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Difference in the Distribution Pattern of *Helicobacter pylori* and Grade of Gastritis in the Antrum and in the Body between Duodenal Ulcer and Benign Gastric Ulcer Patients

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Objectives : *To investigate the relationship between the Helicobacter pylori (H. pylori) colonization and the grade of gastritis in the antrum and in the body of patients with duodenal ulcer (DU) or benign gastric ulcer (BGU)*

Methods : *This study was performed in H. pylori-positive 220 DU patients and 180 BGU patients. H. pylori density was evaluated by modified Giemsa staining and CLO test, and gastritis grade was graded by H&E staining in the antrum and in the body.*

Results : *H. pylori grade by Giemsa staining was 1.24 in the antrum and 0.82 in the body for DU group ($p<0.01$), and those of BGU group were slightly reversed, 0.83 and 0.87, respectively, but without statistical significance. Similarly H. pylori grade by CLO test was 3.1 in the antrum and 2.8 in the body for DU group ($p<0.01$), and those of BGU group 2.3 and 2.6 ($p<0.05$), respectively. In contrast, gastritis grade was 1.7 in the antrum and 1.2 in the body for DU group ($p<0.01$), and those of BGU group 1.6 and 1.3 ($p<0.01$), respectively, similar to those of DU. However, there was a correlation between H. pylori grade and gastritis grade in the antrum and in the body, not only in DU but also in BGU group ($p<0.01$).*

Conclusion : *In spite of different distribution patterns of H. pylori between DU group and BGU group, gastritis grade of the antrum was significantly higher than that of the body in both DU and BGU. However, gastritis is correlated with H. pylori density not only in DU but also in BGU patients. It looks like the inflammatory reaction to H. pylori is stronger in the antrum than in the body.*

Key Words : *Helicobacter pylori, Density, Gastritis, Duodenal ulcer, Benign gastric ulcer*

INTRODUCTION

H. pylori causes chronic gastritis and peptic ulcer[1,2], and it is known that there is a strong correlation between the number of *H. pylori* and the severity of inflammatory cell infiltration[3,4]. However, *H. pylori* has been isolated from patients with chronic gastritis showing no sign of activity and from histologically normal mucosa[5]. In addition, although most studies described more severe gastritis in the antrum than in the body[4,6-8], the density of *H. pylori* colonization in the body may be similar to that in the antrum[9]. Nowadays, it is accepted that chronic gastritis caused by *H. pylori* in a main

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precursor of duodenal ulcer (DU) and benign gastric ulcer (BGU) in a large proportion of ulcer patients[10,11]. However, their pathogenensis is thought to be different[12-14]. We conducted this study to investigate whether there is any difference in the distribution pattern of *H. pylori* and grade of gastritis in the antrum and in the body between DU and BGU groups, and whether there is correlation between the density of *H. pylori* colonization and the grade of gastritis in patients with DU or BGU.

MATERIALS AND METHODS

This study was performed in *H. pylori*-positive 220 patients with active DU and 180 patients with active BGU, who were enrolled from January to December in 1997. *H. pylori* tests were performed by modified Giemsa staining with two mucosal biopsies and by CLO test with one biopsy from the greater curvature aspect of antrum and body, respectively. The patient was regarded as *H. pylori* positive if either Giemsa staining or CLO test was positive in the antrum or in the body. The grade of *H. pylori* colonization by Giemsa staining was graded 0-3[15]; that is, rated grade 0 if there was none in the section, rated grade 1 if there were one or a few isolated groups of *H. pylori*, rated grade 2 if there was a variable layer of *H. pylori* on the mucosal surface and grade 3 if this layer was more or less continuous. The grade of *H. pylori* colonization by CLO test was as follows: rated grade 4 if the test became positive within 20 minutes, rated grade 3 if within 1 hour, rated grade 2 if within 3 hours, grade 1 if within 24 hours and grade 0 if it was negative. The severity and activity of gastritis was graded on a scale of 0-3[16]. Grade 0 corresponds to no inflammatory cell infiltrate, grade 1 to mildly increased cellularity in the lamina propria, including lymphocytes and plasma cells but without significant numbers of neutrophils, grade 2 to moderate numbers of lymphocytes and infiltration of the mucosa with neutrophils and grade 3 to severe mucosal infiltration of large numbers of both lymphocytes and neutrophils.

All data were presented as mean ± SD. For statistical analysis, continuous variables, including age, was analyzed by Student's t test, and categorical variables such as sex by Chi-square test. To compare the grade of *H. pylori* colonization and the grade of gastritis between the antrum and the body in each of DU and BGU group, Wilcoxon signed rank sum test was used. Wilcoxon rank sum test was used for analyzing the grade of *H. pylori* colonization and the grade of gastritis between DU and BGU groups. To examine whether there is any correlation between *H. pylori* colonization and gastritis, Spearman correlation coefficient was used. A p value of <0.05 was considered to be significant.

RESULTS

The mean age of DU group was 43.9 ± 12.7 years and that of BGU group was 52.6 ± 13.6 years, which is significantly higher ($p<0.01$) than that of DU group (Table 1). The number of males was 187(85%) in DU group, and 129(72%) in BGU group, which is lower than that of DU group ($p<0.01$) (Table 1). The mean grade of *H. pylori* colonization by Giemsa staining was 1.24 in the antrum and 0.82 in the body for DU group, which is much lower than that of *the* antrum, 1.24 ($p<0.01$) (Figure. 1). That of BGU group was 0.83 in the antrum and 0.87 in the body, and there was no statistical significance. The grade of *H. pylori* colonization 1.24 in the antrum of DU group was higher than that of BGU group, 0.83 ($p<0.01$). Similarly, the mean grade of *H. pylori* colonization by CLO test was 3.1 in the antrum and 2.8 in the body for DU group, which is lower than that of *the* antrum 3.1 ($p<0.01$) (Figure. 2). Those of BGU group were 2.3 in the antrum and 2.6 in the body, which is higher than that of *the* antrum ($p<0.05$). The

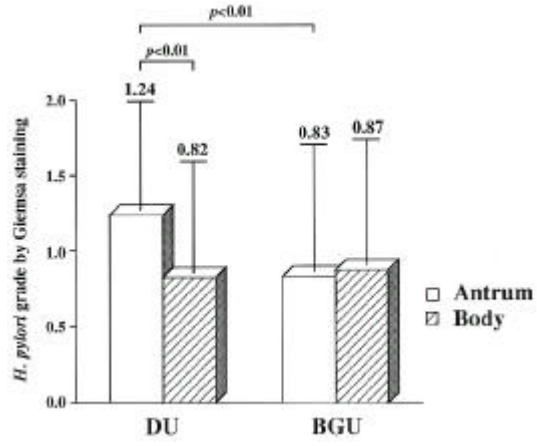

Fig. 1. The grade of *H. pylori* colonization by Giemsa staining in the antrum and in the body of patients with duodenal ulcer (DU) or benign gastric ulcer (BGU). Values are mean ± SD.

grade of *H. pylori* colonization in the antrum of DU group, 3.1 was higher

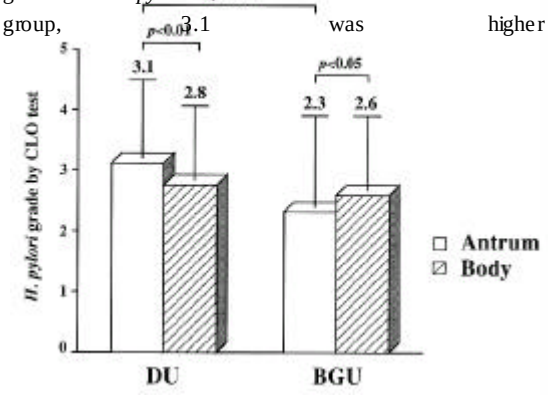

Fig. 2. The grade of *H. pylori* colonization by CLO test in the antrum and in the body of patients with duodenal ulcer (DU) or benign gastric ulcer (BGU). Values are mean ± SD.

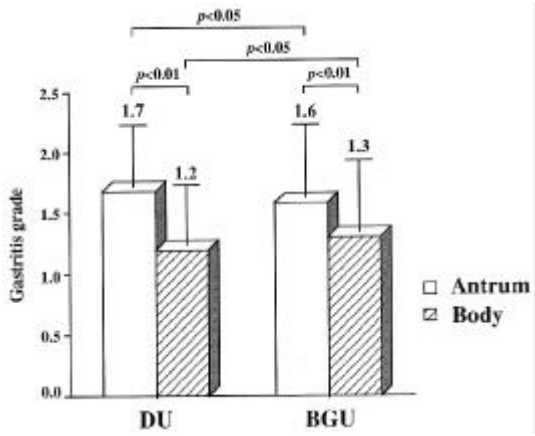

Fig. 3. The grade of gastritis in the antrum and in the body of patients with duodenal ulcer (DU) or benign gastric ulcer (BGU). Values are mean ± SD.

than that of BGU group, 2.3 ($p<0.01$). There was a good correlation (correlation coefficient (r)=0.49, $p<0.001$) in *H. pylori* grade between CLO test and Giemsa staining irrespective of *the* antrum and *the* body of DU or BGU group. The mean grade of gastritis was 1.7 in the antrum and 1.2 in the body for DU group, which is lower than that of *the* antrum ($p<0.01$) (Figure. 3). Similarly, that of BGU group was 1.6 in the antrum and 1.3 in the body, which is lower than that of *the* antrum, 1.6 ($p<0.01$). The grade in the antrum of DU group, 1.7, was higher than in that of BGU group, 1.6 ($p<0.05$). The grade in the body of DU group, 1.2, was lower than in the body of BGU group, 1.3 ($p<0.05$). Gastritis grade was positively correlated with the grade of *H. pylori* colonization from Giemsa staining ($p<0.01$) and CLO test ($p<0.01$) in the antrum of DU group. Positive correlation was found only by Giemsa staining ($p<0.01$), not by CLO test in the body of DU group. In the BGU group, the gastritis grade was positively correlated with the grade of *H. pylori* colonization from Giemsa staining and CLO test, not only in the antrum ($p<0.01$) but also in the body ($p<0.01$). Correlation coefficient (r) between gastritis and *H. pylori* grade by Giemsa staining was higher than by CLO test, and higher in the antrum than in the body, in both of the DU and BGU patients (Figure. 4), although

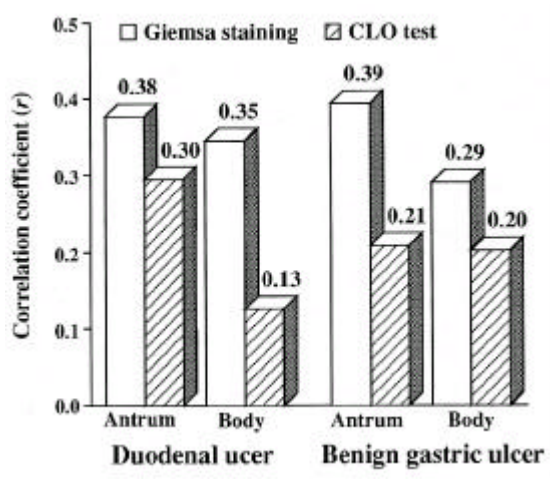

Fig. 4. Correlation coefficient (r) between *H. pylori* grade and gastritis in the antrum and in the body of patients with duodenal ulcer and benign gastric ulcer.

all of these p values were less than 0.01, except that by CLO test in the body of DU ($p=0.062$).

DISCUSSION

For clinical management, the most important piece of information is whether *H. pylori* is present or not. However, variations in colonization density may have a bearing on disease association[17]. For instance, the

major cause of DU and BGU is *H. pylori*, but their pathogenensis is thought to be different. That is, if the *H. pylori* infection occurs when the gastric acid secretion from parietal cell is high, *H. pylori* resides and multiplies in the antrum avoiding the body, causing chronic antral gastritis and DU[12]. However, if *H. pylori* infection occurs in the low acid secretory state, such as malnutrition, immaturity and intercurrent infection, pangastritis and multifocal gastric atrophy occur and BGU or stomach cancer can develop[12,13]. Actually, we found that *H. pylori* density was higher in the antrum than in the body for DU patients ($p<0.01$, Figure. 1, Figure. 2), similar to other reports[3,4,18-20]. This result can be explained by the fact that patients with DU may be resistant to colonization of the oxyntic mucosa by *H. pylori* by virtue of the increased acid secretion found in this group of patients[11]. In contrast, topographic distribution of *H. pylori* was somewhat reversed for BGU patients, that is, *H. pylori* density of *the* body was higher than that of *the* antrum in BGU patients by CLO test ($p<0.05$, Figure. 2), suggesting different pathogenesis results in different diseases, such as DU or BGU. Comparing DU group with BGU, *H. pylori* density of *the* antrum of BGU group was lower than that of DU ($p<0.01$, Figure. 1, Figure. 2), but *H. pylori* density of *the* body of BGU group was similar to that of DU. However, Louw et al.[18] has reported more extensive colonization with *H. pylori* in the body of BGU group than DU.

In general, gastric mucosal inflammation caused by *H. pylori* is more severe in the antrum than that in the body[3,8,9,21]. We found that *the* gastritis grade of *the* antrum was significantly higher than that of *the* body in both of DU and BGU (Figure. 3) in spite of different distribution of *H. pylori* between the DU and BGU group. There are a couple of hypotheses for this phenomenon. First, the inflammatory response to *H. pylori* infection may be poorer in the body mucosa than in the antral mucosa, that is, body mucosa might be more resistant to *H. pylori* associated gastritis than the antral mucosa[9]. Supporting this concept, it has been reported that *H. pylori* induced C-X-C chemokines such as IL-8 and growth regulated (GROα) both in the antrum and in the body, but the association between chemokine expression and inflammation is less in the body[22]. Second, *H. pylori* might colonize the normal antrum and extent proximally along the lesser curvature and into the body with subsequent development of gastritis[3,5,19]. Comparing gastritis of DU group with that of BGU, gastritis of *the* antrum was higher in DU than in BGU ($p<0.01$), and that of *the* body of DU was lower than that in BGU ($p<0.05$). This finding can be correlated with the distribution of *H. pylori* colonization because *H. pylori* grade of *the* antrum in DU was higher than that of BGU by both Giemsa staining(Figure. 1) and CLO test (Figure. 2), and *H. pylori* grade in DU was slightly lower than that in BGU by Giemsa staining, although there was no statistical significance(Figure. 1).

Gastritis grade was correlated with the grade of *H. pylori* by Giemsa staining ($p<0.01$) and CLO test ($p<0.01$) in the antrum of DU group and in the body of DU group by Giemsa staining ($p<0.01$). In addition, in the BGU group, the gastritis grade was correlated with the grade of *H. pylori* colonization from Giemsa staining and CLO test, not only in the antrum ($p<0.01$) but also in the body ($p<0.01$), although gastritis in the body was less severe in spite of higher *H. pylori* grade than in the antrum. This positive correlation between the density of *H. pylori* and gastritis confirms that *H. pylori* plays an important role in the development of gastritis. In investigating the distribution of *H. pylori*, we used CLO test which is commonly used for diagnosing *H. pylori* infection because of its convenience, in addition to modified Giemsa staining which is frequently used for evaluating *H. pylori* density. Because the color of CLO test kit becomes red as the urease of *H. pylori* metabolizes urea to ammonia, the biopsy specimen size can affect the rapidity of a positive result. However, we always obtained biopsy specimens by the same kind of biopsy forceps (Olympus FB-25K-1, diameter 6 mm), and it was supposed that the difference of biopsy specimen in size may not be so significant that it could affect the mean grade of CLO test. CLO test was well correlated with Giemsa staining in evaluating *H. pylori* grade (correlation coefficient (r)=0.49, $p<0.001$) irrespective of antrum and body of DU or BGU group, but correlation coefficient between gastritis and *H. pylori* density by Giemsa staining was higher than by CLO test(Figure. 4).

In conclusion, in spite of different distribution pattern of *H. pylori* between DU and BGU group, gastritis grade of *the* antrum was significantly higher than that of *the* body in both of DU and BGU. However, gastritis was correlated with *H. pylori* density not only in DU but also in BGU patients. It looks like the inflammatory reaction to *H. pylori* is stronger in the antrum than in the body.

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