

# Long-term success of colonic stent insertion is influenced by indication but not by length of stent or site of obstruction

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Accepted: 3 December 2010 / Published online: 5 January 2011  
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## Abstract

**Introduction** Stent insertion plays an important part in the management of acute colonic obstruction. There are limited data on factors influencing short- and long-term success.

**Aims and methods** We investigated indications, technical and clinical success rates, complication rates and the factors influencing them. Patients were identified from our prospective colonic stent database (2000–2008).

**Results** One hundred and four stents were attempted in 96 patients (technical success rate, 83.3%). Clinical short-term success was observed in 74 (77.1%) patients. Follow-up data available for 57 patients showed clinical long-term success in 77% (44/57). Multiple logistic regression analysis showed a significant decline in technical success over the study period ( $p=0.041$ ). Patients with colonic malignancy had significantly higher long-term success rates (81%), compared to those with extra-colonic malignancies (43%) ( $p=0.049$ ). Length of stent and site of obstruction

were not significant factors. Early complications occurred in 10%, and late complications, in 26.3% of cases.

**Conclusion** Colonic stent insertion provides symptom relief in over 70% when used as a long-term solution. Complication rates are high, and a significant minority of patients requires re-intervention. Obstruction caused by extra-colonic malignancy is far less likely to be permanently palliated by a stent, in comparison to colonic malignancy.

**Keywords** Colonic obstruction · Colonic stent · Long-term outcome · Complications

## Background

Colorectal cancer causes obstructions in 8–29% of patients [1]. Colonic obstruction can also be caused by benign diseases of the colon such as diverticular disease or Crohn's disease, as well as by external compression by extra-colonic malignancies. The role of self-expandable metal stents (SEMS) in the management of colonic obstruction has evolved at a much slower pace, compared to the upper GI tract. Presently, SEMS are used either to provide palliative decompression in advanced and/or metastatic disease or as a bridge to elective surgery in patients with curable colonic cancer. There is some evidence of the use of SEMS in non-malignant conditions [2].

Traditionally, surgery was used to achieve decompression of the colon by formation of a temporary or permanent stoma. In patients with possible curable colon cancer, a second operation was then required to achieve tumour excision and bowel anastomosis. In such cases, colonic stents can facilitate decompression. Patients with an obstruction are often compromised by dehydration and electrolyte imbalances. SEMS placement allows stabilisa-

Grant support, none.

**Authors' contributions** CPS designed the study, collected the data, co-analysed the data and wrote the draft manuscript. JR supervised the study design and data collection, co-analysed the data and critically reviewed the manuscript. DFM supervised the study design and data collection, co-analysed the data and critically reviewed the manuscript.

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tion of the patient prior to elective curative surgery. Two non-randomised studies have demonstrated that decompression by stent followed by elective surgery is associated with a lower rate of colostomy formation, a higher rate of primary anastomosis, shorter hospital stay and fewer complications [3, 4]. A Dutch randomised controlled trial comparing surgery with stenting for palliation cases was, however, prematurely terminated, as 25% of the stent patients experienced a perforation of the colon [5].

Technical success of colonic stenting has been reported to exceed 90% in several studies [6–8], while clinical success rates vary between 81–100% [7, 9]. SEMs is, however, associated with a high complication rate of up to 24% [6]. A recent series of 39 Korean patients, palliatively treated with colonic SEMs, showed that those needing shorter stents and with more distal disease were more likely to have good long-term outcomes [10]. A comparative American study of 15 patients treated for extra-colonic malignancies causing colonic obstruction and 34 patients with colorectal cancer causing obstruction demonstrated that the former had a significantly worse outcome [11]. The role of factors influencing SEMs success in colonic obstruction needs to be clarified further to allow selection of its use for the most appropriate patients.

## Aims

This study investigates the indications, technical and clinical success and complication rates for colonic SEMs insertion in our tertiary referral centre. Furthermore, we aim to ascertain whether factors, such as age, sex, site, indication, American Society of Anesthesiologists (ASA) score, year of insertion and type and length of stent, influence technical and clinical outcomes.

## Method

All colonic stent insertions since 2000 were prospectively entered into a database, and patients who underwent colonic SEMs insertion between 2000 and 2008 were included in the

study. Data were extracted from the database, and additional follow-up data were retrospectively collected from the hospital medical records. Follow-up data were recorded for a minimum of 6 months, unless surgery, re-stenting or death occurred earlier. Patients experiencing short-term failure and patients with a functioning stent but less than 6 months follow-up were excluded from the long-term data analysis. All stents were inserted using fluoroscopy by over-the-wire technique. An endoscopic aid was used in cases of obstruction around or proximal to the splenic flexure. For the purpose of the study, we defined technical success as the correct placement of the stent through the stricture, clinical short-term success as clinical improvement for at least 5 days and long-term clinical success as the absence of the need for re-intervention until death or end of follow-up. Multiple logistic regression analysis was performed to ascertain which factors influenced success rates. The study was approved as a clinical audit by the hospital's department of clinical audit and effectiveness.

## Results

One hundred and four SEMs were attempted in 96 patients with a mean age of 72.3 years (36–97 years, 47% male). Indications included colonic malignancy (80.2%), extra-colonic malignancy (14.6%) and others such as Crohn's or diverticular disease (5.2%). The strictures were situated in the rectum (17.7%), sigmoid colon (62.5%) and proximal to the sigmoid colon (19.8%). The Hanaro stent was the most commonly used stent (42.5%), but the other stent types used included Wallstent (21.2%), CHOO (18.7%), Niti-S (8.8%) and others (8.8%). Technical success was achieved in 80 of 96 cases (83.3%), while clinical short-term success was observed in 74 of 96 (77.1%) patients.

Nine early complications occurred in eight cases: early stent migration (3), death within 2 days (2), severe bleeding (2), perforation (1) and stent obstruction (1; Table 1). Early death was caused by extensive haemorrhage and subsequent hypovolaemic shock in a 68-year-old woman with

**Table 1** Complications

	Early complications	Late complications
Cohort	80 patients	57 patients
Stent migration	3 (3.8%)	7 (12.3%)
Tumour overgrowth	n/a	3 (5.3%)
Severe bleeding	2 (2.5%)	
Stent obstruction	1 (1.3%)	4 (7%)
Perforation	1 (1.3%)	1 (1.8%)
Early death	2 (2.5%)	n/a
Total	9 complications in 8 (10%) patients	15 (26.3%)

n/a not applicable

**Table 2** Results by type of stent

	Clinical short-term success	Early complications	Clinical long-term success	Late complications
CHOO	13/15 (86%)	1/15 (6%)	9/10 (90%)	3/10 (30%)
Wallstent	16/17 (94%)	4/17 (23%)	8/12 (67%)	4/12 (33%)
Hanaro	31/34 (91%)	2/34 (6%)	16/24 (67%)	8/24 (33%)
Niti-S	7/7 (100%)	1/7 (14%)	6/6 (100%)	0/6 (0%)
Other	7/7 (100%)	0/7 (0%)	5/5 (100%)	0/5 (0%)
Total	74/80 (92.5%)	8/80 (10%)	44/57 (77%)	15/57 (26%)

external compression by an ovarian cancer. The cause of death in the other case, an 89-year-old man with a sigmoid carcinoma, was not related to the stenting procedure.

Long-term follow-up data were available on 57 patients (47% male) with a mean age of 72.5 years (44–97 years). Indications and site of obstruction in this cohort did not differ significantly from the overall group. Follow-up lasted for a median of 6 months (mean, 15 months; range, 1–72 months). Clinical long-term success was observed in 77% (44/57) of the overall group and in 81% (38/47) of patients with colorectal malignancies. Nine patients were successfully bridged to pre-planned radical surgery. Of the 48 patients for whom the stent was aimed to be the sole long-term treatment, 35 (73%) did not experience recurrence of bowel obstruction and needed no further intervention. Late complications occurred in 15 (26.3%), including seven (12.3%) stent migration, three (5.3%) tumour overgrowth, one (1.8%) late perforation and four (7.0%) cases of recurrent obstruction (Table 2). Of these patients, six underwent palliative surgery, three were given palliative medical care, two were re-stented and a further two underwent re-stenting followed by palliative surgery. Two patients, however, remained asymptomatic after passing the stents spontaneously. Of the subgroup stented prior to radical surgery, only one of nine patients experienced stent migration, which was successfully treated by re-stenting.

Multiple logistic regression analysis showed that technical success was not influenced by age, sex, indication and

site of obstruction. Year of insertion, however, had a significant independent relationship with technical success ( $p=0.041$ ). Stent insertions attempted at the end of the study period were less likely to be successful than those attempted during the early phase of the study. Patients with higher ASA scores also had a significantly lower technical success rate (test for linear association,  $p=0.010$ ). But after adjusting for a year of insertion, this was no longer a significant independent factor ( $p=0.30$ ).

Short-term clinical success was not significantly influenced by age, sex, indication, site of obstruction, year of insertion or ASA score (Table 3).

Colonic SEMS insertion for patients with a colonic malignancy had a significantly higher long-term success rate (81%) compared to those with extra-colonic malignancies (43%; Fisher's exact test,  $p=0.049$ ). Age, sex, indication, site of obstruction, year of insertion, ASA score and type and length of stent had no effect on long-term success rates. Furthermore, there was no statistically significant relation between success and time interval between stent insertion and surgery, re-stenting or death.

## Discussion

Self-expanding metal stent insertion provided symptomatic relief from colonic obstruction in 77% of our patients. The

**Table 3** Factors influencing success

	Statistical test	Technical success	Short-term clinical success	Long-term clinical success
Age	<i>t</i> Test	$p=0.2$ NS	$p=0.62$ NS	$p=0.82$ NS
Sex	Chi-square	$p=1.0$ NS	$p=1.0$ NS	$p=1.0$ NS
Indication	Fisher's exact	$p=0.85$ NS	$p=0.3$ NS	$p=0.049$ Independent risk factor
Site	Chi-square	$p=0.38$ NS	$p=0.65$ NS	$p=0.31$ NS
Year of insertion	Linear association	$p=0.009$ Independent risk factor, $p=0.041$	$p=0.66$ NS	$p=0.76$ NS
ASA score	Linear association	$p=0.01$ Risk factor, not independent, $p=0.30$	$p=0.38$ NS	$p=0.90$ NS
Type of stent	Chi-square	n/a	n/a	$p=0.17$ NS
Length of stent	<i>t</i> Test	n/a	n/a	$p=0.81$ NS
Time to event	Mann–Whitney <i>U</i> test	n/a	n/a	$p=0.23$ NS

n/a not applicable

NS not significant

technical success rate of 83% is at the lower end of the spectrum in previously published series [7, 9]. While those series only reported on patients with colorectal malignancies, we had a mixed group of patients with only 80% colorectal malignancies. The type of indication, however, did not influence our technical success rate. We observed a significant decline in technical success rate over the study period, while numbers of procedures per year rose. Patients with higher ASA scores were less likely to have a successful stent insertion. Adjusting for year of insertion showed that there was no significant independent association between ASA and success. With increasing numbers of procedures per year, it is conceivable that more complex cases were taken which could have led to a subsequent fall in success rate. No referred patient was denied an attempt at stenting. As all procedures were undertaken or at least supervised by a single senior operator, we believe it is unlikely that technical ability decreased over the study period.

Long-term follow-up data showed that colonic SEMS provides an effective bridge to surgery in possibly curable malignant disease with a relatively low complication rate of 11%. As suggested by the two comparative studies [3, 4], this can lead to better long-term outcomes when patients are in an improved medical state before major surgery. When colonic stent insertion as a sole treatment aims to provide long-term relief from colonic obstruction, initial success can be maintained in 70% of cases without the need for re-intervention. This success was maintained for a mean of 15 months (median, 6 months) in our long-term follow-up group. SEMS is therefore an extremely valuable tool when managing patients with advanced and/or metastatic colorectal cancer.

We could not reproduce the Korean finding that shorter stents and patients with more distal disease were associated with long-term clinical success. Indeed, both factors were clearly not associated with success in our patients. Also, the type of stent used did not influence success. The short-term success in palliating colonic compression caused by extra-colonic malignancies offered by SEMS could not be maintained in the long term, as these patients were far more likely to experience re-obstruction than those with a colonic malignancy. This finding is supported by a recent American study demonstrating similar results [11]. The usefulness of colonic SEMS in the management of colonic obstruction due to extra-colonic malignancy is therefore limited.

Like most other series of colonic SEMS, we observed a high late complication rate of 25%. While some complications can be managed by re-stenting, eight of 15 patients required palliative surgery, and three patients required terminal medical care. There have been considerable concerns about late perforations since the premature termination of the Dutch ‘Stent-in 1 Study’ [5]. One patient in our study, however, was

treated with a WallFlex stent, while the ‘Stent-in 1 Study’ used only WallFlex stents. Only two (one early and one late) perforations were observed in our study group. This should alleviate fears about late perforations caused by colonic stents when stent types other than WallFlex are used.

In conclusion, colonic SEMS provides symptom relief in nearly 80% of patients. Successfully stented colorectal cancer patients can be bridged to radical surgery or palliated without the need for re-intervention in a single procedure in 89 and 81%, respectively. This clinical success is, however, associated with complications in a quarter of patients. Length of stent and site of obstruction do not influence outcomes. Stenting of an obstruction caused by benign disease needs further evaluation, while stenting of cases of extra-colonic malignancies is unlikely to yield long-term relief.

**Conflicts of interest** All authors declare no conflict of interest.

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