

# Short Segment Hiatal Hernia: Is It a Clinically Significant Entity?

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## Introduction

Hiatal hernia (HH) is a well-known contributory factor of gastroesophageal reflux disease (GERD). However, studies on the clinical significance of simple small HH are lacking. We conducted a study to clarify the clinical significance of short segment HH (SSHH) in relation to GERD.

## Methods

4,592 consecutive cases (male/female: 2,076/2,516, median age: 49 years) examined with diagnostic esophagogastroduodenoscopy for the first time were enrolled. During the insertion of endoscope, presence of HH was determined and the length was measured, if present. The relationships between gender, age, presence of erosive esophagitis, and columnar-lined esophagus (CLE) and the lengths of HH were analyzed.

## Results

Among 4,592 cases, HH was present in 428 cases (9.3%); SSHH was found in 255 cases (5.6%) and long segment HH (LSHH) in 173 cases (3.8%). HH was more frequent among males and patients with LSHH tended to be older. Erosive esophagitis was observed in 4.8%, 22.0%, and 37.0% of no HH, SSHH, and LSHH group, respectively ( $p < 0.05$ ). CLE was observed in 14.4%, 36.5%, and 24.3% of no HH, SSHH, and LSHH group, respectively ( $p < 0.05$ ).

## Conclusions

SSHH is not a clinically silent and "innocent entity," but rather a condition with a significant pathologic significance similar to LSHH in regard to GERD.

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## Key Words

Hiatal hernia, Gastroesophageal reflux disease, Erosive esophagitis, Columnar-lined esophagus

## Introduction

Sliding type hiatal hernia (HH) is a condition in which the

gastroesophageal junction (GEJ) and some portion of the stomach are displaced above the diaphragm.<sup>1,2</sup> HH impairs lower esophageal sphincter (LES) function and esophageal acid clearance.<sup>1-6</sup> Therefore, it predisposes to gastroesophageal reflux dis-

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ease (GERD), potentially resulting into erosive esophagitis, Barrett's esophagus, and possibly esophageal adenocarcinoma.<sup>4,7-11</sup> There have been studies on the relationship between HH and GERD proving HH to be an important contributory factor for GERD.<sup>4,7,8,11-13</sup> However, most of these studies have been carried out with HHs measuring greater than 2.0 cm in length, hence the clinical significance of a simple small HH, which we defined as a short segment HH (SSHH) measuring less than 2.0 cm in length, has been less studied and not understood clearly. It is generally believed that SSHH usually does not cause symptoms in many patients and is clinically insignificant.<sup>4,14</sup> Therefore, this study was conducted to see whether SSHH is only a minor anatomic abnormality that bears little or no clinical significance, or a clinically significant entity specifically in relation to GERD.

## Materials and Methods

### 1. Patients

4,592 consecutive cases examined with diagnostic esophagogastroduodenoscopy for the first time at Korea University Guro Hospital, Seoul, Korea by various indications were enrolled as subjects from September, 1999 to November, 2004. 2,076 cases (45.2%) were males and median age of the cases was 49 years (36-60 years in inter-quartile range). Cases that had history of digestive tract surgery were excluded. Written informed consent to the study was obtained from each patient and the study was conducted in accordance with the Helsinki Declaration and was approved by the Institutional Review Board at Korea University Guro Hospital (IRB approval No. GR0987-001).

### 2. Endoscopy

Three models of UGI endoscopes were used for this study (GIF-XQ240, XQ260, and Q260, Olympus Medical Systems, Tokyo, Japan). To determine the presence of HH and columnar-lined esophagus (CLE), the subjects were uniformly observed while the endoscope was being inserted. Minimal amount of air was transferred during insertion, just enough to aid the vision. To avoid inaccurate measurements, patients were asked to breathe slowly with shallow breathings and the procedure was performed carefully so that the patients would not retch or belch.

GEJ was defined endoscopically as the distal end of longitudinally arrayed capillaries of palisade zone<sup>15</sup> or, if it was unclear, the proximal end of the gastric type mucosal folds was used instead.<sup>16</sup> HH was diagnosed if GEJ was located at least 0.5 cm

proximal to the level of the diaphragmatic pinchcock action. Endoscopic CLE was diagnosed if squamocolumnar junction (SCJ) was located at least 0.5 cm proximal to the level of the distal end of capillaries in palisade zone. Endoscopic reflux esophagitis was diagnosed and graded according to the Los Angeles (LA) classification.<sup>17</sup>

When HH was present, its longitudinal length was measured endoscopically from the GEJ to the diaphragmatic indentation with the insertion length of endoscope at the incisor guiding as the measurement point. All measurements were performed by a single experienced endoscopist (YTB). HH was divided into two grades: SSHH, if the length was shorter than 2.0 cm and long segment HH (LSHH), if its length was 2.0 cm or longer. HH shorter than 0.5 cm in length was neglected.

The relationships of gender, age, presence of erosive esophagitis, and presence of CLE with the lengths of HH were analyzed.

### 3. Statistical methods

All statistics were generated by using SPSS program (SPSS v13.0 for Windows, Chicago, IL, USA), and the data were analyzed using chi-square test or Mann-Whitney U test. It was considered statistically significant if the p-value was less than 0.05.

## Results

### 1. Hiatal hernia

Among total of 4,592 cases, HH was present in 428 (9.3%); SSHH in 255 (5.6%) and LSHH in 173 (3.8%) subjects (Table 1).

### 2. Gender

Of the 4,592 cases, 2,076 (45.2%) were males and 2,516 (54.8%) were females. When compared to the cases without HH (43.6%), the proportion of males was higher in SSHH (59.6%,  $p < 0.001$ ) and LSHH (62.4%,  $p < 0.001$ ) groups (Table 1).

**Table 1.** Gender and the Status of Hiatal Hernia, n (%)

Gender	No HH	SSHH <sup>a</sup>	LSHH	Total
Male	1,816 (43.6)	152 (59.6)	108 (62.4)	2,076 (45.2)
Female	2,348 (56.4)	103 (40.4)	65 (37.6)	2,516 (54.8)
Total	4,164	255	173	4,592

<sup>a</sup> $p < 0.001$  vs. No HH.

HH, hiatal hernia; SSHH, short segment hiatal hernia; LSHH, long segment hiatal hernia.

**Table 2.** Age of Cases according to the Status of Hiatal Hernia, Median Year (IQR)

No HH <sup>a</sup>	SSHH <sup>a</sup>	LSHH	Total
49 (39.0-59.1)	47 (36.1-57.0)	54 (41.0-66.5)	49 (39.0-59.0)

<sup>a</sup>p < 0.001 vs. LSHH.

IQR, inter-quartile range; HH, hiatal hernia; SSHH, short segment hiatal hernia; LSHH, long segment hiatal hernia.

**Table 3.** Grade of Erosive Esophagitis according to the Status of Hiatal Hernia, n (%)

Erosive esophagitis	No HH	SSHH	LSHH	Total
Present				
LA-A	116 (2.8)	33 (12.9)	22 (12.7)	171 (3.7)
LA-B	74 (1.8)	23 (9.0)	33 (19.1)	130 (2.8)
LA-C	8 (0.2)	0 (0)	6 (3.5)	14 (0.3)
LA-D	0 (0)	0 (0)	3 (1.7)	3 (0.1)
Subtotal	198 (4.8)	56 (22.0) <sup>a</sup>	64 (37.0) <sup>a,b</sup>	318 (6.9)
Absent	3,966 (95.2)	199 (78.0)	109 (63.0)	4,274 (93.1)
Total	4,164	255	173	4,592

<sup>a</sup>p < 0.001 vs. No HH, <sup>b</sup>p = 0.001 vs. SSHH.

HH, hiatal hernia; SSHH, short segment hiatal hernia; LSHH, long segment hiatal hernia; LA, grade of reflux esophagitis according to Los Angeles classification.

Males were more likely to have HH compared to females.

### 3. Age

The median age (inter-quartile range) of the cases without HH, with SSHH, and with LSHH was 49 years (39.0-59.1), 47 years (36.1-57.0), and 54 years (41.0-66.5), respectively (Table 2). Age of the cases with LSHH was higher than those without HH or with SSHH (p < 0.001).

### 4. Reflux esophagitis

Erosive esophagitis was observed in 4.8%, 22.0%, and 37.0% of the subjects without HH, with SSHH, and with LSHH, respectively (Table 3). Erosive esophagitis was more prevalent in cases with HH than those without HH (p < 0.001). Among the subjects with HH, erosive esophagitis was more prevalent in LSHH group than SSHH group (p = 0.001). Proportion of the cases with LA-A grade erosive esophagitis was similar between the SSHH and LSHH groups (12.9% vs. 12.7%; p = 0.512). However, cases with higher grades (grade B or higher) of esophagitis were found more frequently in LSHH group (9.0% vs. 24.3%; p < 0.001).

**Table 4.** Status of Columnar-lined Esophagus according to the Status of Hiatal Hernia, n (%)

Columnar-lined esophagus	No HH	SSHH <sup>a,b</sup>	LSHH <sup>a</sup>	Total
Present	598 (14.4)	93 (36.5)	42 (24.3)	733 (16.0)
Absent	3,566 (85.6)	162 (63.5)	131 (75.7)	3,859 (84.0)
Total	4,164	255	173	4,592

<sup>a</sup>p < 0.001 vs. No HH, <sup>b</sup>p = 0.011 vs. LSHH.

HH, hiatal hernia; SSH, short segment hiatal hernia; LSHH, long segment hiatal hernia.

### 5. Columnar-lined esophagus

CLE was observed in 14.4%, 36.5%, and 24.3% in groups without HH, with SSHH, and with LSHH, respectively (Table 4). CLE was more frequently found in groups with HH (SSHH and LSHH) compared to the group without HH (p < 0.01). Between SSHH and LSHH groups, the detection rate of CLE was significantly higher in SSHH group (p = 0.011).

## Discussion

Sliding type HH is a condition in which the GEJ and the proximal part of the stomach are moved upward through the esophageal hiatus above the diaphragm.<sup>1,18</sup> The relationship between the presence of HH and GERD has evolved over the past decades since its association has first been emphasized by Allison in 1951, and for about 20 years that followed, HH was used synonymously with GERD.<sup>18</sup> However, as the use of manometry became widespread, the aforementioned concept became less popular, with the center of attention on the major risk factor related to GERD shifting from HH to LES in the early 1970s.<sup>19-21</sup> Recently, HH has been reevaluated and studies clarify that HH is indeed a risk factor for GERD,<sup>4,7,8,11-13</sup> and that it may lead to many morbidities such as erosive esophagitis, Barrett's esophagus, adenocarcinoma, etc.<sup>4,7,9-11</sup> Nevertheless, in most of the studies, only the HHs measuring over 2.0 cm in length were considered pathological<sup>1,10,11,16,22,23</sup> and HHs measuring less than 2.0 cm have been underestimated, almost neglected, and it was simply considered as a minor alteration in the GEJ anatomy which was not pathologic.<sup>4,14</sup> To find out the clinical significance of SSHH, we defined it as HH measuring 0.5 to 2.0 cm and carried out the study. HHs measuring less than 0.5 cm, which is an arbitrary standard, were excluded from this study since this level of variations seems to occur relatively often during endoscopy.

There has been much debate as to which marker of GEJ

should be used as the reference point for the presence of HH. Generally, the upper margin of the gastric fold is accepted as GEJ.<sup>16,23</sup> However, sometimes, endoscopists have difficulty identifying this marker clearly. Endoscopists usually get to observe on the most distal 2-3 cm of the esophagus, identifying longitudinally parallel capillaries running underneath the epithelium.<sup>15</sup> DeCarvalho took a particular interest in this anatomy and in 1966 he schematically illustrated the angioarchitecture of the lower esophagus, dividing it into four distinct zones.<sup>24</sup> Later on, these four zones were named as truncal zone, perforating zone, palisade zone (PZ), and gastric zone.<sup>25,26</sup> In our study, the distal margin of the PZ was employed as the marker for GEJ<sup>15</sup> which has been known to correspond to the GEJ.<sup>16,25,26</sup>

In addition to identifying the distal margin of the PZ, SCJ and the site of diaphragmatic pinchcock action were carefully observed to determine the presence of HH and CLE.<sup>15</sup> Hoshihara classified the patterns of GEJ into four types according to the relationship of the distal margin of PZ to SCJ and the site of pinchcock action.<sup>27</sup> In type A, the distal margin of PZ, SCJ, and the site of pinchcock action all fall at the same level. In type B, the distal margin of PZ and the site of pinchcock action lie at the same level but SCJ is proximally located. In type C, the distal margin of PZ and SCJ concurs but the site of pinchcock action is found distal in relation to them. In type D, SCJ is situated proximal to both the distal margin of PZ and the site of pinchcock action. In our study, CLE was considered to be present in type B and D. And type C and D were thought to meet the definition of HH.

We found out that SSHH was similar to LSHH in many aspects. HH showed male predominance in our study. However, there has been differing reports showing male predominance,<sup>28</sup> female predominance,<sup>29</sup> or no difference<sup>30-32</sup> according to the study populations. As the length of HH got longer, the diagnosis of erosive esophagitis was made more frequently and the CLE was more frequently found in both SSHH and LSHH groups than the group without HH. However, CLE was more frequently found in SSHH group than in LSHH group. This finding needs further studies for accurate explanation.

There are some limitations to this study. First, measuring the distance of a location using the incisor as the reference point might lack in precision. Even so, considering the degree of flexion of the endoscope and the fact that esophagus exhibits much less elasticity compared to the stomach or duodenum, the length of HH measured endoscopically using the scope as a ruler could be an reasonable diagnostic method. Second, since biopsy was not

performed, we could only apply the term "columnar-lined esophagus" instead of "Barrett's esophagus." According to the latest guidelines related to Barrett's esophagus, its diagnosis requires both the endoscopic identification of CLE and the histologic confirmation of intestinal metaplasia.<sup>33-35</sup> It would have been more competent if the biopsy had been done in all patients with CLE. Further study is warranted to clarify the significance SSHH on Barrett's esophagus. Third, this analysis was done only with the endoscopic data, and we did not consider the symptoms of the subjects, hence the association between the length of hiatal hernia and non-erosive reflux disease was not assessed. However, the relationship between the length of hiatal hernia and the other two aspects of GERD (i.e., erosive esophagitis and CLE) could be inferred from our study.

The significance of this study is that this is the first report that looked into the clinical significance of SSHH, which has been undervalued and almost neglected. We could observe from our study that SSHH was comparable to LSHH in many aspects. Despite the limitations mentioned above, we conclude that SSHH is not a clinically silent and "innocent entity," but rather a condition with a clinically significant "pathologic entity" quite similar to LSHH as far as GERD is concerned.

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