Evaluating Esophagojejunostomy Anastomosis with Methylene Blue

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ABSTRACT

Introduction: This study sought to determine the utility of the methylene blue test for evaluating esophagojejunostomy anastomosis.

Materials and Methods: The study analyzed 65 patients with gastric cancer who underwent total gastrectomy and esophagojejunostomy anastomosis. The patients were divided into two groups. In Group A (n=30), methylene blue was used to evaluate the esophagojejunostomy anastomoses, while in Group B (n=35), radiological evaluation procedure was used. The presence or absence of anastomotic leakage in the two groups was determined.

Results: The overall incidence of anastomotic leakage in the patients was 1.3% (2 of 65 patients). In Group A, leaks were seen in 1 (3.3%) of 30 patients, while in Group B, leaks were seen in 1 (2.8%) of 35. The methylene blue showed leakage in one case.

Conclusion: Using methylene blue to evaluate esophagojejunostomy anastomosis appears to be a reasonable practice. This procedure is a suitable diagnostic test with a low complication rate that can be performed before reintroducing an oral intake.

Key words: Esophagojejunostomy anastomosis, Methylene blue

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ÖZET

Özefagojejunostomi Anastomozunun Metilen Mavisi ile Değerendirilmesi

Giriş: Özefagojejunostomi anastomozunu değerlendirdiğimiz “metilen mavisi” kullanımının etkinliğini belirlemek amacıyla amaçlanmıştır.


Bulgular: Anastomoz kaçağı oranı %1.3 olarak bulundu (65 hastanın 2’sinde). Anastomoz kaçağı Grub A da 30 hastadan 1 (%3.3)’inde tespit edilirken, Grub B de 35 hastadan 1 (%2.8)’inde tespit edildi. Metilen mavisi bir olguna anastomoz kaçağını belirledi.
INTRODUCTION

Total gastrectomy and esophageal surgery have become increasingly common operations for patients with gastric carcinomas or other benign or malignant conditions of the stomach[1-3]. With advances in surgical techniques, surgical mortality rates of less than 10% have been reported, and in recent years, automatic suturing devices are used increasingly for anastomoses of the gastrointestinal tract[2-4]. Circular staplers have been used since the 1980s, offering several advantages in terms of safety and feasibility over conventional techniques for esophageal surgery after total gastrectomy[5-7]. Stapling devices are used widely worldwide, and stapled esophageal surgery is recognized as the "gold standard", with a leakage rate of 1%[8]. With the introduction of mechanical staplers, the main technical problems with surgery were eliminated almost completely, and today, the main issues are the early detection of postoperative complications and provision of the best possible treatment[9,10].

The main procedure used to diagnose anastomotic leakage used to be a radiological evaluation using a water-soluble contrast swallow[11,12]. Currently, two other reliable diagnostic tests are available: endoscopy and computed tomography (CT)[13,14]. A significant reduction in the morbidity and mortality of anastomotic leaks necessitates not only exact knowledge of the predisposing factors, but early detection and suitable therapeutic strategies[15-18]. Consequently, many surgical departments perform routine radiological evaluations of anastomoses.

This retrospective study examined whether the use of methylene blue to evaluate esophageal surgery anastomoses is a suitable diagnostic test with a low complication rate.

MATERIALS and METHODS

This study reviewed the data of 65 patients with gastric cancer who underwent total gastrectomy and esophageal surgery in 2010 and 2011. The data included patient demographics and factors that might affect anastomotic healing, such as body mass index (BMI) and albumin level. One surgical team performed the procedures on the study patients using a uniform esophageal surgery technique involving an end-to-side esophageal surgery and side-to-side Roux-en-Y reconstruction. All esophageal surgery anastomoses were made using a circular stapling device. During the operation, an intra-abdominal drain was placed near the anastomosis site. The patients undergoing esophageal surgery anastomosis were divided into two groups. In Group A (n= 30), the anastomoses were evaluated using methylene blue, while in Group B (n= 35), radiological evaluation using a water-soluble contrast swallow was made. In Group A, the patients were asked to drink a glass of water containing four to five drops of methylene blue on postoperative day 4. The diagnosis of anastomotic leakage in Group A was based on finding methylene blue in the drain previously inserted at the anastomosis site and then confirming contrast leakage using imaging studies, including Gastrografin and CT. In Group B, radiological examination of the anastomoses using a water-soluble contrast swallow was performed on postoperative day 4. All medical records of the two groups were reviewed retrospectively, and the presence or absence of anastomotic leakage was determined. Statistical analysis consisted of the chi-squared test and Student’s t-test.

RESULTS

The results of the study are summarized in Table 1. Data pertaining to the esophageal surgery anastomosis were available for 65 patients [38 males (54%), 27 females (46%)] with a mean age of 62.7 years (range, 33-78 years). No statistically significant difference was found in terms of age, gender, BMI, or albumin level between the groups. One anastomotic leak was detected in each group; both patients were managed conservatively. The diagnosis of anastomotic leakage in Group A was based on the procedure described in the Materials and Methods section. The diagnosis of anastomotic leakage in Group B was based on initial clinical suspicion on postoperative day 4, and then contrast leakage was confirmed using Gastrografin and CT. After conservative treatment of
the patient with anastomotic leakage in Group A, methylene blue was used for re-evaluation of the anastomosis before re-feeding the patient, and the anastomotic healing was confirmed with water-soluble contrast swallow. No test-related complications were seen in either group.

**DISCUSSION**

Esophagojejunostomy remains critical to the success or failure of reconstruction after total gastrectomy because problems with this anastomosis can lead to severe postoperative complications such as peritonitis, sepsis, subphrenic abscess, and other life-threatening conditions, thus prolonging the hospital stay\[^{19}\]. The leakage rate of esophagojejunostomy has steadily decreased since the introduction of new devices for making the anastomosis\[^{5-7}\]. Even recent studies have not reported a leakage rate of less than 1% for esophagojejunostomy\[^{18,20}\]. The introduction of mechanical staplers, however, essentially eliminated the main technical problems with esophagojejunostomy and now the main issues are the early detection of postoperative complications and their best possible treatment\[^{9,10}\].

The main procedure in the diagnosis of anastomotic leakage was formerly the radiological evaluation of anastomoses with a water-soluble contrast swallow. A recent systematic review of gastrointestinal anastomotic leaks confirmed that routine contrast radiology is still performed in most centers before reintroducing oral intake. It also revealed a lack of consensus on the type of contrast used or the timing of the examination, which ranged from 3 to 14 days postoperatively\[^{21}\]. In some studies, the radiological evaluation of anastomoses needed to be reviewed critically because of the low sensitivity and potential test-related complications that may have lethal outcomes\[^{11,12,22}\].

It should be noted that these radiological evaluations should be performed under standardized circumstances, and the results should be interpreted by an experienced radiologist with good knowledge of the operation and reconstruction techniques involved. Due to postoperative changes, such as swelling of the anastomoses or impaired gastrointestinal passage, false-negative results can occur\[^{12}\].

At our institute, the radiological evaluation of anastomoses with a contrast swallow procedure is not performed routinely. Some surgeons at our institute use the methylene blue procedure to diagnose anastomotic leakage before reintroducing an oral intake. The anastomosis evaluation with methylene blue is a simple method, which can be performed with the patient in bed and requires no interpretation by an experienced radiologist. Many surgeons are unwilling to introduce oral feeding without being sure of the safety of the anastomosis. Evaluating an anastomosis using this method can help the doctor to decide when to start oral feeding. It requires placing a drain at the anastomosis site at surgery, and the drain needs to be patent. Although placement of a drain at the anastomosis site is not a usual practice in many institutes, we routinely place a drain near the anastomosis and test the patency of the drains before the test. In our study, false-negative results were not considered, but they can result from a clogged drain or a drain that is not located at the anastomosis site. Because our study is retrospective and could have been considered a preliminary study to evaluate this procedure, it has some restrictions. Evaluating the sensitivity and specificity of this procedure will require further research studies.

In conclusion, the use of methylene blue to evaluate an esophagojejunostomy anastomosis before

| Table 1. Comparison of the patient characteristics and occurrence of anastomotic leakage in the two groups |
|---|---|---|
| **Variable** | **Group A (n= 30)** | **Group B (n= 35)** | **p** |
| Age (y) | 57.53 ± 8.45 | 58.25 ± 9.95 | 0.755 |
| Gender (male/female) | 19/11 (63.3%/36.7%) | 24/11 (68.6%/31.4%) | 0.656 |
| BMI (kg/m²; mean) | 25.25 (18.40-38) | 26.5 (18-36) | 0.953 |
| Albumin level (g/dL) | 3.44 ± 0.60 | 3.44 ± 0.58 | 0.995 |
| Anastomotic leak (-/+) | 29/1 | 34/1 | 1.00 |
reintroducing oral intake is a helpful option for the surgeon. It is a simple and noninvasive procedure to evaluate leakage of the anastomosis.

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Author Contributions

Bayar S, Demirci S and Cakabay B. performed the surgical procedures; Cakabay B. performed the statistical analysis; Cakabay B, Aksel B, Unal E, Kocaoglu H, and Agkul H. designed the study, prepared the manuscript and undertook a comprehensive literature search.

Competing Interests

We declare that none of the authors listed in this manuscript has any financial or other conflict of interest to disclose.

REFERENCES


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