

# Safety and efficacy of gastrointestinal stents in cancer patients at a community hospital

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**Objective:** Increasing scientific evidence supports the use of self-expanding metallic gastrointestinal (GI) stents. The commonly accepted primary indications are their usefulness as a bridge to surgery and for palliation to avoid surgery. These stents have been shown to have high technical success and low complication rates, leading to improved quality of life for patients. They have also been shown to be cost-effective when compared with alternative therapies. The objective of this study is to present a retrospective review of our local experience. **Methods:** Attempts were made to place 23 GI stents in 16 patients for palliative cancer indications. **Results:** Follow-up was 5–352 days (mean 81.9 d). Presenting symptoms included abdominal distention or pain (81%), nausea or vomiting (69%), constipation (31%) and weight loss (19%). Stents were placed in the colon (11 patients), duodenum (4 patients) or esophagus (1 patient). The technical success rate was 91.3%, the clinical success rate (defined as any improvement in symptoms in patients successfully receiving a stent) was 85.7%, and the complication rate was 21.4% among patients successfully receiving a stent, or 18.8% overall. Of 14 patients successfully receiving at least 1 stent, 10 (71%) were discharged home after a mean of 11.5 days (range 1–26 d). Of patients successfully receiving at least 1 stent, 12 (86%) had passed away at the time of last follow-up. Patients who successfully received a stent but who have since passed away (either in hospital or out of hospital) had their stent(s) in situ for a mean of 57 days (range 5–180 d). **Conclusion:** On the basis of our data, we believe that GI stents may be safely and effectively used in a community hospital setting and that they provide benefit in the palliative care population.

**Objectif :** Des données scientifiques de plus en plus nombreuses appuient l'utilisation d'auto-extenseurs gastrointestinaux (GI) métalliques. Les indications primaires communément reconnues sont leur utilité comme moyen de transition en attendant l'intervention chirurgicale et comme mesure palliative pour éviter l'intervention. On a démontré que ces auto-extenseurs donnent de bons résultats sur le plan technique et produisent de faibles taux de complications, ce qui améliore la qualité de vie des patients. On a aussi démontré qu'ils sont rentables comparativement à d'autres thérapies. Cette étude vise à présenter une analyse rétrospective de notre expérience locale. **Méthodes :** On a tenté la mise en place de 23 auto-extenseurs GI chez 16 patients pour lesquels l'intervention était indiquée comme mesure palliative contre le cancer. **Résultats :** Le suivi s'est établi à 5–352 jours (moyenne de 81,9 j). Les symptômes comprenaient le ballonnement ou la douleur abdominale (81 %), les nausées ou les vomissements (69 %), la constipation (31 %) et la perte de poids (19 %). On a mis en place des auto-extenseurs dans le côlon (11 patients), le duodénum (4 patients) ou l'œsophage (1 patient). Le taux de réussite technique a atteint 91,3 %, le taux de réussite clinique (défini comme toute amélioration des symptômes chez les patients qui ont reçu avec succès au moins un extenseur), à 85,7 %; le taux de complications a atteint 21,4 % chez les patients qui ont reçu l'auto-extenseur avec succès, ou 18,8 % dans l'ensemble. Sur 14 patients qui ont reçu avec succès au moins un auto-extenseur, 10 (71 %) ont reçu leur congé après un séjour moyen de 11,5 jours (plage de 1–26 j). Chez les patients qui ont reçu avec succès au moins un auto-extenseur, 12 (86 %) étaient décédés au moment du dernier suivi. Les patients qui ont reçu avec succès un auto-extenseur mais qui sont décédés depuis (à l'hôpital ou ailleurs) avaient reçu leur auto-extenseur depuis 57 jours en moyenne (plage de 5–180 j). **Conclusion :** Compte tenu de nos données, nous sommes d'avis qu'il est possible d'utiliser en toute sécurité et efficacité des auto-extenseurs GI dans le contexte d'un hôpital communautaire et qu'ils offrent des avantages dans la population en soins palliatifs.

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Increasing scientific evidence supports the use of self-expandable metallic gastrointestinal (GI) stents in the setting of malignant obstruction. Frequently used types include biliary, esophageal, gastroduodenal and colonic stents.

The oncology patient population varies greatly. Presentations include multiple and complex symptoms due to various underlying pathologies. Often these patients are incurable, so palliation becomes the goal. Given their short lifespan, it is desirable to avoid surgical procedures or prolonged hospital stays for these patients.

There are 2 primary categories of indications for stent use: as a so-called “bridge to surgery” and in the setting of palliative care. In the former case, placement of a stent affords the surgeon additional time in which to prepare the patient for an operation. A recent Canadian study found that 18.7% of patients with newly diagnosed colorectal cancer had an initial presentation of obstruction or perforation or required hospital admission.<sup>1</sup> In these cases, placement of a GI stent would give the surgeon more time in which to safely prepare the patient for surgical resection or bypass. If widely metastatic disease is discovered at the time of the initial imaging workup, surgery may be precluded altogether. In the latter case, stent placement may obviate the need for a colostomy by allowing the patient to eat normally and be discharged home earlier — all important considerations, particularly in the palliative population.<sup>2</sup>

There is evidence that stenting may be associated with cost savings in appropriate situations. Targownik and colleagues<sup>3</sup> used decision analysis to calculate the cost-effectiveness of 2 strategies for treating acute, malignant left-sided colonic obstruction: the first was emergent colonic stent followed by elective surgical resection and reanastomosis, and the second was emergent surgical resection followed by diversion (Hartmann’s procedure). They found that the first

approach was associated with a lower mean cost per patient (US\$45 709 v. US\$49 941). Others have found similar cost savings.<sup>4,5</sup>

Placement of GI stents has been shown to have high technical and clinical success rates, typically over 90%,<sup>2,6-11</sup> with acceptable complication rates.

The aim of this report is to present our local experience with placement of 23 GI stents in 16 palliative patients in a community hospital setting. Specifically, we present our patient demographic and referral pattern information and the technical success, complication and clinical success rates we achieved. Our goal was not to duplicate larger prospective studies that looked specifically at clinical success and complication rates but, rather, to determine whether placement of GI stents was both practical and useful for a palliative population treated in a community hospital.

## Methods

Institutional Research Ethics Board approval was obtained for this study, which was performed at the Oshawa site of Lakeridge Health Corporation, Oshawa, Ontario. The site has a total of 338 beds. There are 15 staff radiologists, of whom 2 of the coauthors (M.A. and A.M.) are dedicated and fellowship-trained in interventional radiology (IR); as well, there are 2 IR nurses and 1 IR suite. A total of 210–220 IR procedures are performed monthly, which includes placement of about 50 venous access devices. Neither of the 2 IR staff has dedicated fellowship training in the placement of GI stents (the procedure was not performed at the time of fellowship training); however, this procedure is essentially an extension of advanced IR techniques. All GI stenting procedures were performed in a multidisciplinary fashion: before placement, opinions and consultation were sought from gastroenterol-

ogy, surgery and oncology (as well as any additional specialties relevant to each individual patient).

All patients who were referred for fluoroscopic placement of a GI stent within the IR department were retrospectively reviewed. Patient demographics, procedure indication, procedural details and outcome were recorded. Follow-up was carried out by reviewing the electronic medical record, by radiologic imaging studies, by telephone contact with the referring or primary care physicians and, where necessary, by contact with the patient or patient’s family. “Clinical success” was defined as any improvement in the presenting obstruction-related symptoms.

A basic procedural protocol was followed. All patients underwent pre-procedural CT scans. In some cases, additional imaging included barium studies or endoscopic retrograde cholangiopancreatography. All procedures were performed with the patient under conscious sedation and with fluoroscopic guidance. A basic catheter and stent-over-guidewire technique was used. Contrast was injected before stent deployment to demonstrate the obstruction or stricture. The stent was then deployed according to the manufacturer’s instructions. Six patients received more than 1 stent. In 5 cases, this was because the obstruction or stricture was too long to be covered by a single stent, and 2 or more overlapping stents were deployed. In 1 patient, the first stent placed migrated 1 day after placement, and a second stent was therefore placed 2 days later.

Following the procedure, patients were counselled about pain control, common benign poststent symptoms (e.g., chest pain for several days after stent insertion) and potential complications.

## Results

Between June 2004 and April 2006, 16 patients were referred for placement of enteric stents.

Of the patients, 11 (69%) were women. The mean age was 65 years (range 41–85 y). All patients undergoing stent placement had incurable malignancies (Table 1). Primary presenting symptoms leading to referral for stent placement included abdominal pain or distension (81%), nausea or vomiting (69%), constipation (31%) and weight loss (19%). Stents were placed within the colon (11 patients), duodenum (4 patients) and esophagus (1 patient) (Table 1).

The mean total procedural time was 108.7 minutes (range 50–225 min), and the mean total fluoroscopy time was 34.5 minutes (range 6.1–65.8 min); excluding 2 failed attempts, the mean fluoroscopy time was 32.3 minutes. The technical success rate of stent placement was 91.3%. There were 2 cases of technical failure due to anatomic constraints that prevented crossing of the lesions: in 1 case, it was impossible to traverse a colonic ob-

struction, and in the other, it was impossible to traverse a tortuous sigmoid stricture. In the first failed case, the patient underwent laparotomy and colostomy the following day; in the second case, colonoscopy attempted by a gastroenterologist also failed for the same reason. There were no complications associated with the attempt to place a stent in either of these 2 patients. It is important to note that an older delivery platform was used in both of these cases. A newer, more flexible and easier-to-use delivery system has since replaced the earlier device. In 1 of the successful duodenal stent placements, a direct gastric puncture approach had to be used because it was not possible to advance the stent across the stenosis via an oral approach. The clinical success rate (defined as any improvement in symptoms among patients successfully receiving a stent) was 85.7%.

There were 3 stent-related compli-

cations in patients who had a stent successfully placed, giving a per-patient complication rate of 21.4% or an overall complication rate of 18.8% if all patients are included. The first complication was a large-bowel re-obstruction following colonic stent insertion. The remaining 2 complications both involved colonic stents that migrated. Therefore, of the 21 stents successfully placed, 2 (9.5%) migrated postprocedure. In the 1 patient who experienced stent migration 1 day after placement, symptoms of recurrent bowel obstruction developed. Stent migration was confirmed at the time of abdominal radiography. A second stent that was longer than the initial stent was placed 2 days later, resulting in relief of obstructive symptoms. At the time of last follow-up 2 months later, the stent position remained unchanged. The patient in whom the second colonic stent migrated passed away 4 days after the procedure from mul-

**Table 1**

**Presenting symptoms, diagnosis and type of gastrointestinal stent(s) inserted**

Age, y	Sex	Presenting signs and symptoms	Diagnosis	Type of stent inserted
79	M	No BMs × 3 wk, dehydration, dysphasia	Esophageal tumour with 2 perforations	Esophageal
45	M	N & V, abdominal pain	Pancreatic cancer with gastric outlet obstruction	Duodenal × 2
47	F	N & V, abdominal distension	Bladder cancer, LBO (closed loop)	Colonic
57	M	Abdominal pain, no BMs × 2 wk	Metastatic hepatocellular carcinoma, LBO	Colonic × 2
72	F	N & V, abdominal pain, rectal bleeding, jaundice	Ampullary carcinoma, gastric outlet and liver metastases	Duodenal
83	M	GI bleeding, anemia	Metastatic colorectal cancer, secondary LBO	Colonic
85	F	N & V, abdominal pain, weight loss	Gastric outlet obstruction secondary to gastric cancer	Duodenal
76	M	N & V, abdominal pain, loose stools, weight loss	Malignant sigmoid stricture with liver metastases	Colonic × 2
55	F	N & V, abdominal pain, diarrhea	Colorectal cancer, extrinsic compression from pelvic mass	Ilio-colonic × 2
72	F	Constipation, abdominal pain, dysuria	Clear cell endometrial cancer	Colonic
62	F	N & V, abdominal pain/distension, anorexia, weight loss, fever, loose stools	Pancreatic cancer with gastric outlet obstruction	Duodenal
51	F	N & V, abdominal pain/distension, fever, loose stools	Endometrial cancer	Colonic
66	F	N & V, constipation, abdominal pain/distension	Ovarian cancer, liver cancer	Colonic × 3
72	F	N & V, abdominal distension, umbilical discharge	Colon cancer	Colonic
81	F	Bloody diarrhea, fatigue	Colon cancer, liver metastasis	Colonic
41	F	N & V, dehydration, back pain, abdominal distension, no BMs × 21 d	Endometrial cancer	Colonic × 2

BM = bowel movements; F = female; GI = gastrointestinal; LBO = large bowel obstruction; M = male; N & V = nausea and vomiting.

tisystem failure related to metastatic ovarian cancer.

Among the 14 patients who had a stent successfully placed, 4 died while in hospital. The remaining 10 (71%) were discharged home after a mean of 11.5 days (range 1–26 d).

Range of follow-up was 5–352 days (mean 81.9 d). Of 14 patients who successfully received a stent, 12 (86%) had some improvement in their symptoms. Of patients successfully receiving at least 1 stent, 12 had passed away at time of last follow-up. The patients who successfully received a stent but have since passed away (either in or out of hospital), had their stent(s) in situ for a mean of 57 days (range 5–180 d).

## Discussion

The results reported here are similar to those previously published in the literature. A review of colonic stenting by Khot and colleagues<sup>12</sup> examined case series over a 10-year period and included 598 patients in the analysis. The most common etiology of obstruction was malignancy (92%), with the descending colon being the most common site. The technical success (placement and deployment) rate was 92%, and the overall success (lack of further reintervention over the first 96 hours) rate was 95%. A second review of 54 studies that reported the use of colonic stents in a total of 1198 patients concluded that the placement of enteral self-expanding metallic enteric stents is an effective and safe definitive procedure in palliation of malignant colorectal obstruction.<sup>2</sup> Smaller case studies of enteral stenting with excellent success have also been reported in smaller centres.<sup>13,14</sup>

As mentioned in the Results section, there were 3 stent-related complications in this study. According to published reports, complications generally occur within days of placement. According to 1 study,<sup>12</sup> re-obstruction occurred in 10% of patients and was attributed to tumour overgrowth (62%), fecal impaction

(25%) and migration (10%). Other documented complications include stent migration (10%), pain (5%), bleeding (5%) and tenesmus. Late perforation (4%) is uncommon but also may occur.<sup>12</sup> The associated procedural mortality rate is 1% or less.<sup>12</sup> Reported complications of gastric outlet, duodenal and small intestinal stenting are few and, largely, not serious. Although rare, bleeding may occur; it is believed to be minor and attributed to ulceration from the stent.<sup>15</sup>

In terms of clinical success rates, it should be stressed that patient education regarding diet after stent placement plays a large role. Patients should slowly reintroduce more dense foods, and certain foods such as green leafy vegetables and meats should be avoided, given their obstructive nature.<sup>16</sup>

The initial intent of this study was to determine whether GI stenting was feasible and useful in a palliative patient population and in a community hospital setting. On the basis of our results, we are comfortable in supporting the utility of this procedure in this patient population. Although it is difficult to state definitive conclusions in terms of morbidity and mortality, given the aggressive nature of the cancers afflicting these patients, the majority (85.7%) did have symptomatic improvement. As well, given that most of these patients passed away within a few months of receiving their stent(s), this symptomatic improvement was surely very welcome in their final days. We are also comfortable, from our experiences, in stating that this procedure may be safely performed in a community hospital setting. Initial predicted challenges included reduced nonradiologic support or little-to-no experience should a complication arise. These challenges were easily overcome, however, by approaching each patient in a multidisciplinary fashion, with consultation sought from gastroenterology, surgery and oncology before stent placement. A multidisciplinary

approach, with excellent interdisciplinary communication, collaboration and cooperation is, in our view, a most important key to providing such a service. For optimal results, other relevant specialties (specific to individual patient needs), administration and paramedical IR team members must be kept involved in addition to gastroenterology, surgery and oncology specialists. We are indeed quite pleased and proud of the level of collaboration that occurred at our hospital among all relevant parties and specialties.

Further, this is a procedure that practising interventional radiologists may learn, despite not having been shown this during their fellowship training. Neither of the 2 authors (M.A. and A.M.) who performed these procedures had been trained specifically to place GI stents; however, the basic technique is an extension of advanced IR techniques.

As mentioned in the introduction to this paper, there is limited but increasing evidence that placement of GI stents can lead to cost savings when they are used as a bridge to surgery or in a palliative population. Had our study patients not been treated with 1 or more stents, there might have been increased costs associated with a prolonged in-hospital stay, enteral feeding or palliative surgery, etc. One of the few studies that compared costs of palliative surgery to GI stent placement examined treatment of patients with malignant upper GI tract obstruction and found that treatment involving stent placement cost US\$9921, whereas treatment involving palliative surgery cost US\$28 173.<sup>17</sup> Duration of hospitalization was 4 and 14 days, respectively. In another study by Binkert and colleagues,<sup>4</sup> cost savings were reported for preoperative GI stenting among patients with acute colonic obstruction.

It is important to point out that the expected length of survival will play a role in deciding the appropriateness of this procedure. In this

study, for example, although 12 (86%) of 14 patients who successfully received at least 1 stent have passed away since the time of our follow-up, they had stent(s) in situ for a mean of 57 days (range 5–180 d). If, however, most patients had passed away after only a few days with the stent in situ, one might question the cost–benefit of the procedure for these patients.

A multidisciplinary group of Canadian expert physicians from the fields of oncological general surgery, IR, radiation oncology and gastroenterology has been created to develop Canadian guidelines for the appropriate use of GI stents in the setting of malignant obstruction. The initial draft of the guidelines has been completed and submitted to each subspecialty society for review. We anticipate that this forthcoming document will assist physicians in the appropriate use of GI stents.

**Competing interests:** Drs. Asch and Myers have received research funding from Dermaport and Cook Medical and have been paid consultants for Dermaport and Boston Scientific. None declared for Dr. Baerlocher, Mr. Vellahottam, Mr. Puri and Ms. Andrews.

**Contributors:** Drs. Baerlocher, Asch and Myers designed the study. Drs. Asch and Myers, and Mr. Vellahottam, Mr. Puri and Ms. Andrews acquired the data, which Dr. Baerlocher analyzed. Drs. Baerlocher and Asch wrote the article, and Drs. Asch and Myers, and Mr. Vellahottam, Mr. Puri and Ms. Andrews revised it. All authors gave final approval for the article to be published.

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