



Original article

Endoscopic evaluation of the remnant stomach after gastrectomy: proposal for a new classification

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Abstract

Background. In Japan, approximately half of gastric cancers are diagnosed in the early stage. Longer survival has been provided for patients with early gastric cancer (EGC). Several new surgical procedures have been employed for some EGCs. To compare the functional results of these techniques with those of classic distal gastrectomy, it is important to evaluate the remnant stomach in relation to quality of life (QOL) and secondary cancers. We propose a new endoscopic classification, regarding several aspects of the remnant stomach, which enables common understanding and description of the condition.

Methods. Of 651 patients who underwent a distal gastrectomy or pylorus-preserving gastrectomy (PPG), 324 had at least one upper gastrointestinal (GI) endoscopy during the follow-up period. Ninety-three of the 324 patients underwent a Roux-en-Y reconstruction (RY); 175, Billroth type 1 (B1); and 56, PPG. Endoscopic findings regarding residual food, gastritis, and bile reflux in the gastric stump were investigated for these patients. We classified the amount of residual food into five grades, the degree and the extent of gastritis into five grades, and bile reflux into two grades. First, we evaluated the consistency of diagnosis between two endoscopists, in the first 200 patients, and then we applied the classification to all 324 patients to examine the usefulness of this classification.

Results. Consistency of diagnosis was obtained between two endoscopists who classified the patients independently. The agreement rate was 98.5% for residual food, 93% for gastritis, and 100% for bile reflux. Residual food was observed in 14.0% of the RY group, 22.3% of the B1 group, and 37.5% of the PPG group. These differences were significant (RY versus B1; $P < 0.05$ and RY versus PPG; $P < 0.01$). The remnant stomach after B1 showed significantly more severe and extensive gastritis than that after RY and PPG ($P < 0.01$). As for bile reflux, there was no significant difference among the three groups.

Conclusion. The classification (RGB classification: Residue, Gastritis, Bile) can be used easily and is practical. The results suggest some important differences among methods of reconstruction. This classification seems to be useful to describe these findings and to further evaluate these reconstructive methods.

Key words Gastrectomy · Remnant stomach · Endoscopic classification · Esophagitis · Residual food · Postgastrectomy gastritis · Bile reflux

Introduction

Because of advances in the diagnosis of gastric cancer, the primary lesion is found in earlier stages more frequently than in the past. Maehara et al. [1] reported that the proportion of patients with early gastric cancer had increased from 18% to 57% in Japan during the past two decades. Approximately 75% of patients with gastric cancer are cured. Until recently, a distal or total gastrectomy with D2 lymph node dissection has been used for early gastric cancer (EGC) in Japan. Recently, varieties of surgical treatments, such as pylorus-preserving gastrectomy (PPG), segmental gastrectomy, or wedge resection (for sentinel node-negative patients) have been used for EGCs. To compare the functional results of these techniques with those of classic distal gastrectomy reconstructed by gastroduodenotomy or gastrojejunostomy, it has become important to evaluate the remnant stomach in relation to quality of life (QOL) and secondary cancer. Concerning reflux esophagitis after gastrectomy, the Los Angeles Classification [2] has been used, but there is no standard to describe the endoscopic findings of the gastric remnant. We propose a new endoscopic classification, assessing several aspects of the remnant stomach, which enables common understanding and description of the problems.

Patients and methods

Six hundred and fifty-one patients underwent a distal gastrectomy or PPG at National Cancer Center Hospital, Tokyo between 1993 and 1997. Three hundred and twenty-four of them, who underwent at least one endoscopic session after a distal gastrectomy, were the study group for this report. Ninety-three of the 324 patients underwent a Roux-en-Y reconstruction (RY); 175,

Billroth type 1 (B1); and 56, PPG. At least 40 pictures were taken to record each endoscopic session. Endoscopic findings regarding residual food, gastritis, and bile reflux in the gastric stump were investigated. The first 200 patients were evaluated by two endoscopists independently, reviewing these filmed records to determine the consistency of diagnosis and reproducibility. Then this classification was applied to the entire group of 324 patients.

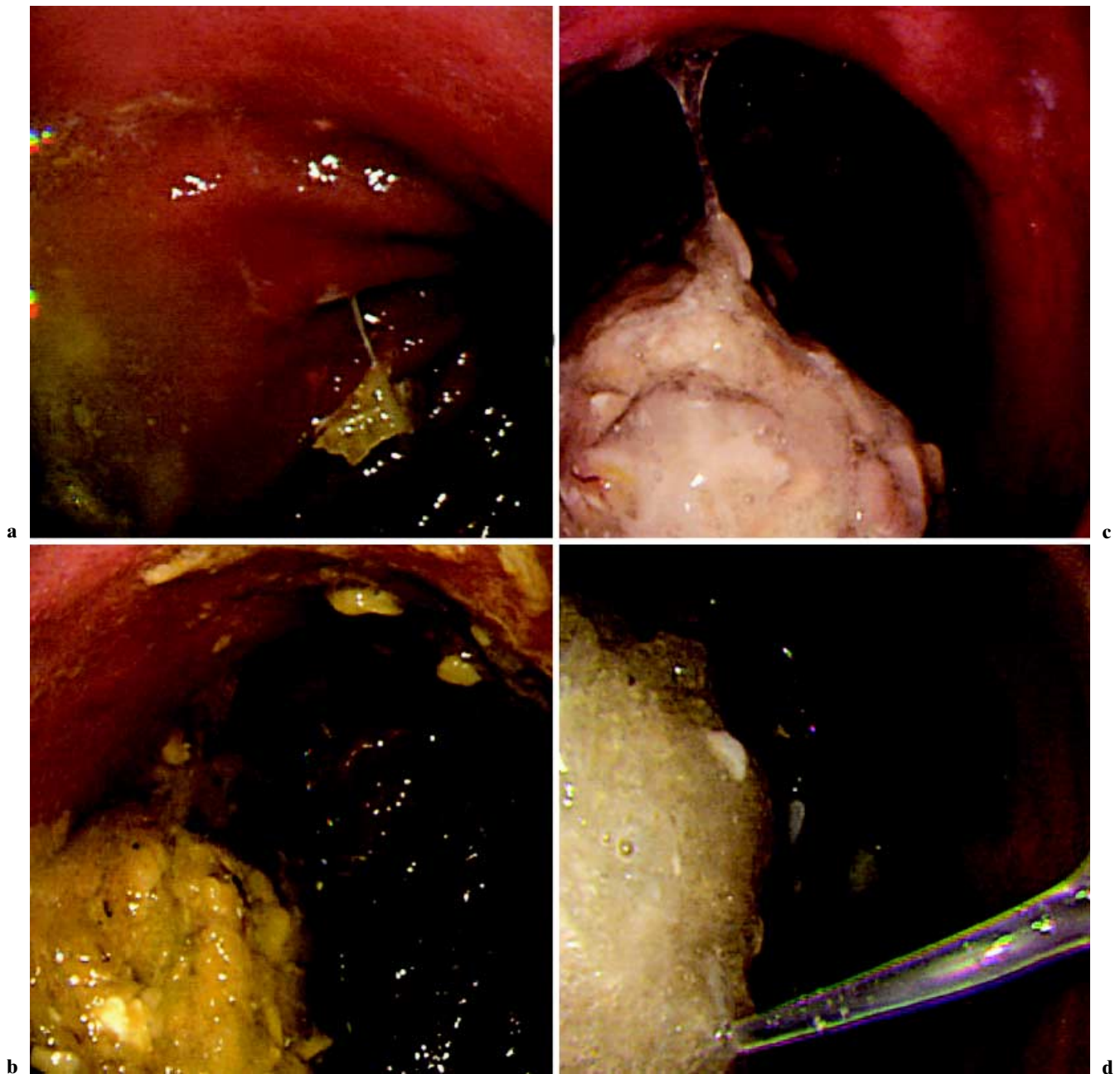


Fig. 1a–b. Residual food. Grade 0, no residual food; grade 1, a small amount of residual food (**a**); grade 2, a moderate amount of residual food, but possible to observe entire surface of the remnant stomach with body rolling (**b**); grade 3, a moderate amount of residual food, which hinders observation of the entire surface even with body rolling (**c**); and grade 4, a great amount of residual food, for which endoscopic observation is impossible (**d**)

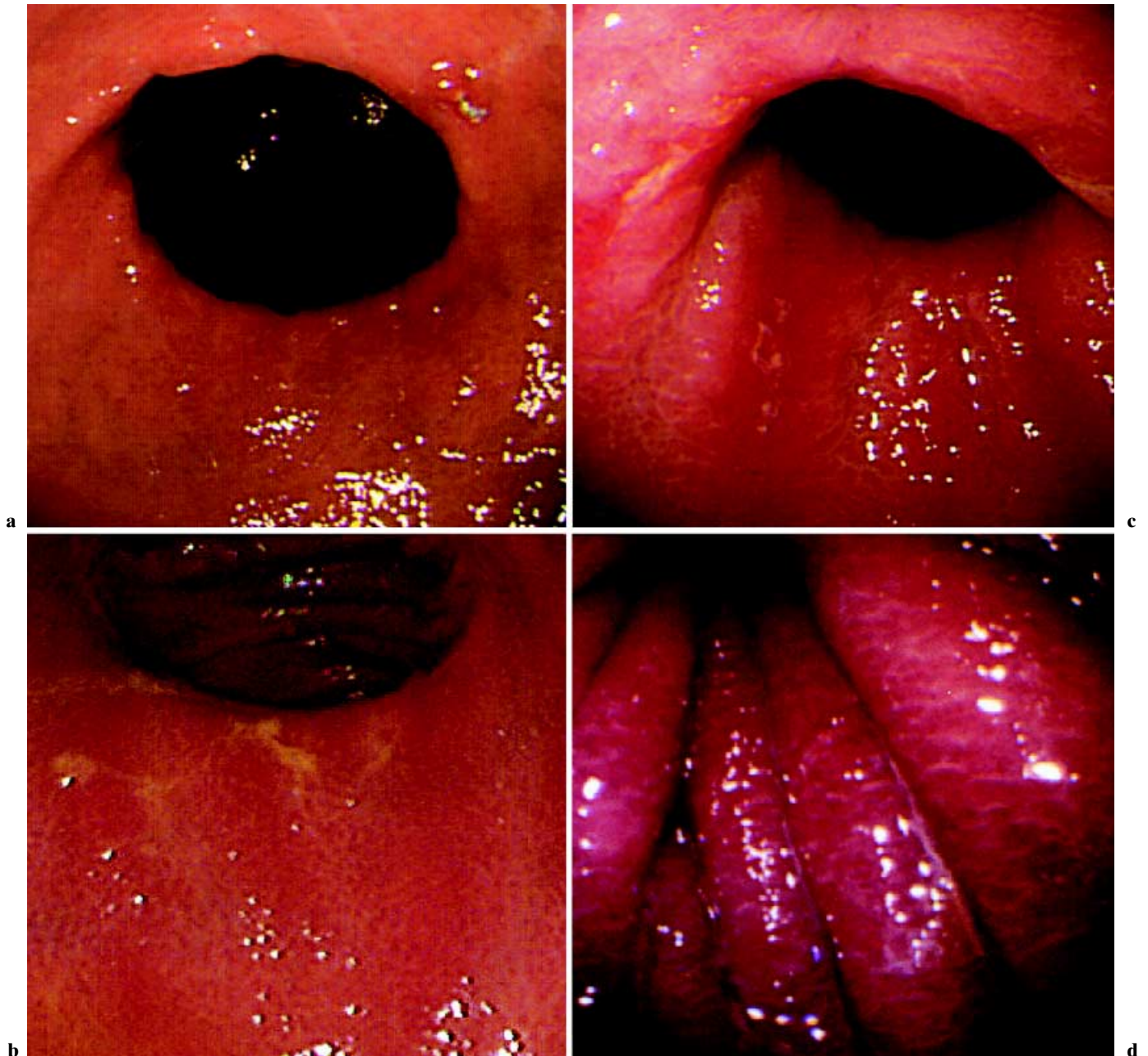


Fig. 2a–d. Gastritis (degree). Grade 0, normal mucosa (**a**); grade 1, mild redness (**b**); grade 2; intermediate grade between grade 1 and grade 3 (**c**); grade 3; severe redness (**d**); grade 4; apparent erosion. The extent of gastritis was divided into four grades. Grade 0, no gastritis; grade 1; limited to the anastomosis; grade 2, intermediate area between grade 1 and grade 3; grade 3, whole remnant stomach

Classification of endoscopic findings

Residual food

The amount of residual food was classified into five grades, as follows: grade 0, no residual food; grade 1, a small amount of residual food (Fig. 1a); grade 2, a moderate amount of residual food, but possible to observe the entire surface of the remnant stomach with body rolling (Fig. 1b); grade 3, a moderate amount of residual

food, which hinders observation of the entire surface even with body rolling (Fig. 1c); and grade 4, a great amount of residual food, for which endoscopic observation is impossible (Fig. 1d).

Gastritis

Gastritis was described by the degree and the extent of the inflammatory change. The degree of gastritis

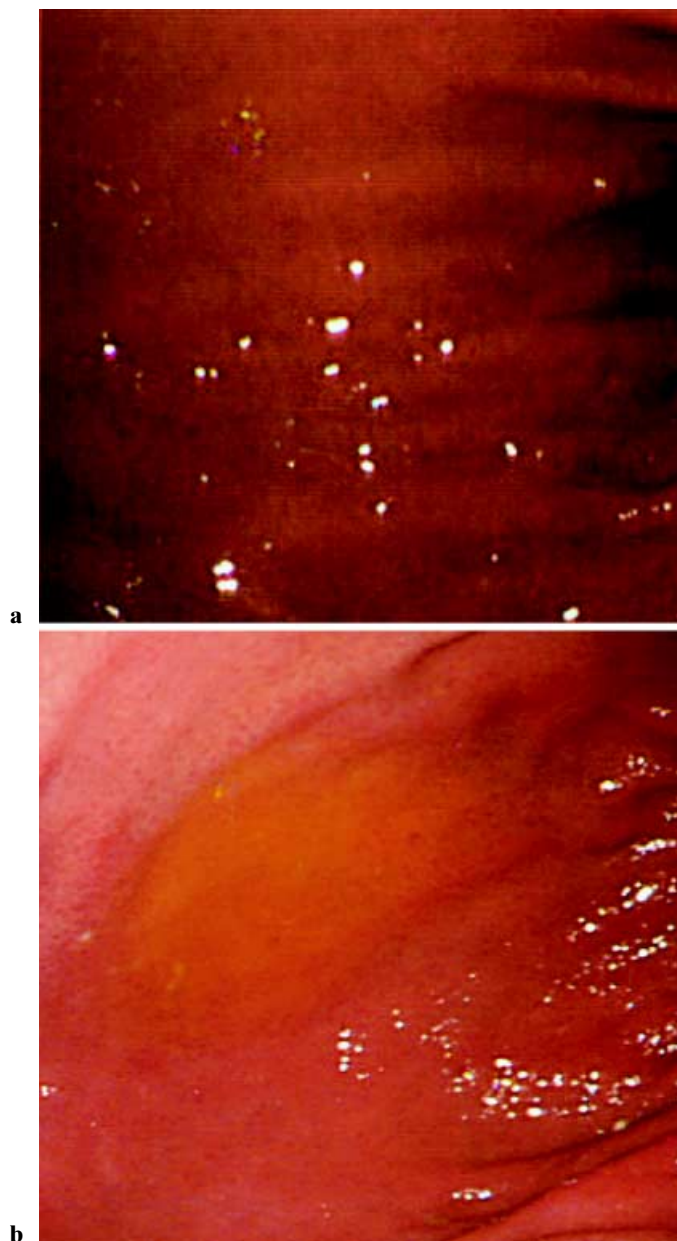


Fig. 3a,b. Bile reflux. Grade 0, absence of bile reflux (a); grade 1, presence of bile reflux (b)

was defined in five categories: grade 0, normal mucosa (Fig. 2a); grade 1, mild redness (Fig. 2b); grade 2, intermediate grade between grade 1 and grade 3 (Fig. 2c); grade 3, severe redness (Fig. 2d); and grade 4, apparent erosion.

The extent of gastritis was divided into four grades: grade 0, no gastritis; grade 1, limited to the anastomosis; grade 2, intermediate area between grade 1 and grade 3; grade 3, whole remnant stomach.

Bile reflux

Concerning bile reflux, absence and presence of bile reflux was defined as grade 0 (Fig. 3a) and grade 1 (Fig. 3b), respectively. When yellowish liquid was observed in the remnant stomach, it was regarded as bile.

To evaluate the usefulness of these classifications, findings were compared according to the type of reconstruction. In this report, we do not mention the correlation between endoscopic findings and clinical symptoms, because the aim was to develop a classification system.

Comparison

Comparison of the condition of the remnant stomach produced by the three different reconstructive methods was made.

Statistical analysis

Findings in each group were analyzed statistically by χ^2 test where appropriate. Differences were considered significant at $P < 0.05$.

Results

Reliability and reproducibility

Table 1 shows the results of the double-checking examination when two endoscopists independently assessed 200 patients by reviewing the films. The rates of agreement by the two observers were 98.5% for residual food, 93.0% for degree and extent of gastritis, and 100.0% for bile reflux. These data suggest the reliability and reproducibility of these classifications.

Findings according to the type of reconstruction

The condition of the remnant stomach according to this classification is summarized in Table 2. Residual food was observed in 14.0% of the RY group, 22.3% of the B1 group, and 37.5% of the PPG group. The patients with RY had a significantly lower tendency of having residual food than those having B1 and PPG ($P = 0.0393$ and $P = 0.0023$, respectively).

The remnant stomach after B1 showed significantly more severe and extensive gastritis than that after RY and PPG ($P < 0.01$). As for bile reflux, there was no significant difference among the three groups.

Relationship between reflux gastritis and other endoscopic findings

The correlation between findings is shown in Table 3. There was no close correlation between gastritis and food residue, nor between gastritis and bile reflux.

Table 1. Results of double-checking by two endoscopists (200 patients)

A. Residual food

| | | Classified by endoscopist A | | | | |
|------------------|---------|-----------------------------|---------|---------|---------|---------|
| | | Grade 0 | Grade 1 | Grade 2 | Grade 3 | Grade 4 |
| By endoscopist B | Grade 0 | 152 | | | | |
| | Grade 1 | 1 | 14 | 1 | | |
| | Grade 2 | | | 21 | | |
| | Grade 3 | | | 1 | 9 | |
| | Grade 4 | | | | | 1 |

B. Gastritis (degree)

| | | Classified by endoscopist A | | |
|------------------|---------|-----------------------------|---------|---------|
| | | Grade 0 | Grade 1 | Grade 2 |
| By endoscopist B | Grade 0 | 125 | 2 | |
| | Grade 1 | 6 | 54 | 4 |
| | Grade 2 | | 2 | 7 |

C. Extent of gastritis

| | | Classified by endoscopist A | | | |
|------------------|---------|-----------------------------|---------|---------|---------|
| | | Grade 0 | Grade 1 | Grade 2 | Grade 3 |
| By endoscopist B | Grade 0 | 125 | 2 | | |
| | Grade 1 | 6 | 33 | 2 | |
| | Grade 2 | | 4 | 27 | |
| | Grade 3 | | | | 1 |

D. Bile reflux

| | | Classified by endoscopist A | |
|------------------|---------|-----------------------------|---------|
| | | Grade 0 | Grade 1 |
| By endoscopist B | Grade 0 | 184 | |
| | Grade 1 | | 16 |

Discussion

In Japan the proportion of EGC has been increasing year by year, reaching 60% in recent years [1,3]. The majority of patients who undergo gastrectomy for EGC are cured. In this situation, the quality of life (QOL) after surgery in the long-term is more important than it was before, and various treatments modified from standard gastrectomy have been tried. Until recently, a gastroduodenostomy (B1) has been the commonest reconstruction used after distal gastrectomy in Japan. It is well known that patients with this type of reconstruction often have a dumping syndrome [4–6]. Some patients with B1 complain of severe heartburn or even throat pain for a long time. They sometimes have bile regurgitation when recumbent. As well as these patients

with symptoms of severe reflux esophagitis, many asymptomatic patients with a B1 anastomosis have severe gastritis [6]. This gastritis is called postgastrectomy gastritis or reflux gastritis [7], and its close relation with bile reflux is precisely described by Dixon et al. [8].

Although grade 3 gastritis was not observed among the patients in this study, marked redness of the mucosa is sometimes seen in remnant stomach reconstructed by Billroth type 2 (Fig. 2d). It seems easy to diagnose grade 3, although we could not confirm the reliability of diagnosing grade 3 in this study. Together with grade 4 (erosion), we included grade 3 as an independent category to describe postgastrectomy gastritis to assure the applicability of this classification.

Because many of the patients undergoing gastrectomy for EGC are long-term survivors, the develop-

Table 2. Comparison of endoscopic findings in remnant stomach after each type of reconstruction

| Reconstruction | R/Y (<i>n</i> = 93) | B1 (<i>n</i> = 175) | PPG (<i>n</i> = 56) | Total (<i>n</i> = 324) |
|---------------------|----------------------|----------------------|----------------------|-------------------------|
| Residual food | | | | |
| Grade 0 | 80 (86.0%) | 136 (77.7%) | 35 (62.5%) | 251 (77.5%) |
| Grade 1 | 7 (7.5%) | 10 (5.7%) | 7 (12.5%) | 24 (7.4%) |
| Grade 2 | 5 (5.4%) | 19 (10.9%) | 0 (0.0%) | 24 (7.4%) |
| Grade 3 | 0 (0.0%) | 10 (5.7%) | 9 (16.1%) | 19 (5.9%) |
| Grade 4 | 1 (1.1%) | 0 (0.0%) | 5 (8.9%) | 6 (1.9%) |
| Gastritis (degree) | | | | |
| Grade 0 | 71 (76.3%) | 90 (51.4%) | 45 (80.4%) | 206 (63.6%) |
| Grade 1 | 19 (20.4%) | 72 (41.1%) | 10 (17.9%) | 101 (31.2%) |
| Grade 2 | 3 (3.2%) | 13 (7.4%) | 1 (1.8%) | 17 (5.2%) |
| Extent of gastritis | | | | |
| Grade 0 | 71 (76.3%) | 90 (51.4%) | 45 (80.4%) | 206 (63.6%) |
| Grade 1 | 12 (12.9%) | 45 (25.7%) | 5 (8.9%) | 62 (19.1%) |
| Grade 2 | 10 (10.8%) | 39 (22.3%) | 6 (10.7%) | 55 (17.0%) |
| Grade 3 | 0 (0.0%) | 1 (0.6%) | 0 (0.0%) | 1 (0.3%) |
| Bile reflux | | | | |
| Grade 0 | 86 (92.5%) | 156 (89.1%) | 54 (96.4%) | 296 (91.4%) |
| Grade 1 | 7 (7.5%) | 19 (10.9%) | 2 (3.6%) | 28 (8.6%) |

R/Y, Roux-en-Y reconstruction; B1, Billroth type 1; PPG, pylorus-preserving gastrectomy

Table 3. Relationship between gastritis and other endoscopic findings

| Findings | Grade | Grade | | | <i>P</i> value |
|---------------------|---------|-------------|------------|-----------|----------------|
| | | Grade 0 | Grade 1 | Grade 2 | |
| Residual food | Grade 0 | 180 (49.0%) | 84 (23.0%) | 12 (3.3%) | NS (0.6732) |
| | Grade 1 | 19 (5.0%) | 8 (2.2%) | 2 (0.5%) | |
| | Grade 2 | 20 (5.4%) | 13 (3.6%) | 2 (0.5%) | |
| | Grade 3 | 10 (2.7%) | 4 (1.1%) | 2 (0.5%) | |
| | Grade 4 | 0 (0.0%) | 1 (0.3%) | 0 (0.0%) | |
| Extent of gastritis | Grade 0 | 136 (77.7%) | 0 (0.0%) | 0 (0.0%) | <0.0001 |
| | Grade 1 | 0 (0.0%) | 60 (16.4%) | 7 (1.9%) | |
| | Grade 2 | 0 (0.0%) | 50 (13.7%) | 10 (2.7%) | |
| | Grade 3 | 0 (0.0%) | 0 (0.0%) | 1 (0.3%) | |
| Bile reflux | Grade 0 | 237 (64.9%) | 95 (26.0%) | 15 (4.1%) | NS (0.6732) |
| | Grade 1 | 18 (4.9%) | 15 (4.1%) | 3 (0.8%) | |

NS, Not significant

ment of stump cancer is another important issue. Furukawa et al. [3] reported that there has been an increase in the number of patients in whom cancers were found in the remnant stomach after partial gastrectomy for malignant diseases. It has become important to investigate the remnant stomach after partial gastrectomy for malignancy. Bile reflux and gastritis may be associated with a higher incidence of a second cancer in the remnant stomach [9].

The Dutch Gastric Cancer Trial showed a much higher incidence of anastomotic leakage after B1 than after gastrojejunostomy. In Western patients, the mortality after anastomotic leakage remains so high that B1 should be avoided [10]. R/Y reconstruction is advocated. On the other hand, a specific complication after R/Y is stasis of the stomach and anastomosed jejunum, known

as Roux stasis syndrome. Many studies regarding this issue have been reported, mainly from Western countries [6,11,12–15]. However, conversion from B1 to R/Y reconstruction is often used to treat severe reflux esophagitis after B1 [6,11,15–17]. Good clinical results are reported.

With the increased number of patients undergoing PPG [18–20] or a distal gastrectomy reconstructed by R/Y [21], markedly different conditions of the remnant stomach have been noted among them, in terms of the degree of gastritis, the amount of food residue suggesting gastric stasis, and the presence of bile juice.

The relationship between these findings and the symptoms is not yet clear. Further evaluation of these factors and of the advantages and disadvantages of the various reconstruction methods is urgently needed. For

this purpose, it is of paramount importance to have a common way of expressing the endoscopic findings of the remnant stomach.

The classification we have proposed here can be used easily and is practical. Although the number of patients evaluated in this study is very small, the results showed a tendency toward suggesting some important differences in the condition of the remnant stomach among the methods of reconstruction. This classification seems useful to describe these findings and to further evaluate these reconstructive methods. In future studies of the condition of remnant stomach, it may be necessary to modify this classification, just as any classification needs modification. We propose this classification as the first classification to describe the endoscopic findings of the remnant stomach.

We would like to propose the name, RGB (food Residue, Gastritis, and Bile reflux), for this classification.

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