Influence of the Stapler Size Used in Esophagojejunostomy Anastomosis: Anastomotic Leak and Strictures After Total Gastrectomy

Özofagojejunostomi Anastomozunda Kullanılan Stapler Boyunun Etkisi: Total Gastrektomiden Sonra Anastomoz Kaçağı ve Darlıklar

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ABSTRACT Objective: This study evaluates whether the stapler size used in esophagojejunostomy affects development of anastomotic leak or stricture. **Material and Methods:** Data of patients who underwent esophagojejunostomy with a stapler between August 2009 and January 2011 were obtained. Patients who underwent a stapled esophagojejunostomy anastomosis were divided into two groups. In Group A (n=30), a 28-mm-diameter stapling device was used whereas group B (n=30) a 25-mm-diameter stapler was used in esophagojejunostomy anastomosis. The differences between groups A and B were analyzed. **Results:** No statically significant differences were found in terms of age, gender, body mass index or albumin levels between the groups. One anastomotic leak and one stricture was detected in each group. There was no significant difference in the rate of leakage or stricture between groups A and B. **Conclusion:** There was no significant relationship between the size of the stapler used in esophagojejunostomy and anastomotic leak or the development of stricture.

Key Words: Surgical staplers; anastomosis, surgical; esophageal stenosis

ÖZET Amaç: Bu çalışma özofagojejunostomi ameliyatlarında kullanılan staplerin boyunun anastomoz kaçağı veya darlık gelişimini etkileyip etkilemediğini değerlendirmektedir. **Gereç ve Yöntemler:** Ağustos 2009-Ocak 2011 arasında stapler ile özofagojejunostomi yapılan hastaların verileri toplandı. Staplerle özofagojejunostomi yapılan hastalar iki gruba ayrıldı. Grup A (n=30)'da özofagojejunostomi anastomozu için 28 mm çapında stapler cihazı kullanılan hastalar, Grup B (n=30)'de 25 mm çaplı stapler kullanılan hastalar yer almaktaydı.Grup A ve B arasındaki farklar karşılaştırıldı. **Bulgular:** Grup A ve B arasında yaş, cinsiyet, beden kitle indeksi veya albumin düzeyi bakımından istatistiksel olarak fark yoktu. Her grupta bir anastomoz kaçağı ve bir darlık saptandı. Grup A ve B arasında kaçağın veya darlığın oranı açısından önemli fark yoktu. **Sonuç:** Özofagojejunostomide kullanılan stapler boyu ile anastomoz kaçağı veya darlık gelişimi arasında önemli ilişki yoktu.

Anahtar Kelimeler: Cerrahi zımba; anastomoz, cerrahi; özofagus darlığı

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Total gastrectomy and esophagojejunostomy have become increasingly common operations for patients with gastric carcinomas or other benign or malignant conditions involving the stomach.[1-3] In recent years, automatic suturing devices have been developed and are increasingly used for anastomoses of the gastrointestinal tract. Specifically, circular staplers have been used since the 1980s which offer several advantages in terms of safety and feasibility over conventional techniques for esophagojejunostomy after total gastrectomy.[4-6] Worldwide, stapler devices have been used

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extensively, and stapled esophagojejunostomy has been recognized as the 'gold standard,' with a leakage rate of 1%.[7]

Studies have defined several factors associated with anastomotic leak and strictures after alimentary tract procedures, but the size of the stapler as a risk factor for anastomotic leakage and strictures after esophagojejunostomy anastomosis have not been investigated in detail. The association between the size of the stapling device used and the subsequent development of a stricture at the esophagojejunostomy anastomosis is controversial. Thus, we investigated the effect of stapler size on anastomotic leak and the development of subsequent anastomotic stricture in an esophagojejunostomy anastomosis.

MATERIAL AND METHODS

Data of the patients who underwent stapled esophagojejunostomy anastomosis in our institution between August 2009 and January 2011 were obtained. The surgeons used an identical technique for esophagojejunostomy anastomosis establishment and anastomosis involving an "end-to-side esophagojejunostomy and side-to-end, Roux-en-Y reconstruction." The data evaluated included patient demographics, the size of the stapler used for the esophagojejunostomy anastomosis, factors that might affect anastomotic healing, such as body mass index (BMI) and albumin level, and the development of an anastomotic leak or stricture. Patients undergoing a stapled esophagojejunostomy anastomosis were divided into two groups. In Group A, a 28-mm-diameter stapling device was used whereas group B a 25-mm-diameter stapler was used for esophagojejunostomy anastomosis. The diagnosis of anastomotic leak was based first on detecting methylene blue in the drain previously inserted near the anastomosis site, and then confirming contrast leak on imaging studies, employing gastrografin and computed tomography. Clinically significant anastomotic strictures were defined as those in patients who developed symptoms of outlet obstruction requiring dilatation. Comparisons between groups for age, BMI and albumin level were calculated by using Student's t test. Mean ± standard deviation (SD) was given for these variables. Comparisons of gender distribution between groups were calculated by using Chi-square test. Comparisons of leakage and stricture distributions between the groups were performed by using Fisher's Exact test. Frequencies and percentages were given for categorical variables.

RESULTS

The results of the study are summarized in Table 1. Data pertaining to the size of the stapler used to perform the anastomosis at the esophagojejunostomy anastomosis were available for 60 patients. The stapler diameter was 28 mm (Group A, n=30) or 25 mm (Group B, n=30). One patient was diagnosed with multicentric gastric carcinoid, while the others had gastric adenocarcinomas. The patients in groups A and B were comparable in terms of age, gender, BMI and albumin level. There was no statically significant difference for age, gender and albumin level between the groups. Despite the use of stapler with larger diameter in patients with higher BMI, this difference was not statistically significant between the two groups.

TABLE 1: Comparison of the patients' characteristics and occurrence of anastomotic leakage and stricture in two groups.

Variable	Group A (n= 30)	Group B (n= 30)	P value
Age (y)	55.93±9.5	58.43±10.10	0.328[a]
Gender (male/female)	19/11(48.7%/52.4%)	20/10(51.3%/47.6%)	0.787[b]
BMI (kg/m^2; mean)	26.15(18.00-33.20)	25.25(18.40-38.00)	0.728[d]
Albumin level (g/dL)	3.44±0.60	3.45±0.61	0.983[a]
Anastomotic leak (-/+)	29/1	29/1	1.00[c]
Anastomotic stricture (-/+)	29/1	29/1	1.00[c]

BMI, body mass index; Group A, stapler diameter 28 mm; Group B, stapler diameter 25 mm a: Student's t-test, b: Chi-Square test, c: Fisher's Exact test, d: Mann Whitney U test.

One anastomotic leakage was detected in each group; both patients were managed conservatively. An anastomotic leakage did not predispose to the development of a stricture.

In group A, one patient developed a clinically significant anastomotic stricture three months postoperatively. In group B, one patient developed a clinically significant anastomic stricture 5 months postoperatively. Both patients were treated with balloon dilatation.

BMI, body mass index; Group A, stapler diameter 28 mm; Group B, stapler diameter 25 mm; a: Student's t-test, b: Chi-Square test, c: Fisher's Exact test, d: Mann Whitney U test.

DISCUSSION

Esophagojejunostomy remains critical for the success or failure of reconstruction after total gastrectomy, because impairment of this anastomosis can lead to severe postoperative complications such as peritonitis, sepsis, subphrenic abscess and other life-threatening conditions, prolonging the hospital stay.[8] Esophagojejunostomy is an important determinant of the success or failure of total gastrectomy. The development of automatic circular staplers has allowed reconstruction to be accomplished more easily and safely than previously; however, complete prevention of anastomosis dehiscence remains challenging.

The leakage rate of esophagojejunostomy has ranged between 3 and 10% since the introduction of new devices for anastomosis.[4-6] Even recent studies have not reported a leakage rate of less than 1% for esophagojejunostomy.[9,10] The lowest reported leakage rates were 1% among 588 patients treated at the National Cancer Institute in Japan[7] and 1.35% among 148 patients in Europe.[11] Our leakage rate was 3.3% among 60 patients; two patients had an anastomotic leakage with minor dehiscence, and were treated with conservative therapy. The leakage rates were similar in whom small or large staplers were used for stapled esophagojejunostomy showing that the size of the stapler was not a predictor of an anastomotic leak. An anastomotic leak did not predispose to the development of a stricture in our study. The absence of correlation between anastomotic leak and anastomotic strictures may be explained by the fact that none of the patients suffered from a complete anastomotic breakdown, and none had to undergo takedown of the reconstruction and deviation of the esophagus. Given the inherent properties of the esophagus that supposedly increase the risk of leakage, surgical technique likely plays a major role, rather than stapler size. When a circular stapler is used at esophagojejunostomy, several precautions are necessary. The entire layer of the esophagus must be secured around the anvil head of the circular stapler. The esophagus should be dissected 2-3 cm proximal to the resection line, and a thread of purse-string sutures should be tied tightly around the esophagus, leaving no lax area.

The stapling technique itself has been associated with a higher likelihood of benign anastomotic stricture formation at the esophagogastric anastomosis after esophageal resection for cancer when compared with the hand-sewn technique.[12] Stapler size has also been associated with the occurrence of strictures after esophagogastric anastomosis.[13] Berrisford noted that although different stapler designs had no effect on the stricture rate after an esophagogastric anastomosis, staplers with a smaller diameter were associated with strictures significantly more compared to the larger ones.[14] Johansson et al. reported that there was a correlation between the size of the staple cartridge and the anastomotic diameter in esophagojejunostomies, and side-to-side procedure resulted in a long and wide anastomosis without strictures.[15] We applied an end-to-side esophagojejunostomy procedure to all our patients because we do not have enough experience for side-to-side procedure in our clinic. In group A, one patient developed a clinically significant anastomotic stricture three months postoperatively. In group B, one patient developed a v significant anastomotic stricture five months postoperatively. Both patients were treated with balloon dilatation. In our patients, development of stricture rates were similar in patients undergoing stapled esophagojejunostomy using the smaller or larger staplers, showing that the size of the stapler used was not related to the occurrence of clinically significant anastomotic strictures. Anastomotic

strictures were most frequently seen three months after surgery and were probably due to the normal wound retraction that always occur in the healing tissue. The need for dilatations decreased markedly further on during the first postoperative year and this probably reflects the maturing period in the healing process.[15] Because decreased vascular supply is a risk factor for the development of anastomotic strictures, the blood flow to the anastomosis must be maintained and the degree of tension between the esophagus and jejunum must be normal.

In conclusion, stapler size used at esophagojejunostomy anastomosis is not associated with the development of clinically significant anastomotic strictures or anastomotic leak.

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