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Research Article

Self-Expandable Metal Stent as a Bridge to Surgery for the Management of Obstructing Colorectal Cancer - A Single Centre Experience

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Abstract

Introduction: Placement of self-expandable metal stent (SEMS) as a bridge to surgery for malignant colorectal obstruction is quite feasible regarding short-term outcomes, but oncological and long-term outcomes are still debatable. The aim of this study is to present our experience and try to conclude whether this type of malignant colorectal obstruction management is applicable and safe.

Materials and Methods: Six patients with obstructive colorectal cancer who underwent SEMS placement were included in our study and several perioperative factors were assessed.

Results: Technical and clinical success rates were 100%, with no perioperative complications and two-year overall survival rate of the patients is 83.3%.

Conclusion: SEMS placement in patients with malignant colorectal obstruction as a bridge to surgery is an effective way of reaching elective surgery with primary anastomosis, but further investigations are needed regarding long term advantages of this procedure.

***Keywords**: Malignant Obstruction; Self-Expandable Metal Stent; Bridge to Surgery*

Introduction

Colorectal cancer (CRC) is one of the leading causes of cancer mortality worldwide [1]. About 8 - 13% of the patients with advanced colorectal cancer develop malignant colorectal obstruction (MCRO), which manifests as bloating, pain, obstipation and vomiting. This condition requires relief as soon as possible [2-4]. In the past, the main treatment of this pathology was to perform emergency surgery (ES) in order to relieve the intestinal obstruction, which includes a variety of procedures such as Hartmann's procedure or colostomy alone. However, due to the acidosis, electrolyte and water balance disorders, the general condition of patients is often poor, which increases the mortality rates and incidence of postoperative complications [5]. Also, the seriously edematous abdominal tissues impede the visual field and space during operation.

Aim of the Study

The aim of this study is to present the experience of our clinic in the management of patients with MCRO, who had self-expandable metal stent (SEMS) placed as a bridge to surgery (BTS).

Materials and Methods

Patient selection: The patients selected for the current study were admitted to First Clinic of Abdominal Surgery of Military Medical Academy of Sofia, Bulgaria with acute obstructive CRC and underwent SEMS placement as a BTS in the period between May 2017 and November 2019. The ColoRectal Obstruction Scoring System (CROSS) [6] was used for the representation of the clinical features of bowel obstruction (Table 1) and the diagnosis was confirmed with histological examination.

Level of oral intake	Score
Requiring continuous decompressive procedure	0
No oral intake	1
Liquid or enteral nutrient	2
Soft solids and full diet with symptoms of stricture*	3
Soft solids and full diet without symptoms of stricture*	4

Table 1: *Colorectal obstruction scoring system (CROSS) [6].*

**: Symptoms of stricture - abdominal pain, distension, nausea, vomiting and constipation.*

Patient characteristics: In the abovementioned period of two years and six months, 7 patients who were admitted to Military Medical Academy of Sofia with diagnosed colonic obstruction (Figure 1) were managed by SEMS placement as a BTS. One of the patients was excluded from the study as histologically benign stricture of the rectosigmoidal region was diagnosed. The other 6 patients had MCRO. Among them, 3 patients were with stage II/III disease, one was stage IV with non-resectable multiple bilobar hepatic metastases and the others (n = 2) had stage IV disease with resectable distant metastases. Patient's baseline characteristics as age, gender, CROSS score, along with tumor characteristics, type of SEMS and its diameter and length, type of operation and the condition of the patient after the procedure were all retrieved from their medical records. The location of the tumor was classified as right-sided colon (ascending colon and right side of transverse colon), left-sided colon (left side of transverse colon, descending colon and sigmoid colon) and rectum. Pathological report was used to precisely measure the size of the tumor, its depth, lymphatic invasion, vascular invasion, perineural invasion and the number of lymph nodes harvested.

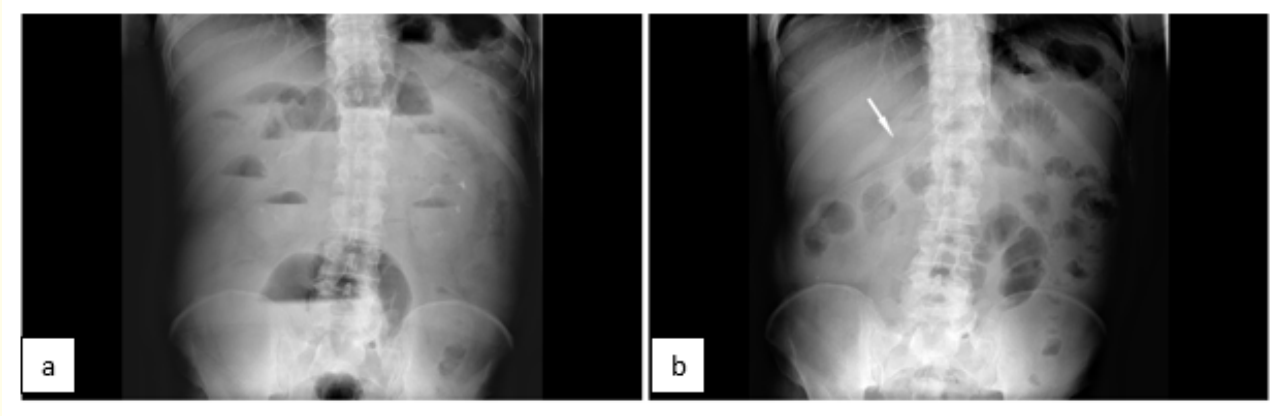

Figure 1: *a) Abdominal X-ray of one of our patients with malignant colorectal obstruction and typical air-fluid levels in the abdomen; b) Abdominal X-ray of the same patient 24 hours after SEMS (arrow) placement.*

SEMS placement: The placement of SEMS through tumor masses in caecum and low part of rectum were avoided. All the procedures were performed by the gastroenterologists in our medical department. Fluoroscopic guidance, which was established after the injection of a radiocontrast dye in the intestinal lumen to assess the correct position of the stent, combined with endoscopic view assistance were used in our cases. The SEMS were deployed with "through the scope"- placement technique, where the colonoscope was passed through the obstruction and the stent placed through the working channel of the endoscope, before expanding. Uncovered SEMS were used in all 6 patients (Figure 2), as the covered with polyethylene membrane ones have a higher migration rate. The possibility of tumor in growth through the uncovered stents we deployed was minimal as the placement period before operative intervention was short.

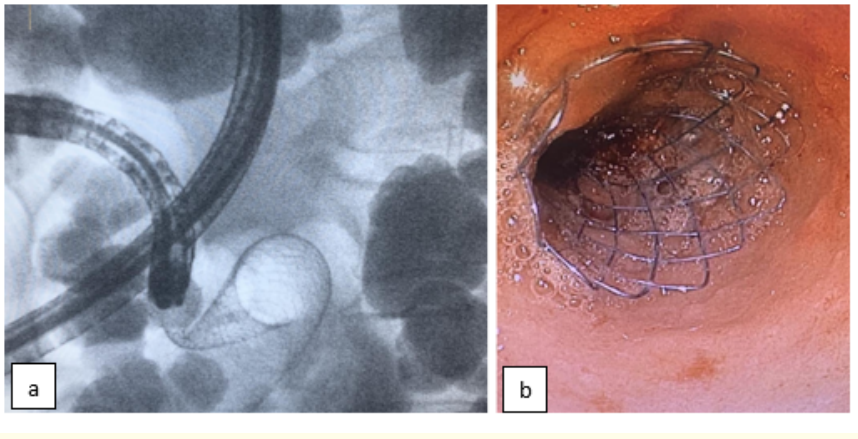

Figure 2: *a) SEMS placement with through the scope technique under fluoroscopic guidance; b) Endoscopic view of the deployed uncovered SEMS.*

The diameter of the stents we used was 23 mm, which makes the decompression sufficient and the length was 120 mm in order to cover fully the edges of the malignant process with several centimetres, decreasing the possibility of re-obstruction (Figure 3).

Figure 3: *Resected specimen with SEMS deployed through the malignant process.*

The successful SEMS placement on the first attempt and correct deployment of the stent was summarized as technical success. Clinical success was defined as resolution of obstructive symptoms (loss of air-fluid level and defaecation) within 48 hours of stent placement.

Surgery and follow-up: Elective surgery with primary anastomosis was performed in all of the patients. Three of the procedures were laparoscopic and the other three - conventional. The interval between SEMS placement and elective surgery was few days to 4 months in one of the patients due to the conduction of neoadjuvant chemotherapy. Patients follow-up is presented with two year overall survival (OS) rate.

Results

Patient characteristics are summarized in table 2.

Characteristics	n (%)
Age (years)*	66.5 (52 - 85)
Male/Female	5/1 (83.3/16.7)
Tumor localization	
Right-sided colon	1 (16.7)
Left-sided colon	4 (66.6)
Rectum	1 (16.7)
TNM-staging	
II	2 (33.3)
III	1 (16.7)
IV	3 (50.0)
CROSS score before stent placement**	
0	3 (50.0)
1	2 (33.3)
2	1 (16.7)
3	0 (0.0)
4	0 (0.0)
Technical success rate in SEMS placement	6 (100.0)
Clinical success rate in SEMS placement	6 (100.0)

Table 2: *Characteristics of the patients with SEMS placed as a BTS (N = 6).*
**: Data presented as median range; **: CROSS - colorectal obstruction scoring system [6].*

Patients included in our study are 6 with a median age of 66.5 years. Five of them are male and one is female. Fifty percent (3/6) of the patients were classified as CROSS score 0. Most of the tumors were localized at the left side of the colon (66.6%; 4/6) and the stage of the disease was mainly IV (3/6; 50%). Technical and clinical success were observed in all the patients in the study (100%). As for stent placement complications, none of the patients had SEMS related complications (migration, perforation and re-obstruction). The median period between SEMS deployment and elective surgery was 7.5 days as presented on table 3.

Characteristics	
Period between SEMS deployment and surgery (days)*	7.5 (3 - 124)
Tumour diameter (mm)*	50 (40 - 100)
Laparoscopic/ conventional operation	3/3
Type of operative intervention	
Right hemicolectomy	1
Left hemicolectomy	2
Resection of sigmoid colon	2
Anterior resection of rectum	1
Tumour depth invasion (T3/T4)	3/3
Lymphatic invasion**	2/4
Vascular invasion**	3/3
Perineural invasion**	2/4
Harvested lymph nodes* (number)	17 (12 - 46)
Postoperative period***, days	6.5 (4 - 8)

Table 3: *Perioperative and pathological characteristics of patients with SEMS placement as a BTS (n = 6).*

: Data presented as median range; **: Data presented as positive/negative; *: Period from operation to discharge.*

One of the patients conducted neoadjuvant chemotherapy and surgery was performed 4 months after stent placement. Three of the operations done were laparoscopic (50%) and the interventions were mainly left hemicolectomy and resection of the sigmoid colon. After pathological examination of the specimens, tumor diameter (mean range = 50 mm), tumor invasion and other pathological characteristics were measured. All the malignant processes were T3 and T4 stage. Median number of harvested lymph nodes was 17. None of the patients developed postoperative complications (anastomotic leakage, ileus, bleeding). All patients included in this study were discharged from our department 6.5 days after surgical intervention. The OS rate in our study is 83.3%, with adjuvant chemotherapy conducted in all the patients.

Discussion

Malignant intestinal obstruction is an emergency condition which leads to water-electrolyte balance disorder, acid-base balance disorder and bacterial translocation. Three main treatment options are available in the management of patients with malignant colorectal obstruction which are: emergency surgical resection with stoma formation; emergency stoma with elective resection of the tumor afterwards and lastly SEMS placement with elective resection of the tumor. Emergency surgery was formerly considered first line therapy, but in elderly patients in poor condition is a risky option for treatment with mortality rate up to 15% [7]. Since the introduction of SEMS deployment in 1991, the use of these stents as a BTS was widely developed, with good short-term outcomes and doubtful long-term and oncological ones.

Since the introduction of SEMS by Dohmoto., *et al*. [8] in 1991 as a palliative treatment and as a bridge to surgery in 1994 [9], they became an alternative method for managing malignant colorectal obstruction (Figure 1). The good general condition of patients after SEMS placement with subsequent adequate bowel preparation and elective surgery has obvious advantages over ES in short-term outcomes [10-13]. However, the European Society of Gastrointestinal Endoscopy (ESGE) guidelines published in 2014 do not recommend SEMS placement as a BTS for MCRO [14]. Since SEMS placement began to be covered by Japanese health insurance in 2012, some large-scale

multicenter studies have been conducted, which proved that its use as a BTS is considered safe and effective in the short-term [15]. There are few reports studying the long-term outcomes of SEMS as a BTS in patients with MCRO, which leads to concerns regarding whether SEMS placement or ES is the procedure of choice in the management of patients with MCRO.

One of the main factors affecting the short- and long-term outcomes of SEMS placement is the technical success rate of the procedure, which in our study was 100%. Uncovered stents are preferred as the ones used in our study, due to lower rate of migration [18]. Endoscopic stent placement is not a simple procedure and should be performed by experienced endoscopists [19]. Success rates vary depending on individual institutions experience. Stent design and limited experience with pancreaticobiliary endoscopy, along with the lack of proper equipment, can be noted as risk factors for perforation [20]. Procedures should be performed in the same manner and in centers where conversion to surgery is possible if complications occur. In our study no adverse events were noticed in the period between SEMS placement and elective surgery.

In some studies, regarding to rates of primary anastomosis, stoma formation and adverse events, SEMS placement is superior to ES [19,20]. During emergency surgery the operative field is poor and tissue separation, exposure and lymph node dissection is more difficult, compared with elective surgery, because of the intestinal dilatation, edematous intestinal tract and the worse patient condition. SEMS placement effectively restores intestinal patency and makes abdominal tissue edema subside, which gives the physician the chance to perform medical resuscitation, bowel preparation, accurate tumor staging, optimization of comorbidities and total colonic endoscopic examination in order to exclude synchronous lesions [23]. This allows patients with MCRO managed with SEMS placement as a BTS to have a subsequent elective laparoscopic surgery. Laparoscopic surgery after SEMS placement is reported as safe [24]. The operative field during laparoscopic interventions is broader with more clearly seen anatomical structures, which are difficult to expose in open emergency surgery. This explains the higher number of harvested lymph nodes in the patients managed with SEMS placement. Current guidelines suggest that the number of harvested lymph nodes should be more than 12 [25], which is similar to the numbers in our study.

ESGE guidelines renounce the use of SEMS as a BTS for MCRO, as they reported a considerably greater incidence of local disease recurrence in patients older than 75 years. They recommend the use of stents as a BTS to be only limited to high-risk patients with ASA score ≥ III and/or age > 70 years. Another study reported similar worse outcomes which were considered to have occurred due to perforation after the placement of the stent [26]. In particular, perforation may lead to increased incidence of peritoneal carcinomatosis and sepsis, which can make a curable colorectal cancer a non-curable one due to SEMS intervention [27]. Follow-up data from the Stent-in 2 trial reported that the overall recurrences in patients with perforation after stent placement was increased compared to the ones after ES or SEMS placement without perforation [28]. In our study such complication was not observed. Curative surgery with sufficient lymph node dissection will be possible after stent placement without perforation. Nevertheless, SEMS placement may impact the oncological outcomes as after the enforced radial dilatation it can disseminate cancer cells into the surrounding lymphatics, bloodstream and even the peritoneal cavity. A study reported that SEMS placement may even cause higher rates of tumor ulceration, perineural and lymph node invasion than ES, which can worsen the oncological outcome [29]. On the other hand, several other studies reported no difference in long-term outcomes between SEMS deployment and ES [30,31]. Considering the superior surgical outcomes and absence of major oncological differences between SEMS placement and ES, European guidelines will probably expand indications for stenting as a BTS in the future. Many systematic reviews about SEMS as BTS were published in the past few years, which could generate confusion due to the contrasting results. Further high-quality data regarding long-term and oncological outcomes is needed in order to obtain conclusion on the problem. Development of international guidelines with therapeutic algorithms and quality-of-life analyses will be of benefit.

The present study included patients admitted to our department who required emergency decompression because of acute MCRO. They were all managed by SEMS deployment. Our observations noticed good short-term outcomes, with satisfactory number of laparoscopic surgical interventions and primary anastomosis after the SEMS placement, a sufficient number of lymph nodes dissected, no incidences of stoma formation and adverse events in the postoperative period.

Conclusion

SEMS placement as a BTS is a more adequate treatment option than emergency surgery for patients with an increased risk of post-operative mortality. It allows further elective laparoscopic management with primary anastomosis, improving quality of life. As long as adverse events as perforations are avoided, SEMS placement as a BTS could be a first treatment option for MCRO. However, with regard to all the controversial studies, the debate is still active.

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