Super-Flexible Through-the-Scope Self-Expandable Metallic Stent Insertion for the Management of Malignant Tortuous Hepatic or Splenic Flexure Colonic Obstruction

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To the Editor: The methods for obstruction of colon cancer include emergency surgery or self-expanding metallic stents (SEMSs). SEMS insertion was shown to be a safe, easy, and effective treatment for left-sided malignant colon obstruction, for palliative treatment or as bridge to resection.[1-5] The cases reported of SEMS insertion in the colon proximal to the splenic flexure were <5% of all studies. The long distances and the tortuosity of the distal bowel make it difficult to advance and position the stent in the target proximal colon, and obstruction of right colon has traditionally been managed by acute operation. Stent implant for a proximal colon obstruction is a safe, feasible, and effective treatment for palliation or as a bridge to surgery, and a significantly higher morbidity and mortality was occurred in emergency right-sided colon resection compared with elective resections.[1-5]

In the present study, we evaluated technique feasibility and treatment outcomes following a super-flexible through-the-scope (TTS)-SEMS for the management of malignant colon obstruction at hepatic or splenic flexure caused by primary colon cancer as either palliative treatment or a bridge to surgery.

This study was conducted in accordance with the recommendations of the *Declaration of Helsinki* and was approved by the ethics committees of our hospital. Between September 2013 and June 2016, 16 patients with acute lower bowel and right colonic obstruction (subtotal or total obstruction) were included in this study, with the following inclusion criteria: (i) the acute lower bowel and right colonic obstruction were confirmed to be colon carcinoma by enhanced computed tomography (CT) scan or endoscopy; (ii) the occlusion site was located at hepatic or splenic flexure colon; and (iii) single mass was considered as the cause of lower bowel and right colonic obstruction. The exclusion criteria included (i) any intestinal tract perforations, (ii) any acute intestinal infection disease (e.g., ulcerative colitis or Crohn's disease), (iii) severe internal hemorrhoid or crissum varicosity bleeding, and (iv) severe bleeding tendency or coagulation disorders. Abdominal CT of subtotal obstruction showed distending and air-fluid level, displaying a lower bowel and right colon obstruction and small amounts of liquid or gas in the left colon. There is no liquid or gas in left colon at abdominal CT of complete colon obstruction. Before patient inclusion in the study, informed consent was obtained from each patient and/or the legal guardian; the risks and benefits of the treatment were fully explained. The patient's age was 70.3 ± 12.5 years (range, 55.0–89.0 years), including nine men and seven women. The average history of the obstruction symptoms was 19.6 ± 3.6 days (range, 14.0–25.0 days). All patients were treated with a super-flexible TTS-SEMS for palliation in six patients and as a bridge to surgery in ten patients.

The TTS-SEMS colonic stents used in this study (Micro-Tech Medical Instruments Corporation, Nanjing, China) were knitted from nonmagnetic memory Ni-Ti alloy wire and consisted of a self-expanding, cross-linked stainless cylindrical mesh body with a mushroom head at both ends to prevent stent migration. The diameter of the stent body is 26–30 mm, the total length is 60–120 mm when fully expanded, and the diameter of the mushroom head ranged from 34 to 38 mm. The TTS-SEMS colonic stent presented the following structural improvements: (i) the diameter of the Ni-Ti alloy wire was 0.20 mm to increase stent flexibility; (ii) the outer diameter of the stent delivery system was 3.3 mm (~10F) to reduce the system's profile to enhance its pushability and flexibility; and (iii) three radiopaque marks were placed at both ends and the middle site to facilitate an accurate position during stent release [Figure 1a and 1b].

The distal colon preparation was performed using repeated 500-ml sodium phosphate enemas before colon stent implant. Under endoscopic and fluoroscopic guidance, stent insertion procedure was performed in all patients. A 4-m hydrophilic straight-tip 0.035 inch × 450 cm JAG wire (Boston Scientific, Washington,

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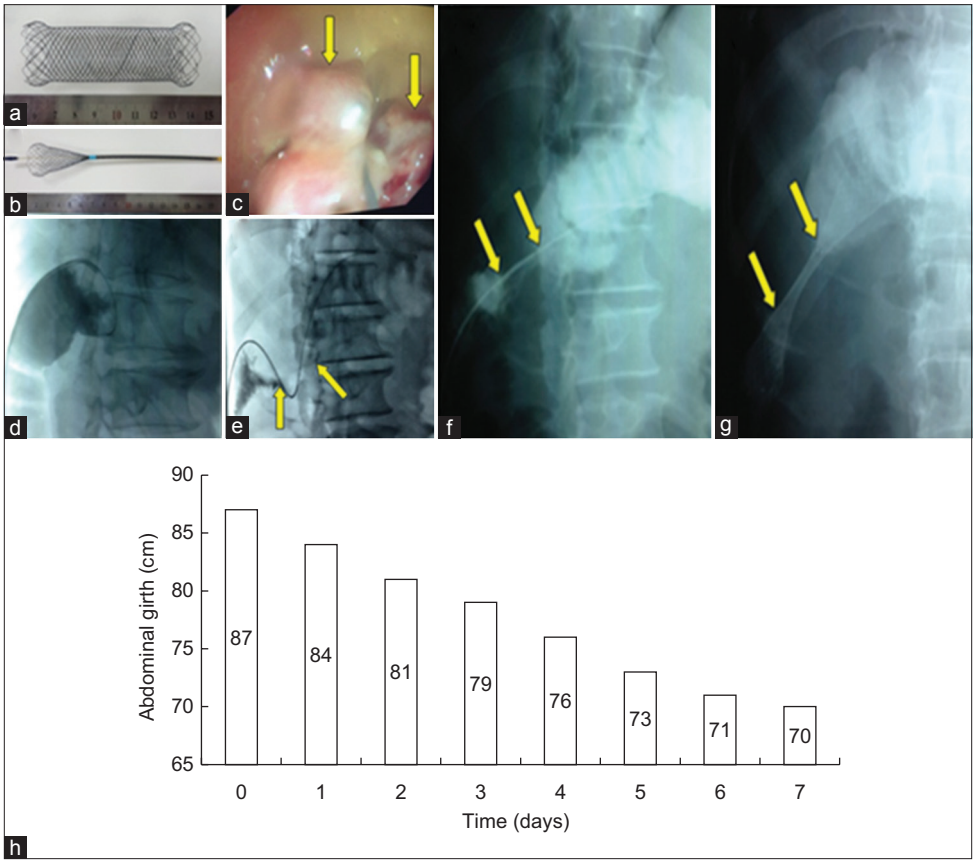

Figure 1: Super-flexible through-the-scope self-expandable metallic stent (a). Stent conveyor (b). Colonoscopy showing lumen occlusion with mass at hepatic flexure (yellow arrows; c). Digestive tract radiography confirmed the extent and length of the diseased colon (yellow arrows; d-f). Through-the-scope self-expanding metallic colorectal stent (26 mm × 80 mm) was delivered and released at the occlusive (yellow arrows; g). Abdominal girth after super-flexible self-expanding metallic stent placement (h).

DC, USA) was passed through the colonoscope and into the occluded colonic lumen under direct visualization [Figure 1c], then 8.5F guiding catheter (ENVOY, Cordis, FL, USA) was exchanged to arrive at the distal ostium of the stricture after removing the endoscope, and the tract was opacified by the injection of iodinated contrast and air to provide a double-contrast image that could clearly display the occlusion or stricture site of the diseased. A 0.035 inch × 260 cm angled-tip guidewire (Terumo, Tokyo, Japan) was then used to cross the occluded colonic lumen under fluoroscopic guidance. After the guidewire was passed through the lesion, the guiding catheter was advanced over the guidewire into the proximal colon and contrast and double-contrast imaging was performed through the guiding catheter to opacify the anatomy of the stricture (lesion position and length) [Figure 1d-1g].

All stent insertion procedures were performed under fluoroscopic guidance. A super-stiff guidewire (Micro-Tech, Nanjing, China) was inserted into the proximal colon length to provide sufficient support for stent deployment. The guiding catheter was then removed, and an uncovered super-flexible TTS self-expandable metallic colonic stent was advanced over the wire, positioned, and released fluoroscopically with the center of the stent in the middle of the stricture. The immediate escape of air and liquid feces through the stent indicated successful decompression. The guiding catheter was then reinserted over the wire and into the stent with an iodinated contrast to verify the patency and evaluate for perforation.

Patients were take 500–1000 ml paraffin orally to help colonic cleaning and oral diet after the procedure. The outcomes of super flexible TTS-SEMS insertion were evaluated by technical success, clinical improvement, complications, and patency and location of the stent. All patients' data are summarized in Table 1. Emergency abdominal CT scan found that the sites of obstruction were hepatic flexure (n = 5) and splenic flexure (n = 11) and were shown obstruction in all patients (100%). The mean angulation was 123.7° ± 20.5° (rang 110°–160°) and the occlusion was III degree (I: 50–75%, II: 75–99%, and III: 100%). Stent insertion was technically successful in all patients (100%). Patients' abdominal girth was decreased from 87 ± 4 cm before stent insertion to 70 ± 4 cm seven days later [Figure 1h].

There was no super-flexible TTS-SEMS-related morbidity or mortality, and complication (perforation, bleeding, stent migration, stent reocclusion, and infection in 2 weeks) had occurred. Ten patients received one-stage surgery after 9.7 ± 1.0 days (range 8–12 days) and meanwhile four patients received liver metastasis resection. Six patients, who had lung and liver metastasis, and the aged (75.0–89.0 years), accepted stent implant as palliative treatment, sequential therapy (chemotherapy or radiotherapy), the average stent patency was 217.6 ± 122.7 days, and the mean survival was 221.0 ± 124.0 days.

Traditional treatment for subtotal or complete malignant colon obstruction necessitates emergency colon resection; the mortality rate of surgery was 17% compared with 7.7% for elective surgery.[1] SEMSs were widely used to management for malignant colonic

Table 1: Details of patients with super-flexible TTS-SEMS placement

Number	Gender/age (years)	History (days)	Diagnosis	Location (flexure)	Occlusion (50–75, 75–99, 100)	Length (cm)	Angulation (°)
1	Female/66	22	Primary CA	Splenic	III	5	110
2	Male/61	18	Primary CA	Hepatic	III	5.2	120
3	Male/89	25	Primary CA	Splenic	III	5.5	120
4	Female/64	20	Primary CA	Splenic	III	4.1	110
5	Male/85	22	Primary CA	Splenic	III	4.5	110
6	Male/65	14	Primary CA	Splenic	III	4.2	150
7	Female/81	18	Primary CA	Splenic	III	4.7	160
8	Male/55	13	Primary CA	Hepatic	III	4.3	110
9	Male/76	21	Primary CA	Splenic	III	5.0	140
10	Female/59	16	Primary CA	Splenic	III	4.8	120
11	Female/65	18	Primary CA	Hepatic	III	5.3	120
12	Female/79	21	Primary CA	Splenic	III	4.6	130
13	Male/66	18	Primary CA	Hepatic	III	4.6	120
14	Male/75	24	Primary CA	Splenic	III	5.1	130
15	Female/72	22	Primary CA	Splenic	III	4.9	120
16	Male/67	21	Primary CA	Hepatic	III	5.4	110

Number	Sent size	Time (min)			Technique successful	Subsequent treatment	Days to surgery
		Procedure	Colonoscopy	Fluoroscopy			
1	MTN-CG-L-26/80	68	38	8	Successful	Surgery	8
2	MTN-CG-L-26/80	85	36	20	Successful	Surgery	10
3	MTN-CG-L-26/80	78	43	15	Successful	Palliation	0
4	MTN-CG-L-26/80	77	37	18	Successful	Surgery	9
5	MTN-CG-L-26/80	78	42	16	Successful	Palliation	0
6	MTN-CG-L-26/80	69	40	13	Successful	Surgery	10
7	MTN-CG-L-26/80	113	58	30	Successful	Palliation	0
8	MTN-CG-L-26/80	88	45	19	Successful	Surgery	8
9	MTN-CG-L-26/80	95	45	23	Successful	Palliation	0
10	MTN-CG-L-26/80	79	41	19	Successful	Surgery	9
11	MTN-CG-L-26/80	92	48	20	Successful	Surgery	10
12	MTN-CG-L-26/80	82	36	18	Successful	Palliation	0
13	MTN-CG-L-26/80	98	50	25	Successful	Surgery	10
14	MTN-CG-L-26/80	86	49	17	Successful	Palliation	0
15	MTN-CG-L-26/80	84	45	18	Successful	Surgery	12
16	MTN-CG-L-26/80	87	44	16	Successful	Surgery	11

TTS: Through-the-scope; SEMSs: Surgery or self-expanding metallic stents; CA: Cancer.

obstruction as a bridge to surgery or palliative therapy.[1] SEMSs insertion were avoided colostomy and associated with lower complication and mortality rates compared with urgent surgery, and elective one-stage surgery at a later point in time. Less SEMSs be used in the proximal colon obstruction group were mostly caused by technical failure of stent placement, because of difficulty passing the guidewire or stent delivery system through the long distances and angulated colon (such as the hepatic flexure) and placing the stent in the target colon.[2,3] Most of the proximal colon obstructions were complete and the poor endoscopic view and disturb access to the obstructive lesion might lead to technical failure.[1-3]

Super-flexible TTS-SEMS (Micro-Tech Medical Instruments Corporation, Nanjing, China) is a new intestinal stent. It has some advantages compared with a conventional SEMS:[4] (i) excellent flexible makes it to better fit the curved colon wall, (ii) due to its compliance to eliminate the pressure of bend site and to reduce friction, hemorrhage, and hyperplasia in stent site, and (iii) more excellent patency, because the middle bracket could not prone to fold when stent is bending, which makes it continued patency. Super-flexible TTS-SEMS is designed though the scope that avoids disturb of long distances and angulated colon makes it smooth arrive to obstruction colon and pass it.

Cho *et al*.[5] reported that the technical success rate of proximal colon obstruction than distal colon obstruction was 86% versus 97%, clinical improvement was 78% versus 91%, and abdominal symptoms were marked improvement in all successful patients shortly after the SEMS implant. In our study, super-flexible TTS-SEMS was successfully applied in all patients of malignant hepatic or splenic flexure colonic cancer and their obstruction symptom was resolved shortly after the super-flexible TTS-SEMS placement. There were no early complications such as bowel perforation, stent expansion failure, and malposition, and there was no procedure-related mortality. Effective colon preparation was possible after stenting in surgery patients, and there were no postoperation complications, perforations or procedure-related deaths, and stent dislodgements. Follow-up of six palliative patients was through telephone and lacked of image data was defects of this article.

In conclusion, super-flexible TTS-SEMS for the management of larger tortuous hepatic or splenic flexure colonic obstruction is safe and effective, which can provide an opportunity for malignant proximal colon obstruction. It is a useful therapy and should be applied widely. However, the sample size is small in this study and has some limitations, so further large sample studies are needed.

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Conflicts of interest

There are no conflicts of interest.

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