Safety and efficacy of duodenal stent insertion for gastric outlet obstruction: characterisation of a regional district general hospital service

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ABSTRACT

INTRODUCTION Placement of a duodenal or pyloric stent is a recognised palliative procedure for symptomatic relief of malignant gastric outlet obstruction. This procedure can be associated with significant complications, reinterventions and poor long-term relief of obstructive symptoms. However, there may be a faster return to diet and shorter hospital stay in comparison to other palliative procedures (eg gastrojejunostomy). The aim of this study was to determine the safety and efficacy of duodenal stenting in our regional district general hospital in comparison to that of larger tertiary centres.

MATERIALS AND METHODS All patients with gastric outlet obstruction who had duodenal stent placement attempted in our region between 1 August 2013 and 31 July 2018 were identified by retrospective analysis of prospectively maintained coding databases and medical notes. Patient demographics, safety outcomes and efficacy outcomes were then extracted. Results were interpreted with respect to data from best available published evidence from larger tertiary centres.

RESULTS Of 43 duodenal stent insertion attempts, 84% had a successful return to diet, 18% underwent reintervention, 18% suffered adverse events, mean length of stay post-intervention was 8.6 days and mean survival post-intervention was 132 days.

CONCLUSIONS Patients with malignant gastric outlet obstruction in whom duodenal stent placement was attempted had similar outcomes to published data from larger tertiary centres. Duodenal stent placement remains an acceptable treatment option for these patients in our region.

KEYWORDS

Stent – Gastric outlet obstruction – Gastrointestinal cancer

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Introduction

Gastric outlet obstruction is the consequence of any disease process which produces a mechanical obstruction to gastric emptying at the distal stomach. Such disease processes can be benign or malignant, although malignancy accounts for the majority of cases.¹ Malignant gastric outlet obstruction is a consequence of a wide range of cancers including pancreatic, distal gastric or duodenal cancer. More rare cancers such as cholangiocarcinoma or ampullary carcinoma can also lead to gastric outlet obstruction, and lymphoma or metastatic disease must also be considered.

Gastric outlet obstruction is fatal if left untreated and the median survival of patients with locally advanced, irresectable disease may be as short as three to four months, although this depends on the exact tissue type of cancer.² Patients presenting with gastric outlet obstruction are likely to have poor physiological reserve due to underlying malignancy, which is often advanced at

presentation. The physiological reserve is further diminished by loss of fluid and electrolytes with excessive vomiting, and poor nutritional status due to impairment of gastric emptying.

Placement of a duodenal or pyloric stent is a recognised palliative procedure for symptomatic relief in patients with gastric outlet obstruction. This was first described in the 1990s and involves deployment of a self-expanding metal stent at the area of obstruction.³ This can be done under fluoroscopic or endoscopic guidance alone, or a combination of both.

In contrast to other palliative interventions for malignant gastric outlet obstruction, such as surgical bypass in the form of gastrojejunostomy, stent placement may be associated with faster return to diet and shorter hospital stay. However, it may also be associated with significant complications, higher reintervention rate, and poorer long-term relief of obstructive symptoms.^{4,5} From a health service perspective, it is important to understand whether

pyloric and duodenal stent procedures can be performed with comparable safety and efficacy in district general hospitals compared with tertiary centres. Only 33% of patients with gastric cancer will be treated with curative intent, so palliative intervention will probably be required at local centres.⁶

The primary aim of this study was to determine the safety and efficacy of duodenal stenting in our regional district general hospital in comparison with larger tertiary centres.

Materials and methods

All attempts at duodenal stenting for gastric outlet obstruction of any cause over a five-year period (1 August 2013 to 31 July 2018) in our region were identified by retrospective analysis of a prospectively maintained coding database and medical notes. Basic patient demographics were extracted (age, sex), followed by procedural details (cause of gastric outlet obstruction, technical success of the procedure and any reason for failure, grade of clinician performing the procedure), and details of outcomes and adverse events (return to diet, reintervention rate, adverse events within 30 days, post-procedure length of stay, post-procedure survival).

Once extracted, these data were compared with recent meta-analysis data from European tertiary upper gastrointestinal centres to determine the performance of our regional hospital service.⁵ Successful return to diet was defined by the presence of documented evidence within the medical notes of the patient eating and drinking post-procedure. In patients who had multiple stent attempts, post-procedure length of stay and survival were measured from the first stent attempt.

Results

Forty-six attempts at duodenal stent insertion were identified from the coding database. On further analysis, three of these represented water-soluble contrast studies in patients with symptoms suggestive of gastric outlet obstruction. The studies did not demonstrate any obstruction amenable to stenting, and symptoms in these cases were probably due to other causes. These were therefore not true attempts at duodenal stenting and were removed from the analysis.

Forty-three attempts at duodenal stent insertion were therefore identified during the time period specified. These took place in 38 patients; 17 were male and 21 were female, and median age was 74 years (range 40–93 years, interquartile range, IQR, 65–82 years). Some 35 patients (92%) had malignant disease, the most common being gastric malignancy (12 patients, 32%) and pancreatic malignancy (10 patients, 26%). Successful return to diet was achieved in 32 patients (84%).

Mean length of stay for all 38 patients post-procedure was 8.6 days (IQR 2.0–9.5 days). Mean survival for all 38 patients post-procedure was 131.7 days (IQR 29.0–155.0

days). For patients with malignant gastric outlet obstruction only, mean survival post-procedure was 129.6 days.

Reintervention was required in seven patients (18%). For four of these patients, a repeat attempt at stenting was carried out within seven days due to the initial attempt being technically unsuccessful. For one patient the initial attempt was technically successful, however the stent became blocked within seven days, and an upper gastrointestinal endoscopy and balloon dilatation of the stent was performed. For the remaining two patients, reintervention was required within eight weeks of the initial successful attempt due to tumour ingrowth (one patient underwent repeat stenting, and the other underwent upper gastrointestinal endoscopy and balloon dilatation). No adverse events were reported after reintervention.

Within 30 days post-procedure, adverse events occurred in 7 patients (18%). These included perforation (three patients, 8%), stent occlusion (two patients, 5%), sudden death of unknown cause within 24 hours post-procedure (one patient, 3%) and minor gastrointestinal bleeding not requiring any endoscopic or surgical intervention (one patient, 3%). There were an additional seven deaths within 30 days of the procedure, all of which occurred after discharge from hospital in patients with advanced malignant disease.

All procedures were performed within working hours (Monday to Friday, 9am to 5pm). In all 24 procedures involving radiological staff, a consultant radiologist was performing the procedure. In 39 procedures involving endoscopists (the majority of whom were surgeons), 36 procedures were performed by a consultant and three by a specialty trainee. Outcomes by professionals involved are highlighted in Table 1.

Technical success was achieved in 35 procedures (81%). The most common reason for the remaining eight procedures being technically unsuccessful was difficulty advancing the guidewire or stent across a tight stricture. Comparison of these results to those from Upchurch *et al* is shown in Table 2.⁵

Discussion

Malignant gastric outlet obstruction can be the cause of distressing symptoms and nutritional decline in a situation where life expectancy is likely to be limited due to locally advanced or metastatic disease. A palliative solution which has a high chance of improving symptoms while minimising hospital stay and potential adverse events is therefore of great importance.

Palliative duodenal stenting is a technique often reserved for high volume tertiary upper gastrointestinal centres. Our regional district general hospital service has fortunately been able to retain this technique, therefore minimising the distress and delays which can be caused to patients and families by a long commute or transfer to a regional centre. It is therefore important that the safety and efficacy of our regional service are assured and comparable with larger tertiary centres.

Table 1 Outcomes of stenting procedures by professionals involved

Procedure performed by	Procedures (n)	Patients (n)	Technical success n (%)	Return to diet n (%)	Adverse events n (%)
All cases	43	38	35/43 (81%)	32/38 (84%)	7/38 (18%)
Joint radiologist and endoscopist	20	18	14/20 (70%)	14/18 (78%)	2 perforation; 1 GI bleeding; 1 sudden death
Endoscopist only	19	17	17/19 (89%)	15/17 (88%)	1 perforation; 2 stent occlusion
Radiologist only	4	3	4/4 (100%)	3/3 (100%)	0/4 (0%)

Table 2 Comparison of primary and secondary outcomes with best available research⁵

Outcome	Our data	Upchurch (2018)
Successful return to diet ^a	84%	93% (39/42)
Reintervention	18%	30% (13/42)
Adverse events ^b	18%	23% (10/42)
Mean length of stay	8.6 days	5.1 days
Mean survival post-intervention	132 days	56 days

^aDefined as 'technical success of the intervention' by Upchurch *et al*
^bAny Clavien–Dindo grade

In this retrospective study, all attempts at duodenal stenting for gastric outlet obstruction of any cause were identified over a specified five-year period. Safety and efficacy data were extracted which were then compared with recent meta-analysis data from European tertiary upper gastrointestinal centres.⁵

Over the five-year time period specified, forty-three attempts at duodenal stent insertion took place. This equates to one procedure every six weeks on average. As expected, 92% of patients had malignant disease, the most common being gastric and pancreatic malignancy. All procedures took place within working hours, and the vast majority were performed by consultants. On further analysis of outcomes of stenting procedures by professionals involved, procedures performed by a radiologist alone seem to be more clinically and technically successful. Conversely, procedures performed by both a radiologist and endoscopist seem to have a higher complication rate; this may be a reflection of more difficult cases being performed as joint procedures rather than by a single endoscopist/radiologist.

Technical success and successful return to diet were achieved in 81% of procedures and 84% of patients, respectively. Successful return to diet, defined as 'technical success of the intervention' by Upchurch *et al* was reported as 93% in their study.⁵ These numbers are broadly comparable. Of the six patients who did not have a successful return to diet in our study, mean survival was twenty-one days post-procedure. A previous systematic

review of case series involving stents placed for malignant gastric outlet obstruction demonstrated technical success in 589/606 cases (97%) and clinical success in 526 (87%), with a final resolution of symptoms occurring after a mean of 4 days.⁷ In another study of 120 patients who underwent endoscopic stenting for malignant gastric outlet obstruction at a single tertiary unit, technical success was achieved in 96%.⁸ However, as a review of case series⁷ and a retrospective study of a single unit,⁸ there is potential for selection and publication bias, therefore the true technical and clinical success rates may not be as optimistic as published.⁷

Reintervention rate in our study was 18%, compared with a higher rate of 30% reported by Upchurch *et al*.⁵ Of seven patients in whom reintervention was required, only five required reintervention within seven days, either due to technical failure or stent blockage. For the remaining two patients, reintervention was within eight weeks and was due to tumour ingrowth, a known consequence of malignancies with often aggressive growth patterns.

Adverse events were comparable also, with 18% of patients in our study experiencing an adverse event, compared with 23% as reported by Upchurch *et al*.⁵ Of seven patients who experienced an adverse event, one patient died within 24 hours of the procedure, of unknown cause (Clavien–Dindo grade V); whereas the remainder of patients experienced an adverse event of Clavien–Dindo grade IIIa or lower. The additional seven deaths within thirty days of the procedure were all after hospital discharge and were considered to be a probable consequence of the patients' advanced malignant disease burden. In Dormann *et al*,⁷ bleeding and perforation occurred in 7 patients (1.2%), stent migration in 31 patients (5%) and stent obstruction in 104 (18%). Khashab *et al* reported a much lower complication rate of 1.7%, although it is possible that patients with complications presented to local hospitals instead of the tertiary centre, thus escaping data collection.⁸ Our data demonstrate a much shorter mean survival post-intervention than Upchurch *et al*.⁵ This may be reflective of the fact that only one study in their meta-analysis reported mean survival data.

There were a number of limitations to this study. Our small sample size is reflective of regional treatment pathways, with a lower volume of duodenal stenting in our regional hospital in comparison with tertiary upper gastrointestinal centres. Unfortunately, it is not possible to provide further

detail on technical aspects of the procedures (delivery system length, wires used, site of obstruction etc) as this information is incompletely recorded. Any conclusions drawn from the comparison between our data and those of Upchurch *et al* may be of limited value, owing to the variability in the definitions of outcomes between the studies.⁵ Only patients with gastric outlet obstruction who underwent stenting have been included; patients who were too unwell for intervention, refused intervention or underwent an alternative procedure (eg gastrojejunostomy) were not included.

There were no identified cases of stent migration in our 38 patients and this may be a consequence of study design; patients may have developed recurrence of symptoms during the study period but may not have presented to our service, therefore no notes are available. Furthermore, any patients who moved out of the area and had a recurrence of symptoms or who presented to a different hospital will not have been accounted for. Finally, this study was challenged by a lack of standard documentation in clinical notes, especially relating to the reporting of stent-related symptoms. Future work should focus on a prospective, observational study which makes use of patient-reported symptom severity scores (eg the Gastric Outlet Obstruction Scoring System). Further research into any potential relationship between other patient demographics (specifically body mass index and deprivation score) and outcomes may also be of interest.

Conclusion

Patients with malignant gastric outlet obstruction in our region in whom duodenal stent placement was attempted had similar outcomes to published data from larger tertiary centres.

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