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The Outcome of Self-Expanding Metal Stents in Elderly Patients

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ABSTRACT

Background and Objectives: Emergency surgery for large bowel obstruction is associated with high morbidity and mortality rates, especially in elderly patients. Colonic self-expanding metal stents may provide temporary relief of obstructions and enable preoperative evaluation. The aim of this retrospective study was to assess the clinical outcomes of emergency stenting in elderly patients with large bowel obstructions.

Methods: Between 1997 and 2010, patients presenting with large bowel obstructions were treated predominantly with self-expanding metal stent insertion. Clinical data, including age, site of obstruction, success rate, and surgery and mortality rates, were collected. Patients were divided into 3 groups (I, II, and III) according to age: <69, 70 to 79, or >80 years.

Results: One hundred thirty-two consecutive patients underwent stent implantation, with a mean age of 72.1 years (range, 28–95 years). Similar diversity of sex, indication, and stricture location was found. There were no significant differences in clinical success (88.7%, 73.8%, and 78.4%, $P = .16$) and stent-related mortality (2.1%, 3.3%, and 3.6%, $P = 1.00$). Similar rates of stoma creation were also found (59.3%, 46.7%, and 60.0%, $P = .76$). In contrast, rates of surgery were lower in older patients (50.9%, 38.1%, and 13.5%, $P = .0013$), and mortality during the same admission was significantly higher in patients >70 years of age (4.0%, 15.0%, and 22.2%, $P = .027$). Kaplan-Meier 30-day survival curves for the 3 groups showed a trend toward earlier death among patients >70 years of age.

Conclusions: This study demonstrates that stenting provides similar success rates in all age groups but is associated with higher mortality rates in older patients.

Key Words: Large bowel obstruction, Colonic stenting.

INTRODUCTION

For many years, surgery was the only conventional treatment for colorectal obstruction, with a price of high rates of mortality and morbidity.[1] Surgical treatment options included decompressing colostomy or large bowel resection with or without a stoma. However, since the introduction of colorectal stenting in 1990 by Dohmoto et al,[2] large bowel obstruction relief may be achieved with better outcomes, especially in palliative patients.[3] By alleviating the need for emergency surgery, stenting also enables preoperative comorbidity evaluation, proximal large bowel assessment, and staging of cancer, if needed. After the emergency treatment of obstruction and in cases when surgery is indicated, stenting enables laparoscopic colorectal resection with better short-term outcomes.[4,5] The aim of this study was to assess morbidity and mortality in elderly patients undergoing stenting for large bowel obstruction at Darent Valley Hospital from 1997 to 2010.

METHODS

A retrospective case review was performed of all patients registered in a prospective database who underwent self-expanding metal stent (SEMS) insertion for colorectal obstruction within the Colorectal Unit at Darent Valley Hospital (Dartford, UK) between January 1997 and December 2010. Data including demographic details, stricture location, indication for the procedure, success, failure, and complications of the procedure were collected. Data related to perforation, stent migration, reobstruction, fracture of the stent, and other major complications were included. Stenting-related mortality was defined as death caused by direct stenting-related complications (mainly perforation). Calculation of mortality during the same admission and poststenting 30-day mortality rates were recoded on the basis of the National Health Service's com-

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puterized system. Patients were divided into 3 groups: those <70 years of age (group I), those aged 70 to 79 years (group II), and those >80 years of age (group III).

Technical Considerations

Colorectal stenting was carried out in the interventional radiology room under light sedation and appropriate monitoring, with the patient placed in the left lateral decubitus position. In most cases, SEMS were inserted as a joint procedure between a colorectal surgeon and a radiologist using the "over-the-wire" method. The colonoscope was introduced to the lesion site, and a flexible guidewire was inserted to bypass the stricture. The scope was then retracted to enable introduction of the stent, which later was positioned and deployed. Some cases were done using the "through-the-scope" method, predominantly for proximal tumors, whereby the stent was introduced through the colonoscope. Fluoroscopy was required to ensure successful wire placement and to delineate the size of the tumor for the assessment of stent length. Final assessment of stent positioning was made using water-soluble contrast material, ensuring colon decompression. We used 2 types of stent: the metallic WallFlex Colonic Stent (Boston Scientific Corporation, Natick, MA) and the Memotherm Colonic Stent (Bard Medical, Covington, GA). In all cases of the through-the-scope method, Boston Scientific stents were used.

Statistical Analysis

Undisclosed data were collected on a personal computer, using Microsoft Excel software (Microsoft Corporation, Redmond, WA). Continuous variables such as age were categorized into subgroups and compared using Student *t* tests or Mann-Whitney *U* tests, depending on their distribution. Categorical variables such as tumor location were compared using χ^2 tests. All *P* values were 2 sided and indicated significance when <.05. We constructed probability curves using the Kaplan-Meier method and compared them using the log-rank test. Statistical analysis was performed using StatsDirect version 2.7.8 (StatsDirect Ltd, Cheshire, UK).

RESULTS

During the study period, 132 SEMS were deployed in a similar number of patients for treatment of colorectal pathology, with an average age of 72.1 years. Of these, 53 were included in group I (average age, 59.7 years; range, 28–69 years), 42 were in group II (average age, 75.2 years; range, 70–79 years), and 37 were in group III (average age, 86.3 years; range, 80–95 years). Similar diversity of gender, indication for the procedure, and colonic stricture location was found **(Table 1)**. There were no significant differences in the technical success rates of the procedure (88.7%, 76.2%, and 78.4%, $P = .23$) and clinical success rates (88.7%, 73.8%, and 78.4%, $P = .16$). Data concerning complications were available for 124 of 132 patients and were comparable for the different groups (25.5%, 30.0%, and 12.1%, $P = .17$). Details concerning specific complications are specified in **Table 2**. The mortality rate during the same admission was significantly higher in the older groups (4.0%, 15.0%, and 22.2%, $P = .027$), but stent-related mortality and 30-day mortality were similar. Kaplan-Meier 30-day survival curves showed a similar tendency of probability of survival for the 2 older groups (70–80 and ≥80 years) compared with the young group (18–70 years), with a log-rank *P* value of .19 **(Figure 1)**.

Of all stented patients, 48 (36.4%) underwent surgery. Of these, 27 (20.4% of all patients) were operated on urgently because of failure of stent insertion, failure to achieve bowel decompression, or stent complications. Twenty-one patients (15.9%) underwent planned surgery, of whom 11 (8.3%) underwent laparoscopic surgery. When comparing age groups, it is notable that the younger groups had more surgery (50.9%, 38.1%, and 13.5%, respectively, $P = .0013$; **Figure 2**), though there was no statistical difference between the indication for surgery (planned vs urgent) or the surgical approach (laparoscopic vs open). Detailed data concerning surgery are presented in **Table 3**.

Stoma prevention was achieved in 105 of 132 patients (79.4%), and only 27 patients (20.6%) had stomas. A significant difference in stoma rate was discovered when comparing age groups, with a higher rate of stoma among the young group (17 of 53 [32.1%], 7 of 42 [16.7%], and 3 of 37 [8.1%], $P = .0147$). The risk for a patient <70 years of age to have a stoma was 5.5 times higher than that of a patient >80 years of age.

DISCUSSION

Colorectal cancer accounts for about 1 million new cases per year worldwide,[6] with 15% of all cases presenting as acute colonic obstructions, making it the leading cause of large bowel obstruction.[7] Colonic obstruction necessitates urgent decompression that traditionally required surgery, which carries high risk for mortality and morbidity, as well as high stoma rates.[1] However, in recent years, the use of colorectal stenting proved to be a successful method for relief of symptoms of large bowel obstruction. It also

Table 1.
Colonic stenting: data per age group

Criterion	Group I Age < 70 y (n = 53)	Group II Age 70–79 y (n = 42)	Group III Age ≥ 80 y (n = 37)	*P*	All Cases (n = 132)
Gender					
Male	33/53	20/42	16/37)	.16	69/132
	(62.3%)	(47.6%)	(43.2%)		(52.3%)
Female	20/53	22/42	21/37		63/132
	(37.7%)	(52.4%)	(56.8%)		(47.7%)
Indication for the procedure					
Palliative	37/53	29/42	33/37	.13	99/132
	(69.8%)	(69.0%)	(89.2%)		(75.0%)
Bridge to surgery	12/53	7/42	3/37		22/132
	(22.6%)	(16.7%)	(8.1%)		(16.7%)
Other	4/53	6/42	1/37		11/132
	(7.6%)	(14.3%)	(2.7%)		(8.3%)
Stricture location					
Upper rectum	10/53	10/42)	3/37	.16	23/132
	(18.9%)	(23.8%	(8.1%)		(17.4%)
Rectosigmoid junction	11/53	7/42	8/37		26/132
	(20.7%)	(16.7%)	(21.6%)		(19.7%)
Sigmoid colon	23/53	19/42	20/37		62/132
	(43.4%)	(45.2%)	(54.1%)		(47.0%)
Descending colon	3/53	2/42	6/37		11/132
	(5.7%)	(4.8%)	(16.2%)		(8.3%)
Proximal colon	6/53	4/42	0/37		10/132
	(11.3%)	(9.5%)	(0.0%)		(7.6%)
Technical success/failure					
Success rate	47	32	29	.23	108/132
	(88.7%)	(76.2%)	(78.4%)		(81.8%)
Failure rate	6	10	8		24/132
	(11.3%)	(23.8%)	(21.6%)		(18.2%)
Clinical success/failure					
Success rate	47	31	29	.16	107/132
	(88.7%)	(73.8%)	(78.4%)		(81.1%)
Failure rate	6	11	8		25/132
	(11.3%)	(26.2%)	(21.6%)		(18.9%)
Complication rate	13/51	12/40	4/33	.17	29/124
	(25.5%)	(30.0%)	(12.1%)		(23.4%)
Stent-related mortality	1/47	1/30	1/29	1.00	3/106
	(2.1%)	(3.3%)	(3.5%)		(2.3%)
Same-admission mortality	2/50	6/40	8/36	**.027**	16/126
	(4.0%)	(15.0%)	(22.2%)		(12.7%)
30-d mortality	7/53	10/42	10/37	.153	27/132
	(13.2%)	(23.8%)	(27.0%)		(20.4%)

Table 2.
Complications: data per age group*

Type of Complication	Group I Age < 70 y	Group II Age 70–79	Group III Age ≥ 80 y	*P*	All Cases
Perforation	5/51 (9.8%)	2/40 (5.0%)	1/33 (3.0%)	.619	8/124 (6.5%)
Migration	3/51 (5.9%)	1/40 (2.5%)	1/33 (3.0%)	.479	5/124 (4.0%)
Obstruction	3/51 (5.9%)	3/40 (7.5%)	0/33 (0.0%)	.649	6/124 (4.8%)
Stent fracture	1/51 (2.0%)	1/40 (2.5%)	0/33 (0.0%)	.476	2/124 (1.6%)
Other	1/51 (2.0%)	5/40 (12.5%)	2/33 (6.1%)	.316	8/124 (6.5%)
Total	13/51 (25.5%)	12/40 (30.0%)	4/33 (12.1%)	.17	29/124 (23.4%)

*Percentages were calculated from known data.

enables management and correction of fluid and electrolyte imbalance, cardiac arrhythmias, and respiratory complications.[3] SEMS insertion can also be used in benign strictures such as diverticular disease, postradiation, and anastomotic stricture.[8] The array of colonic stenting technical success rates in the literature is wide, with a mean of 92% (range, 66.6%–100%). Clinical success rates are slightly lower, reaching a mean of 88% (range, 46%–100%). Technical failure is due mainly to the inability to place a guidewire through the stricture.[9,10] A recent systematic review and meta-analysis of randomized clinical trials of SEMS insertion versus emergency surgery by Tan et al[11] found lower technical and clinical success rates of 70.7% and 69.0%, respectively, which were linked partially to complete large bowel obstruction. Tight strictures, such as in complete obstruction, can cause marked abdominal distension and difficulties in guidewire placement, leading to lower rates of stent deployment.[11,12]

Our study represents a single-center experience of colorectal stenting. It demonstrates a technical stent placement success rate of 81.8% and a clinical success rate of 81.1%, both within reported ranges.

With the increase in life expectancy and the link between colorectal cancer and age, there is a higher likelihood that an elderly population will exhibit acute mechanical colonic obstruction due to advanced cancerous disease.[13] Age is an independent risk factor for death due to colonic obstruction.[14–17] Previous strategies for the treatment of colonic obstruction were associated with high mortality rates of 15% to 34%.[14,18] In an Association of Coloproctology of Great Britain and Ireland study of large bowel obstruction that included data on nearly 8000 patients, the average mortality rate was 16.5%, but when adding risk factors such as age > 85 years and American Society of Anesthesiologists score of III, the mortality rate has reached 50%.[14] The results of our study outline a tendency toward a higher proportion of 30-day mortality rates among the different age groups (13.2%, 23.8%, and 27.0%, $P = .153$; 12.7% overall). Although this difference might be linked to a small sample size, it also indicates better outcomes for SEMS insertion compared with surgery. Higher rates of mortality during the same admission for the older groups, II and III, were found (4.0%, 15.0%, and 22.2%, $P = .027$; 20.4% overall), even though similar bowel decompression rates were achieved, with comparable complication rates. An additional effect was the different curvature tendency shown in the Kaplan-Meier diagram regarding the 30-day probability of survival, which was similar for groups II and III compared with group I **(Figure 1)**. Those differences might be related to additional concomitant diseases among the elderly population. We believe that the disturbance of homeostasis, which is caused by colonic obstruction including dehydration due to shift of fluids, electrolyte imbalance, reduced intestinal blood flow, and mucosal edema with bacterial translocation, causes a physiologic "insult" that is more challenging for the aged population, thus influencing survival rates.

Alleviating obstruction with stent insertion is feasible in an elderly population. Buchanan et al[19] published their experience in stenting elderly patients (median age, 82 years; range, 69–96 years), with successful SEMS placement in 9 of 11 patients and a median survival time of 5 months. When analyzing outcomes in a population >70 years of age with colorectal obstructions, Guo et al[20] compared stent insertion and primary surgery, with better results for the stenting group in terms of primary anastomosis and 30-day mortality rate. Although without discussing the issue of age, other studies of large bowel obstruction have published better results for SEMS insertion compared with urgent surgery in terms of primary anastomosis and stoma rates, with comparable complications and mortality results.[9–11] On the other hand, elderly patients undergoing urgent colorectal surgery have worse 1-year survival rates. In a study by Mamidanna et al,[21] patients were classified into 3 age groups: 70 to 75, 76 to 80, and >80 years. Thirty-day

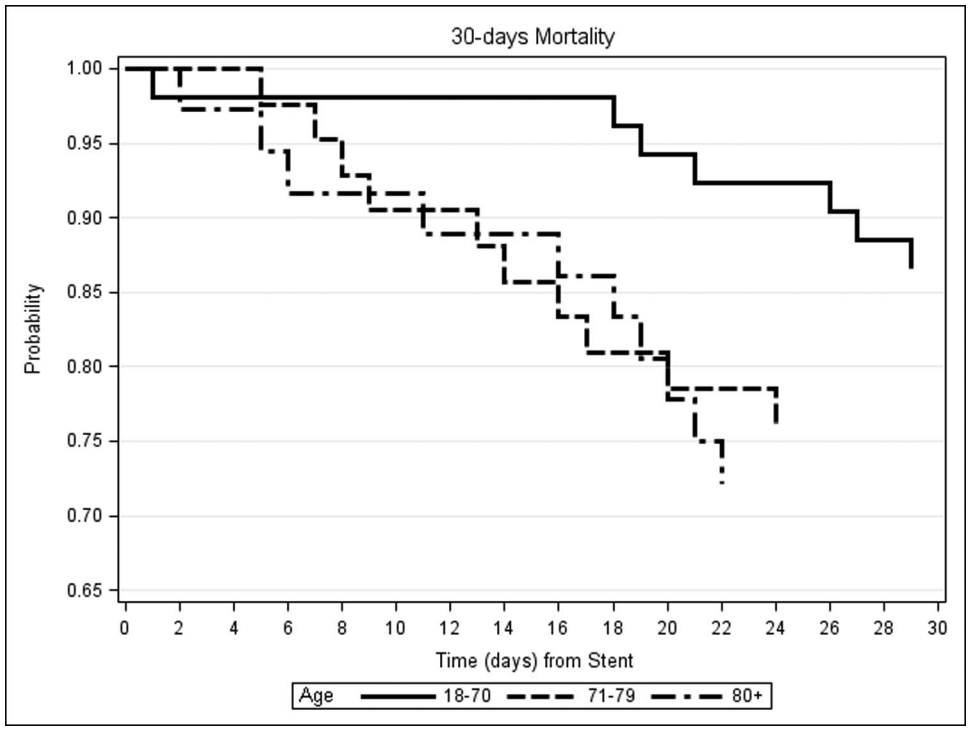

Figure 1. Kaplan-Meier 30-day survival curve per age group (log-rank $P = .1904$).

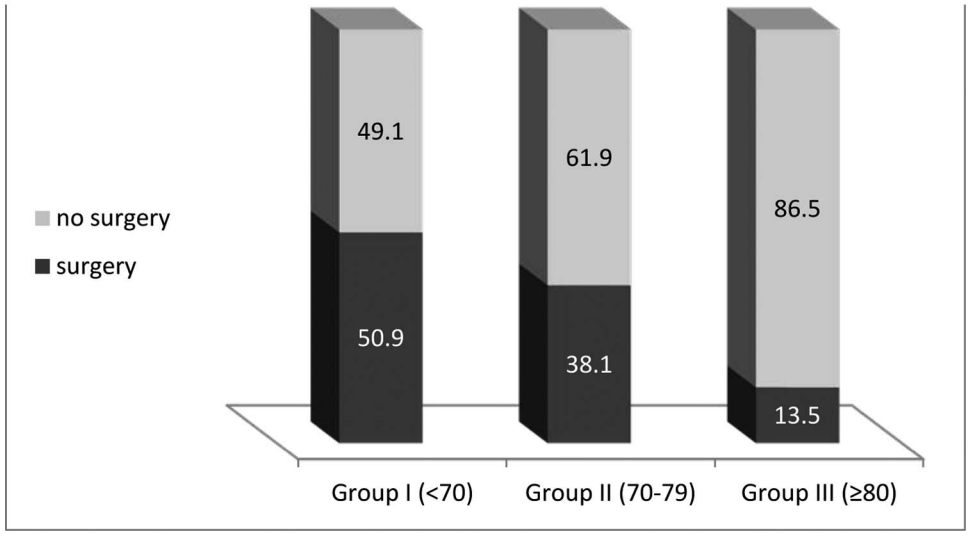

Figure 2. Ratio (%) of surgery versus no surgery per age group ($P = .0013$).

mortality rates were 17.0%, 23.3%, and 31.0%, respectively ($P < .001$). Advanced age was an independent risk factor for mortality in risk-adjusted regression analyses. Surgery for octogenarians with colorectal cancers was also linked to significant morbidity and mortality rates in a study by Tan et al.[22] An association between advanced age, emergency surgery, and comorbidity was found. In our opinion, the data in the literature suggest that elderly patients would probably have difficulties in regaining homeostasis after an incident of

Table 3.
Surgical details

Criteria	Group I Age < 70 y	Group II Age 70–79 y	Group III Age ≥ 80 y	*P*	All Cases
Any surgery (per age group)	27/53 (50.9%)	16/42 (38.1)	5/37 (13.5%)	**.0013**	48/132 (36.4%)
Surgery timing					
Planned surgery	13/27 (48.2%)	6/16 (37.5%)	2/5 (40.0%)	.91	21/48 (43.8%)
Urgent surgery	14/27 (51.8%)	10/16 (62.5%)	3/5 (60.0%)		27/48 (56.2%)
Surgical approach					
Open surgery	20/27 (74.1%)	14/16 (87.5%)	3/5 (60.0%)	.145	37/48 (77.1%)
Laparoscopic surgery	7/27 (25.9%)	2/16 (12.5%)	2/5 (40.0%)		11/48 (22.9%)
Stoma					
Per patient who had surgery	17/27 (59.3%)	7/16 (43.8%)	3/5 (60.0%)	.7616	26/48 (54.2%)
Per age group	17/53 (32.1%)	7/42 (16.7%)	3/37 (8.1%)	**.0147**	27/132 (20.6%)
Stoma prevention	36/53 (67.9%)	35/42 (83.3%)	34/37 (91.9%)		105/132 (79.4%)

large bowel obstruction, but they would probably do better with stenting than with emergency surgery.

Another remarkable issue is the significant difference between the proportions of patients undergoing surgery among the different age groups, with higher rates in younger patients causing higher rates of stoma **(Figure 2)**. Similar rates of emergency versus planned surgery and laparoscopic versus conventional surgery were found. We cannot fully explain this difference, because of the retrospective nature of our study. Nevertheless, we suspect that this difference might be linked to patients' comorbidity issues (discussed earlier in this article) as well to patients' and surgeons' preferences relating to end-of-life decision making. We believe that surgeons have a greater reluctance to pursue aggressive management in the poststenting period, although in some cases, patients were probably too sick to undergo surgery. We also think that older patients, as well as surgeons treating the elderly, tend to prefer less invasive techniques such as SEMS insertion and avoid the choice of surgery. "Failure to rescue" in those cases is partially a consequence of attitude rather than a result of disease and aggressive management. Similar tendencies are found in other areas of colorectal cancer treatment. A study by Serra-Rexach et al[23] examined differences in therapeutic approach in 503 patients with colorectal malignancies who were divided into a young group (age < 75 years) and an older group (age ≥ 75 years). Although no differences were observed between the groups in terms of tumor differentiation, extension, tumor stage, or comorbidities, young patients were more likely to receive surgery, radiotherapy, and chemotherapy and were less likely to receive palliative care. The authors concluded that elderly patients with colorectal cancer are undertreated. Similar attitudes toward the elderly are found when observing research in the field of chemotherapy, in which the elderly are underrepresented in clinical trials.[24,25]

CONCLUSIONS

Our study demonstrates similar indications and stricture locations when comparing SEMS placement in young and

elderly patients. Comparable success, failure, and complication rates were found, with a higher same-admission mortality rate among the older patients. We believe that this dissimilarity represents the significant divergence in the disease burden due to large bowel obstruction, especially in elderly patients. We also observed a relationship between age and the tendency to operate, with aging patients less likely to undergo surgery for large bowel obstruction. This, we believe, reflects on the different attitudes of both patients and surgeons in terms of decision making. Prospective randomized trials are needed to better determine the benefits of SEMS compared with emergency surgery.

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