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Stricture Following Esophageal Reconstruction

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Owing to varying clinical definitions of anastomotic stricture following esophageal reconstruction, its reported incidence rate varies from 10% to 56%. Strictures adversely impact patients' quality of life. Risk factors, such as the anastomosis method, leakage, ischemia, neoadjuvant chemoradiotherapy, and underlying disease have been mentioned, but conflicting information has been reported. Balloon dilation is regarded as a safe and effective treatment method for patients with benign anastomotic strictures. Reoperations are seldom required. The etiology and management of anastomotic strictures are reviewed in this article.

Keywords: Esophageal stenosis, Esophagectomy, Anastomosis

Introduction

The reported incidence rate of anastomotic stricture following esophageal reconstruction varies from 10% to 56% [1]. This wide range is due to differences in the definition of anastomotic stricture across studies. Although anastomotic stricture seems to be a logical outcome to measure and is simple to conceptualize, it is difficult, if not impossible, to define unambiguously [2]. A stricture should be strongly suspected when a patient develops dysphagia following esophageal reconstruction. However, dysphagia can also develop in association with other factors, such as conduit dysfunction [3], laryngeal nerve palsy [4], and impaired swallowing movement of the oropharynx [5,6]. Fiberoptic endoscopy can elucidate the degree of stenosis and yield the objective, quantitative criteria. The inability to pass a flexible endoscope with a diameter of 5–12 mm is often used as the basis for defining stricture. However, notably, dysphagia is not always proportionate to the severity of the stricture. A stricture without dysphagia necessitates further discussion or intervention even if the anastomotic diameter is less than 5 mm. Because of the lack of consensus on the definition, care should be taken when interpreting the reported incidence and treatment outcomes of strictures in various scientific studies.

Etiology

Anastomosis with circular staplers

Early strictures following anastomosis are mostly related to scar contraction or a fistula, whereas strictures that develop more than 1 year postoperatively are often associated with recurrence. The diameter of the anastomosis site with staples is usually fixed and determined based on the size of the circular device, the method of anastomosis with linear staples, and the competence and degree of contraction.

Benign anastomotic strictures are most frequently detected 3 months after esophagectomy [7]. Johansson et al. [7] reported their experiences with anastomotic strictures following esophagogastrostomy or esophagojejunostomy. The anastomotic diameter was measured in 557 endoscopic procedures. Additional endoscopic procedures because of dilatations were separately recorded, and the diameter measured before the dilatation was reported at every noted occasion. In the control group, between 3 and 12 months,

422 endoscopic procedures were performed. The anastomotic diameter increased significantly during the first postoperative year in the esophagectomy group. Anastomoses performed with a 25-mm cartridge were tighter than those performed with a 28-mm cartridge, followed by stapled side-to-side anastomoses [7]. Petrin et al. [8] reported that the incidence of stricture was inversely proportional to the diameter of the stapler. The incidence of stenosis was 62.5% with 21-mm staplers, 16.7% with 25-mm staplers, and 5.1% with 28-mm staplers. No cases of stenosis were reported with larger-diameter staplers (≥29 mm). Nevertheless, occasionally, surgeons have to choose smaller staplers if the anastomosis needs to be made in a narrow space, such as the cervical or surrounding thoracic inlet area, particularly in patients with a small frame.

Anastomosis with the hand-sewn technique

Several randomized studies have compared the use of circular staplers with the hand-sewn technique in terms of the risk of anastomotic stricture [9-13]. Law et al. [9] reported the results of a randomized controlled study conducted in Hong Kong and concluded that the stapled technique led to a higher rate of stricture formation (40%) than the hand-sewn technique (9.1%). However, the stricture rate in the stapled group was relatively high. Hsu et al. [10], from Taiwan, reported the results of another randomized controlled study that used identical criteria to define benign strictures. They reported comparable stricture rates in the stapled (18%) and hand-sewn groups (14%), but they used only 21-mm circular staplers. Two small randomized studies reported stricture rates of 15% and 26%, respectively, in the stapled groups without statistically significant differences [11,12]. In a French multi-institutional trial, Valverde et al. [13] reported equal stricture rates in the stapled and hand-sewn groups (both 13%). Urschel et al. [14] performed a meta-analysis of 5 randomized controlled trials and reported a relative risk of 0.99 for anastomotic stricture in hand-sewn versus stapled anastomoses]. Circular staplers provide a fixed internal diameter, but some degree of contracture is inevitable. An internal diameter exceeding 21 mm seems sufficient for swallowing but is hard to maintain. Technical advancements resulting in less scar contracture or expansion of suture lines over time are required.

Anastomosis with linear cutting staplers

Collard et al. [15] suggested an anastomosis technique with a linear cutting stapler to ensure a greater cross-sectional area of the cervical anastomosis. The terminalized semi-mechanical side-to-side suture technique provided a significantly larger cross-sectional area (225±15.7 mm^2) than the manual technique (136±15 mm^2). Several modifications of this technique have been developed and are associated with a lower risk of anastomotic dilation [1,16-18]. Blackmon et al. [19] compared the outcomes of using circular-stapled or hand-sewn techniques with those of using the side-to-side stapled technique for intrathoracic anastomoses. The rate of strictures requiring esophageal dilation was higher with the hand-sewn technique (34.8%) than with the side-to-side stapled technique (8.7%) and circular-stapled technique (8.7%) (p=0.04) [19]. However, because these techniques require a longer esophageal stump than end-to-end anastomosis techniques, a sufficient proximal resection margin of the tumor is required [15].

Other factors

Anastomotic stricture, ischemia, and leak are inter-related. Briel et al. [20] reported 393 consecutive esophagectomy patients; ischemia and leak alone led to a stricture in 48% (10 of 21) and 46% (13 of 28) of patients, respectively. The combination of ischemia and leak led to a stricture in 50% (5 of 10) of patients. Recovery from ischemia or healing of the leak without stricture development occurred in 52% (11 of 21) of patients with ischemia alone and 54% (15 of 28) of patients with a leak alone. Of the 80 patients who developed a stricture, 52 (65%) showed no evidence of conduit ischemia or anastomotic leak.

Other risk factors, such as cardiovascular disease, liver disease, neoadjuvant chemoradiotherapy, blood loss, and reflux esophagitis, were mentioned, but with conflicting details.

Management

Anastomotic strictures that develop early after surgery are usually benign. However, because late strictures are often associated with malignancy, every effort (including endoscopy and positron emission tomography/computed tomography) should be made to rule out tumor recurrence. Benign anastomotic strictures are most frequently found after 3 months but show dilation in the first year [7]. Symptoms, including dysphagia, can also improve over time. De Leyn et al. [21] reported that 27% of patients had dysphagia, while 15% had heartburn and/or regurgitation 3 months postoperatively. After 1 year, heartburn and/or regurgitation were commonly reported (up to 21%), while dysphagia was noted less frequently (15%). Early strictures

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requiring 1 or more dilatations were seen in 18.7% of patients. Five patients developed a late anastomotic stricture; in 4 patients, the strictures were located at the level of the intrathoracic anastomosis and associated with severe esophagitis. Hence, careful evaluation of patients based on symptoms, endoscopy, and esophagography is required to rule out functional dysphagia.

Prophylactic use of proton pump inhibitors

The use of proton pump inhibitors (PPIs) can reduce the prevalence of benign anastomotic strictures. Johansson et al. [22] reported the results of a randomized trial on the prophylactic use of PPIs after uncomplicated esophagectomies with gastric tube reconstruction and circular-stapled anastomoses. For 1 year, 79 patients were randomized to receive twice-daily PPIs or no treatment. Benign anastomotic strictures developed in 5 of 39 patients (13%) in the PPI group and in 18 of 40 patients (45%) in the control group (risk ratio, 5.6; 95% confidence interval, 2.0–15.9; p= 0.001).

Dilation of strictures

There are several techniques for esophageal dilation. Bougienage is a traditional and effective method that has been used for centuries. Because the procedure is simple, patients can take treatment into their own hands once they become used to it. Balloon dilation is regarded as a safe and effective treatment method for patients with benign anastomotic strictures [23], although a proportion of patients with benign anastomotic strictures who experience recurrent strictures require multiple therapeutic sessions [24]. The overall clinical success rate with balloon dilation in the literature ranges from 83% to 100% [25-28]. My institutional experiences showed similar success rates to those of other reports [29]. Overall clinical success was achieved in 153 of 155 patients (99%) after a single balloon dilation (n=78) or multiple balloon dilations (n=75). The primary patency rates after 1 month, 3 months, 6 months, 1 year, 2 years, 3 years, and 5 years were 88%, 67%, 59%, 52%, 49%, 45%, and 43%, respectively. The corresponding secondary patency rates were 98%, 92%, 86%, 82%, 79%, 75%, and 74%, respectively. No treatment-related deaths occurred in this series. Esophageal ruptures, including 32 type 1 and 2 type 2 ruptures, occurred in 22 of 155 patients (14%) and in 34 of 309 balloon dilations (11%).

Development of better and safer dilatation techniques, combined stricturotomy [30,31], and/or stenting [32] resulted in a major decrease in morbidity caused by these strictures. Metal stenting was reported to offer greater improvement in quality of life from baseline at 12 months compared to repeated balloon dilation for patients with refractory anastomotic esophageal strictures. However, there were no statistically significant between-group differences in the success rate, time to recurrent dysphagia, or frequency of re-interventions per month according to the number of balloon dilations during 12 months after initial treatment [33]. Esophagocolostomy or a jejunal bypass graft can be considered for surgical correction. However, with developments of interventional methods, reoperation is rarely required.

Conclusion

The incidence of stricture following esophageal reconstruction varies because of lack of consensus for definition. Anastomotic strictures that develop early after surgery are usually benign. However, because late strictures are often associated with malignancy, every effort should be made to rule out tumor recurrence. The use of PPIs can reduce the prevalence of benign anastomotic strictures. Interventional procedures under a endoscope are effective for the treatment of anastomotic strictures.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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