Thoracic and Cardiovascular Surgery

Management of the Cervical Esophagogastric Anastomotic Stricture

Andrew C. Chang, MD, and Mark B. Orringer, MD

Esophagogastric anastomotic stricture following esophagectomy with a gastric esophageal substitute can be a vexing problem for the patient and treating physician. We describe the clinical practice at a single center with extensive experience in esophageal surgery for management of this complication.
Semin Thorac Cardiovasc Surg 19:66-71 © 2007 Elsevier Inc. All rights reserved.

KEYWORDS esophagectomy, complications, self-bougienage, esophageal dilatation, dysphagia

Although the management of a cervical esophagogastric anastomotic leak occurring early after an esophagectomy is generally straightforward, and this complication is seldom associated with death, the long-term sequelae of a cervical leak are far from inconsequential. As we and others have observed, as many as one-third of cervical esophagogastric anastomotic leaks result in an anastomotic stricture as healing occurs,[1,2] and this represents an unsatisfactory outcome for an operation that is intended to provide comfortable swallowing. The implications are similar in patients who survive an intrathoracic esophageal anastomotic leak. Our group has previously reported an anastomotic leak rate averaging 13% in nearly 1100 transhiatal esophagectomy patients at the University of Michigan, with nearly half of these patients developing subsequent anastomotic strictures,[3] consistent with reported incidences of both cervical anastomotic leak from 5 to 26% and anastomotic stenosis from 10 to 31%.[4-6] In this article, we will discuss our current practice regarding the management of anastomotic strictures following esophagectomy.

Conduit ischemia and anastomotic technique are likely the two major factors that contribute to anastomotic stricture in the absence of salivary fistulae. When performing a cervical esophagogastric anastomosis, our preference is to perform a semimechanical stapled anastomosis[7] using an Endo-GIA II 30 mm/3.5 endoscopic linear stapler (Tyco Healthcare, Norwalk, CT) to construct the side-to-side esophagogastric anastomosis. The remaining anterior esophagostomy and gastrostomy are then closed with a two-layer hand-sewn technique. Recently, Santos and coworkers reported their experience with a total mechanical stapled cervical esophagogastric anastomosis in which the anterior esophagogastrostomy is closed with a linear stapler; they demonstrated a decrease in the need for repeated anastomotic dilation.[8]

We and others have found that the mechanical linear stapled technique decreases significantly the occurrence of postoperative cervical anastomotic salivary fistulae. Both the need for and the frequency of anastomotic dilation compared with hand-sewn anastomoses were lower among patients receiving stapled anastomoses.[9-11] Ercan and coworkers reported that within 1 year of operation 37% of patients with a stapled anastomosis remained free of the need for anastomotic dilation compared with 12% of propensity-score matched patients with a completely hand-sewn anastomosis.[10] Regardless of anastomotic technique, patients in this retrospective study most frequently required anastomotic dilation at 2 months following operation. This finding reinforces our understanding that most early anastomotic strictures are due to the development of anastomotic scar and are nonmalignant. In contrast, patients presenting with late cervical dysphagia, 1 year or later following an esophagectomy for cancer, should be evaluated for recurrent mediastinal disease or anastomotic recurrence.[12]

Anastomotic stricture is only one cause of early postoperative dysphagia. It is important to align the cervical esophagogastric anastomosis properly with the remnant cervical esophagus and fundus of the transposed gastric conduit to avoid symptomatic angulation of the junction of cervical esophagus and stomach. Improper application of the 30-mm linear stapler such that the entire cartridge length is not utilized may result in an inadequate anastomotic opening and resultant dysphagia.

Section of Thoracic Surgery, University of Michigan Medical Center, Ann Arbor MI.

Address reprint requests to Andrew C. Chang, MD, Section of Thoracic Surgery, TC2120G/0344, 1500 East Medical Center Drive, University of Michigan Medical Center, Ann Arbor, MI 48109. E-mail: andrwchg@umich.edu

1043-0679/07/$-see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1053/j.semtcvs.2006.11.001

Association with Anastomotic Leak

Without question, the prevention of an anastomotic leak is the key to a successful functional outcome of a cervical esophagogastric anastomosis. In our initial experience with the side-to-side stapled cervical esophagogastric anastomosis, we observed not only an anastomotic leak rate of less than 3%, but also a dramatic reduction in the need for late postoperative anastomotic dilatations.[11]

In the patient who experiences a cervical esophageal anastomotic leak, the neck wound is opened widely at the bedside; irrigation of the wound is accomplished by having the patient swallow water and nutrition is maintained with jejunostomy tube feedings. The wound is then packed lightly with saline-moistened gauze, which is changed at least two to three times daily or more frequently as needed. At each dressing change, the patient swallows 4 to 6 ounces of water and any cervical drainage from the wound is aspirated with a bedside Yankauer suction device. The wound is then repacked gently with a saline-moistened gauze. If bile regurgitation from the cervical wound is problematic despite upright posturing, nasogastric tube decompression of the intrathoracic stomach is at times required to facilitate cleanliness and healing of the neck wound. Healing of the cervical esophagogastric anastomotic leak is assessed by observing the relative amount of swallowed water that issues from the neck wound at the time of the dressing change. As the amount decreases and the majority of drainage while swallowing can be prevented by gentle pressure on the skin directly over the anastomosis, the patient is permitted to resume oral intake, initially, of clear liquids. Any food issuing from the neck wound with swallowing can be "flushed away" as described above. Early passage of 30-, 36-, and 46-Fr Maloney tapered esophageal dilators (Medovations, Milwaukee, WI) within 1 week of drainage is performed to maintain a satisfactory lumen and prevent the late development of a stenosis (Fig. 1). Such an anastomotic fistula generally diminishes greatly in output or heals completely within 7 to 10 days of external drainage.[1,13] It is not necessary that the cervical wound and fistula be healed completely before resumption of an oral diet is permitted. If adequate dilation of the anastomosis to a 46-Fr size has been achieved, the majority of swallowed food will enter the intrathoracic stomach preferentially, and little will leak from the neck wound. Patients and their families quickly become adept with cervical wound dressing and management as described above.

It is of paramount importance that a patient who develops

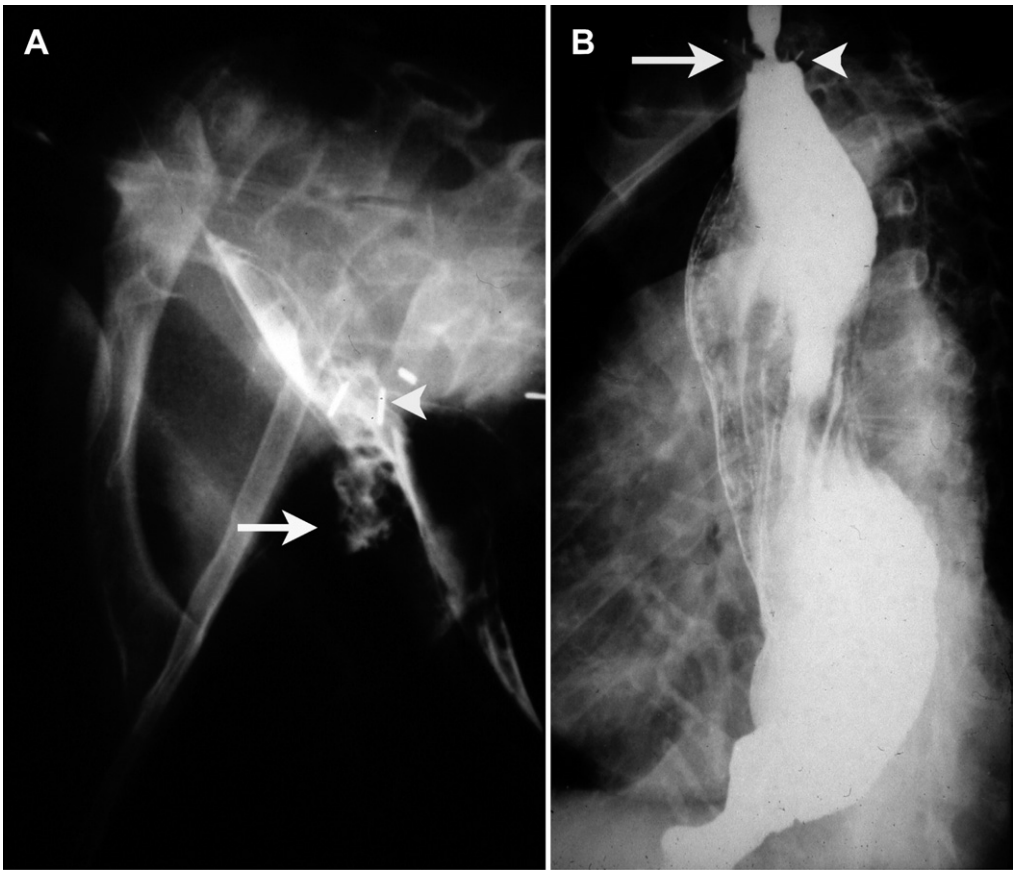

Figure 1 (A) Thin barium esophagogram demonstrating an early cervical esophagogastric anastomotic leak (arrow) in an otherwise asymptomatic patient. (B) At follow-up this patient was found to have an anastomotic stricture (arrow) that required serial Maloney dilation. Arrowheads indicate metallic clips placed at operation for subsequent fluoroscopic localization of the cervical esophagogastric anastomosis.

a perioperative anastomotic leak be evaluated for unidentified sources of continued sepsis if cervical drainage alone does not result in defervescence and clinical improvement within 24 to 48 hours. Continued mediastinal soilage is suspected if persistent purulent drainage from the neck is observed or if the characteristic odor of necrotic stomach is present.[14] A dilute barium esophagogram should be obtained or repeated to determine whether undrained mediastinal extravasation of contrast is present. Upper endoscopy can be performed to evaluate mucosal viability of the intrathoracic stomach and to estimate the extent of anastomotic disruption. Direct visualization of the gastric conduit through the opened cervical incision can confirm the occurrence of gastric tip necrosis. Although in most instances clinical findings provide an accurate reflection of the adequacy of transcervical drainage, a chest computed tomography can help determine whether there is persistent mediastinal soilage that might require more extensive transcervical or even transthoracic drainage.

Technique of Anastomotic Dilation

Functional assessment of the health of the esophageal replacement following transhiatal esophagectomy at our institution is primarily subjective based on the patient's ability to tolerate a mechanical soft diet. Long-term follow-up is important to gauge the functional status following transhiatal esophagectomy and a cervical esophagogastric anastomosis. The presence and degree of dysphagia is assessed at each postoperative visit based on patient symptoms and the frequency with which anastomotic dilation is needed and is graded as follows: none, mild (no treatment required), moderate (requiring occasional dilation), or severe (requiring regular dilation).

Patients who experience any degree of cervical dysphagia after a cervical esophagogastric anastomosis are encouraged to return for outpatient anastomotic dilation, generally performed by passage of progressively larger tapered Maloney esophageal dilators without sedation or anesthesia. As a general rule, passage of a 46 Fr or larger size dilator through the anastomosis is a prerequisite for achieving comfortable swallowing. Maloney bougienage can be performed without fluoroscopic or endoscopic assistance. The initial dilation is performed either at the patient's bedside within 1 week of drainage of a cervical esophageal anastomotic leak or in an outpatient procedure room when a patient presents in follow-up with the complaint of cervical dysphagia. Typically, at the initial dilation, three dilators of increasing size, 36-, 40-, and then 46-Fr caliber, are passed with the patient sitting upright and the neck slightly flexed. If a patient develops an anastomotic stricture following either an esophagocolic or an intrathoracic esophagogastric anastomosis, dilation may be performed with endoscopic and/or fluoroscopic guidance. In our experience, if a 30- or 36-Fr Maloney dilator gently passed "blindly" easily crosses the anastomosis, progressive dilation without endoscopic or fluoroscopic control is usually possible. When the patient returns for follow-up within 2 weeks of discharge, 36- and 46-Fr Maloney dilators are passed through the anastomosis. If the patient has no dysphagia, and there is no resistance to passage of the dilators, the need for subsequent dilatations is dictated by the return of cervical dysphagia.

For patients in whom resistance to passage of the dilators is encountered, or cervical dysphagia recurs within several days or weeks of the initial anastomotic dilation, a more aggressive program of esophageal dilation is undertaken (Fig. 2). In these instances, biweekly outpatient visits for esophageal dilation are performed over 2 to 3 weeks in the presence of family or friends who will be helping. Then, with the surgeon's assistance, the patient learns to pass the dilator through the anastomosis. Finally, the family member or friend is taught to assist the patient by supporting the dilator while the patient again passes the dilator through the anastomosis, without physician assistance. Once facility with passage of the dilator is achieved, the patient is issued a 46-Fr or larger dilator for home use with instructions to pass it daily for 1 week, then every other day for 1 week, and then at increasingly longer intervals until the longest duration between dilatations without the recurrence of dysphagia can be established.

With this aggressive initial program of dilation, anastomotic healing in a patent configuration is often achieved, allowing long-term comfortable swallowing with little or no need for subsequent dilation. Of the patients who have required repeated anastomotic dilation, 124 have been instructed in performing self-dilation and issued 44- to 50-Fr Maloney dilators. Comfortable swallowing has been achieved and maintained with this program in the majority of patients.

Insurance Issues

We have found that many insurance companies initially will not provide reimbursement for a Maloney dilator dispensed from the clinic for home use; an esophageal dilator is not among the traditional "durable goods" (eg, a cane or walker) for which medical insurers will pay. Once this "equipment" is defined in an explanatory letter by the surgeon as a "vital and medically necessary" durable good, reimbursement is generally provided. Furthermore, having found that patients can perform self-bougienage safely, it has become apparent to us that decreasing the number of scheduled outpatient procedures for these patients results in a reduction in professional and facility charges, providing further incentive for insurance plans to cover the cost of this equipment.

Indications for Endoscopy or Further Intervention

In general, patients with a cervical esophagogastric anastomotic stricture undergo outpatient bougienage without the need for endoscopic examination, regardless of whether the gastric conduit was placed in the posterior mediastinum or in a retrosternal position. In those patients in whom the anatomy at the anastomosis simply prevents passage of even a 28-Fr dilator, initial

Figure 2 Outpatient instruction in self-dilation of a cervical esophagogastric anastomotic stricture using a 46-Fr Maloney esophageal dilator. The patient is positioned sitting upright with the neck slightly flexed. (A-B) The physician demonstrates to the patient the technique of passage of the esophageal dilator. (C) The patient then passes the dilator himself with the physician's assistance. (D-E) With a family member supporting the dilator and initially assisted by the physician, the patient passes the Maloney esophageal dilator into the oropharynx and then gently advances the dilator to 35 cm from the incisors, as noted by calibrated markings on the bougie. (F) The patient assisted by the family member passes the dilator independently of the physician. (Color version of figure is available online at http://journals.elsevierhealth.com/periodicals/ystcs.)

endoscopic guide-wire dilation facilitated by conscious sedation is necessary. Once the anastomotic stricture has been dilated endoscopically to the 46- to 50-Fr range, the patient should return within 1 week for outpatient "blind" passage of dilators as described above to maintain long-term patency and comfortable swallowing. If a patient develops an esophagoenteric anastomotic stricture following use of a conduit other than the stomach to reestablish alimentary continuity, or if an intrathoracic anastomosis is constructed following esophagogastrectomy, we and others recommend initial endoscopic evaluation,[15] which permits the placement of a guide-wire under direct vision well beyond the narrowed anastomosis to facilitate its bougienage.

The occasional patient develops a "hard" anastomotic stricture that requires considerable force to cross with a 46-Fr or larger dilator. Such a refractory anastomotic scar may respond dramatically to direct endoscopic injection of steroids combined with esophageal dilation, initially described for the treatment of corrosive esophageal strictures and anastomotic stricture following tracheoesophageal fistula repair,[16] and more recently reported for the treatment of peptic strictures.[17,18] Typically, four-quadrant 0.5-mL intralesional injections of triamcinolone acetonide (Kenalog, 40 mg/mL diluted 1:1 with saline solution, Bristol-Myers Squibb, Princeton, NJ) is performed immediately preceding esophageal dilation.[19] The administration of mitomycin C (MMC), an antiproliferative agent, for treatment of recurrent anastomotic strictures has also been reported to be effective

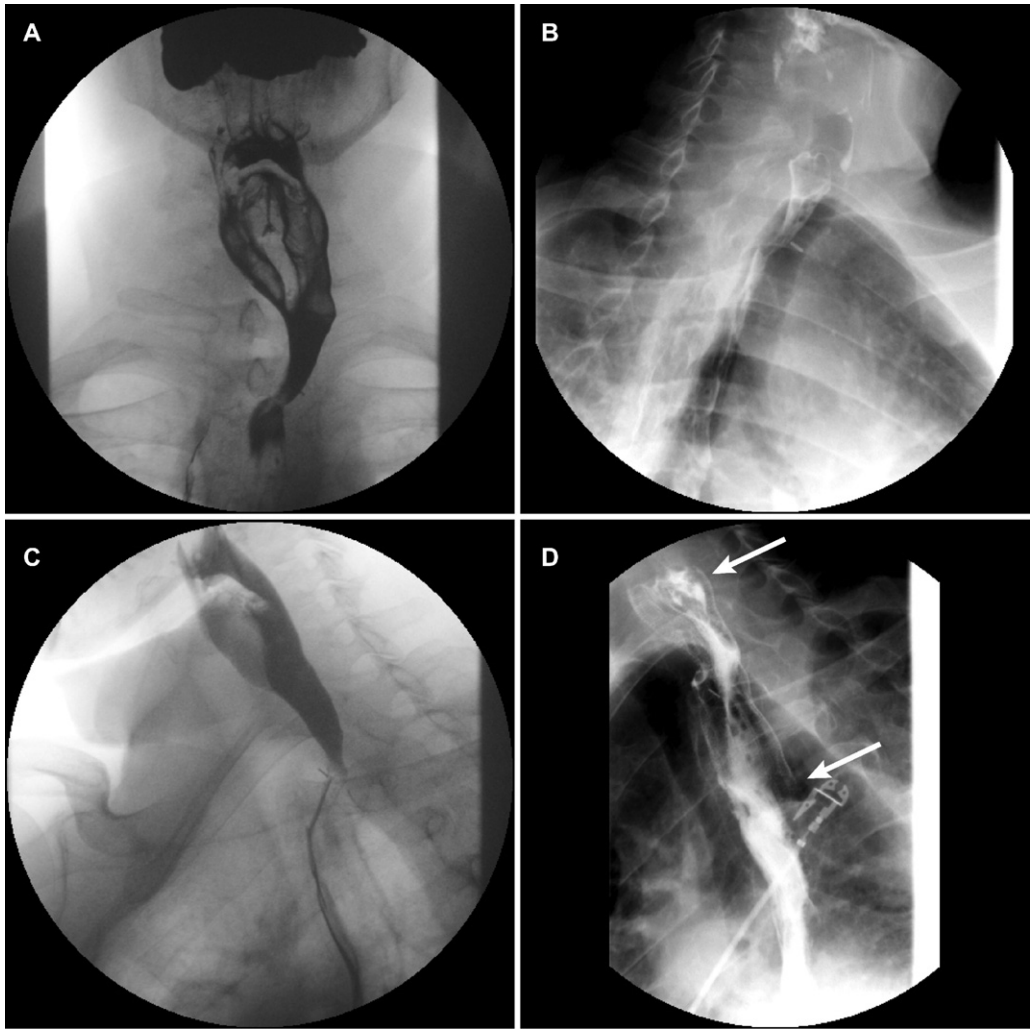

Figure 3 (A-C) Barium esophagogram views of a malignant cervical esophagogastric anastomotic stricture. (D) Placement of a self-expanding metallic stent (arrows) resulted in marked regurgitation and aspiration limiting the stent's efficacy to palliate patient dysphagia. Ultimately the stent was removed within 1 week of its initial placement at the patient's request.

in small series, but this procedure requires direct visualization of the anastomosis to administer a MMC-soaked pledget against exposed mucosa immediately following anastomotic dilation.[20] Despite reports to the contrary,[21] in the authors' experience, balloon dilation of cervical esophagogastric anastomotic strictures is ineffective in providing satisfactory long-term management of this problem. Alternative techniques including endoscopic electrocautery incision[22] have been reported.

It has been our experience that few patients with benign strictures at the cervical esophagogastric anastomosis have required operative revision. When this is necessary, a partial upper sternal split to facilitate exposure of the esophagus in the thoracic inlet is beneficial.[23] The risk of recurrent laryngeal nerve injury is high.

In selected patients found to have a malignant stricture of the cervical esophagogastric anastomosis, the local recurrence is almost invariably associated with transmural invasion that is surgically incurable. Chemotherapy and definitive radiation are generally indicated, since operative management requires transthoracic resection of the intrathoracic stomach and long-segment colon interposition, a formidable surgical endeavor. Schipper and coworkers reported their retrospective series of 27 patients undergoing reoperation for locally recurrent esophageal cancer, including only 5 patients who had previously undergone a cervical anastomosis. Among this group of selected patients, representing the largest reported series to date, 8/27 patients were found to be unresectable at exploration. In addition 4 of 19 patients who underwent resection were found to have microscopic residual disease (R1). Of these 12 patients incompletely or not resected, 10 were dead due to recurrent carcinoma at the time of follow-up.[24]

There are few other options available for palliation of dysphagia occurring in patients with a malignant stricture of the cervical esophagogastric anastomosis. Stent placement at this location has been felt to be relatively contraindicated,[25] particularly due to patient discomfort following placement of such devices which necessitates positioning the proximal

portion of the stent across the upper esophageal sphincter into the hypopharynx. If stent position is more distal, then there is a greater risk for stent migration. Although the use of self-expanding metallic stents has been reported in several small series[26,27] in the treatment of unresectable primary cervical esophageal cancer, there are scant data regarding the use of such devices in the setting of a cervical esophageal anastomotic stricture. It has been our experience that even if pharyngeal discomfort can be avoided, patients undergoing stent placement across a cervical esophagogastric anastomosis are at greater risk for severe symptomatic reflux and aspiration (Fig. 3).

Conclusions

While generally not life-threatening, cervical dysphagia due to anastomotic stricture impairs quality of life following restorative operations[28] for the treatment of a variety of malignant and benign esophageal disorders. The development of anastomotic techniques utilizing the linear stapler has reduced the incidence of postoperative stricture, particularly in the absence of an anastomotic leak. Regardless of operative technique, stricture following cervical esophagogastric anastomosis remains a problem that most often can and should be addressed by the operating surgeon. As with any operation, we advocate detailed preoperative discussion with the patient and family regarding not only immediate but also long-term complications of esophagectomy, such as anastomotic stricture. Prompt attention to symptoms of cervical dysphagia with appropriate evaluation and esophageal dilation, aggressively repeated as necessary, in our experience will provide the patient with a satisfactory result.

References

1. Orringer M, Lemmer J: Early dilation in the treatment of esophageal disruption. Ann Thorac Surg 42:536-539, 1986
2. Briel JW, Tamhankar AP, Hagen JA, et al: Prevalence and risk factors for ischemia, leak, and stricture of esophageal anastomosis: gastric pull-up versus colon interposition. J Am Coll Surg 198:536-541, 2004
3. Orringer MB, Marshall B, Iannettoni MD: Transhiatal esophagectomy: clinical experience and refinements. Ann Surg 230:392-400, 1999
4. Dewar L, Gelfand G, Finley RJ, et al: Factors affecting cervical anastomotic leak and stricture formation following esophagogastrectomy and gastric tube interposition. Am J Surg 163:484-489, 1992
5. Vigneswaran WT, Trastek VF, Pairolero PC, et al: Transhiatal esophagectomy for carcinoma of the esophagus. Ann Thorac Surg. 56:838-844, 1993
6. Gandhi SK, Naunheim KS: Complications of transhiatal esophagectomy. Chest Surg Clin N Am 7:601-610, 1997
7. Collard JM, Romagnoli R, Goncette L, et al: Terminalized semimechanical side-to-side suture technique for cervical esophagogastrostomy. Ann Thorac Surg 65:814-817, 1998
8. Santos RS, Raftopoulos Y, Singh D, et al: Utility of total mechanical stapled cervical esophagogastric anastomosis after esophagectomy: a comparison to conventional anastomotic techniques. Surgery 136:917-925, 2004
9. Behzadi A, Nichols FC III, Cassivi SD, et al: Esophagogastrectomy: the influence of stapled versus hand-sewn anastomosis on outcome. J Gastrointest Surg 9:1031-1040, 2005
10. Ercan S, Rice TW, Murthy SC, et al: Does esophagogastric anastomotic technique influence the outcome of patients with esophageal cancer? J Thorac Cardiovasc Surg 129:623-631, 2005
11. Orringer MB, Marshall B, Iannettoni MD: Eliminating the cervical esophagogastric anastomotic leak with a side-to-side stapled anastomosis. J Thorac Cardiovasc Surg 119:277-288, 2000
12. Rice TW: Anastomotic stricture complicating esophagectomy. Thorac Surg Clin 16:63-73, 2006
13. Orringer MB, Lemmer JH: 1986: early dilation in the treatment of esophageal disruption. Updated in 1993. Ann Thorac Surg 56:1432-1433, 1993
14. Iannettoni MD, Whyte RI, Orringer MB: Catastrophic complications of the cervical esophagogastric anastomosis. J Thorac Cardiovasc Surg 110:1493-1500, 1995
15. Law S, Fok M, Chu KM, et al: Comparison of hand-sewn and stapled esophagogastric anastomosis after esophageal resection for cancer: a prospective randomized controlled trial. Ann Surg 226:169-173, 1997
16. Holder TM, Ashcraft KW, Leape L: The treatment of patients with esophageal strictures by local steroid injections. J Pediatr Surg 4:646-653, 1969
17. Kirsch M, Blue M, Desai RK, et al: Intralesional steroid injections for peptic esophageal strictures. Gastrointest Endosc 37:180-182, 1991
18. Lee M, Kubik C, Polhamus C, et al: Preliminary experience with endoscopic intralesional steroid injection therapy for refractory upper gastrointestinal strictures. Gastrointest Endosc 41:598-601, 1995
19. Kochhar R, Makharia G: Usefulness of intralesional triamcinolone in treatment of benign esophageal strictures. Gastrointest Endosc 56:829-834, 2002
20. Annino DJ Jr, Goguen LA: Mitomycin c for the treatment of pharyngoesophageal stricture after total laryngopharyngectomy and microvascular free tissue reconstruction. Laryngoscope 113:1499-1502, 2003
21. Trentino P, Pompeo E, Nofroni I, et al: Predictive value of early postoperative esophagoscopy for occurrence of benign stenosis after cervical esophagogastrostomy. Endoscopy 29:840-844, 1997
22. Hordijk ML, Siersema PD, Tilanus HW, et al: Electrocautery therapy for refractory anastomotic strictures of the esophagus. Gastrointest Endosc 63:157-163, 2006
23. Orringer MB: Partial median sternotomy: anterior approach to the upper thoracic esophagus. J Thorac Cardiovasc Surg 87:124-129, 1984
24. Schipper PH, Cassivi SD, Deschamps C, et al: Locally recurrent esophageal carcinoma: when is re-resection indicated? Ann Thorac Surg 80: 1001-1006, 2005
25. Shim CS: Esophageal stenting in unusual situations. Endoscopy 35: S14-S18, 2003
26. Sarper A, Oz N, Cihangir C, et al: The efficacy of self-expanding metal stents for palliation of malignant esophageal strictures and fistulas. Eur J Cardiothorac Surg 23:794-798, 2003
27. Macdonald S, Edwards RD, Moss JG: Patient tolerance of cervical esophageal metallic stents. J Vasc Interv Radiol 11:891-898, 2000
28. McLarty AJ, Deschamps C, Trastek VF, et al: Esophageal resection for cancer of the esophagus: Long-term function and quality of life. Ann Thorac Surg 63:1568-1571, 1997