Role of endoscopic stenting in the duodenum

David L. Carr-Locke
Director of Endoscopy, Brigham and Women’s Hospital, Associate Professor of Medicine, Harvard Medical School, Boston, Massachusetts, USA

Summary

Background: Gastric outlet obstruction may cause the presenting symptoms, or may develop during the course of pancreatic or biliary malignancy. Treatment options for malignant gastric outlet obstruction are limited. Surgical gastrojejunostomy is commonly performed, but carries significant morbidity and mortality.

Methods: Over the past two years, we conducted a prospective study to determine the safety, feasibility and outcomes of the newly-designed Wallstent Enteral® (Sneider, Minneapolis, MN) to treat a variety of malignant gastric outlet obstructions. We deployed stents 16 to 22 mm in diameter and 60 to 90 mm in length directly through the endoscope.

Results: Twelve patients (10 women and 2 men, mean age = 59.7 years) underwent the procedure. After stenting, six patients were able to eat a regular diet, and three were able to eat a pureed diet. In three patients, the procedure was unsuccessful because of multiple obstructions that were not recognized prior to stenting in one and stents that were deployed either too proximally in one or too distally in another. Three patients were discharged within 24 hours after stenting and three had the procedure as an outpatient.

Conclusions: Placement of the Wallstent Enteral through the endoscope is safe and effective palliation for a variety of malignant gastric outlet obstructions, and leads to significant improvement in many aspects of patients’ quality of life.

Key words: duodenum, endoscopy, stenting

Introduction

Malignant gastric outlet and duodenal obstruction may cause the presenting symptoms, or may develop during the course of pancreatic or biliary malignancy. Approximately ten percent of patients with pancreatic cancer develop gastric outlet or duodenal obstruction during the course of their disease. Open surgical gastrojejunostomy is the standard treatment for malignant gastric outlet obstruction (GOO). Unfortunately, this intervention can be associated with significant morbidity and mortality [1]. Newer laparoscopic alternatives are still evolving. Self-expanding metallic stents designed for the biliary tract, such as the Gianturco-Rösch Z-stent (Wilson-Cook, Inc., Winston-Salem, NC) and the Wallstent (Schneider, Minneapolis, MN) have been reported to provide effective treatment alternatives with minimal morbidity [2-10] but small caliber lumens.

We have conducted a prospective study to determine the technical feasibility and clinical outcomes of using an improved-design self-expanding metal stent (Wallstent Enteral®) to treat malignant GOO. These stents have the advantage of direct placement through the endoscope channel (TTS) and a large luminal diameter. Direct TTS stent placement is easier and more precise than non-TTS and the large stent diameter may allow patients to eat a regular diet.

Materials and methods

Over the past two years, we have used commercially available Wallstent Enteral stents or their prototypes to treat 12 patients who had malignant gastric or duodenal stenoses (see Table 1). All patients treated are included in this report. Several patients were treated before the stents were approved by the Food Drug Administration for marketing as a gastrointestinal device, but all were approved for compassionate use by the Brigham and Women’s Research Committee. We obtained informed consent from all patients prior to treatment.
Table 1. Technical feasibility and clinical outcomes of placement of Wallstent Enteral

<table>
<thead>
<tr>
<th>No</th>
<th>Age</th>
<th>Gender</th>
<th>Stricture location</th>
<th>Etiology</th>
<th>Efficacy/patency</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>57 M</td>
<td>M</td>
<td>Gastrojejunostomy</td>
<td>Pancreatic cancer</td>
<td>7 wk*</td>
<td>Pureed diet</td>
</tr>
<tr>
<td>2</td>
<td>45 M</td>
<td>M</td>
<td>Gastrojejunostomy</td>
<td>Pseudomyxoma peritonei</td>
<td>10 mo</td>
<td>Regular diet</td>
</tr>
<tr>
<td>3</td>
<td>65 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Pancreatic cancer</td>
<td>6 wk*</td>
<td>Pureed diet</td>
</tr>
<tr>
<td>4</td>
<td>51 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Colon cancer</td>
<td>4 of 7 wk*</td>
<td>Pureed diet</td>
</tr>
<tr>
<td>5</td>
<td>54 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Pancreatic cancer</td>
<td>15 wk*</td>
<td>Regular diet</td>
</tr>
<tr>
<td>6</td>
<td>66 W</td>
<td>W</td>
<td>Antrum/bulb</td>
<td>Ovarian cancer</td>
<td>2 wk*</td>
<td>Had multiple obstructions that were not recognized prior to stenting, had supportive therapy</td>
</tr>
<tr>
<td>7</td>
<td>71 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Duodenal cancer</td>
<td>2 wk*</td>
<td>Stent deployed too proximally, had supportive therapy</td>
</tr>
<tr>
<td>8</td>
<td>43 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Ovarian cancer</td>
<td>7 wk</td>
<td>Stent deployed too distally, had gastrojejunostomy</td>
</tr>
<tr>
<td>9</td>
<td>85 W</td>
<td>W</td>
<td>Duodenal</td>
<td>Duodenal cancer</td>
<td>10 wk*</td>
<td>Regular diet</td>
</tr>
<tr>
<td>10</td>
<td>57 W</td>
<td>W</td>
<td>Antrum/bulb</td>
<td>Breast cancer</td>
<td>28 wk*</td>
<td>Regular diet</td>
</tr>
<tr>
<td>11</td>
<td>76 W</td>
<td>W</td>
<td>Antrum/bulb</td>
<td>Gallbladder cancer</td>
<td>10 wk*</td>
<td>Regular diet</td>
</tr>
<tr>
<td>12</td>
<td>46 W</td>
<td>W</td>
<td>Antrum/bulb</td>
<td>Biliary cancer</td>
<td>24 wk</td>
<td>Stent deployed too distally, had second stenting.</td>
</tr>
</tbody>
</table>

*Expired.

b Had been treated with biliary Wallstent.

Had biliary and enteral Wallstents placed during one session.

Endoscope could be passed through the stricture, we marked the distal end of the stricture by injecting Renografin contrast submucosally for additional guidance. During deployment, we repositioned stents frequently because there was a tendency for them to move away from the endoscope. We assessed the adequacy of stent placement at the conclusion of each procedure using endoscopy and fluoroscopy.

Results

The mean follow-up period for the group was thirteen weeks (range 2 to 40 weeks). One patient was lost to follow-up at 40 weeks, another patient who underwent gastrojejunostomy was lost to follow-up at seven weeks. Nine patients died after the procedure from progression of their cancer unrelated to the stent implantation.

Stent implantation

Fourteen Wallstent Enteral was implanted for the 12 patients. All stent deployments were technically successful. There were no major short or long-term complications, such as bleeding from the cancer, perforation, or stent migration. Placement of enteral stents in the second portion of the duodenum in patients who had biliary Wallstents did not cause obstruction of the biliary outflow. In at least three patients, the stent protruded approximately 1 to 2 cm into the normal antrum and did not cause any gastric obstruction or any new symptom.

Clinical outcomes

Six patients were able to eat a regular diet, and three others were able to eat a pureed diet within 24 hours of stent placement. Three patients developed recurrent symptoms of obstruction at two, four, and 21 weeks after stent placement. Of these three patients, one patient was found to have the stent deployed too distally and another patient was found to have tumor ingrowth into the stent. Both patients underwent successful restenting two and 21 weeks after the initial stent placement. The third patient had supportive therapy only. Stenting did not relieve the symptoms of three patients. One patient was found to have multiple distal small-bowel strictures that were not recognized prior to stent insertion and two patients had stents that were deployed suboptimally: one stent expanded too distally, and this patient subsequently underwent gastrojejunostomy, another stent was too proximal, and this patient was given supportive therapy only. Both technical failures occurred when one-size prototypes only were available. As we gained experience in stent placements, we were able to discharge patients earlier after stenting such that three patients were discharged within 24 hours after stent placement. Three patient had the procedure performed as an outpatient. Another patient had both biliary and enteral Wallstents placed during the same setting and was discharged two days later. Two other patients were also discharged within 48 hours after stenting. One patient was hospitalized for six days after stent placement to receive supportive care.
Discussion

The treatment of malignant gastroduodenal stenoses is difficult. Many patients have advanced malignant disease and are too ill to undergo surgical gastrojejunostomy, which is associated with significant morbidity and mortality [1]. It is not uncommon for patients to be treated with only supportive therapy, which, unfortunately, does not relieve nausea and vomiting or allow adequate food intake. Other treatment options have been tried. Treatment with chemotherapy or radiation therapy is typically unhelpful. A surgically-placed jejunostomy for feeding combined with percutaneous endoscopic gastrostomy has been used in patients with gastroduodenal stenoses [5], but this combined therapy is often unsatisfactory. Other endoscopic modalities to dilate or ablate the stenoses have been used infrequently, because they provide only a transient response and are associated with a significant risk of perforation.

Our prospective study found that endoluminal treatment of malignant GOO with the self-expanding metallic Wallstent Enteral is a safe and effective alternative to surgery. TTS deployment facilitates accurate and safe stent insertion. The slim and flexible delivery systems permit stent placements into the angulated lumen of the gastrointestinal tract without prior dilation of the stenoses. The large diameter of these stents allows patients to eat regular food and perhaps prevents early occlusion due to tumor ingrowth. With experience, we found that placements of Wallstent Enteral were associated with minimal morbidity, allowing us to discharge patients shortly after stenting.

The design of the stents that we used differed from those of the stents used in previous reports [2-10]. In 1992, Kozarek and colleagues, successfully placed Z-stents in the efferent limb of a patient who had had a Whipple resection for pancreatic carcinoma and in the efferent limb of a patient who had Billroth II anastomosis for gastric carcinoma with good results [6]. Following this report, Maetani and associates, treated three patients who had malignant gastric and duodenal stenoses with Z-stents and reported similar results [7,8]. The delivery system of the Z-stent was large: thus, direct TTS placement was not possible. Keymling and colleagues used the endovascular Wallstent as palliative treatment for malignant duodenal stenoses [5], but as this stent had short delivery system, it was placed through a gastrostomy. The stents that we used had delivery system long enough to allow TTS placement (230 cm). Howell and others [4] used the biliary Wallstent as palliation for GOO. Although the biliary Wallstent allowed TTS placement, its diameter was small (10 mm) and thus limited patients’ diets to clear liquids or soft foods. In comparison, the diameter of Wallstent Enteral is much larger (18, 20 or 22 mm), potentially allowing patients to eat a regular diet. Despite shortcomings in the design and delivery systems of the stents used previously, these reports indicate that self-expandable metal stents can be used safely to treat malignant gastric or duodenal obstruction.

In the era of cost containment, the cost effectiveness of the Wallstent Enteral to treat malignant gastrointestinal obstruction must be considered. Although our study evaluated only feasibility and outcomes, our experience suggests that use of the Wallstents would be cost effective (Table 2). The overall cost of treatment with the Wallstent is
likely to be lower than the overall cost of treatment with
gastrojejunostomy, because stent placement does not require
costly use of operating room and hospitalization for post-
operative recuperation. In addition, stenting can be expected
to provide more quality and quantity of life. Patients who
receive stents require less time to recuperate than do patients
who undergo surgery and stent placement is associated with
minimal morbidity. In contrast, surgery is associated with
significant mortality. In the future, we expect placement of
the Wallstent to become the preferred treatment because it
may improve quality and quantity of life and use fewer
resources.

In conclusion, our initial experience with use of Wallstent
Enteral to treat patients with malignant GOO is favorable.
Stent deployment is technically feasible and in some patients
allows effective palliation of obstructive symptoms and the
ability to take food orally.

Table 2. Potential Cost-effectiveness of Wallstent Enteral to treat
malignant gastrointestinal stenoses.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Surgery</th>
<th>Stent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Overall</td>
<td>More</td>
<td>Less</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quality of life</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-op</td>
<td>Prolonged</td>
<td>Immediate</td>
</tr>
<tr>
<td>Remaining life expectancy</td>
<td>Similar</td>
<td>Similar</td>
</tr>
<tr>
<td>Overall</td>
<td>Less</td>
<td>More</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity of life</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure mortality</td>
<td>Significant</td>
<td>Small</td>
</tr>
<tr>
<td>Overall</td>
<td>Less</td>
<td>More</td>
</tr>
</tbody>
</table>

References

1. Weaver D, Winczek R, Bowman D et al. Gastrojejunostomy: is it helpful for
2. Topazian M, King E, Grendell J. Palliation of obstructing gastric cancer with
3. Holstege A, Gross V, Lock G et al. Self-expanding metallic stent placement in
   the palliation of inoperable malignant gastric outlet obstruction (abstract).
   Gastrointest Endosc 1995;41(4):A38.
   expandable stenting in late stage malignancy (abstract). Gastrointest Endosc
   1994;140:A38.
   by percutaneous insertion of an metal stent. Gastrointest Endosc 1993;39(3):439-
   41.
6. Kozarek R, Ball T, Patterson D. Metallic self-expanding stent application in the
   upper gastrointestinal tract: caveats and concerns. Gastrointest Endosc
7. Maetani I, Ogawa S, Hoshi H et al. Self-expanding metal stents for palliative
   treatment of malignant biliary and duodenal stenoses. Endoscopy 1994;26:701-
   4.
8. Maetani I, Inoue H, Sato M et al. Percutaneous stent placement techniques of
   self-expanding metal stents for malignant gastric outlet and duodenal stenoses.
9. Rajmohan I, Roddie G. Treatment of malignant duodeno-biliary obstruction with