Follow-up evaluation for benign stricture of upper gastrointestinal tract with stent insertion

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AIM: To determine the best method for benign stricture of the upper gastrointestinal tract (UGIT) with stent insertion by follow-up evaluation.

METHODS: A total of 110 stents insertions were performed in 110 cases of benign stricture of the UGIT. Permanent (group A) and temporary (group B) placement of an expandable metal stent in 30 cases and 80 cases respectively. All cases were completed under fluoroscopy.

RESULTS: In group A, 30 uncovered or antireflux covered or partially covered expandable metal stents were placed permanently. In group A, 5 cases (16.7%) in 3-months, 5 cases (20.0%) in 6-months, 6 cases (25%) in the 1st year, 6 cases (50%) in the 3rd year, and 4 cases (80%) in the 5th year exhibited dysphagia relapse. In group B, a partially-covered expandable metal stent was temporarily placed in each patient and removed after 3-7 days via gastroscopy. Follow-up data in this group showed that 8 cases (7.5%) in 3-months, 9 cases (12.0%) in 6-months, 10 cases (15.4%) in the 1st year, 6 cases (20%) in the 3rd year, and 3 cases (25%) in the 5th year exhibited dysphagia relapse. The placement and withdrawal of all stents were all performed successfully. The follow-up of all cases lasted for 3-99 months (mean 41.6±19.7 months).

CONCLUSION: The best method for benign stricture of UGIT with stent insertion is temporary placement of a partially-covered expandable metal stent.

Cheng YS, Li MH, Chen WX, Zhuang QX, Chen NW, Shang KZ. Follow-up evaluation for benign stricture of upper gastrointestinal tract with stent insertion. World J Gastroenterol 2003; 9(11): 2609-2611
http://www.wjgnet.com/1007-9327/9/2609.asp

INTRODUCTION
Benign stricture of the upper gastrointestinal tract (UGIT) refers to stenosis caused by benign pathological changes in the pharynx, esophagus, stomach, and duodenum. Such stenosis includes marginal stricture after surgery, chemical-burn-related stricture, simple scar-related stricture after radiation therapy for tumor, digestive stricture, and functional stricture (achalasia). Since July 1994, 110 cases with benign stricture of the UGIT have been treated with stent insertion and followed-up. We herein report our experiences.

MATERIALS AND METHODS

Materials
Our subjects were 110 patients with benign stricture of the UGIT (61 males, 49 females; age 18-84 years, mean 53.9 years). Sequential trials were adopted for these cases who were nonrandomly divided into the following two groups according to the method of stent insertion: 30 cases with permanent uncovered or antireflux covered or partially covered metal stent dilation (group A), and 80 cases with temporary partially covered metal stent dilation (group B). In group A there were 6 cases of simple cicatricial stricture after radiation therapy for esophageal carcinoma, 8 cases of achalasia, 13 cases of esophageal and esophagogastric marginal stricture, 2 cases of gastroduodenal marginal stricture, and 1 case of esophageal chemical-burn-related stricture. The mean diameter of the strictured UGIT was 3.2±2.3 mm before stent placement and 17.8±2.4 mm after stent placement. In group B there were 2 cases of simple scar-related stricture after radiation therapy for esophageal carcinoma, 67 cases of achalasia, 9 cases of esophageal and esophagogastric marginal stricture, and 2 cases of esophageal chemical burn. The mean diameter of the strictured UGIT was 3.3±2.1 mm before stent placement and 22.3±2.7 mm after stent placement. All cases had dysphagia grades 2-4 before stent insertion and dysphagia grades 0-2 after stent insertion. All cases were examined by barium-meal radiography of the UGIT and gastroscopy.

Methods
It involved an empty stomach for at least 4 h and examination of the normal bleeding and clotting time. Two types of metal stent were used: covered stainless steel wire Z-stent (COOK, USA), and partially covered or uncovered or antireflux covered nitinol stent (Zhiye Medical Equipment Research Institute, Changzhou, China; and Youyan Yijin Advanced Materials Co. Ltd, Beijing, China). The COOK stents were constructed from multiple fragments, each fragment was typically 2-cm long. The stent was completely coated on the outer layer and mounted with a metal barb. The diameter of the stent body was 18 mm and that of the horn was 25 mm. The body of the partially covered metal stents was coated with intracavity silica gel. The areas within 2 cm of both ends of the stents were not covered. Stents were 4-14 cm in length and 16-30 mm in diameter. They had single or double horns, the horn diameter was 20-35 mm.

The different types of metal stents were placed differently. For example, placement of the partially-covered nitinol internal stent used in groups B and C firstly involved spraying the
pharynx with 1% lidocaine (as a mist) for anesthesia. When a stent was placed, the patients were placed in a sitting position or lying on the side, and where applicable with their false teeth removed and a teeth bracket mounted. A 260-cm-long guidewire was first led into the distal end of the benign stricture. The stent was mounted on the propeller whose front end was coated with sterilized liquid paraffin. Guided by the wire, the propeller on which the stent was mounted was moved through the strictured section. Under fluoroscopic control, the outer sheath was slowly withdrawn and the stent expanded under its own tension. After the stent was placed, radiography was performed to observe the patency of the UGIT. In group B, 500-1 000 ml of ice-cold water was injected 3-7 days after stent placement via a biopic hole under gastroscopy, which caused the stent to reduce its diameter. Bioplc plicers were then used to withdraw the stent using a gastroscope. Gastroscopy was performed again in the UGIT to detect complications, such as bleeding, mucosal tearing, or perforation of the UGIT. The patients returned to the ward and consumed cold drinks and snacks for 2 days before resuming a normal diet. It was preferable for patients to eat solid food since the natural expansion caused by ingesting food reduced the retraction of the UGIT.

Criteria for therapeutic efficacy included diameter of the most-strictured section of the UGIT before and after dilation, and dysphagia score before and after dilation.

After stent placement barium-meal radiography was performed to observe the patency of the UGIT. The patients ate semifluid food on the day after surgery, and were treated with antibiotics, antacids, and antireflux drugs. One week after stent removal, barium-meal radiography of the UGIT was performed to observe the patency of the UGIT. The patients went to a clinic or were followed-up by telephone at the 3rd, 6th months, 1st, 3rd and 5th year.

RESULTS

In group A, 30 uncovered or antireflux covered or partially-covered stents were placed. Stent placement was successful in all the cases. In group B, 80 partially-covered stents were placed and removed under gastroscopy guidance 3-7 days after stent insertion. The successful rate of stent placement and extraction was 100%. Relapse rate of dysphagia treated with stent insertion during follow-up is shown in Table 1.

DISCUSSION

Since Domschke et al[1] reported the first successful treatment of malignant esophageal strictures with an uncovered expandable metal stent in 1990, placement of covered or uncovered or antireflux covered expandable UGIT metal stents has been shown to be a safe, easy, and effective treatment for malignant UGIT strictures. Cwikiel et al[2] reported the first successful treatment of benign esophageal strictures in 1993. Cheng et al[3] reported the first successful treatment of benign esophageal strictures with temporary partially covered stent in 1999. Many patients with benign UGIT strictures have received treatment with uncovered or covered or temporary partially covered metal stents[4-26]. Permanent uncovered metal stent insertion for benign functional stricture in the UGIT had poor mid-term and long-term therapeutic efficiency, mainly due to frequent severe gastroesophageal reflux and restenosis (hyperplasia of granulation tissue). After a 12-month follow-up, three uncovered metal stents could not be removed in three cases of achalasia, and we had to resect and reconstruct the esophageal cardia. Therefore, permanent uncovered metal stent dilation is not suitable for cases of functional stricture of the UGIT. Permanent partially covered metal stent dilation had poor mid-term and long-term therapeutic efficiency, mainly due to reflux and stent migration[27-37].

Temporary partially-covered metal stent dilation was used for benign stricture of the UGIT with both excellent immediate and mid- and long-term therapeutic efficacy. Firstly, the design of the stent coincided with the specific anatomy of the UGIT and pathological manifestations of benign stricture. If a stent was not well designed, it did not exhibit therapeutic efficacy, and was also associated with a higher frequency of complications such as stent migration. With the aim of solving these problems, we designed a special stent for benign stricture of the UGIT. The stent was partially covered. A membrane covered the inner wall of the stent, with the area within 2 cm of the stent orifice not covered. The upper orifice of the stent was a large horn, which increased the stability of the stent but made it difficult to withdraw. Secondly, the diameter of the stents used in this group was 16-30 mm. By dilating the stent, the stricture could almost be returned to the maximum diameter of a normal strictured UGIT. What the diameter of a stent is most appropriate is that the stent should expand the strictured part without complications. We found that the bigger the diameter of stents was, the better the mid- and long-term therapeutic efficacy was, but the ideal size still needs to be further investigated.

The further development of biologically degraded stents for the gastrointestinal tract would provide advantages of a very long retention time without the necessity to remove the stent[38]. This would provide potentially superior stent insertion for cases of benign stricture of the UGIT. In the treatment of UGIT benign stricture with stent insertion, temporary partially-covered metal stent dilation will gradually replace others and become the preferred method for the nonsurgical treatment of

Table 1 Relapse rate of dysphagia treated with stent insertion

| Group | Follow-up >3 months (n) | Dysphagia relapse (n) | Dysphagia relapse rate (%) | Follow-up >6 months year (n) | Dysphagia relapse (n) | Dysphagia relapse rate (%) |
|-------|-------------------------|-----------------------|---------------------------|-----------------------------|-----------------------|---------------------------|
| A     | 30                      | 5                     | 16.7%                     | 25                          | 5                     | 20.0%                     |
| B     | 80                      | 8                     | 7.5%                      | 75                          | 9                     | 12.0%                     |

| Group | Follow-up >1st year (n) | Dysphagia relapse (n) | Dysphagia relapse rate (%) |
|-------|-------------------------|-----------------------|---------------------------|
| A     | 24                      | 6                     | 25.0%                     |
| B     | 65                      | 10                    | 15.4%                     |

| Group | Follow-up >3rd year (n) | Dysphagia relapse (n) | Dysphagia relapse rate (%) |
|-------|-------------------------|-----------------------|---------------------------|
| A     | 12                      | 6                     | 50.0%                     |
| B     | 30                      | 6                     | 20.0%                     |

| Group | Follow-up >5th year (n) | Dysphagia relapse (n) | Dysphagia relapse rate (%) |
|-------|-------------------------|-----------------------|---------------------------|
| A     | 5                       | 4                     | 80.0%                     |
| B     | 12                      | 3                     | 25.0%                     |
REFERENCES

1. Domschke W, Foerster EC, Matek W, Rodli W. Self-expanding mesh stent for esophageal cancer stenosis. Endoscopy 1990; 22: 134-136

2. Cwikiel W, Willen R, Stridbeck H, Liool -cil R, Von Holstein CS. Self-expanding stent in the treatment of benign esophageal stricture: experimental study in pigs and presentation of clinical cases. Radiology 1993; 187: 667-671

3. Cheng YS, Yang RJ, Shang KZ, Li MH, Chen WX, Zhuang QX, Xu JR, Chen NW, Yang SX. Esophageal benign structure with temporary stent insertion. J. Fujian Med. Zahi. 1999; 8: 32-34

4. Song HY, Choi KC, Kwon HC, Yang DH, Cho BH, Lee ST. Esophageal strictures: treatment with a new design of modified Gianturco stent. Work in progress. Radiology 1992; 184: 729-734

5. Cwikiel W, Willen R, Stridbeck H, Lillo-Gil R, von Holstein CS. Self-expanding stent in the treatment of benign esophageal strictures: experimental study in pigs and presentation of clinical cases. Radiology 1993; 187: 667-671

6. Song HY, Do YS, Han YM, Sung KB, Choi EK, Sohn KH, Kim HR, Kim SH, Min YI. Covered, expandable esophageal metallic stent tubes: experiences in 119 patients. Radiology 1994; 193: 689-695

7. Foster DR. Use of a Streecker esophageal stent in the treatment of benign esophageal stricture. Austral Radiol 1995; 39: 399-400

8. Profili S, Bifulco V, Demelas P, Migaleddu V, Meloni GB. Possibility of using self-expanding uncoated stents in benign esophageal stenosis. Experience in a case of post-irradiation stenosis. Radiol.Med 1995; 89: 171-173

9. Strieker EP, Boos I, Vetter S, Strohm M, Domschke S. Nitinol esophageal stents: new designs and clinical indications. Cardiov. Intervent Radiol 1996; 19: 15-20

10. De Gregoriy B, Hinsman K, Karon RM, Morrison K, Saxon RR, Barton RE, Keller FS, Rosch J. Treatment of esophageal obstruction from mediastinal compressive tumor with covered, self-expanding metallic Z-stents. Gastrointest. Endosc. 1996; 43: 483-489

11. Moore SW, Ilves R. Treatment of esophageal obstruction with covered, self-expanding wallstents. Ann Thorac Surg 1996; 62: 963-967

12. Song HY, Park SI, Do YS, Yoon HK, Sung KB, Sohn KH, Min YI. Expandable metallic stent placement in patients with benign esophageal stricture. Results of long-term follow-up. Radiology 1997; 203: 131-136

13. Foster DR. Self-expandable osseous stents in the management of benign peptic oesophageal strictures in the elderly. Br J Clin Pract 1997; 51: 199

14. Tan BS, Kennedy C, Morgan R, Owen W, Adam A. Using uncovered metallic endoprostheses to treat recurrent benign esophageal strictures. Am J Roentgenol 1997; 168: 1281-1284

15. Sheikh RA, Trudeau WL. Expandable metallic stent placement in patients with benign esophageal strictures: results of long-term follow-up. Gastrointest. Endosc 1998; 48: 227-229

16. Neuaus W, Schumacher B. Use of metal stents in gastroenterology. Z Gastroenterol 1998; 36: 121-134

17. Sheikh RA, Trudeau WL. Expandable metallic stent placement in patients with benign esophageal strictures: results of long-term follow-up. Gastrointest. Endosc 1998; 48: 227-229

18. Wengrower D, Fiorini A, Valero J, Waldbaum C, Chopita N, Landoni N, Judchack S, Goldin E. EsophaCoil: Long-term results in 81 patients. Gastrointest. Endosc 1998; 48: 376-382

19. Sandha GS, Marcon NE. Expandable metal stents for benign esophageal obstruction. Gastrointest. Endosc Clin N Am 1999; 9: 437-446

20. Boulos M, Armstrong WS, Chandler WF, Omminger MB. Epidu- ral abscess: a delayed complication of esophageal stenting for benign stricture. Ann Thorac Surg 1999; 68: 569-570

21. Fiorini A, Fleischner D, Valero J, Israel E, Wengrower D, Goldin E. Self-expandable metal coil stents in the treatment of benign esophageal strictures refractory to conventional therapy: a case series. Gastrointest. Endosc 2000; 52: 259-262

22. Macdonald S, Edwards RD, Moss JG. Patient tolerance of cervical metallic stents. J Vasc Interv Radiol 2000; 11: 891-898

23. Lee JG, Hsu R, Leung JW. Are self-expanding metal mesh stents useful in the treatment of benign esophageal stenoses and fistulas? An experience of four cases. Am J Gastroentrol 2000; 95: 1920-1925

24. Song HY, Jung HY, Park S, Kim SB, Lee DH, Kang SG, Min Y. Covered retrievable expandable nitinol stents in patients with benign esophageal strictures: initial experience. Radiology 2000; 217: 551-557

25. Cordero JA Jr, Moores DW. Self-expanding esophageal metallic stents in the treatment of esophageal obstruction. Am Surg 2000; 66: 995-999

26. Ackroyd R, Watson DI, Devitt PG, Jamieson GG. Expandable metal stents should not be used in the treatment of benign esophageal strictures. J Gastroentrol Hepatol 2001; 16: 484-487

27. Dormann AJ, Deppe H, Wiggingham H. Self-expanding metallic stents for continuous dilatation of benign stenoses in gastrointestinal tract - first results of long-term follow-up in interstent application in pyloric and colonic obstructions. Z Gastroenterol 2001; 39: 597-600

28. Profili S, Meloni GB, Fio CF, Pischedda A, Bozzo C, Ginesu GC, Canal GC. Self-expandable metal stents in the management of cervical esophageal and/ or hypopharyngeal strictures. Clin Radiol 2002; 57: 1028-1033

29. Yates M R, Morgan DE, Baron TH. Palliation of malignant gastric and small intestinal strictures with self-expandable metal stents. Endoscopy 1998; 30: 266-272

30. Mauro MA, Koehler RE, Baron TH. Advances in gastrointestinal intervention: the treatment of gastroduodenal and colorectal obstructions with metallic stents. Radiology 2000; 215: 659-669

31. DePalma GD, Catanzano C. Remove self-expanding metal stents: a pilot study for treatment of achalasia of the esophagus. Endoscopy 1998; 30: 595-96

32. Ell C, May A, Hahn EG. Self-expanding metal endoprostheses in palliation of stenosing tumors of the upper gastrointestinal tract. Comparison of experience with three stent types in 82 implantations. Dtsch Med Wochenschr 1995; 120: 1343-1348

33. Smout AJ. Back to the Whale bone? Gut 1999; 44: 149-150

34. Muntaz H, Barone GW, Kettel BL, Ozdemir A. Successful management of a nonmalignant esophageal perforation with a coated stent. Ann Thorac Surg 2002; 74: 1233-1235

35. Acunas B, Poyanl A, Rozanes I. Intervention in gastrointestinal tract: the treatment of esophageal, gastroduodenal and colorectal obstructions with metallic stents. Eur J Radiol 2002; 42: 240-248

36. Petrozzio L, Costamagna G. Stenting in esophageal strictures. Dig Dis 2002; 20: 154-166

37. Catanach S, Barrison I. Self-expanding metal stents for the treatment of benign esophageal strictures. Gastrointest. Endosc 2001; 54: 140

38. Fry SW, Fleischer DE. Management of a refractory benign esophageal stricture with a new biodegradable stent. Gastrointest. Endosc 1997; 45: 179-182

39. Catanach S, Barrison I. Self-expanding metal stents for the treatment of benign esophageal strictures. Gastrointest. Endosc 2001; 54: 140

40. Therasse E, Oliva VL, Lafontaine E, Perreault P, Giroux MF, Soulez G. Balloon dilatation and stent placement for esophageal lesions: indications, methods, and results. Radiographics 2003; 23: 89-105