Gastroptosis is Associated with Less Dyspepsia, Rather than a Cause of Dyspepsia, in Japanese Persons

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Abstract

Objective Gastroptosis is recognized by its characteristic appearance on barium studies. The present prospective study assessed the relationship between gastroptosis and dyspeptic symptoms.

Methods Japanese subjects underwent health screening, and gastroptosis was diagnosed by barium studies. Consecutive subjects (500 women and 167 men) with gastroptosis were identified and the same number of age-matched subjects without gastroptosis were selected as controls. Dyspepsia was classified as reflux-like (heartburn and belching), dysmotility-like (bloating and fullness), or ulcer-like dyspepsia (epigastralgia) based on the Rome II criteria.

Results Body mass index was significantly lower in women with gastroptosis than in controls [19.7±1.83 (SD) vs. 23.4±3.70, p<0.0001], and also in men (19.7±2.00 vs. 23.9±2.89, p<0.0001). The incidence of dyspepsia was significantly lower in women with gastroptosis than in controls (56/500 vs. 87/500, p<0.01) and also in men (10/167 vs. 25/167, p<0.05), especially in women with ulcer-like dyspepsia (15/500 vs. 32/500, p<0.05) and in men with reflux-like dyspepsia (2/167 vs. 12/167, p<0.05). By logistic regression analysis, gastroptosis was associated with a lower risk of dyspepsia (odds ratio: 0.62, 95% CI: 0.405-0.941, p=0.025) and ulcer-like dyspepsia (odds ratio: 0.36, 95% CI: 0.177-0.726, p=0.004) in women.

Conclusion Dyspeptic symptoms were significantly less common in subjects with gastroptosis. Accordingly, gastroptosis may protect against dyspeptic symptoms, rather than causing functional dyspepsia.

Key words: body mass index, dysmotility-like dyspepsia, gastroptosis, reflux-like dyspepsia, ulcer-like dyspepsia

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Introduction

Gastroptosis is recognized by a characteristic shape of the stomach on barium studies. In the past, abdominoplasty or gastrectomy was occasionally performed for patients with gastroptosis, because it was thought to cause gastric dysfunction or disturbance of the abdominal vessels (1). In Japan, gastroptosis has been considered as a possible pathophysiological factor for dyspepsia (2). However, to date there has been no clear evidence of a close relationship between gastroptosis and dyspepsia (2). As gastroptosis is often observed in people with a low BMI, a relationship between gastroptosis and dyspepsia is more likely to be detected in Japan. An internet search (YAHOO JAPAN) using “gastroptosis” as the key word revealed 520,000 entries (December 8, 2010). Thus, gastroptosis is recognized as a common condition in Japan.

In the Rome III criteria (3), functional dyspepsia (FD) is classified as a gastroduodenal disorder. In addition to the influence of gastric function (emptying and accommodation) and gastric acid production, H. pylori status has also at-

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tracted recent attention. Since the stomach is the organ that releases gastric contents into both the duodenum and the esophagus, it should play an important role in the pathophysiology of FD. However, gastric morphology was abandoned as a possible cause of FD in western counties from the 1940s (1). Even in Japan, where barium studies are still frequently done as screening for upper gastrointestinal tract (GI) diseases, there have been few reports about the relationship between gastroptosis and dyspeptic symptoms. We do not even know whether dyspepsia is common or uncommon in persons with gastroptosis. Accordingly, we conducted the present study to assess the relationship between gastroptosis and dyspepsia in the Japanese population.

Methods

Subjects

Subjects were prospectively enrolled from 2007 to 2009 during health checks that included barium studies as screening for upper GI abnormalities at our related hospital, the Hidaka hospital. Approximately 6,000 people underwent this examination yearly. This study was approved by the Ethics Committee Review in the Hidaka hospital. All subjects gave written informed consent to use of their data for investigations and the study was performed in conformity with the Declaration of Helsinki.

Diagnosis of gastroptosis

Barium studies were performed with 165 mL of 180w/v % barium sulfate (Kaigen Co., Tokyo, Japan) and 6 g of effervescent salts (Kaigen Co.). To prevent gastric contractions, scopolamine butylbromide (20 mg) was given intramuscularly, except for subjects >65 years old; subjects with heart disease, diabetes mellitus, glaucoma, or prostate disease; and subjects who did not want this injection. After esophagography, the first filling view of the stomach with the entire 165 mL of barium obtained with standing position was used to diagnose gastroptosis, which was defined existing if the lesser curvature of the angle was located below a horizontal line connecting the bilateral iliac spines. Then five hundred consecutive women with gastroptosis were taken with double horizontal line connecting the bilateral iliac spines. Then ing if the lesser curvature of the angle was located below a

Another 167 age-matched men without gastroptosis were also enrolled as controls. Persons with organic gastroduodenal disorders, including gastric cancer, active/scarring ulcers, malrotation of the stomach, or heterotaxia, were excluded, as were patients with inadequate images due to rapid flow of barium into the duodenum. Detection of gallstones or surgical hemoclips (indicating prior cholecystectomy) on the fluoroscopic images also led to exclusion. However, subjects with gastric fundic gland polyps were not excluded.

Assessment of dyspeptic symptoms and BMI

Before the barium studies, nurses interviewed all subjects to assess GI symptoms. Subjects who mainly complained of lower GI symptoms, such as diarrhea and flatus, were excluded, as were those taking proton pump inhibitors and H2 receptor antagonists. Dyspeptic symptoms were classified as reflux-like (heartburn, regurgitation, and belching), dysmotility-like (postprandial fullness, bloating, early satiety, nausea, vomiting, and anorexia), or ulcer-like (epigastric pain and epigastric heat) according to the criteria of Rome II (4) and Halder, Tally et al (5). When subjects had two or more kinds of symptoms, we counted them as having each type of dyspepsia. Nurses also calculated the body mass index (BMI, kg/m²) for all subjects.

Statistical analysis

The significance of differences was assessed statistically by the chi-square test (Stat View J-4.5, Apple Computers, Japan) for comparison of the incidences of dyspeptic symptoms between subjects with gastroptosis and the controls. Student’s t-test was used (Stat View J-4.5) to assess differences of BMI between the gastroptosis and control groups. We employed logistic regression analysis to calculate the odds ratio and 95% confidence interval (CI) for each parameter to investigate risk factors for dyspeptic symptoms with SPSS software (SPSS Japan Inc., Tokyo, Japan). The factors used for analysis were gastroptosis (positive or negative), age (5-year intervals), and BMI (0.5 kg/m² intervals). Cox & Snell (CS) and Nagelkerke (N) R-squared values were calculated by logistic regression analysis. We performed the Hosmer-Lemshshow test to evaluate the fitness of the model, and obtained the percent correctness. For all analyses, p<0.05 was regarded as indicating significance. Results are expressed as the mean +/- SD.

Results

Table 1 shows a profile of the subjects with gastroptosis and the controls. There was a significant difference of BMI between both women and men subjects with gastroptosis and the respective controls. For both women and men, BMI was significantly lower in the subjects with gastroptosis than in the controls.

Table 2 shows the number of subjects with dyspeptic symptoms in the gastroptosis group and the control group. Both women and men with gastroptosis had a significantly
lower overall incidence of dyspeptic symptoms. In addition, ulcer-like symptoms and reflux-like symptoms were significantly less frequent in female and male subjects with gastroptosis, respectively, than in the control groups.

According to multivariate analysis, gastroptosis was a factor related to a lower prevalence of all dyspepsia and ulcer-like dyspepsia in women (Table 3). In men, however, gastroptosis was not associated with a lower prevalence of any type of dyspepsia (Table 4). Table 5 shows the data for all of the subjects with gastroptosis.

### Discussion

In this study, we clearly demonstrated that subjects with gastroptosis had a much lower incidence of all dyspeptic symptoms than controls without gastroptosis, especially ulcer-like dyspepsia in women and reflux-like dyspepsia in men. Gastroptosis was independently associated with a lower prevalence of dyspepsia in women, especially ulcer-like dyspepsia. These findings make it clear that dyspepsia is less common in Japanese subjects with gastroptosis, which has never been reported before. Moreover, it is likely that gastroptosis might be a protective factor, rather than a
Subjects with gastroptosis have a lower BMI than the controls. Therefore, physicians might have assumed that gastroptosis was a cause of dyspepsia when they saw patients with both dyspepsia and gastroptosis. However, there have been no studies that confirmed a cause and effect between gastroptosis and functional dyspepsia.

It is not clear why subjects with gastroptosis have fewer dyspeptic symptoms. Since their BMI was lower than that of the controls, gastroptosis subjects may watch their weight more carefully and have a better diet. A close relation between a high BMI and gastroesophageal reflux disease (GERD) has been reported (6-8). Dieting may be good for dyspeptic symptoms. However, multivariate analysis in this study showed that gastroptosis is an independent low-risk factor for dyspepsia, while there was no relation between BMI and dyspepsia. Therefore, we should consider that gastroptosis might be a protective factor against dyspeptic symptoms, rather than being a cause of dyspepsia.

Recently, we reported that subjects with cascade stomach have more dyspeptic symptoms than the controls (9), possibly because the fundus acts as a large acidic pocket (10, 11). We assumed that in subjects with cascade stomach, ingested food and fluid pools in the fundus, and thus exists very close to the gastroesophageal junction. If transient lower esophageal sphincter relaxation (TLESR) (12) then occurs with opening of the lower sphincter, pooled refluxate could enter the esophagus rapidly. On the other hand, the elongated gastric body of persons with gastroptosis might prevent gastric contents from entering the esophagus after TLESR. Moreover, the large capacity of the stomach in persons with gastroptosis might mean that a larger volume is needed to trigger TLESR than in persons with a normal stomach or cascade stomach. Recently, early gastric emptying has been suggested to have an important role in the development of dyspepsia (13-15), rather than delayed gastric emptying (3, 4, 16). It was reported that patients with severe nausea and vomiting have very rapid emptying of swallowed barium during fluoroscopy (17). In gastroptosis subjects, ingested food could be retained in the

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>p value</th>
<th>R-squared</th>
<th>R-squared</th>
<th>Percent Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dyspepsia</td>
<td>0.653</td>
<td>0.254 - 1.687</td>
<td>0.379</td>
<td>0.010</td>
<td>0.022</td>
<td>90.42</td>
</tr>
<tr>
<td>Gastroptosis</td>
<td>1.000</td>
<td>0.962 - 1.040</td>
<td>0.998</td>
<td>0.863</td>
<td>0.754 - 1.019</td>
<td>0.882</td>
</tr>
<tr>
<td>Reflux-like</td>
<td>0.907</td>
<td>0.183 - 4.506</td>
<td>0.905</td>
<td>0.001</td>
<td>0.006</td>
<td>97.01</td>
</tr>
<tr>
<td>Age</td>
<td>1.022</td>
<td>0.955 - 1.095</td>
<td>0.528</td>
<td>1.097</td>
<td>0.755 - 1.261</td>
<td>0.849</td>
</tr>
<tr>
<td>BMI</td>
<td>0.975</td>
<td>0.353</td>
<td>0.154 - 1.844</td>
<td>0.320</td>
<td>0.014</td>
<td>0.040</td>
</tr>
<tr>
<td>Dysmotility-like</td>
<td>0.998</td>
<td>0.949 - 1.050</td>
<td>0.939</td>
<td>0.794</td>
<td>0.631 - 0.998</td>
<td>0.048</td>
</tr>
<tr>
<td>Gastroptosis</td>
<td>0.415</td>
<td>0.048 - 3.620</td>
<td>0.426</td>
<td>0.975</td>
<td>0.891 - 1.067</td>
<td>0.578</td>
</tr>
<tr>
<td>Ulcer-like</td>
<td>0.960</td>
<td>0.698 - 1.320</td>
<td>0.802</td>
<td>0.65</td>
<td>0.187 - 0.712</td>
<td>0.003</td>
</tr>
<tr>
<td>Age</td>
<td>0.990</td>
<td>0.956 - 1.025</td>
<td>0.564</td>
<td>0.937</td>
<td>0.850 - 1.034</td>
<td>0.196</td>
</tr>
<tr>
<td>BMI</td>
<td>0.975</td>
<td>0.989</td>
<td>0.936 - 1.045</td>
<td>0.698</td>
<td>0.989</td>
<td>0.974 - 1.149</td>
</tr>
</tbody>
</table>

Cl: confidence interval; BMI: body mass index

Table 4. Multivariate Analysis of Risk Factors for Dyspepsia in Men
gastric body like swallowed barium. In patients with GERD and FD, dyspeptic symptoms overlap (18), and these conditions are not easily distinguished. Because TLESR, gastric emptying, and gastric accommodation are closely interrelated, conditions like gastroptosis that affect gastric capacity for ingested food, fluid, and air could be important. Thus, further studies of subjects with gastroptosis should be done in the future.

It is not obvious why women with gastroptosis had a lower incidence of ulcer-like dyspepsia. Even among men, if we could have studied a larger number of subjects, we may have obtained similar results. Because proton pump inhibitors are more effective than H2 receptor antagonists for ulcer-like dyspepsia, it is considered to be acid-related (19). Gastric acid entering the duodenum plays an important role in FD (20), and patients with gastroptosis seem to have a less acidic stomach than the controls. Since the ages of both groups were matched, the influence of H. pylori infection (which affects gastric acid secretion) could also be ignored. It is possible that retention of ingested food is superior in (which affects gastric acid secretion) could also be ignored. It is possible that retention of ingested food is superior in persons with gastroptosis than in controls without gastroptosis or secretion of gastric acid itself might be lower in gastroptosis subjects. Further studies are also required to assess these issues.

In conclusion, dyspeptic symptoms are less common in Japanese subjects with gastroptosis. We should pay more attention to the influence of gastric morphology on the etiology of FD. “Gastroptosis leads to FD and emaciation” has turned out to be an “old wives tale”.

The authors state that they have no Conflict of Interest (COI).

References