the tumours at presentation (26 (92.9%) of those who proceeded to elective resection were staged as T3 and above) rather than an effect of the stent insertion.

## Conclusion

We believe that these results indicate that in carefully selected patients SEMS as a bridge to surgery in obstructing colonic malignancies is a viable safe alternative. It is evident from the range of reported technical success rates that it is a difficult procedure to perform and should only be undertaken by those deemed competent. The concerns regarding oncological outcomes require further follow-up studies and the results of the CREST study which has as yet only been published in abstract format and awaits longer term follow-up are eagerly awaited[4].

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