Interventional management of benign strictures of the gastrointestinal tract from the stomach to the colon

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A B S T R A C T

Balloon dilation and stent placement are increasingly being used when treating patients with benign gastrointestinal tract strictures, as surgery carries a high risk of morbidity and mortality. Fluoroscopically guided intervention permits precise fluoroscopic control of the balloon catheter and stent placement. This article reviews the techniques and outcomes of balloon dilation and stent placement for the management of benign gastroduodenal and colonic strictures.

Keywords: Balloon dilation, Benign strictures, Colonic strictures, Gastroduodenal strictures, Stent placement

Introduction

Surgery has traditionally been performed on patients with benign gastrointestinal (GI) tract stricture who do not respond to conservative medical treatment.1,2 However, surgery may increase the chance of morbidity and mortality, and impair wound healing, especially in patients with high risk factors, such as advanced age, poor nutritional state, or combined diseases.2,3

As a nonsurgical treatment for benign stricture of the GI tract, endoscopically or fluoroscopically guided balloon dilation has been described in the literature as a safe and effective modality and an effective alternative to surgery.1–13 It is a relatively brief procedure and is cost-effective compared to surgery.

Fluoroscopically guided balloon dilation has some advantages over an endoscopically guided treatment, as it not only allows identification of the proximal and distal ends of the stricture, but also provides fluoroscopic control of the entire balloon catheter during its placement and inflation.2,7

Stent placement is indicated for benign gastroduodenal strictures, secondary to chronic ulcer disease where surgery is not feasible and repeated balloon dilation has failed, according to the Cardiovascular and Interventional Radiological Society of Europe (CIRSE) guidelines published in 2006.14 The use of stent placement for benign stricture of the colon is controversial and may be considered as potential therapy for selected benign strictures in patients who are acutely ill.15,16

This article reviews the fluoroscopically guided interventional techniques such as balloon dilation and stent placement, and the outcomes of interventional management for benign gastroduodenal and colonic strictures, as well as the possible complications.

Fluoroscopically guided interventional techniques

Fluoroscopically guided balloon dilation

A contrast study is usually performed prior to fluoroscopically guided balloon dilation to delineate a stricture and plan the procedure. However, in cases of definite stricture, confirmed by endoscopy and/or computerized tomography (CT) scans, a contrast study is not necessary. In those patients, contrast medium could remain proximal to the obstructed segment, and thus delay the balloon dilation procedures.

In cases of gastroduodenal stricture, local anesthesia or conscious sedation is provided immediately prior to the procedure. A 0.889 mm (0.035 inch), angled exchange guidewire is inserted with fluoroscopic guidance through the patient’s mouth and across the stricture. A deflated balloon catheter is then passed over the guidewire to a position across the stricture. The deflated balloon catheter is slowly inflated with dilute, water-soluble contrast medium until the hourglass deformity created by the stricture disappears from the balloon contour, or if the patient experiences severe pain. Elimination of the balloon waist is an indicator of a successful dilation. Balloon inflation is maintained for 1 minute. If the waist of the balloon is not eliminated during the first inflation, a second or third inflation is performed during the same procedure.

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The diameter of the balloon is selected based on fluoroscopic assessment of the severity of the stenosis. A balloon diameter of 15–20 mm is selected for dilating pyloric strictures associated with peptic ulcer or adhesion (Fig. 1), and a 20–25 mm diameter for anastomotic strictures after the first balloon dilation using a 10- to 15-mm balloon6–8 (Fig. 2).

Patients with colonic strictures are positioned in the left lateral decubitus position and an enema tube is introduced into the rectum. A small amount of contrast medium is injected through the tube to outline the strictures. Under fluoroscopic guidance, a 0.889 mm (0.035 inch), hydrophilic guidewire is inserted through the anus across the strictures and into the colon with a balloon diameter of 20 mm. If blood is seen on the balloon catheter, or if the patient complains of severe pain during balloon inflation, the procedure is terminated. If balloon dilation of the strictures is easily accomplished, the balloon is not blood tincted, and the patient does not report severe pain, then, a second 10-mm balloon catheter is inserted over the second guidewire next to the preexisting catheter, and the two balloons are inflated simultaneously9,10 (Fig. 3). The second balloon catheter diameter can be increased to 15 mm or 20 mm if the dilation is insufficient to disrupt the strictures. In general, fibrous, short, fixed strictures respond better to mechanical dilation than inflammatory strictures.11

Fluoroscopically guided stent placement

Preparations and guidewire insertion techniques of stent placement are similar to those used for balloon dilation. For stent placement, the 0.889 mm (0.035-inch) guidewire is replaced with a super-stiff, J-tip guidewire, and a stent introducer assembly is inserted across the strictures, and the stent is placed across the strictures.12

The usual stent diameter is 18–20 mm for gastroduodenal stents and 24–30 mm for colonic stents. Covered stents are generally used for benign gastroduodenal or colonic strictures because uncovered stents may cause tissue hyperplasia through the stent meshes during the follow-up.

Outcomes of interventions for gastroduodenal strictures

For benign anastomotic obstruction after gastrojejunostomy or gastroduodenostomy, balloon dilation was seen to be clinically effective in 95% (16 of 17) of patients without recurrence during the mean follow-up period of 13.5 months6 (Fig. 2). For benign anastomotic strictures after total gastrectomy, balloon dilation provided obstructive symptom relief (mean asymptomatic period, 23 months) in 91% (21 of 23) of patients without major complications.12 For benign strictures after restrictive stomach surgery to create a small gastric reservoir in patients with morbid obesity, balloon dilation showed relief of symptoms in 50% of patients without procedure-related complications during the mean follow-up period of 29 months.

Severely angulated, tortuous, or edematous, benign gastric outlet strictures are usually refractory to balloon dilation.13,18 In a comprehensive review of early (<3 months) symptomatic anastomotic strictures occurring after gastric surgery, the initial clinical success rate was 49% (31 of 63), although the overall clinical success was 89% with repeated balloon dilation and/or stent placement.13

For benign pyloric or duodenal strictures, secondary to peptic ulcer or Crohn’s disease, fluoroscopically guided balloon dilation showed a high initial clinical success rate of 92% (12 of 13) patients, although additional balloon dilation was necessary in five of these patients (42%; Fig. 1).9,15

The uncovered stents used in benign gastroduodenal strictures are more flexible and resist migration; however, they are subject to tissue hyperplasia when used for a prolonged period of time. Covered stents have the advantage of resisting tissue hyperplasia.13,17 The reports of uncovered stents in patients with benign gastroduodenal strictures, are very limited19,20; three patients with duodenal anastomotic strictures or pyloric peptic ulcer strictures showed initial symptomatic improvement; however, stent migration or jaundice caused by tissue hyperplasia did develop. Stent placement in seven patients with resistant, early (<3 months), anastomotic strictures after gastric surgery showed a benefit for five patients (71%), regardless of whether the stent placement was temporary (two patients) or permanent (three patients).13

For temporary stenting using covered stents, 2 months is reportedly the stent indwelling time.13,17 However, it is usually very difficult to keep a stent in place during the indwelling period; in one study, three of the four temporarily placed stents for benign gastroduodenal strictures migrated13 (Fig. 4). Because of the high risk of migration, stents should be used only in selected patients with resistant, benign, gastric outlet strictures.

Outcomes of colonic strictures interventions

Colonic strictures develop due to numerous disorders, such as postoperative anastomotic strictures, diverticular disease, radiation therapy, or inflammatory bowel disease. Among these strictures, anastomotic strictures occur in 3–30% of patients after colorectal surgery.21 Balloon dilation has been proven to be a safe and effective method for colorectal anastomotic strictures.22,23

Fig. 1. Fluoroscopically guided balloon dilation for peptic ulcer strictures in a 75-year-old patient. (A) Upper gastrointestinal (UGI) series prior to balloon dilation shows strictures (arrows) of the pylorus and duodenal second portion. (B) A 20 mm diameter balloon dilation was performed with full dilation of the balloon catheter. (C) UGI series 1 month after balloon dilation shows improvement of the luminal diameter (arrows).
Fig. 2. Fluoroscopically guided balloon dilation for an anastomotic stricture in a 58-year-old patient. (A) Upper gastrointestinal (UGI) series prior to balloon dilation shows an anastomotic stricture (arrows) at the gastroduodenostomy site. (B) Initially, 15 mm diameter balloon dilation was easily accomplished (not shown), and the caliber of the balloon catheter was increased to 20 mm. The waist formation (arrow in B) disappeared after full dilation (C). (D) UGI series 1 month after balloon dilation shows improvement of the luminal diameter (arrows).

Fig. 3. Fluoroscopically guided balloon dilation for an anastomotic stricture in a 55-year-old patient. (A) Barium enema study shows a benign, tight colorectal anastomotic stricture (arrows) after lower anterior resection for rectal cancer. (B) Double balloon dilation was performed using 15 mm and 20 mm diameter balloon catheters. (C) Barium enema study performed immediately after the procedure shows good passage of contrast medium through the widened lumen (arrows). Barium enema study performed five weeks later showed maintenance of the widened lumen (not shown).
effective procedure for the treatment of benign strictures of colorectal anastomosis. Recently, a double-balloon dilation protocol was proposed and if full, 20-mm balloon dilation was performed with no blood tinge seen on the deflated balloon surface or without severe pain experienced by the patient; otherwise, double-balloon dilation with an additional 10–15 mm diameter balloon catheter was then performed (Fig. 3). Complete improvement, defined as normal bowel habits, was achieved in 86% of the 42 patients studied during the median follow-up of 63.7 months. No complications occurred related to the balloon dilation. Older strictures may be well organized and structurally stabilized, making them more resistant to balloon dilation.

When balloon dilation performed for benign colonic strictures fails, surgical resection is then considered. Colonic stenting may be an alternative to surgery and has been reported in patients with postoperative anastomotic strictures (most commonly), diverticulitis, or colonic fistula. Covered stents have shown definite advantages for preventing tissue hyperplasia into the stent, as well
as closing off a fistula or diverticulitis, whereas uncovered stents were accompanied by tissue hyperplasia with difficult stent removal. Temporary colonic stenting using a retrievable covered stent for 2 months has been reported with a successful outcome in a patient with anastomotic rectal strictures.

Complications

Perforation is a life-threatening complication requiring meticulous care or urgent surgical treatment. Fortunately, only a mild intramural tear occurs in most cases. In cases of transmural rupture with persistent extraluminal leakage, even following conservative treatment, insertion of a covered metallic stent may be effective to prevent leakage. A transmural rupture with progressive clinical deterioration is an absolute surgical indication. Early perforation within 24 hours of the procedure may be caused by a guide-wire manipulation and balloon dilation. Late perforation is caused by erosion of stent meshes through the wall of the intestine.

Hemorrhage can be a minor complication, requiring only conservative treatment. In benign strictures, life-threatening hemorrhage is rarely expected. Stent migration seems to be the major drawback of stent placement in benign GI strictures because they are relatively shorter and smoother in length, compared to malignant strictures (Fig. 4). Proximally migrated stents can be removed from the stomach using a stent retrieval set or endoscopy. If the stent is impacted and causes obstruction, surgical removal is required.

Stent obstruction can be caused by food bolus or tissue hyperplasia. Impacted food should be removed endoscopically. Tissue hyperplasia can be managed by coaxial placement of a second stent.

Future perspectives

Development of a new stent design will be required to resolve stent-related complications and increase their long-term patency. For example, a better fixation technique could reduce stent migration, a major drawback associated with the use of covered stents. Temporary stenting should also be further investigated to determine the optimal stent indwelling period sufficient to stabilize a stricture. Secure stent fixation seems contradictory to temporary stenting, as stent removal is a prerequisite for temporary stenting. Both secure stent fixation and easy removal, if required, are necessary for successful temporary stenting.

The development of biodegradable stents is now being actively researched; they are expected to reduce procedure-related complications and to replace temporary stenting.

In conclusion, fluoroscopically guided balloon dilation is safe and effective for the treatment of various benign strictures of the GI tract, especially benign anastomotic strictures. Fluoroscopically guided stent placement could be potential therapy for selected benign strictures of the GI tract.

Conflicts of interest

All contributing authors declare no conflict of interest.

References