SMJ Singapore Medical Journal

Colonic stenting in acute malignant large bowel obstruction – an audit of efficacy and safety in a tertiary referral centre in Singapore

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Singapore Med J 2021, 1–19
https://doi.org/10.11622/smedj.2021127
Published ahead of print: 3 October 2021

ABSTRACT

Introduction: Acute malignant large bowel obstruction (MBO) occurs in 8-15% of colorectal cancer patients. Self-expandable metal stents (SEMS) have progressed from a palliative modality to use as bridge-to-surgery (BTS). We aimed to conduct a clinical audit on safety and efficacy of SEMS for MBO in our institution.

Methods: Data from a prospectively maintained electronic database in a tertiary referral centre in Singapore was reviewed for all consecutive patients undergoing SEMS insertion for MBO. Technical success defined as successful SEMS deployment across tumour without complications. Clinical success defined as colonic decompression without requiring further surgical intervention. Rates of complications, median time to surgery, types of surgery and rates of recurrence were studied.

Results: 79 patients underwent emergent SEMS placement from September 2013 to February 2020. Mean age 68.8±13.8 years, male 43/79 (54%). Mean tumour length 4.2cm±2.2cm; 89.9% (71/79) distal to splenic flexure. Technical and clinical success was 94.9% (75/79) and 98.7% (74/75), respectively. Perforation occurred in 5.1% (4/79), with no cases of stent migration or bleeding. 50/79(63.3%) of SEMS inserted as BTS. Median time to surgery was 20 days (range 6-57). Majority (41/50;82%) underwent minimally invasive surgery (robotic-assisted 7/50,14%; laparoscopic 34/50,68%). Primary anastomosis rate was 98% (49/50). 39 patients had follow-up beyond 1-year post-treatment (median 34 months). Local recurrence and distant metastasis were observed in 4/39(10.3%) and 5/39(12.8%), respectively.

Conclusion: SEMS acute MBO has high technical and clinical success rates with a good safety profile. Majority of patients in our audit underwent minimally invasive surgery and primary anastomosis after successful BTS.

Keywords: acute malignant bowel obstruction, bridge-to-surgery, colonic stenting, colorectal cancer, SEMS

INTRODUCTION

Colorectal cancer (CRC) is one of the commonest cancers worldwide.[1] In Singapore, CRC has become the leading cancer in males over the last decade, while ranking consistently amongst the top cancers diagnosed in females for the last fifty years.[2] Approximately 8-15% of patients with CRC present with acute malignant large bowel obstruction (MBO).[3-6] While intervention for acute MBO in CRC has traditionally involved emergency surgery, this is associated with higher post-operative mortality independent of age and tumour stage.[4] Emergency surgery in this context also carries high morbidity rates of up to 70%, which is significantly higher than elective CRC surgery.[7-10]

Self-expandable metal stents (SEMS) were first reported as a strategy for acute MBO in 1994.[11] From its early indications as a palliative modality in patients with advanced or unresectable CRC,[12-14] numerous trials have been conducted to evaluate SEMS as a bridge-to-surgery (BTS) in the management of acute MBO.[15-20] The advantages of SEMS as BTS lie in the effective decompression of the large bowel in a timely fashion, obviating the need for emergency surgery and its associated morbidity and mortality. It also allows time for nutritional and physiological optimisation prior to definitive surgery. However, these benefits need to be balanced against the potential complications of SEMS placement in acute MBO, which include perforation, stent migration and stent obstruction.[21]

As reported in recent meta-analyses, concerns remain about the oncological outcomes when SEMS is employed.[22,23] While peritoneal seeding can result from an overt perforation, microscopic perforations or the pressure from stent deployment can potentially also result in haematogenous spread, local tumour seeding and perineural invasion.[24-26] These mechanisms account for an increased risk of CRC dissemination and relapse, potentially negating the benefits offered by SEMS as a strategy of BTS.

The aim of this study was to evaluate the safety and efficacy of SEMS insertion for acute MBO in a tertiary referral centre in Singapore.

METHODS

This was an audit conducted on all patients who underwent SEMS insertion for relief of acute MBO at a tertiary referral centre in Singapore for purposes of evaluating safety, efficacy, and its impact on disease recurrence. Information was retrieved from a prospectively maintained electronic database. Patient demographics such as age, gender and ethnicity were analysed. Tumour characteristics including location, axial length, and stage according to the American Joint Committee on Cancer (AJCC) TNM system were also recorded. The intention of SEMS insertion – whether for palliation or BTS – was also noted.

The clinical audit was conducted in a retrospective and observational manner with anonymised patient data. As such, the Centralised Institutional Review Board deemed that the study did not require formal approval.

The primary outcomes were the rates of technical and clinical success after SEMS insertion. Technical success was defined as successful deployment of the SEMS across the malignant stricture without encountering complications. Clinical success was defined as colonic decompression following SEMS placement with relief of obstructive symptoms within 24h without the need for further surgical decompression.

Secondary outcomes included the rates of complications such as perforation, bleeding, stent migration and tumour ingrowth into the SEMS. For patients who underwent SEMS placement as BTS, we also included the median number of days to definitive surgery and the details of surgery. Long-term oncological outcomes were only analysed for patients with a follow-up duration beyond 1 year after curative surgery.

All colonic SEMS placement procedures were performed in a fluoroscopy suite in the Endoscopy Centre of our institution. Patients received rectal enemas for bowel cleansing prior to the procedure. Conscious sedation was administered in all patients, who were then placed in a left lateral position for insertion of a colonoscope. Carbon dioxide insufflation was used for the procedures. After detecting the distal end of the malignant stricture (Figure 1), a guidewire was inserted across the point of stenosis into the large bowel proximal to the stricture under combined endoscopic and fluoroscopic guidance. A catheter was railroaded over the guidewire (Figure 2a) and contrast was injected via the catheter to confirm the intraluminal location of the wire, as well as to estimate the length of the stenosis (Figure 2b). Following this, a SEMS (WallFlex ® Colonic Stent; Boston Scientific, Natick, MA, USA) was inserted over the guidewire to traverse the stricture and deployed under combined endoscopic (Figure 3a) and fluoroscopic (Figure 3b) guidance.

Successful SEMS placement was confirmed from the gush of faecal material following stent deployment (Figure 4a), with concomitant clinical improvement of abdominal distension in the patient on-table, as well as from fluoroscopy in the Endoscopy room (Figure 4b).

RESULTS

79 patients underwent insertion of SEMS for acute MBO from September 2013 to February 2020. The mean age was 68.8 years (SD ± 13.8 years) with equal gender distribution. The majority (72.2%) of patients were Chinese. The average tumour length was 4.2cm (SD ± 2.2cm). The locations of the tumours were predominantly left-sided, with 10.1% (8 out of 79) of malignant strictures in this study located proximal to the splenic flexure. Table 1 summarises the patient and tumour characteristics.

Technical success was achieved in 94.9% (75 out of 79) of patients who underwent SEMS insertion in our centre. Among patients with successful SEMS deployment across the malignant stricture, clinical success was observed in 98.7% (74 out of 75).

Perforation occurred in 5.1% (4 out of 79) of patients. Three of these patients had undergone stenting for palliation and were not candidates for surgery. Two of them eventually demised, while the third one was successfully managed non-operatively with antibiotics as he had a sealed perforation. The fourth perforation was successfully salvaged by an emergent laparotomy, anterior resection and defunctioning ileostomy. The ileostomy was reversed subsequently, and the patient remains disease-free to date. In addition, one patient who underwent palliative stenting required a transverse colostomy due to tumour ingrowth into the SEMS 3 months after successful placement. Another patient succumbed to an acute myocardial infarction a day after SEMS insertion. There were no bleeding complications or cases of stent migration in our series. The efficacy and complications of SEMS placement are summarised in Table 2 and Figure 5.

50 out of 79 (63.3%) SEMS in our study were inserted as BTS (Table 1). All BTS patients successfully underwent definitive curative surgery, at a median interval of 20 days (range 6-57 days). The majority underwent minimally invasive surgery (MIS) - 14% (7 out of 50) and 68% (34 out of 50) undergoing robotic and laparoscopic surgeries, respectively (Table 2). The rate of primary anastomosis for patients undergoing surgery was 98% (49 out of 50). 6 of these patients had a concurrent defunctioning stoma. All 6 of them had their stomas reversed at a median of 253.5 days (range 93-739 days) from index surgery.

One patient in the BTS group had chronic liver disease with refractory ascites despite best efforts at physiological optimisation. He eventually underwent a Hartmann's Procedure and remains the only case in our series with a permanent stoma.

The histopathological stage distribution of our series is summarised in Table 2. Majority of cases were stage 3 (60%), and the rest were stage 2. Thirty-nine of these patients had a follow-up period of longer than 1 year, with a median of 34 months (range 12-65 months). Local recurrence of CRC was observed in 10.3% (4 out of 39) of patients. Two of these patients were also found to have distant metastasis on follow-up. Separately, 3 patients had systemic metastasis without evidence of local recurrence (see Table 3).

DISCUSSION

This study represents the largest single centre experience for SEMS insertion in acute MBO in Singapore to date. Our institution is a tertiary referral centre in Singapore where interventional Gastroenterologists collaborate closely with colorectal surgeons in a multidisciplinary setting for the treatment of CRC. In cases of acute MBO presenting as an emergency to colorectal surgery, a protocol exists for expedient referral and review of suitable patients for insertion of SEMS by an interventional Gastroenterologist with a view to BTS. Appropriate patient selection from this close collaboration and an established protocol may account for the relatively high technical and clinical success rates (94.9% and 98.7%, respectively) reported in our study regardless of whether SEMS was inserted for palliative intent or as BTS. These rates are comparable to similar case series performed in tertiary academic centres[27,28] and indeed higher that that reported in several other studies.[29-33]

Endoscopic SEMS insertion as BTS has been shown in meta-analyses to decrease peri-operative morbidity.[12,34-36] In our audit, the majority of SEMS inserted were as BTS, with a median of 20 days between SEMS insertion and definitive surgery. While the interval is longer than most reports in the literature, this was due to a combination of logistical considerations and the need for patient optimisation, as most of our patients were from the geriatric age group. Notably, we did not experience a corresponding increase in stent-related complications despite

the longer interval to surgery. The high clinical success rate in our series allowed for 82% (41 out of 50) of our patients to undergo single-stage MIS resections. The presence of the SEMS did not pose a significant impediment to the successful completion of MIS, with none of our cases requiring intra-operative conversion to open surgery. The rate of primary anastomosis was also higher than that reported in earlier studies.[34-37]

While SEMS insertion as BTS enables the surgery to be converted from an emergency to a semi-elective setting, the benefits need to be balanced against the potential risks. Our audit revealed a perforation rate of 5.1%, in keeping with rates reported in the literature, which range between 4 and 11%.[37-39] Two of our patients who eventually died were not candidates for surgery and demise would likely have been imminent even without the attempted SEMS insertion. The remaining two cases in our series were successfully managed despite their stent perforations. Only one patient developed tumour overgrowth into the stent after palliative SEMS – his symptoms recurred after 3 months. There were no cases of stent migration and no bleeding complications in our series. We attribute the former to our use of uncovered SEMS, and a reasonably short interval-to-surgery in the BTS group.

Opponents to the use of SEMS as BTS used to cite oncological outcomes as a concern.[22-24] However, more recent studies have shown that SEMS as BTS has disease-free survival comparable to emergency surgery in acute malignant large bowel obstruction.[33,40] The increasing acceptance of SEMS for BTS has been reflected in the 2020 update of the European Society of Gastrointestinal Endoscopy (ESGE) Guideline.[41] In our series, 39 patients had a median follow-up duration of 34 months (range 12-65 months). The rates of local recurrence and distant metastases were 10.3% and 12.8%, respectively. It should be noted that half of patients who had local recurrence during follow-up were Stage 3C CRC at diagnosis. Similarly, 60% of patients with distant metastasis on follow-up were Stage 3C at the time of diagnosis, with the remaining 40% having Stage 2B disease. Three of these patients had

declined adjuvant chemotherapy and another patient was unable to tolerate the full course of chemotherapy. Therefore, our results appear to be consistent with the postoperative recurrence rates of CRC as stratified by tumour stage,[42] and perhaps reflect tumour biology instead of a SEMS-related phenomenon.

A recently published case series describing the experience of a single surgeon from a tertiary institution in Singapore reported that majority (63.2%) of patients underwent open surgery after insertion of a colonic stent for MBO.[32] The median time to surgery was 10 (range 0-21) days. In contrast, 84% of patients in our study underwent MIS for resection of the obstructing CRC after colonic stenting as BTS. The overall primary anastomosis achieved in our study was also 98%. We postulate that this difference in outcomes could be due to several factors such as the protocolised management of MBO between colorectal surgeons and interventional Gastroenterologists in our institution. This could have resulted in better patient selection and transition of care post-stenting. The median interval to definitive curative surgery in our study was 20 days (range 6-57 days), which is double that reported in the study by Tang et al.[32] It is possible that the longer interval to surgery in our study allowed time for optimization of the patient prior to surgery, resulting in a higher proportion receiving MIS. Moreover, the oncological outcomes in patients who had SEMS inserted as BTS were reported in our study, adding to the local data available on colonic stenting for MBO in our population.

As a clinical audit, our analysis suffers from the usual limitations of a retrospective study, coupled with the lack of a comparative arm – the group of patients who underwent upfront emergency surgery. However, this is currently the largest case series of SEMS in acute MBO in Singapore and it adds valuable information in support of this multi-disciplinary approach. In our institution, the availability of SEMS as a BTS has resulted in a high rate of single-stage MIS resections and primary anastomoses in this group of patients.

In conclusion, SEMS insertion in acute MBO has high technical and clinical success rates with a good safety profile. It increases the likelihood of patients benefiting from a single-stage MIS resection and primary anastomosis.

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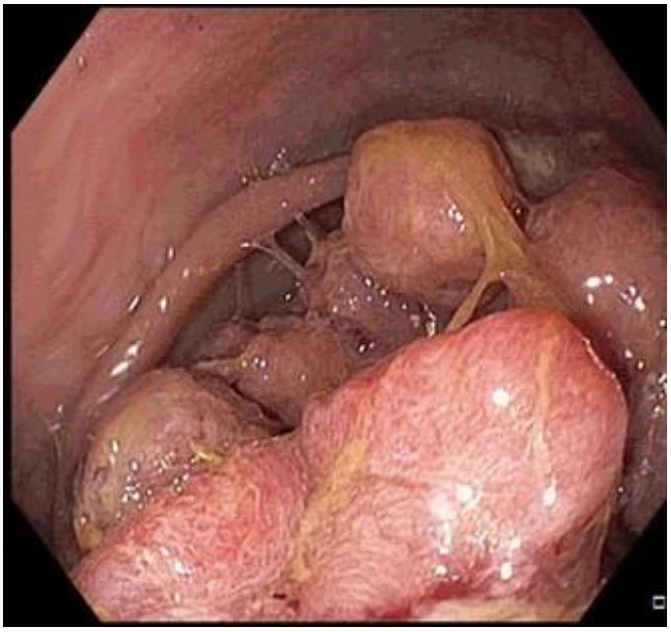

Fig. 1 Colonoscopy image of distal end of malignant stricture.

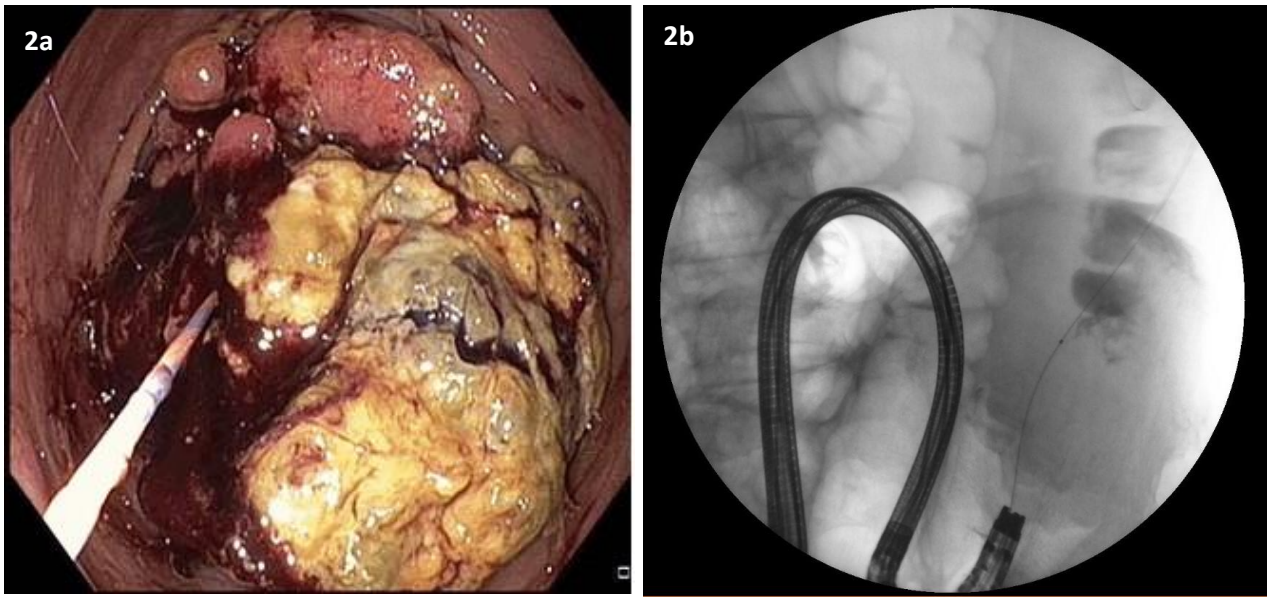

Fig. 2 (a) Insertion of catheter over guidewire. (b) Contrast injection to confirm intraluminal position of guidewire and to delineate stricture.

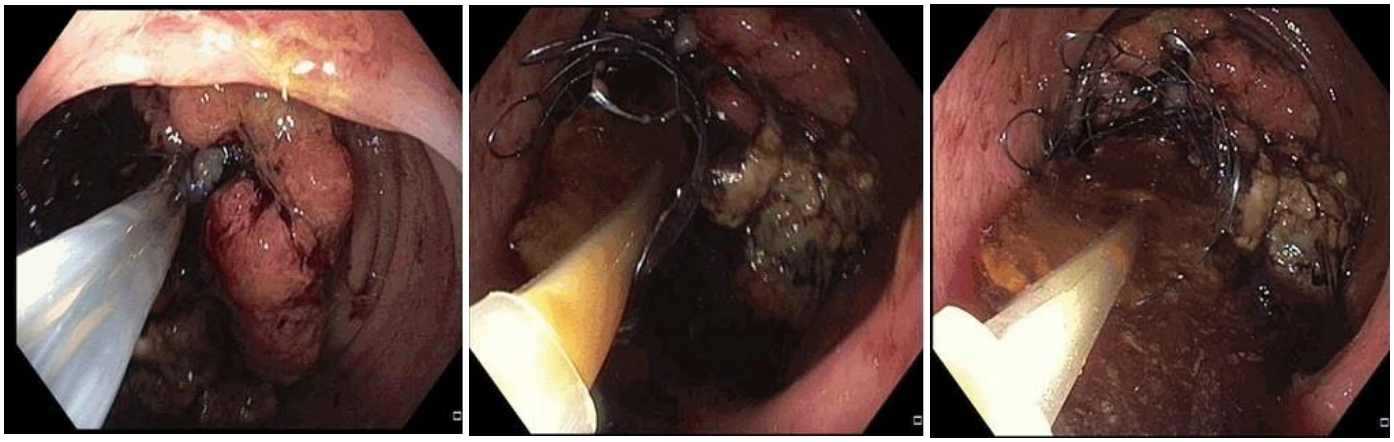

Fig. 3a Endoscopic image of SEMS deployment across malignant stricture.

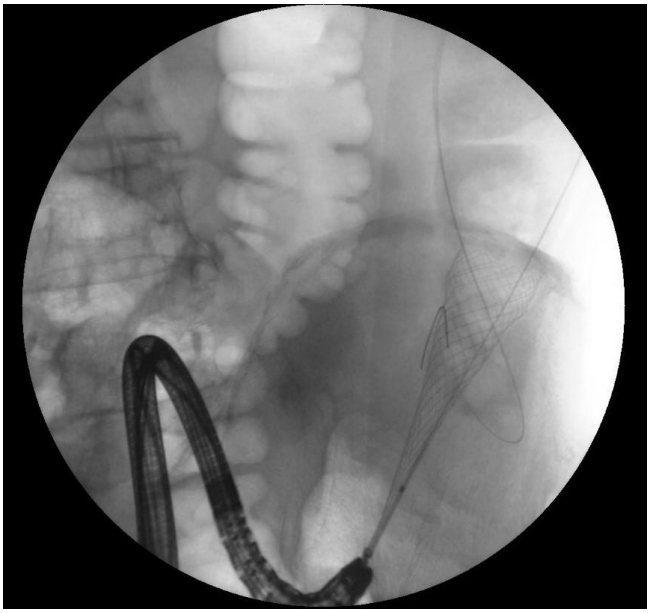

Fig. 3b SEMS deployment under fluoroscopic guidance.

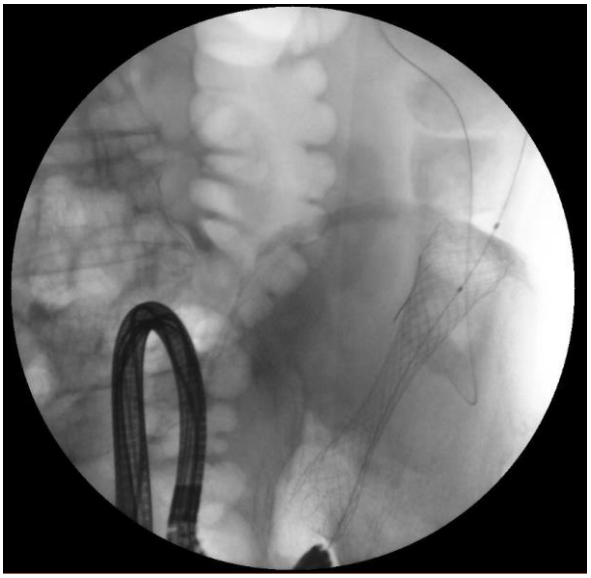

Fig. 4a Gush of faeculent material following successful deployment of SEMS across malignant stricture.

Fig. 4b Fluoroscopic image of SEMS deployed across malignant stricture.

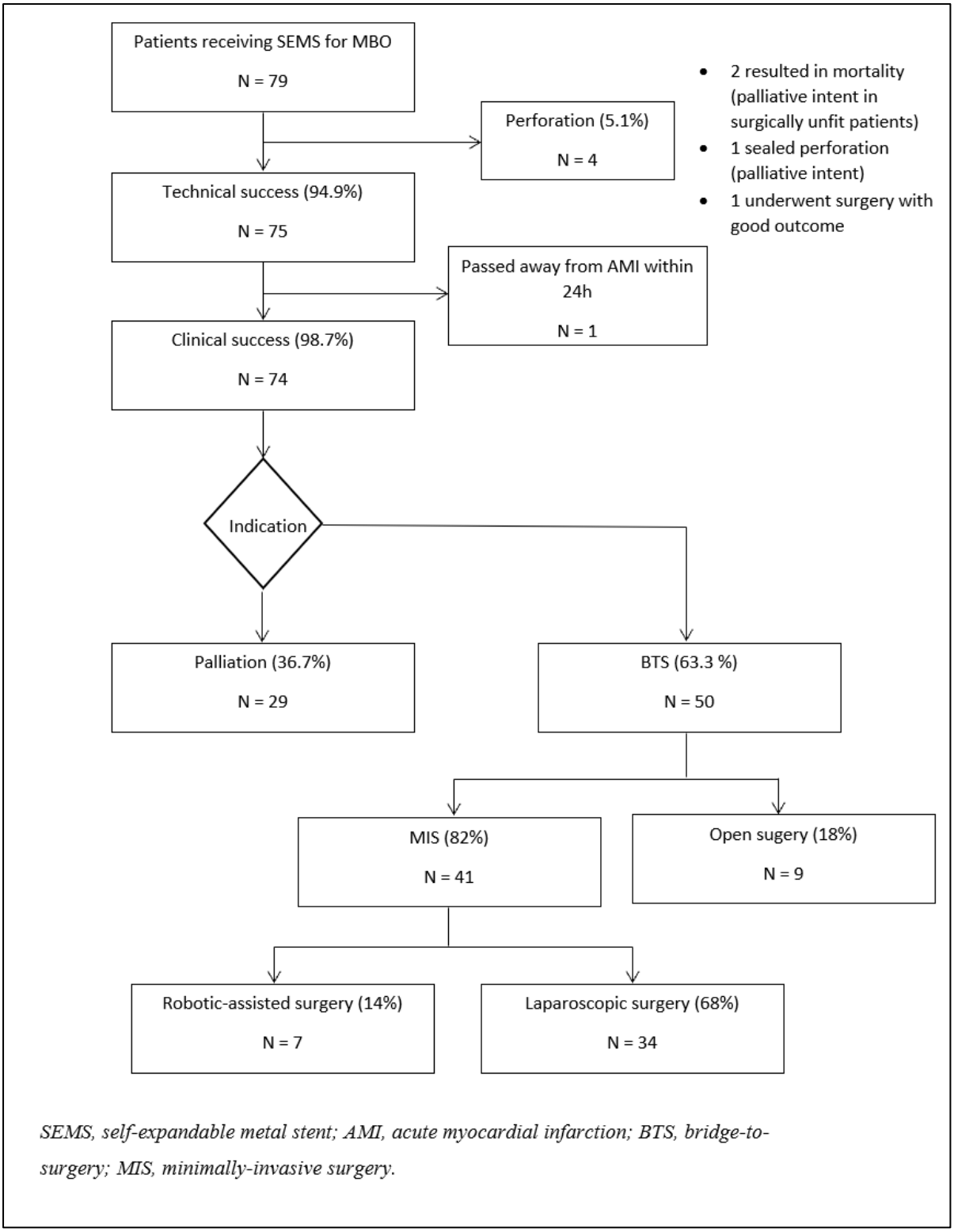

Fig. 5. Flowchart of patients undergoing SEMS for MBO in our audit.

Table I. Summary of patient demographics, tumour characteristics and outcomes of SEMS insertion.

Patient demographics (n=79)	
Mean age, years (SD)	68.8 (± 13.8)
Gender, n (%)	
Male	43 (54.4)
Female	36 (45.6)
Ethnicity, n (%)	
Chinese	57 (72.1)
Malay	18 (22.8)
Indian	1 (1.3)
Others	3 (3.8)
Tumour characteristics	
Location of tumour, n (%)	
Rectum	4 (5.1)
Rectosigmoid	14 (17.7)
Sigmoid	30 (38.0)
Descending	23 (29.1)
Transverse	8 (10.1)
Length of tumour, cm (SD)	4.2 (± 2.2)
Indications, n (%)	
BTS	50 (63.3)
Palliative intent	29 (36.7)
Outcomes, n (%)	
Technical success	75 (94.9)
Clinical success	74 (98.7)
Complications, n (%)	
Perforation	4 (5.1%)
Stent migration	0 (0)
Bleeding	0 (0)
Tumour ingrowth into stent	1 (1.3%), occurred 3 months after SEMS insertion

SEMS, self-expandable metal stent; BTS, bridge-to-surgery

Table II. Outcomes of patients undergoing SEMS.

Patients with SEMS inserted as BTS (n=50)	
Median days to curative surgery (range)	20 (6-57)
Types of surgery, n (%)	
Robotic-assisted	7 (14)
Laparoscopic	34 (68)
Open	9 (18)
Rate of primary anastomosis, n (%)	49 (98)
Tumour AJCC stage, n (%)	
Stage 2A	12 (24)
Stage 2B	8 (16)
Stage 3A	1 (2.0)
Stage 3B	16 (32)
Stage 3C	13 (26)

SEMS, self-expandable metal stent; BTS, bridge-to-surgery; AJCC, American Joint Committee on Cancer.

Table III. Characteristics of patients with local recurrence and distant metastases at follow-up.

Patients with follow-up more than 1 year		**N = 39**
Median follow-up, months (range)		**34 (12-65)**
Local recurrence		**N = 4**
	AJCC stage at diagnosis	**Received recommended adjuvant chemotherapy?**
Patient 1	3C	No
Patient 2	3C	No
Patient 3	2A	No
Patient 4	2B	Yes
Distant metastases		**N = 5**
	AJCC stage at diagnosis	**Received recommended adjuvant chemotherapy?**
Patient 1	3C	No
Patient 2	3C	No
Patient 5	2B	No
Patient 6	3C	Yes
Patient 7	2B	No

*Patients 1 and 2 had local recurrence and distant metastases on follow-up
AJCC, American Joint Committee on Cancer.