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Randomized Clinical Trial

Colorectal Endoscopic Stenting Trial (CReST) for obstructing left-sided colorectal cancer: randomized clinical trial

CReST Collaborative Group

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Abstract

Background: Colorectal cancer often presents with obstruction needing urgent, potentially life-saving decompression. The comparative efficacy and safety of endoluminal stenting *versus* emergency surgery as initial treatment for such patients is uncertain.

Methods: Patients with left-sided colonic obstruction and radiological features of carcinoma were randomized to endoluminal stenting using a combined endoscopic/fluoroscopic technique followed by elective surgery 1–4 weeks later, or surgical decompression with or without tumour resection. Treatment allocation was via a central randomization service using a minimization procedure stratified by curative intent, primary tumour site, and severity score (Acute Physiology And Chronic Health Evaluation). Co-primary outcome measures were duration of hospital stay and 30-day mortality. Secondary outcomes were stoma formation, stenting completion and complication rates, perioperative morbidity, 6-month survival, 3-year recurrence, resource use, adherence to chemotherapy, and quality of life. Analyses were undertaken by intention to treat.

Results: Between 23 April 2009 and 22 December 2014, 245 patients from 39 hospitals were randomized. Stenting was attempted in 119 of 123 allocated patients (96.7 per cent), achieving relief of obstruction in 98 of 119 (82.4 per cent). For the 89 per cent treated with curative intent, there were no significant differences in 30-day postoperative mortality (3.6 per cent (4 of 110) *versus* 5.6 per cent (6 of 107); $P = 0.48$), or duration of hospital stay (median 19 (i.q.r. 11–34) *versus* 18 (10–28) days; $P = 0.94$) between stenting followed by delayed elective surgery and emergency surgery. Among patients undergoing potentially curative treatment, stoma formation occurred less frequently in those allocated to stenting than those allocated to immediate surgery (47 of 99 (47.5 per cent) *versus* 72 of 106 (67.9 per cent); $P = 0.003$). There were no significant differences in perioperative morbidity, critical care use, quality of life, 3-year recurrence or mortality between treatment groups.

Conclusion: Stenting as a bridge to surgery reduces stoma formation without detrimental effects. Registration number: ISRCTN13846816 (http://www.controlled-trials.com).

Introduction

Despite the introduction of national screening programmes and campaigns to raise awareness of early symptoms of colorectal cancer, a persistent one in six patients present with advanced, obstructing tumours that require a hazardous, but potentially life-saving emergency procedure[1]. Such patients are often elderly with significant co-morbidities and consequent increased risk of postoperative morbidity and mortality[2–4]. Historically, the standard approach has been emergency surgery with resection of the diseased segment usually requiring stoma formation, often permanent. On-table antegrade irrigation[5] can allow primary resection and anastomosis, but is not performed widely, often because a specialist colorectal surgeon is not available or because the patient is physiologically unstable.

Insertion of a self-expanding metal stent (SEMS) to relieve obstruction may be a better initial treatment for left-sided carcinomas than surgery[6–8]. The theoretical advantages of stenting as a bridge to surgery include buying time to correct fluid and electrolyte imbalances, improve respiratory function, optimize medical co-morbidities, obtain more accurate staging, and allow access to colorectal specialists, thereby enabling bowel continuity to be restored more safely. Stenting is sometimes unsuccessful, can cause bowel perforation, and has been blamed for tumour dissemination[9,10]. Indeed, two previous randomized trials[11,12] comparing stenting *versus* emergency surgery for potentially curative colonic cancer closed prematurely because of increased complications in the stenting arm, poor success rate of stenting, and increased 30-day morbidity following SEMS insertion. Consequently, European guidance[13] did not recommend SEMS placement as a bridge to elective surgery for patients with potentially curative left-sided malignant colonic obstruction.

The CReST (ColoRectal endoscopic Stenting Trial) was initiated to address two key questions: is there benefit (reduced mortality and morbidity, stoma formation, and better quality of life-adjusted survival) from endoluminal stenting compared with immediate surgery for patients presenting with an obstructing colonic cancer? If benefit exists, is this for patients undergoing attempted curative treatment, palliative treatment, or both? This report focuses on patients with potentially

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curative tumours as, subsequent to commencement of the CReST trial, evidence for the benefit of SEMS in the palliative setting emerged[13] (few patients requiring palliative treatment were randomized).

Methods

Study design and participants

This RCT (ISRCTN 13846816) took place in 39 acute NHS hospitals in the UK. Eligible participants were aged over 18 years, presenting with left-sided colonic obstruction considered to be due to colonic malignancy, and fit enough to undergo emergency surgery. Patients with signs of peritonitis and/or perforation, incipient caecal perforation, or obstruction in the mid or lower rectum that might require neoadjuvant chemoradiotherapy were not eligible.

Participants were assigned in a 1 : 1 ratio to either stenting, or to surgical decompression with or without tumour resection (*Fig. S1*). Allocations were obtained by telephone or internet from the Birmingham Clinical Trials Unit using a minimized randomization procedure balancing for curative intent, primary tumour site (transverse colon, splenic flexure, descending colon, sigmoid, rectosigmoid, rectum), as diagnosed by CT and contrast enema, and Acute Physiology And Chronic Health Evaluation severity score. There was no blinding of participants, clinicians, or research staff. All participants provided written informed consent to participate. For the duration of the study, interim analyses of data on morbidity, hospital stay, and 30-day mortality were reviewed, in strict confidence, by an independent Data Monitoring and Ethics Committee. The study was approved by the Oxford Research Ethics Committee (B 08/H0605/90).

Procedures

Before the study started, five stenting workshops, attended by approximately 150 colleagues, were held for participating units; each unit was required to have performed 30 stents for obstructing colorectal cancer, and any participating radiologist must have undertaken at least 10 stent procedures previously and consider themselves confident with the techniques stipulated for the trial. This included a preprocedure enema, SEMS insertion using a combined endoscopic and fluoroscopic technique, no predilatation or postdilatation, and plain radiography after the procedure. The type and brand of stent used was decided by the local radiologist; it was not mandated. A team comprising designated lead surgeons, radiologists and, where required, gastroenterologist, was formed in each centre, to establish a clear management pathway.

Patients were classified before randomization as having disease suitable for palliative or potentially curative treatment. After resuscitation, patients allocated to stenting had a SEMS deployed across the tumour and, where stenting was performed as a bridge to surgery, operation was recommended between 1 and 4 weeks after stent insertion. For patients with unresectable local or metastatic disease, and those unfit for major surgery, stenting was considered palliative and no further surgery was mandated. Patients in whom stenting failed underwent appropriate emergency surgical decompression along lines similar to that for patients allocated to surgery. Patients allocated to emergency surgery underwent tumour resection, bypass (loop stoma) or decompression (stoma), according to the surgeon's preference, disease stage, and clinical condition.

Outcomes

Co-primary outcome measures were 30-day mortality and duration of hospital stay during the first year after randomization (including time in hospital for stenting, surgical resection, and any subsequent stay under the care of a surgeon). This definition was intended to capture both the initial stay and subsequent hospital admissions for stoma closure. Secondary outcomes were stenting completion and complication rates, presence and duration of a stoma, anastomosis rates, critical care unit stay, perioperative morbidity, 6-month survival, proportion disease-free at 3 years (potentially curative group only), resource use, rate of adjuvant chemotherapy, adherence to chosen chemotherapy protocol, and quality of life.

Cancer and tumour-specific quality of life were assessed using European Organization for Research and Treatment of Cancer (EORTC) QLQ-C30 and EORTC QLQ-CR29 respectively. The EuroQol EQ-5D-3L™ (EuroQol Group, Rotterdam, the Netherlands) was administered to allow costs per quality-adjusted life-year to be calculated. Quality-of-life questionnaires were completed at baseline, 4, 12, and 24 months after randomization.

Stent-related complications included, but were not limited to, failure to deploy the stent, bowel perforation, stent displacement, and reobstruction. Stent insertion was considered an adverse event if it resulted in further acute obstruction requiring a second stent insertion and/or emergency surgery. Morbidity was recorded at discharge and defined as any event leading to hospital admission or prolonging hospital stay, and categorized according to the Clavien–Dindo system[14]. Stoma presence was recorded after the initial intervention had been completed and stoma removal procedures were recorded at subsequent follow-up. Postoperative imaging was recommended every 12 months and mandated at 3 years. If patients were lost to hospital follow-up, the general practitioner was contacted. Long-term survival was monitored by flagging via the National Health Service Information Centre.

To investigate the representativeness of the randomized population, centres were asked to record a limited amount of anonymized data on patients with left-sided bowel obstruction presumed secondary to carcinoma, who were potentially eligible for the trial but not entered.

Statistical analysis

Target recruitment was 400 patients (200 curative and 200 palliative management), which would provide 90 per cent power to detect differences in mortality similar to those reported in an earlier national audit[4] of large bowel obstruction (16 per cent following emergency surgery and 4 per cent following elective surgery), and 90 per cent power to detect a 0.35 standard deviation reduction in time spent in hospital, equivalent to 1–2 days. With randomization of few patients for palliative treatment, the Trial Management Group, blinded to accumulating data, decided to close recruitment once over 200 patients with potentially curative colorectal cancer had been randomized.

Analyses were undertaken on an intention-to-treat basis, using all available data, irrespective of eligibility or treatment compliance, with stratification between potentially curative and palliative groups. Minimal loss to follow-up was anticipated and, originally, an equal number of palliative and potentially curative cases. It was also anticipated that approximately 5 per cent of

patients would be found not to have cancer, but would be included in the intention-to-treat analyses.

Differences in survival, recurrence, and duration of hospital stay were compared using unadjusted Cox proportional hazards models and displayed in Kaplan–Meier plots. Data on hospital stay for patients who died, withdrew, or had less than 1 year's follow-up were included in the primary analyses, but sensitivity analyses were also undertaken excluding such patients. Differences in categorical and continuous variables were assessed using Mantel–Haenszel and *t* tests respectively. All *P* values are two-sided and $P < 0.050$ was considered significant. Analyses were performed using SAS® version 9.4 (SAS Institute Cary, NC, USA).

Results

Between 23 April 2009 and 22 December 2014, 739 patients were assessed for eligibility, of whom 477 (64.5 per cent) were considered eligible, and 262 not eligible. Of these, 246 were randomized; one allocated to surgery withdrew consent and was excluded from all analyses, leaving 245 participants who were assigned randomly to receive stenting (123 patients) or emergency surgery (122) (*Fig. 1*). Baseline characteristics were balanced across treatment arms (*Table 1*). Median age was 71 (i.q.r. 61–79) years and 149 of the 245 patients (60.8 per cent) were men. Forty-one patients (16.7 per cent) had severe and 154 (62.9 per cent) mild systemic disease. Of the 245 randomized patients, 217 (88.6 per cent) were classified as having potentially (probably or possibly) curative treatment (110 allocated to stenting, 107 to emergency surgery) (*Fig. 1*).

Stenting was attempted in 119 (96.7 per cent) of the 123 patients allocated to stenting, achieving relief of obstruction in 98 (82.4 per cent) (*Table 2*), with similar success rates in the potentially curative and palliative groups: 86 of 106 (81.1 per cent) *versus* 12 of 13 (92.3 per cent) respectively ($P = 0.32$). All of the 25 patients in whom stenting was not attempted or failed then underwent surgery.

All but 3 (2.5 per cent) of the 122 patients allocated to emergency surgery underwent surgery; 1 undergoing potentially curative treatment was found to have a non-cancer pseudo-obstruction, and 2 in the palliative group received

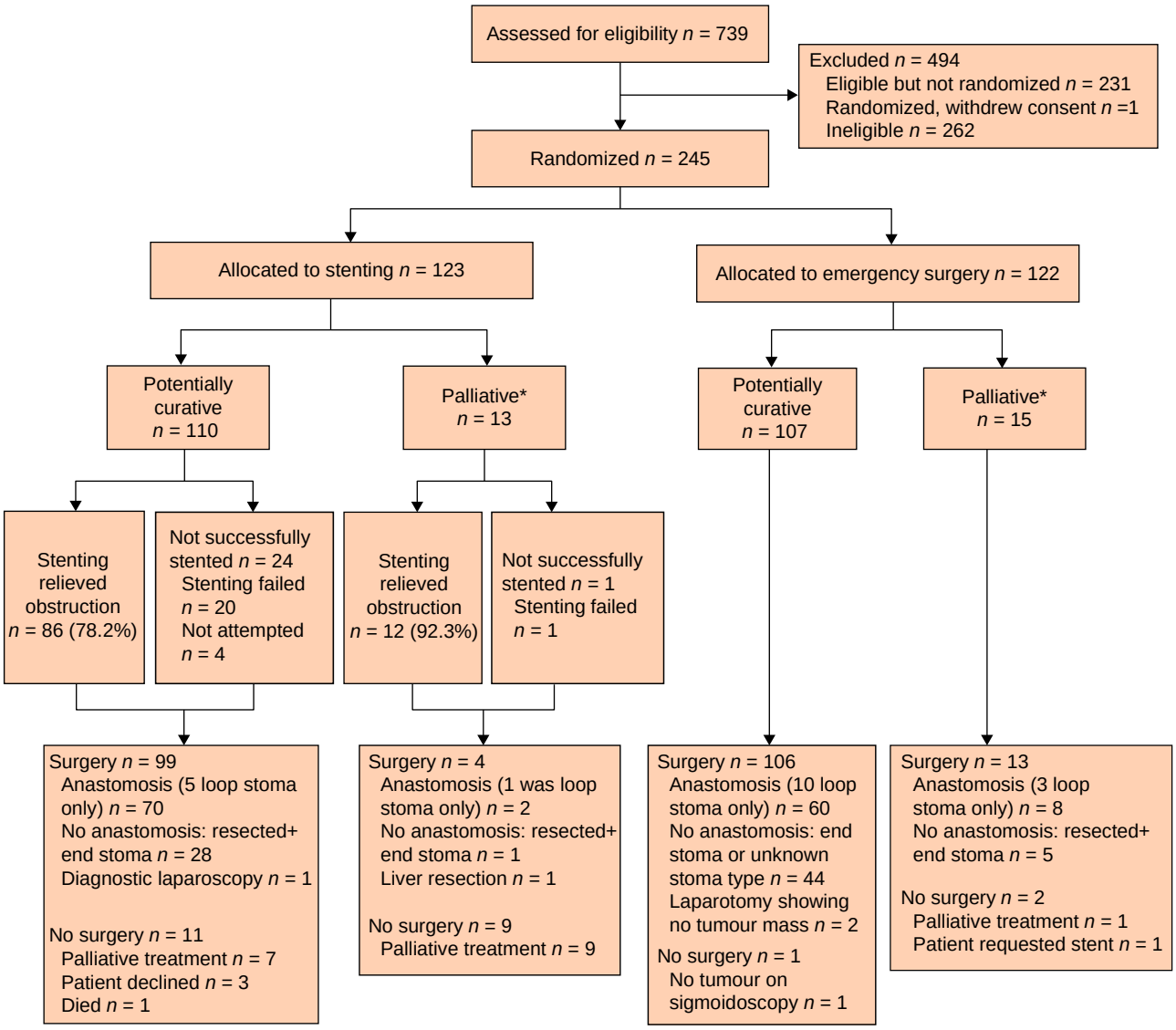

Fig. 1 CONSORT diagram for the trial

*Management classified as not or probably not curative at randomization.

Table 1 Baseline characteristics

	Stenting ($n = 123$)	Emergency surgery ($n = 122$)	Total ($n = 245$)
Age (years)			
< 50	7 (5.7)	7 (5.7)	14 (5.7)
50–59	17 (13.8)	15 (12.3)	32 (13.1)
60–69	30 (24.4)	38 (31.2)	68 (27.8)
≥ 70	69 (56.1)	62 (50.8)	131 (53.5)
Mean(s.d.)	69.9 (12.2)	69.1 (11.2)	69.5 (11.7)
Median (i.q.r.; range)	71 (61–80; 34–93)	70 (62–78; 36–89)	71 (61–79; 34–93)
Sex			
F	51 (41.5)	45 (36.9)	96 (39.2)
M	72 (58.5)	77 (63.1)	149 (60.8)
Tumour site			
Transverse colon	4 (3.3)	3 (2.5)	7 (2.9)
Splenic flexure	7 (5.7)	7 (5.7)	14 (5.7)
Descending colon	28 (22.8)	30 (24.6)	58 (23.7)
Sigmoid	68 (55.3)	67 (54.9)	135 (55.1)
Rectosigmoid	15 (12.2)	14 (11.5)	29 (11.8)
Rectum	1 (0.8)	1 (0.8)	2 (0.8)
Treatment type			
Potentially curative	110 (89.4)	107 (87.7)	217 (88.6)
Probably curative	78	73	151
Possibly curative	32	34	66
Palliative	13 (10.6)	15 (12.3)	28 (11.4)
Probably not curative	3	6	9
Palliative	10	9	19
APACHE score			
1	1	1	2
2	3	2	5
3	6	6	12
4	3	2	5
5	12	10	22
6	8	9	17
7	9	11	20
8	7	7	14
9	4	3	7
10	11	11	22
Unknown	59	60	119
Median (i.q.r.)	6 (5–8)	7 (5–8)	6.5 (5–8)
ASA grade			
P1 normal healthy patient	23 (18.7)	27 (22.1)	50 (20.4)
P2 mild systemic disease	79 (64.2)	75 (61.5)	154 (62.9)
P3 severe systemic disease	21 (17.1)	20 (16.4)	41 (16.7)

Values in parentheses are percentages unless indicated otherwise. APACHE, Acute Physiology And Chronic Health Evaluation.

Table 2 Stent complications reported for 98 patients in whom stenting relieved the obstruction

	Immediate (< 24 h)	Intermediate (1–7 days)	Late (7–28 days)
Patients experiencing any complication*	5 of 98 (5.1)	12 of 97 (12.4)	17 of 97 (17.5)
Perforation	1	2†	1
Haemorrhage	0	0	0
Infection	0	4	1
Respiratory depression	0	1	0
Hypotension	0	0	0
Migration	3	2	0
Reobstruction	–	4	3
Any degree of sensation	–	–	10‡
Other	1§	2¶	2#

Values in parentheses are percentages. Stenting was attempted in 119 of 123 patients allocated to this treatment, and relieved the obstruction in 98. *Patients could have more than one complication. †One local perforation at time of planned surgery, one suspected perforation. ‡Recorded only for patients in whom part of the stent was in the rectum. §Fractured catheter. ¶Small bowel ileus, retention requiring suprapubic catheter, pneumonia (1), cardiac arrest (1). #Eating difficulties (1), abdominal pain (1).

stents. Fewer patients allocated to stenting went on to have surgery. Among those undergoing potentially curative treatment, 11 of 110 (10 per cent) *versus* 1 of 107 (10.0 per cent) allocated to stenting and emergency surgery respectively did not undergo surgery, all but 1 (who had a cardiac arrest) because they were treated palliatively for unresectable or metastatic disease. Similarly, among patients deemed suitable for palliative treatment, 9 of 13 (69.2 per cent) allocated to stenting *versus* 2 of 15 (13.3 per cent) allocated to emergency surgery did not have surgery (*Fig. 1*).

Surgical procedures reflected the typical range performed in this group of patients (*Table 3*). Of those in the potentially curative group who underwent surgery, 70 of 99 (70.7 per cent) allocated to stenting and 60 of 106 (56.6 per cent) allocated to surgery had anastomoses ($P = 0.04$). Some 47 of 99 patients (47.5 per cent) in the stenting group and 72 of 106 (67.9 per cent) in the emergency surgery group had a stoma formed at the time of the index operation ($P = 0.003$). Of these, 28 *versus* 44 were stomas formed without an anastomosis ($P = 0.047$), and 5 *versus* 10 were loop stomas. Subsequent to the initial surgery, stoma reversal was reported for 1 patient allocated to stenting (1 loop stoma) and 2 allocated to surgery (2 loop), whereas 3 in the stenting group and 1 in the surgery group had stomas formed. Hence, 49 of 110 patients (44.5 per cent) in the stenting group and 71 of 107 (66.4 per cent) in the surgery group who received potentially curative treatment had stomas at 1 year ($P = 0.001$). Among patients in the palliative group, stoma formation was also

Table 3 Intraoperative data

	Potentially curative			Palliative		
	Stenting ($n=110$)	Surgery ($n=107$)	P‡	Stenting ($n=13$)	Surgery ($n=15$)	P‡
Intraoperative forms received	110	107		13	14	
Patients who had surgery	99	106		4	13	
Tumour site			0.39			0.80
Transverse colon	8	4		0	0	
Splenic flexure	5	5		0	2	
Descending colon	19	21		2	5	
Sigmoid	50	55		2	5	
Rectosigmoid	13	15		0	1	
Rectum	4	4		0	0	
Missing	0	2		0	0	
Perforation present	10 of 99 (10.1)	9 of 106 (8.5)	0.69	0 of 4	0 of 13	
Stent site	5					
Caecum	1	3				
Other	4	6				
Resection performed						
Overall	93 of 110 (84.5)	93 of 107 (86.9)	0.62	2 of 13 (15.4)	10 of 15 (66.7)	0.007
Patients who had surgery	93 of 99 (93.0)	93 of 106 (87.7)	0.13	2 of 4 (50.0)	10 of 13 (76.9)	0.32
Panproctocolectomy	1	0		0	0	
Total colectomy	3	6		0	2	
Extended right hemicolectomy	8	8		0	0	
Right hemicolectomy	2	3		0	1	
Left hemicolectomy	15	8		0	2	
Subtotal/segmental colectomy	8	10		0	0	
Sigmoid colectomy	7	10		2	1	
Hartmann's procedure	13	23		0	4	
Anterior resection	34	23		0	0	
Other	2	2		0	0	
Stoma fitted						
Overall	47 of 110 (42.7)	72 of 107 (67.3)	<0.001	3 of 13 (23.1)	10 of 15 (66.7)	0.02
Patients who had surgery	47 of 99 (47.5)	72 of 106 (67.9)	0.003	3 of 4 (75.0)	10 of 13 (76.9)	0.94
End	28	43		1	5	
Loop	19	28		2	5	
Unknown	0	1		0	0	
Assessment of resection			0.66			
Curative	68	71		0	2	
Palliative	3	5		2	5	
Uncertain	20	17		0	3	
Missing	2	0				
Transferred to critical care	34 of 96 (35.4)	41 of 103 (39.8)	0.52	2 of 4 (50.0)	6 of 12 (50.0)	1.00
HDU	22	29		2	3	
ICU	11	12		0	3	
Unknown	1	0		0	0	
Any metastases	18 of 98 (18.4)	16 of 106 (15.1)	0.53	3 of 4 (75.0)	11 of 13 (84.6)	0.67
Liver	7	7		3	10	
Peritoneum	4	6		1	4	
Lung	2	2		1	1	
Lymph nodes	6	1		0	1	
Other	2*	4†		0	0	

Values in parentheses are percentages. *Kidney (1), pancreas (1); †bladder (2), mesentery (2). HDU, high-dependency unit. ‡Mantel–Haenszel test.

less frequent in patients allocated to stenting than those allocated to surgery: 3 of 13 (23.1 per cent) *versus* 10 of 15 (66.7 per cent) ($P=0.024$).

There were 4 stenting-related perforations (3.3 per cent) (*Table 2*). One was a guidewire perforation, managed by stent insertion with no further complication. Three resulted in urgent surgery, with 1 patient requiring postoperative mechanical ventilation; none died. After stenting, no patients were admitted to the high-dependency unit. Among patients who had potentially curative treatment, 34 of 96 (35.4 per cent) in the stenting arm and 41 of 103 (39.8 per cent) in the emergency surgery arm were admitted to critical care after surgery ($P=0.52$) for a median of 3 days in both groups (*Table S2*). The duration of hospital stay in the first year after randomization for patients who received potentially curative treatment also did not differ significantly between the groups: median 19 (i.q.r. 11–34) days for those allocated to stenting *versus* 18 (10–28) days for those allocated to surgery (rate ratio (RR) 1.01, 95 per cent c.i. 0.75 to 1.37; $P=0.94$) (*Fig. 2a*). No difference was apparent either in sensitivity analyses excluding patients who did not contribute a full year of data owing to death (32 allocated to stenting, 24 to surgery), withdrawal (2 surgery), or lack of follow-up (3 stenting, 2 surgery) (*Table S2*).

For patients who had potentially curative treatment, 30-day mortality rates were similar: 3.6 per cent (4 of 110) for stenting and 5.6 per cent (6 of 107) for emergency surgery (HR 0.63, 0.18 to 2.25; $P=0.48$) (*Fig. 2b*). Neither 6-month nor overall mortality differed by treatment group (*Fig. 2b* and Table 4), nor did 3-year recurrence (47 of 110 in stenting group *versus* 36 of 107 in surgery group; HR 1.24, 0.80 to 1.91; $P=0.34$) (*Fig. 2c*). Of 28 patients considered at randomization to require palliative treatment, all but 5 died within 24 months of randomisation.

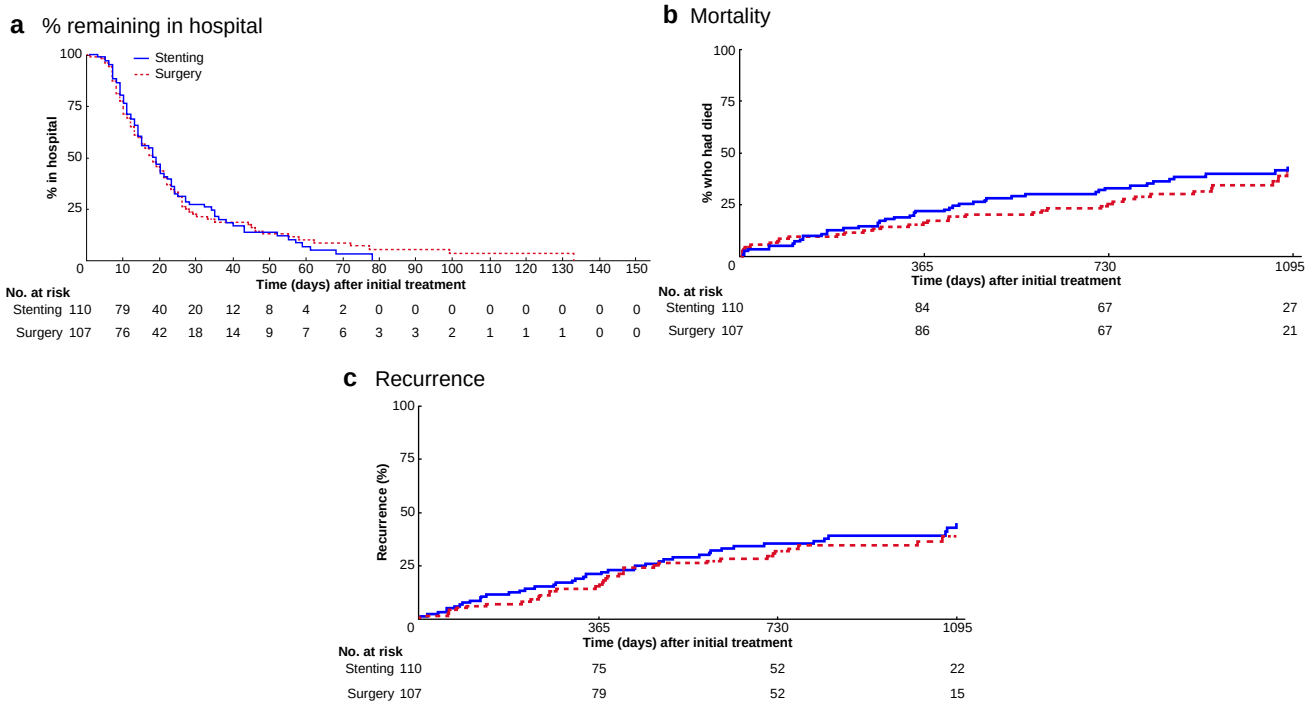

Fig. 2 Kaplan–Meier plots showing percentage remaining in hospital, mortality, and recurrence for those who underwent potentially curative treatment

a Percentage remaining in hospital, **b** mortality, and **c** recurrence.

Table 4 Death rates

	No. of deaths*		P‡	HR†
	Stenting (*n*=110)	Surgery (*n*=107)		
30 days	4 (3.6)	6 (5.6)	0.48	0.63 (0.18, 2.25)
6 months	14 (12.7)	10 (9.3)	0.51	1.32 (0.58, 2.96)
3 years	44 (40.0)	36 (33.6)	0.46	1.18 (0.76, 1.84)
Overall	50 (45.5)	40 (37.4)	0.56	1.13 (0.75, 1.72)

Values in parentheses are *percentages and †95 per cent confidence intervals. ‡*P* values are from unadjusted Cox models.

Postoperative complications occurred in 40 patients (32.5 per cent) in the stenting group and 46 (37.7 per cent) in the emergency surgery group. Similar numbers of patients in the stenting and emergency surgery groups had complications graded as Clavien–Dindo III or worse: 22 (17.9 per cent) *versus* 27 (22.1 per cent). Among patients who had potentially curative treatment with anastomoses, 5 of 68 (7.4 per cent) in the stenting group and 2 of 57 (3.5 per cent) in the surgery group had anastomotic leaks ($P = 0.35$) (*Table S4*). There were no significant differences in complications requiring or prolonging hospital stay, or any particular type of complication (*Table S1*). Just under half of the patients received chemotherapy, with similar proportions in the stenting and emergency surgery groups (*Table S5*). There were no differences between the two groups in any of the quality-of-life measures at 3 or 12 months.

The proportion of patients found not to have colonic cancer (23 of 245, 9.4 per cent) was somewhat higher than the 5 per cent predicted at the start of the study. Of these, 16 had been allocated surgery and 7 to stenting, and at randomization all were classified as having potentially curative treatment. Most were found to have diverticular disease (*Table S3*). Three patients without cancer died, one from multiple organ failure following failed stenting and postoperative surgical complications (3 days after randomization), one from chronic obstructive pulmonary disease (4 years after randomization), and one from stroke (5 years after randomization).

Discussion

Despite achieving high procedural success rates, which allowed meaningful comparison between stenting and surgery, stenting did not reduce the duration of hospital stay under the surgical team in the year after surgery. Nor was there any significant reduction in 30-day mortality (low event rate). The main benefit from stenting was a significant reduction in long-term stoma formation, consistent with findings in other studies[15,16]. It is well recognized that stomas adversely affect quality of life, but this was not found in the present study.

European guidelines[13,17] currently recommend stenting for palliation, and so just 7 per cent of patients randomized in CReST had palliative disease. By contrast, stenting as a bridge to surgery in potentially curative disease is recommended only as an option to consider[17], but nevertheless remains commonly but sporadically practised[18]. The basis for not recommending stenting as a bridge to surgery is concern about procedural failure and consequent patient safety. Two previous trials[11,12] comparing stenting with surgery closed prematurely because of low stent insertion success rates, high stent-related complication rates, and increased 30-day morbidity following SEMS insertion. Stenting was more frequently successful in the present study, relieving obstruction in 82 per cent of patients (98 of 119)—a higher rate than the 71 per cent (82 of 116) and 69 per cent (80 of 116) technical and clinical success rates respectively reported in a meta-analysis of four small RCTs[19]. This was achieved across 39 hospitals, each providing an acute treatment

pathway for SEMS insertion. The authors believe that the stenting workshops, protocol-driven procedures, and shared experience through trial participation all contributed to these low failure rates. The clinical perforation rate in CReST was low, similar to that reported in the meta-analysis, with no deaths from perforation.

In contrast to a recent meta-analysis showing reduced morbidity for SEMS as a bridge to surgery compared with immediate surgery[15], postoperative complication rates were similar in the stenting and surgery groups in the present trial. One previous study[20] closed prematurely because the emergency surgery group had a significantly increased anastomotic leak rate. Few patients in CReST developed an anastomotic leak, and the overall rate was comparable to the 3.5 per cent reported in a large elective patient series[21], and much lower than the 20 per cent leak rate in the Dutch Stent-In trial[11]. There was no difference in postoperative critical care or duration of hospital stay.

There are concerns that stent insertion might lead to increased local and metastatic spread. Sloothaak and colleagues[10] reported an increased recurrence risk in a subgroup analysis of patients who had stent-related perforation, and increased cytokeratin 20 mRNA expression has been reported following stent insertion[9]. These concerns have persisted, with conflicting results from meta-analyses of randomized trials and large cohort studies[22–25]. In CReST, there was no significant difference in recurrence over 3 years after treatment, a time frame within which seeding of tumour cells would be expected to become clinically apparent. This contrast with other studies may be explained by the lower perforation rate here, but could also be due to lack of statistical power to detect moderate differences. Although a meta-analysis of individual-patient data from these trials might help clarify whether stenting increases the risk of recurrence, the present analysis suggests that any increase in a patient population with predominantly advanced disease is unlikely to be of clinical significance.

Stenting for patients with obstructing left-sided colorectal cancer can achieve high technical and clinical success rates across a large number of providing units. For patients with advanced or rapidly progressive disease, better treatment planning can be provided, and unnecessary surgery and stoma formation avoided. Stomas can be avoided in the majority of patients who proceed to surgery, and anastomotic leak rates are low. This study has provided no indication that stenting increases the risk of recurrent malignancy. Stenting as a bridge to surgery should therefore be considered as a standard option for patients with obstructing but potentially curable colonic cancer, particularly when there are doubts about curability and patient desire to avoid stoma formation, or when there is no specialist colorectal surgeon available to perform urgent surgery.

Collaborators

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Supplementary material

Supplementary material is available at *BJS* online.

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