Stenting of upper and lower GI tract obstruction

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Stenting in gastroduodenal outlet obstruction

Gastric and duodenal outlet obstructions are most commonly caused by malignancy of the gastric antrum or duodenum, direct invasion or extrinsic compression of the duodenum from pancreatic and cholangiocarcinoma or by metastatic involvement from distant primaries. Other causes include benign lesions such as peptic strictures of the gastric outlet or duodenum, or pyloric dysfunction after gastric pull-up for esophageal carcinoma. Patients with gastric outlet or duodenal obstruction often exhibit intractable vomiting and inability to eat. The consequences are gastric distention, weight loss and dehydration, which may have to be treated by intravenous fluid administration. As most patients with underlying malignancy present at an advanced stage, curative surgery is usually not possible. The classical methods of treatment for these patients have been surgical gastroenterostomy, percutaneous jejunostomy or percutaneous gastrojejunostomy (1-3). However, surgical operation carries a relatively high risk of morbidity and mortality and the long-term results of percutaneous palliative treatments are poor (1-3). Self expanding metallic stents are being used as a non-invasive alternative for palliation in patients with inoperable disease. Selected patients with stenoses secondary to chronic ulcers of the pylorus and duodenum, who are not surgical candidates, can also benefit from stenting. Similarly, selected patients with pyloric dysfunction after gastric pull-up for esophageal resection can also be treated by self expanding stems.

Because of the anatomic curvature of the duodenum, flexible stents should be used. The most commonly employed devices are the 16 mm vascular Wallstent and the 20mm to 22 mm "Enteral" Wallstent (Boston Scientific Corporation, Watertown, MA, USA) (4-9).

An accurate pre-procedure diagnosis is essential. In addition to CT and upper GI series, endoscopy and biopsy should be performed to evaluate length, location and nature of the stenosis. In addition, distal obstruction of the small bowel should be excluded. Insertion of stents via gastrostomy (10-12) as well as the peroral route has been described (4-9). However, the peroral route is preferable as it obviates the inconvenience and risk of gastrostomy. The patient is placed in the supine or left lateral position on the fluoroscopy table. After administration of intravenous sedation and local anesthesia to the throat, a steerable guidewire and angiographic catheter are advanced under fluoroscopic control through the stenosis. If gastric retention is present gastric contents are removed by suction to facilitate access to the stenosis and reduce the risk of aspiration. A combined fluoroscopic and endoscopic approach is used by many several authors, though most strictures can be managed by radiologic means alone. After passing the stricture the lesion is delineated once more by contrast injection. Then a stiff wire (e.g. Amplatz Superstiff) is used for placement of the stent. Fluoroscopy is essential for correct stent deployment ; this may be supplemented by endoscopy. At the end of the procedure the correct position of the stent is documented with gastrografin and a plain radiograph of the abdomen is obtained within 24 hours to assess adequate stent expansion. Follow-up is mainly clinical, but barium studies may be useful to demonstrate good function.

Whether stent placement is performed under fluoroscopic guidance alone, or using a combined endoscopic and fluoroscopic technique, depends mainly on operator preference. We find it useful to work in partnership with an endoscopist. Advancing the constrained stent through the working channel of an endoscope can overcome the problem of guidewire looping in the (usually dilated) stomach. When a stent has to be placed into the distal duodenum a stiffening tool is particularly useful in preventing guidewire looping and helps to overcome the friction encountered when pushing the instrument around the "duodenal C". As an alternative to the endoscope, an overtube such as an 11F Mulllins sheath (Cook, Bjaeverskov, Denmark) may be used. Unlike de Baere *et al.* (5) and Feretis *et al.* (4) we do not think that balloon dilatation before stent placement in the gastroduodenal region is necessary because the stents expand well within a short period of time in most cases. Recent studies with six or more patients (4,8,13), and our own experience with 17 patients, showed no significant differences in the results obtained with various types of Wallstent. Initial technical success was achieved in 83% to 100% (mean 95%) in a total of 58 reported patients. The initial success at palliation was 80% to 100% (mean 93%). Reported reobstruction rates vary from 8% to 50% but secondary sustained palliation until death was achieved in 80% to 100% (mean 87%). Although there

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are no significant differences in the results obtained with various stent types we favor the 16 mm vascular Wallstent or the "Enteral" Wallstent of 20mm to 22 mm diameter, both of which exhibit good longitudinal flexibility and may be introduced through the working channel of an endoscope. Other types of stents such as the Strecker Tantalum-stent, the Strecker Nitinol-stent (Boston Scientific Corporation) or modified covered Gianturco-stents (William Cook Inc., Bloomington, IN, USA) have been used only in small numbers of patients.

No major complications have been reported. Stent obstruction (less than 25% in most series) usually can be treated easily with coaxial insertion of second stent. Ingrowth of tumor or inflammatory tissue has been reported only in four of the 58 (7%) patients mentioned above. This is probably related to the short survival of most patients and the fact that most obstructions were due to external tumor compression. Consequently we do not see a role for covered stents which are more costly and have greater longitudinal rigidity.

Gastric stenting is a promising and cost-effective alternative to gastroenterostomy or longterm jejunostomy for the management of gastric outlet obstruction. It should be the primary approach in patients unfit for surgery or those with a limited life expectancy. The main aim of palliative stenting is to improve the quality of life in patients with inoperable gastric outlet obstruction by relieving vomiting and enabling peroral diet. Stenting is a safe, minimally invasive procedure which does not require general anesthesia. The relief of symptoms is immediate. We recommend a semisolid diet to avoid food bolus obstruction, but most patients are able to have a normal diet.

Stenting for acute ileus in colo-rectal obstruction

Acute obstruction of the large bowel usually requires urgent surgical treatment. It is caused by a number of benign and malignant diseases but by far the most frequent cause is colorectal carcinoma (14). Eight percent to 29% of patients present with acute obstruction and have a poor prognosis (15). Other causes include malignant infiltration from adjacent malignant tumor, and metastatic involvement. Benign conditions such as diverticulitis or other inflammatory bowel diseases and anastomotic or post-irradiation strictures are less frequent.

Patients with acute obstruction (15) generally have a poor prognosis because of a poor general condition related to dehydration and electrolyte imbalance. Usually staged surgical procedures with a temporary colostomy are advocated to relieve acute large bowel obstruction. According to a recent German multicenter study (16) the rates of mortality and morbidity in emergency operations for colonic cancer are approximately 12% and 39% respectively, decreasing to 3.5% and 23% when the patients are treated electively. Furthermore, it has been shown that the best oncologic approach to obstructing carcinoma of the colon is primary resection without colostomy. Self expandable metal stents facilitate single stage surgery with primary anastomosis and reduce costs, mortality and morbidity. Rapid relief of the ileus allows the patient to be prepared for operation and elective tumor resection with primary anastomosis, avoiding enterostomy. Stent placement has also been advocated as a definitive method of palliation of colonic obstruction in patients with disseminated metastatic disease who are not surgical candidates. In selected cases stents may be also used for preoperative decompression of obstruction in acute diverticulitis.

The diagnosis of acute colonic obstruction is made by plain film radiography and an enema with water soluble contrast medium. Colonoscopy and biopsy can help to determine the exact location and nature of the obstruction. Other diagnostic and staging procedures such as abdominal ultrasound, computed tomography etc. may be delayed until after stent placement. The stenosis can be negotiated with radiologic techniques alone or with combined endoscopic-radiologic methods. Following administration of intravenous sedation and analgesia, the stricture is negotiated with steerable or hydrophilic guidewires in combination with torque-control angiographic catheters. For stent placement a superstiff guidewire has to be used. As most colonic cancers are located in the rectosigmoid region these stenoses can usually be negotiated with interventional catheter techniques alone. However, we have found it convenient to use a combined endoscopic-fluoroscopic approach particularly for lesions beyond the distal descending colon. The endoscope is helpful as a stiffening tool for managing the rectosigmoid curvature, to straighten out kinks and to deal with elongation of the bowel. It serves as a guiding tool, especially in lesions proximal to the descending colon and around the splenic flexure.

Immediate post procedural care consists of recording the blood pressure and pulse at regular intervals, treatment of electrolyte imbalance and intravenous administration of fluids. Patients scheduled for elective one-stage surgery receive adequate bowel preparation. Plain films of the abdomen are usually obtained after 24 to 48 hours to assess adequate position and expansion of the stent and resolution of the radiologic signs of ileus. In patients in whom stents are placed for palliation and for whom no subsequent surgery is planned, stool softeners should be used to prevent fecal impaction.

Successful stent placement using endoscopic, radiologic or combined methods can be achieved in 73% to 94% (mean 89%) (9,17-22). In most patients the 20 mm to 22 mm esophageal Wallstent, the vascular Wallstent, and the "Enteral" Wallstent have been used. We currently favor the latter because of its large diameter and longitudinal flexibility, which allow it to conform to the curvature of the bowel. This device can be advanced through a 3.8 mm endoscopic working channel as it is mounted on a 10F-system. Stents should be 2 cm to 7 cm longer than the stricture to reduce the risk of migration.

Gianturco-Z-stents have been used in one series (21), whereas Ultraflex esophageal and Memotherm stents have been implanted only occasionally (9,17,22). Recently, flexible modified Z-stents with a polyurethane covering have been introduced, but these stents are not commercially available (17). In our opinion, the additional cost of covered stents cannot be justified for preoperative stenting, when the stent serves only as a temporary means to keep the bowel lumen patent for bowel cleansing and normalisation of intestinal transit until elective surgery. Even when stents are used for palliation, tumor ingrowth seems to be a rare event making the use of covered devices unnecessary. We believe that the only current indication for the use of covered stents is the sealing of colonic fistulas (17).

For preoperative stenting in six recent reports with more than 10 patients (9,17,18,20-22) between 1996 and 1999, comprising a total of 140 patients with acute ileus, clinical success was achieved in 87% to 100% (mean 96%). The technical success rate for crossing the lesion with a guidewire and subsequent stent placement was 73% to 100% (mean 89%). The majority of patients were treated with Wallstents and some with Gianturco-Z-stents. No significant difference in the results between Z-stents or large caliber Wallstents could be found.

Experience with stenting of obstruction in inflammatory stenosis due to diverticulitis is still limited. Three of the four patients we stented for acute diverticulitis, with short stenotic lesions, had rapid relief of obstruction, whereas the fourth patient with a long segment stenosis had no significant improvement.

Palliative decompression for non resectable primary colorectal or metastatic malignancy in 58 patients has been described in recent publications (9, 17-19). Initial clinical benefit was achieved in 71% to 100% (mean 90%). However, recurrent symptoms due to to fecal impaction, stent migration, or tumor ingrowth or overgrowth were seen in 29% (range 21% to 66%) even in cases where large caliber stents of 20 mm to 25 mm diameter were used. Some of these patients had to be treated with additional stents or surgical decompression. In our experience the length of the stenosis is an important determinant of long-term patency : stenting of long (> 5 cm) metastatic lesions which needed more than one stent gave rather disappointing results. The higher tendency for dysfunction is probably related to disturbance of propulsive peristalsis which leeds to stool impaction.

The overall rate of severe complications ranges from 0% to 32% (mean 10%) but is usually less than 10% in experienced hands (9,17-22). Perforation caused by guidewire manipulation usually has no sequelae, whereas perforations caused by balloon dilatation before or after stent placement prove to be more severe, requiring surgery in the majority of cases. Therefore, we never use balloon dilatation before stent placement and only rarely following implantation, in the stent does not expand adequately. Late perforations are rare but may be caused by steroids, chemo-therapy and radiation therapy or by the sharp free ends of the metal wire mesh. In one of our patients who declined surgery after rapid relief of symptoms following stenting of acute diverticulitis a late perforation occured after 4 months. Stent migration occurs in 0% to 26% (mean 6.5%). It seems directly related to stent diameter and the severity of the stenosis. Therefore, we recommend the use of stent diameters 20 mm or greater. Prophylactic stenting for subacute ileus with incomplete obstruction or non-circular lesions should be avoided.

Inadequate bowel decompression is usually related to stent malpositioning, incomplete expansion or stent migration (17-20,22). In our own experience stenting of long segment stenosis, particularly in extensive metastastic disease requiring more than one stent, early dysfunction secondary to fecal impaction and/or inadequate peristaltic propulsion was not infrequent (27%). Placement of a large bowel tube through the stented segment is an effective method of bowel cleansing and preparation for elective palliative surgery in these cases.

In summary placement of self-expanding metallic stents for preoperative decompression of acute ileus in colorectal cancer particularly of the left hemicolon is a cost effective minimally invasive alternative to emergent surgery. Is buys time for improving the patient's overall condition and staging of the disease enabling the performance of elective one-stage surgery with tumor resection and primary anastomosis after appropriate bowel cleansing. According to Binkert *et al.* (23) cost savings of up to 29% can be achieved in preoperative stent placement for colonic carcinoma mainly due to a shorter hospital stay and fewer days in the ICU.

Preoperative stenting to decrease the high complication rate of emergent surgery for diverticulitis with severe colonic obstruction can probably be done safely provided the inflammatory tumor obstruction of the bowel lumen is short and elective surgery after treatment with antibiotics is performed in due course. However, the treatment of such strictures with stents alone is not recommended because of the risk of delayed perforation. In patients with non resectable malignant disease, stenting may provide adequate long-term palliation obviating the need for surgery or colostomy. However, long segment stenoses which require more than one stent of 60 to 90 mm in length have a relative high risk of reocclusion due to stool impaction or mucosal prolapse. Tumor ingrowth or overgrowth may be of further concern in patients with prolonged survival.

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