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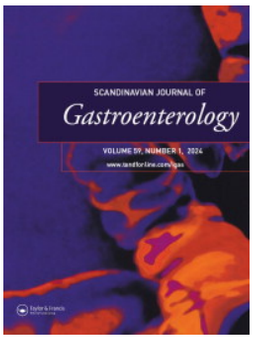

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RESEARCH ARTICLE

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Similar success rate in proximal and distal colonic stent placement: a retrospective multi-center study

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ABSTRACT

Objectives: Stenting of malignant colon obstruction is used as a bridge to surgery or as an alternative to surgical colostomy in a palliative setting. Current guidelines recommend stent placement as the first line of treatment in colonic obstruction in both curative and palliative settings. However, it is unclear whether the location of the malignant obstruction influences the outcome of the stenting procedure. The goal of this study was to compare the outcomes of colonic stents between proximal and distal colonic strictures with regard to technical and clinical success and the risk of adverse events.

Methods: A multi-center retrospective cohort was composed of patients who underwent a colonic stent placement at two tertiary hospitals between 2013 and 2021. The technical and clinical outcome, stent type used, duration of post-procedural hospital stay and complications were noted.

Results: A total of 148 patients who underwent colonic stenting were identified. 41 patients underwent stent placement in the proximal colon and 107 patients underwent a distal stent placement. There was no difference in technical success (100% vs 96.3%, $p=0.209$), clinical success (97.0% vs 89.6%, $p=0.199$) or complications (24.4% vs 37.4%, $p=0,135$)

Conclusion: Technical success and clinical success rates are high and do not differ between stent locations. There is no significant difference in complication rates between proximal and distal colonic stents.

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Colonic stent; colon cancer; palliative care

Introduction

The rate of colonic obstruction due to colon cancer is estimated around 8%–13% of colorectal cancer patients [1–3]. Historically emergency surgical interventions (resection or the creation of a diverting stoma) have been the standard approach for patients with malignant obstruction of the proximal colon. However, in the last decades endoscopic stenting has emerged as an alternative to emergency surgery. Stenting of malignant colon obstruction is used as a bridge to surgery or as an alternative to a surgical colostomy in a palliative setting. In a curative setting the use of colon stents has the advantage of lower stoma and complication rates, while in the palliative setting is associated with a shorter hospital stay [4–6]. Current guidelines recommend stent placement as the first line of treatment in colonic obstruction in both curative and palliative settings [7]. However, it is unclear whether the location of the malignant obstruction influences the outcome of the stenting procedure, as most series predominantly included patients with more distal tumors.

Several retrospective studies suggested that stenting a colonic obstruction proximal to the splenic flexure has a significantly lower success rate compared with a distal obstruction [8, 9] while other studies found no difference between proximal and distal obstruction [10–13]. With regard to complications, there has been a suggestion that palliative stents in the sigmoid are associated with a high risk of perforation [14]. Therefore, the aim of this study is to compare the rate of success and complications between patients with a proximal and distal malignant obstruction who underwent colonic stenting.

Patients and methods

Patients

A search of the electronic records of two tertiary hospitals was performed to identify all patients who underwent colonic stent placement. Addenbrookes hospital had an electronic record system that allowed cases to be identified from 2013 onwards while University College London Hospital had an electronic record

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system that allowed cases to be identified from 2019. For each patient, the following data were extracted from the clinical record: gender, age at the time of procedure, location of the malignant obstruction, type of obstruction, treatment intention (palliative versus bridge to curative surgery), stent type and any complications that occurred during or after the procedure. Patients who were referred from another hospital and who had no follow-up in the participating hospitals were excluded from the study.

Follow-up time was counted from the day of stent insertion to either death, surgery or a complication, whichever came first. If a second stent was placed this was excluded from the study. Complications were retrieved from the participating hospital's computer system. Patients were deemed to have sufficient follow-up if their last hospital contact was within 3 months of either death, surgery or a complication. If patients had not experienced any complications or surgery and were alive, the last day of follow-up was August 8th 2023. Patients for whom no follow-up was available at the participating hospitals or patients whose last known contact was more than 3 months old were excluded from the study.

Procedure description

All procedures were performed under fluoroscopy. Bowel preparation consisted of one or more enemas. CO2 insufflation was used for all procedures. A colonoscope was advanced to the stricture. A guidewire was then advanced across the stricture. A canula or ERCP extraction balloon were then positioned over the guidewire across the stricture of obtain a colonogram to confirm adequate position and delineate the stricture. Following this, a stent was deployed under fluoroscopy. The choice of stent was at the discretion of the endoscopist. No periprocedural antibiotics were used.

Informed consent

Given the retrospective nature of the study and the fact that the vast majority of the patients had passed at the time of the study no informed consent was judged necessary.

Definitions

The location of malignant obstruction was defined as either rectum, sigmoid, descending colon, splenic flexure, transverse colon, hepatic flexure, ascending colon or caecum. Rectum, sigmoid, descending colon and splenic flexure were defined as *distal colon*, all the other locations as *proximal colon*. The type of obstruction was defined as either *partial* or *complete* (inability to pass stool for multiple days). *Technical success* was the primary outcome and was defined as stent placement in the intended position. *Clinical success* as an improvement in bowel symptoms relating to the obstruction. If the patient was asymptomatic prior to the endoscopic procedure this was also noted. Days of hospitalization were counted from the first day after stent placement till discharge (or transfer to another hospital) regardless of whether the duration of admission was related to the endoscopic procedure.

Statistical analysis

For our statistical analysis of the results, associations between categorical variables were assessed with Pearson's $\chi 2$ test. Hospital days, age and follow-up were compared using the unpaired t test with Welch's correction. A p value <0.05 was considered statistically significant. Statistical analyses were performed using GraphPad Prism version 9.3.1 for Windows, GraphPad Software, Boston, Massachusetts, USA.

Results

Patient characteristics

A search of the electronic records of Addenbrookes hospital identified 155 consecutive patients who underwent stent placement between 2013 and 2022. Of those, 19 were excluded from the study: 15 due to lack of follow-up data, 3 patients had a benign stricture and 1 patient had missing data regarding the moment of his stent dislocation. A search of the electronic records of University College London Hospital identified 19 patients who underwent stent placement between 2019 and 2022. Of those, 7 were excluded due to lack of follow-up. Combining the data from the two hospitals, a total 148 patients were included in the study.

Patient characteristics are described in detail in Table 1. There were 41 patients (46% men; mean age, 76.6 years) who underwent endoscopic stent placement for malignant obstruction of the proximal colon. A total of 107 patients (49.5% men; mean age, 73.6 years) underwent endoscopic stent placement for a distal colon obstruction. 141 (95%) of patients had passed at the end of the follow-up period.

The vast majority of stents in both groups were placed with palliative intent. Comparing the proximal and distal stent groups we found no significant difference in age, gender or the percentage of complete obstruction.

Follow-up

Mean ± SD follow up was 263.1 ± 265.8 days for the proximal and 230.5 ± 230.5 days for the distal group. There was no significant difference between the two groups ($p = 0.492$, Figure 1). Of note, in both groups there was a subset of patients who had a follow-up of more than 250 days with a colonic stent *in situ*, suggesting that for a subset of patients a stent provides adequate long-term palliation of the malignant stricture.

Procedural outcomes

There was no difference in technical success rate between proximal and distal colonic stent placement ($p = 0.209$). In the

Table 1. Patient characteristics.

	Stent location		
	Proximal $n = 41$	Distal $n = 107$	p-value
Age (mean)	76.6 (±14.8)	73.6 (±15.9)	0.269
Gender (male %)	19 (46.3%)	53 (49.5%)	0.826
Complete obstruction (%)	12 (29.3%)	28 (26.1%)	0.704
Intent of Procedure (Palliative %)	41 (100%)	97 (90.6%)	0.043

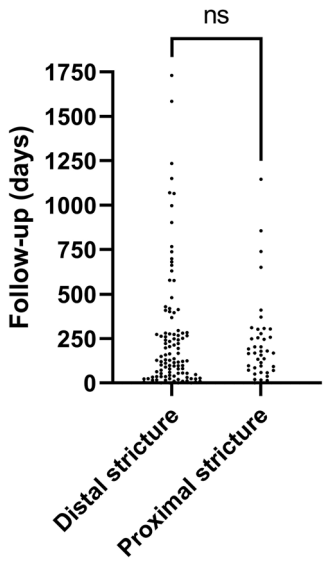

Figure 1. Follow-up after colonic stent placement.

patient group who underwent a colon stent placement for a proximal malignant lesion, 8 patients had insufficient data to determine clinical success and these were excluded from the analysis of clinical success. In the patient group who underwent a colon stent placement for a distal malignant lesion, 9 patients had insufficient data to determine clinical success. Another 21 patients had no symptoms of obstruction prior to the stent placement; hence, 30 patients in the distal group were excluded from analysis of clinical success. This left 33 patients in the proximal group and 77 patients in the distal group with sufficient follow-up. Comparing the distal and proximal groups showed no difference in clinical success between the distal and proximal group ($p = 0.199$). There was no difference in post-procedure hospitalization days between the two groups (mean 4.10 days in the proximal group and 5.04 days in the distal group, $p = 0.440$)

Complications

There was also no significant difference in complication rate (24.4% in the proximal group versus 37.4% in the distal group, $p = 0.135$). Looking at the kind of complications there was also no statistical difference between the proximal and distal groups in rates of perforation, stent migration, stent obstruction, colitis or post-procedural fever (Table 2).

Perforation in particular can have severe consequences. 2 Patients had a perforation in the proximal group, which were both treated conservatively. One patient recovered and one patient was sent home with palliative care. 14 patients had a perforation in the distal group. 5 patients underwent surgery, of those 4 recovered. 8 patients were treated conservatively; of those 1 recovered and 7 passed away due to the perforation. The outcome of the perforation was unknown for one patient in the distal group.

Stent type

For 123 patients the stent type (uncovered, partially covered or fully covered) was known. Table 3 provides a summary of complications type stratified by stent type. Combining the partially and fully covered groups, a comparison was made between uncovered and (partially) covered stents. No differences were found in complication rate for any of the complication subtypes.

Table 2. Procedural outcomes.

		Stent location		
		Proximal $n = 41$	Distal $n = 107$	p-value
Technical success (%)		41 (100%)	103 (96.3%)	0.209
Clinical improvement* (%)		32 (97.0%)	69 (89,6%)	0.199
Days of hospitalization (mean ± SD)		4.10 ± 5.06)	5.04 ± 9.20	0.440
Complication (%)		10 (24.4%)	40 (37.4%)	0.135
Complication type	Perforation	2 (4.9%)	14 (13.1%)	0.150
	Stent migration	2 (4.9%)	11 (10.3%)	0.299
	Stent obstruction	6 (14.6%)	12 (11.2%)	0.569
	Colitis	0 (0%)	2 (1.9%)	0.378
	Post-procedural fever	0 (0%)	1 (0.9%)	0.535

*In the proximal stricture group 8 patients had insufficient data to determine clinical success. In the distal stricture group 9 patients had insufficient data to determine clinical success and 21 patients had no symptoms of obstruction prior to the stent placement; all these patients were excluded from analysis of clinical success.

Table 3. Complications in relation to stent type.

	Stent type			
	Uncovered ($N = 91$)	Partially covered ($N = 25$)	Fully covered ($N = 7$)	(Partially) covered versus uncovered p-value
Perforation	10	2	0	0.437
Stent migration	9	0	1	0.228
Stent obstruction	11	2	3	0.609
Colitis	1	1	0	0.436
Post-procedural fever	1	0	0	0.552

Discussion

The aim of this study was to compare the rate of success and complications of stenting between patients with proximal and distal malignant large bowel obstruction. Using a multi-center retrospective cohort we found no difference in technical and clinical success between both groups. The rates of technical and clinical success rates were high in both the proximal and distal group and are in line with previously reported figures [8, 10, 12, 15–17]. The relatively large cohort described in this study provides further support for the use of colonic stents as a first-line treatment option in decompression of proximal and distal malignant colonic obstruction, a position that is also endorsed by the ESGE guideline [7]. Importantly we did not find that the location of the obstruction had an effect on technical or clinical outcome, and this suggests that a proximal location of the obstruction should not preclude an attempt to place a colonic stent.

There is very limited data on complications in proximally placed colonic stents, but the incidence of complications seen in the distal stent cohort is in line with previously published figures and most patients in this cohort were treated with palliative intent, effectively extending a minimally invasive treatment option for patients with limited life expectancy who would previously have required surgery. Furthermore, the

finding of a subpopulation of patients who had a follow-up of more than 250 days without complications supports the notion that colonic stents can also provide long-term palliation without the need for invasive palliative surgery. It is currently unclear whether a (partially) covered or uncovered stents are superior in the stenting of malignant strictures. This study did not show any difference in complication rate but the impact of stent type (covered versus uncovered) used in palliative colonic stenting on quality of life is being examined by the CReST2 trial that is currently underway in the UK.

Our study has limitations. The retrospective methodology means that outcomes that may be of importance to patients have not been captured, for example quality of life, need for further admission and impact of stent on long-term bowel function. Both participating centers are large referral centers and the procedural outcomes may be different in hospitals who handle a smaller number of cases. While the patient number included in this study is relatively large for studies on colonic stents, it is possible that larger, preferably prospective registries may uncover differences that were not significant in this study. Despite these limitations, this study provides further support for the notion that colonic stenting for malignant obstruction is reasonably safe and highly effective in both the distal and proximal colon and emphasises the emerging role of stenting of proximal colonic obstruction as a viable treatment option in the palliative setting.

Disclosure statement

None of the authors declare a conflict of interest.

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