Colonic self-expanding metal stents (SEMS) in acute large bowel obstruction

Mohammad I Khan, Adrian Claydon

Abstract

Aim Colonic SEMS are increasingly used in the management of acute large bowel obstruction, both as a bridge to surgery and as a definitive palliative measure in patients unfit for surgery. We describe our experience from a New Zealand hospital and compare our data with that already published in literature.

Methods In this retrospective 4-year study, data was collected from the case notes of 28 consecutive patients with acute large bowel obstruction referred for colonic SEMS. Uncovered Boston Scientific colonic SEMS were placed endoscopically under fluoroscopic guidance. Technical success was considered as correct placement of stent after deployment and clinical success as the passage of flatus and faeces after stent insertion. Data was analysed using descriptive statistics.

Results Our technical and clinical success rates were 90% and 88% respectively. The procedure was palliative in 15 patients and as a bridge to elective surgery in 13 cases. Procedure-related mortality was 7%. It was because of one early and one late perforation. The average length of stay post procedure was 2 days. Mean survival post stent insertion in the palliative group was 2.4 months and for those with a bridge to surgery was 14 months.

Conclusion Our results support the data published from international centres in terms of deployment of SEMS in patients with acute large bowel obstruction, both as a bridge to surgery and as a definitive palliative measure.

Large bowel obstruction is a surgical emergency. It is most commonly caused by colorectal cancer and rarely by benign strictures and extrinsic compression of the colon.\(^1\) Presently, the standard of care for such patients is either a two-step diverting colostomy with subsequent colonic resection or a one-step resection with primary anastomosis with or without on-table lavage, especially in right-sided tumours where surgery is considered to be curative.

Permanent colostomy is performed in incurable, advanced cancers. Insertion of a self expanding metal stent (SEMS) is now a well established alternative to emergency surgery. It can be used both as a bridge to elective surgery, allowing time for optimization of preoperative care or as a definitive procedure in cases of locally unresectable tumours or in patients with comorbidities and therefore at high risk for surgery.

SEMS, therefore, avoids emergency surgery which has a high mortality and complication rate. Colostomy care also entails increased costs and a lower quality of life.\(^2\) However, SEMS are costly (about $2000/stent) and are also associated with
procedure-related complications including bleeding, perforation, stent occlusion and migration.\textsuperscript{3}

Over the last decade, there has been increasing international literature on the use of SEMS in acute large bowel obstruction. To date, New Zealand data has been limited to a single study which compared SEMS with traditional surgery in patients with metastatic tumours.\textsuperscript{4} We describe our own experience in a New Zealand unit with SEMS, both as a palliative procedure in inoperable cases and as a bridge to elective surgery.

**Patients and Methods**

This is a retrospective study of 28 consecutive patients (12 males, 16 females) referred for colonic SEMS since November 2006 to our endoscopy unit. The mean age of the patients was 72 years with an age range from 31 to 92 years. All patients had CT of the abdomen and pelvis prior to stenting.

Twenty-four patients had clinical and radiographic evidence of colonic obstruction at the time of referral (abdominal pain, dilated loops on imaging), while the remaining four patients had either radiographic (two patients) or endoscopic evidence (two patients) of bowel obstruction with no visible lumen. Seven patients had right-sided obstruction (hepatic flexure; 3, transverse colon; 4) while the rest were left-sided obstructions. Two of the patients with right-sided tumours had stent insertion as a bridge to surgery. Both were referred from a peripheral hospital. Initial surgery was postponed as both patients had nutritional depletion, renal impairment, and in one case, urosepsis.

The mean length of the obstructing lesion, as identified on the CT scan was 4.8cm (range; 2–10cm). As shown in Table 1, thirteen patients were referred as a bridge to elective surgery. Fifteen patients were referred for palliative stenting because of locally unresectable lesions or the patients were either considered unfit for surgery (one patient) or declined surgery (two patients). These included one patient with extrinsic rectosigmoid compression because of metastatic ovarian tumour and one patient with diverticular stricture.

**Table 1. Summary statistics of patients referred for palliative stenting and stenting as a bridge to surgery**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Bridge to surgery</th>
<th>Palliative stenting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient No</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Male : Female ratio</td>
<td>5:8</td>
<td>7:8</td>
</tr>
<tr>
<td>Right-sided lesions (n)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Left-sided lesions (n)</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>Mean tumour length (cm)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Survival</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alive (n)</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Dead (n)</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Mean hospital stay (days)</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

SEMS were placed by two endoscopists during the study. An endoscopic technique was used under fluoroscopic guidance as seen in Figures 1 and 2.
Intravenous midazolam and fentanyl were used for conscious sedation. Olympus therapeutic colonoscopes were used for all procedures. A therapeutic Olympus gastroscope was used in left-sided obstructions if the colonoscopy failed to reach the obstruction site. All cases were non-traversable with the scope. Routine balloon dilatation of the lesion before stenting was not performed.

A super stiff Boston Scientific 0.035 guidewire was passed through the stricture and then a canula was passed over the guidewire for radiological contrast to assess the length of the lesion and colonic anatomy immediately proximal to the lesion. The canula was then withdrawn and a metallic stent was passed over the wire, through the biopsy channel of the scope and positioned across the stricture.
The position of the released stent was checked both endoscopically and fluoroscopically before the endoscope was withdrawn. The stent used were mainly the Boston Scientific uncovered SEMS of different lengths and diameters were deployed depending upon the tumour length and site. The shortest stent used was 60mm and the longest one was 120mm. The widest diameter stent used was 25mm. The procedure was considered technically successful if the SEMS was correctly placed across the stricture as determined by fluoro-imaging and endoscopy. Clinical success was considered to be the return of flatus and bowel movement. Descriptive statistics were used to analyse the data.

**Results**

Twenty-five patients had technically successful stent placement (90 %). Three of them required balloon dilatation of either the proximal or distal end of the stent after placement due defective expansion of the stents. One patient had a technical failure as the obstruction site was not reached and the patient was sent for emergency surgery. One patient had clinical failure after technically successful stent deployment and had emergency surgery. One patient had defective stent opening and after failure of balloon dilatation required the insertion of a second stent. One patient had immediate procedure-related perforation and died on the second day of stent placement. The three technical failure cases were from the group referred for palliative stenting.

One patient had delayed perforation 6 weeks after the placement of stent. One patient had significant haemorrhage post stenting requiring transfusion but settled on conservative treatment. Two patients had stent migration, one with diverticular stricture and another one with malignant rectal stricture one week post stent deployment. They went for elective surgery. One patient had two stents inserted to cover a long malignant stricture. Another patient had a second stent insertion after the first one migrated distally.

The mean length of hospital stay for successful stenting was 2 days (mean 1–7 days). Four cases were done as day cases and twelve were discharged the day after the procedure. Two patients died as inpatients after the procedure, one with perforation and another one with clinical failure after stent deployment. One patient had an inpatient surgery after the successful deployment of stent.

Ten patients are still alive post stenting. All except one of them had stenting as a bridge to surgery as shown in Table 1. The mean survival, to date, for them is 14 months. Those who died after clinically successful placement of stent had a mean survival of 2.7 months (range; one week – six months).

As shown in Table 1, only one patient in the palliative group is still alive. He had resectable tumour at the time of diagnosis but surgery was precluded because of medical comorbidities. Only two patients had a survival of less than a month after successful deployment of stent.

**Discussion**

The first reported case of colonic SEMS was by Dohmoto *et al* in 1991 as palliative treatment in a case of malignant stenosis of the rectum. Since then it has been increasingly used as a therapeutic modality not only in primary colorectal cancers but also for extrinsic and benign causes of large bowel obstruction.
Colonic SEMS may be used as a primary form of palliation in advanced and unresectible tumours or as a bridge to elective surgery in patients presenting with acute large bowel obstruction. Colonic SEMS compares favourably with emergency surgery in terms of mortality and morbidity, length of hospital stay, cost-effectiveness and quality of life.

We use a combined endoscopic and fluoroscopic method in all of our patients as compared to a pure radiological method employed in some centres. In literature the technical and clinical success rate is around ninety percent which are comparable to our study.

Three of our patients (10%) had defective expansion of either the proximal or distal end of the stent as picked by a follow up X-ray on the second day of the procedure. They were either successfully balloon dilated (two cases) or re-stented (one case).

Seven of our patients (25%) had either a hepatic flexure tumour (3 cases) or a transverse colon lesion (4 cases). Although, the literature suggests more technical difficulties in proximal colonic lesions all of our right-sided stents were a technical and clinical success. Also, once the lesion was reached we had successful guidewire cannulation of the stricture in all cases. This is better than those reported from other centres.

We think our higher cannulation rate may be related to the use of sphincterotomes for tumours which are present on colonic bends and may be difficult to cannulate with a straight cannula or a wire. The angulation of a sphincterotome can be controlled in a graded manner and the tip directed to the axis of the tumour.

We employed uncovered stents in all of our cases except one as they less likely to migrate. Two of our patients had stent migration after technically correct placement and one had distal migration after misplacement (10 %). Inappropriate patient selection as those with low grade obstruction and chemotherapy given post stent insertion with shrinkage of tumour mass are other causes of stent migration in literature.

Obstruction of SEMS with tumour in growth and over growth can happen and is commonly treated with placement of a second stent through the first stent. We have not encountered them in our study.

Bleeding is rare in SEMS placement. One of our patient developed significant bleeding requiring transfusion but it settled on conservative management. Perforation is more common when pre-dilatation of the stricture is performed. We did not routinely pre-dilate but had one case of early and one case of late perforation. Both cases did not have rescue surgery and died with comfort care. Our study, therefore, has a procedure-related mortality of seven percent.

SEMS are more cost effective when compared with emergency surgery. Our study with a mean hospital stay of 2 days is comparable with short hospital stay following successful placement of SEMS. This is also supported by the previous New Zealand study which showed significantly reduced mean hospital stay in the stented patients. We recommend SEMS deployment as a day-stay procedure in cases of uncomplicated SEMS insertion.
There is a clear role of SEMS as a definitive procedure in locally unresectable tumours presenting with acute large bowel obstruction. However, its role, as a bridge to surgery, in patients with a potentially curative disease is still debatable, with conflicting reports in literature. Clearly, the higher morbidity and mortality rates of emergency surgery, especially in left-side tumours, has to be balanced against the potential stent-related complications. Perhaps, the local expertise in each hospital and tumour characteristics (left versus right-sided tumours) should dictate the choice of intervention.

The limitation of our study was the retrospective design of the study. Data collected from the review of case notes has a potential for under-reporting of the complication rates.

Competing interests: None.

Author information: Mohammad I Khan, Adrian Claydon, Gastroenterologists, Tauranga Public Hospital, Tauranga

Correspondence: Dr Mohammad I Khan, Gastroenterologist, Tauranga Public Hospital, Private Bag 12024, Cameron Road, Tauranga, New Zealand. Email: imran.khan@bopdhb.govt.nz

References:
