The Effect of Deep Sedation in Endoscopic Diagnosis of Hiatal Hernia

Gülce Ecem Kılıç¹, İbrahim Doğan², Güner Kılıç², Ali Karataş², Selma Demirbaş Yüceldi³, Mehmet Arhan², Mehmet İbiş²

¹Department of Internal Medicine, Gazi University, Faculty of Medicine, Ankara, Turkey
²Department of Gastroenterology, Gazi University, Faculty of Medicine, Ankara, Turkey
³Department of Gastroenterology, Sakarya Education and Research Hospital, Sakarya, Turkey


Corresponding author: Gülce Ecem Kılıç, e-mail: gulcecan@hotmail.com
Received: September 1, 2022 Accepted: November 1, 2022 Publication date: December 30, 2022 DOI: 10.5152/DiagnIntervEndosc.2022.223047

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Abstract

Objective: Compliance of the patient with endoscopic examination may significantly affect the diagnosis of hiatal hernia. In this study, we had 2 aims: first, to investigate the effect of deep sedation on the esophagogastric junction to prevent changes in anatomical landmarks due to movements caused by coughing or retching, and second, to show the effect of experience in the evaluation of the esophagogastric junction.

Methods: Endoscopy records of 10,359 sequential patients were screened in the database of Gazi University Faculty of Medicine Department of Gastroenterology between January 2016 and February 2019, and 4,083 patients with various indications aged 18 and over were included in the study. There were 4 patient groups; deep-sedated and non-deep-sedated patient groups were divided into subgroups of experienced and inexperienced endoscopists.

Results: The frequency of hiatal hernia was significantly lower in the deep-sedated group than in the non-deep-sedated group (7.2% vs. 16%, respectively) (P < .001). Similarly, the frequency of esophagitis was significantly lower in the deep-sedated group (13.5% vs. 21.7%, respectively) (P < .001). Experienced endoscopists were more likely to detect both hiatal hernia and esophagitis in deep-sedated and non-deep-sedated groups.

Conclusion: We demonstrated that the diagnosis of hiatal hernia and esophagitis was significantly increased when it was performed without deep sedation. Patient compliance during endoscopy is important to ensure that the anatomic landmarks do not move.

Keywords: Deep sedation, endoscopy, hiatal hernia

INTRODUCTION
Gastroesophageal reflux disease (GERD) is an important health problem with a prevalence of 10%-20%.¹ The diaphragmatic crus wraps the lower esophageal sphincter (LES) from the outside, providing it to function effectively as an antireflux barrier.² When the antireflux barrier, which is one of the significant factors in the development of GERD, is disrupted, esophageal mucosa resistance and clearance decrease.³,⁴ The hiatal hernia (HH) is the most important factor that damages the structure of the antireflux barrier. It causes both decrease in LES pressure and deterioration in esophageal clearance. As the acid contact time increases with the mucosa, symptoms, esophagitis, and other complications occur.⁵

It is significant to be able to accurately diagnose HH in deciding on medical, endoscopic, or surgical treatments. During endoscopy, due to patient incompatibilities such as gagging and coughing, there are shifts in the anatomic landmark and the diagnosis of HH can be misdiagnosed.⁶ Sedation is preferred to control the anxiety and pain of patients, increase tolerance of the endoscopy, and perform an optimal procedure. It gives the endoscopist time for a good evaluation of the esophagogastric junction (EGJ). Keeping the air supplied for imaging during endoscopy makes the procedure more accurate and reliable. The patient’s involuntary movements are eliminated, but there are few studies suggesting endoscopy with deep sedation.⁷

Measuring the gastroesophageal mucosal junction, the EGJ, and the distance of the hiatus from the teeth during endoscopy (EGD) is significant in the diagnosis of HH, but subjective evaluation of these anatomical landmarks by the endoscopists may lead to differences or missed diagnosis.⁸ We also considered that the experienced endoscopists who took enough time to examine the EGJ carefully made diagnosis of HH differently compared to the inexperienced endoscopists.
Therefore, in our study, we aimed to show the effect of deep sedation and endoscopists’ experience in the diagnosing of HH and esophagitis.

METHODS

Patients
A total of 10,359 patients who were admitted to our endoscopy unit which is a large tertiary center affiliated with a university between January 2016 and February 2019 with a variety of indications were scanned retrospectively, and 4,083 patients were included in our study. We excluded therapeutic endoscopies, liver cirrhosis, gastrointestinal system (GIS) malignancy, GIS bleeding, gastric surgery (e.g., fundoplication, gastrectomy), and esophageal motor diseases.

Study Design
There were 2 patient groups, deep-sedated and non-deep-sedated patient groups which were divided into subgroups of experienced and inexperienced endoscopists. The experienced and inexperienced endoscopist groups were determined according to the minimum quality requirements for competence according to a specialist medical society, as performing more than 3000 upper endoscopies and less than 3000 upper endoscopies, respectively. In our clinic, endoscopists are routinely trained on how to correctly evaluate EGJ. Therefore, a consensus has been achieved among endoscopists in the diagnosis of HH since the beginning of this study. The distance of the gastroesophageal mucosal junction, EGJ, and hiatus from the teeth is routinely measured in all upper endoscopic examinations in our center. Endoscopic findings of reflux esophagitis are classified according to the Los Angeles (LA) classification as grades A to D. All patients received topical pharyngeal anesthesia with lidocaine spray before the endoscopic procedure. By the anesthesiologist, 30 mg propofol and 3 mg midazolam were administered intravenously to the deep-sedated group. On the other hand, the patients without deep sedation were intravenously administered only 3 mg midazolam. The frequency and demographic features of HH and esophagitis of each patient group, as well as the frequency of HH and esophagitis detection according to the experience of endoscopists, were evaluated.

The study protocol was approved by the ethics commission on December 12, 2018 with document number E.164452, and the study was conducted in accordance with the Helsinki Declaration.

Instruments
The Olympus GIF-H170, EVIS-EXERA III CLV-190 (Olympus, Tokyo, Japan) videoscope that was used has an insertion diameter of 9.2 mm by an oral approach.

Statistical Analysis
Data are presented with mean ± standard deviation (SD) and median. Non-parametric continuous variables were compared using the Mann-Whitney U-test. Pearson’s chi-square (χ²) test was used in comparison analysis for categorical variables between independent groups. Univariate and multivariate logistic regression analysis adjusted for age, sex, endoscopist, and deep sedation was used to analyze factors affecting HH and esophagitis detection. The results of the regression analysis are presented with odds ratio and 95% confidence interval. In this study, the statistical significance level was accepted as P < .05. Data analysis was performed using Statistical Package for the Social Sciences version 15.0. (SPSS, Inc, Chicago, IL, USA).

RESULTS
A total of 4083 patients (1507 men, 2576 women) were included in the study. The ages of the patients ranged from 18 to 92 (mean ± SD, 50.21 ± 15.61 years, median 51). Demographic data are shown in Table 1.

The prevalence of HH was 11.7% (n = 476) and esophagitis prevalence was 17.7% (n = 721) among all patients, and both HH and esophagitis were less detected in the deep-sedated group (P < .001). While the frequency of HH was 7.2% (n = 145) in the deep-sedated group, the frequency of HH was 16% (n = 331) in the non-deep-sedated group (P < .001). Similarly, the frequency of esophagitis was less in the deep-sedated group (13.5% and 21.7%, respectively) (P < .001). Detailed data are shown in Table 2.

While the diagnosis of HH was not found to be related to experience in the deep sedation group, on the contrary, the frequency of experienced endoscopists diagnosing esophagitis was higher in both groups (Table 3).

Table 1. Demographic Data

<table>
<thead>
<tr>
<th>Age, years</th>
<th>Total Patients (n = 4083)</th>
<th>Deep-Sedated (n = 2009)</th>
<th>Non-Deep-Sedated (n = 2074)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>50.21 ± 15.61</td>
<td>49.13 ± 15.752</td>
<td>51.26 ± 15.40</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Median</td>
<td>51 (18-92)</td>
<td>50 (18-92)</td>
<td>52 (18-90)</td>
<td></td>
</tr>
</tbody>
</table>

Sex, n (%)

<table>
<thead>
<tr>
<th></th>
<th>Total Patients (n = 4083)</th>
<th>Deep-Sedated (n = 2009)</th>
<th>Non-Deep-Sedated (n = 2074)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1507 (36.9%)</td>
<td>661 (32.9%)</td>
<td>1228 (59.2%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female</td>
<td>2576 (63.1%)</td>
<td>1348 (67.1%)</td>
<td>846 (40.8%)</td>
<td></td>
</tr>
</tbody>
</table>

Endoscopist, n (%)

<table>
<thead>
<tr>
<th></th>
<th>Total Patients (n = 4083)</th>
<th>Deep-Sedated (n = 2009)</th>
<th>Non-Deep-Sedated (n = 2074)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced</td>
<td>2009 (49.2%)</td>
<td>1000 (49.8%)</td>
<td>1009 (48.6%)</td>
<td></td>
</tr>
<tr>
<td>Inexperienced</td>
<td>2074 (50.8%)</td>
<td>1009 (50.2%)</td>
<td>1065 (51.4%)</td>
<td>.472</td>
</tr>
</tbody>
</table>

n (%): percent of column.
* Mann–Whitney U.
* Pearson chi-square.
Factors affecting the presence of HH in the regression analysis are given below. Hiatal hernia was detected more in older ages. It was 1.53 times more common in male patients. It was understood that performing endoscopy without deep sedation increased the frequency of HH detection by 2.44 times. The experienced endoscopist was found to detect 1.32 times more HH (Table 4).

Factors affecting the presence of esophagitis were evaluated by univariate and multivariate logistic regression analysis. As the age of the patients increased, the rate of esophagitis detection increased. Esophagitis was 1.72 times more in male patients. It was understood that performing endoscopy without deep sedation increases the frequency of esophagitis detection by 1.77 times. The experienced endoscopist was found to detect 1.38 times more esophagitis (Table 5).

### DISCUSSION

In our study, we demonstrated the effect of deep sedation in the correct diagnosis of HH and esophagitis. The HH was less common in the deep-sedated group (7.2% and 16%, respectively). In addition, the prevalence of HH was 11.7% among all patients. It was similar to the prevalence of HH in other countries. The lower frequency of HH in the deep-sedated group was similar to the results of Lee et al.

While the prevalence of esophagitis was 17.7% among all patients in our study, it generally reported less than 10% prevalence in Asian societies in the literature. It is known that this ratio is higher in Western countries and has increased rapidly in recent years. It may be due to the increasing obesity and dietary habits in our country resembling western-style nutrition such as fast food. The prevalence of esophagitis was found significantly lower in deep-sedated group in our study (13.5% vs. 21.7%). In contrast, there was a significant difference in the only minimal esophagitis group in a study of Lee et al. In that study, the definition of minimal change esophagitis: whitish/reddish color was used as erosion without edematous and mucosal fractures. However, minimal change esophagitis does not conform with any category according to the LA classification. Therefore, a complete consensus could not be achieved among the observers in that study. Also, endoscopic findings showing minimal changes in the author’s previous report are not associated with GERD symptoms. Perhaps, minimal change esophagitis may have occurred with gagging, coughing, and difficulty during endoscopy. Patient incompatibilities and measurement shifts may often be observed during endoscopy.

Many studies have accepted endoscopy as the gold standard diagnostic method for the diagnosis of HH. Endoscopy is the most preferred method for ease of use and access. Fornari et al emphasized that it is appropriate to accept endoscopy as the gold standard since 3 main diagnostic methods (barium x-ray, endoscopy, high-resolution manometry) are not completely correlated with each other. Sedation gives the endoscopist time for a good evaluation of the EGJ. Low-dose propofol (30 mg), which does not cause pressure changes in LES, was used in our study. It was ensured that EGJ was evaluated correctly by eliminating the negative factors caused by the patient (coughing, gagging, and lack of cooperation in breathing). Therefore, deep sedated endoscopy has become more preferred in recent years.

We realized that the effect of experience on HH and esophagitis detection had not been previously researched in the literature, so our secondary aim in the study was to reveal the effect of the experience of evaluating EGJ. Although the frequency of HH detection was high in favor of the experienced endoscopist in deep-sedated and non-deep-sedated groups, there was a statistically significant difference only in the non-deep-sedated group. Likewise, the frequency of esophagitis detection was higher in both groups in favor of the experienced endoscopist. In contrast to the hernia arm, statistical significance was found in both groups. Although there was no statistically significant deep-sedated group in terms of hernia, the effect of experience should not be ignored. The reason for the high frequency of hernia and esophagitis detection in the experienced group is that an experienced endoscopist spends sufficient time evaluating EGJ and carefully examines the structures that make up the composite.

Correct diagnosis of HH is of great importance in making treatment decisions and preventing complications. The size of HH has been shown to be significantly and independently associated with high-grade dysplasia of Barrett’s esophagus and adenocarcinoma. A study by Wu et al revealed that the risk of developing esophageal adenocarcinoma is 8 times higher in cases with HH. Thus, an accurate diagnosis of HH may prevent cancer.

There are several limitations to our study. First, this was a retrospective study from a single center. Although the data have been chosen prospectively, bias risk cannot be denied. Second, other factors affecting EGJ (proton pump inhibitor, obesity, smoking, COPD, etc.) could not be ruled out in every patient.

In conclusion, in the literature, there are negative aspects of endoscopy in HH diagnosis compared to high-resolution manometry. However,
Table 4. Evaluation of Factors Affecting Hiatal Hernia Detection with Univariate and Multivariate Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate Logistic Regression</th>
<th>Multivariate Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>P</td>
</tr>
<tr>
<td>Age</td>
<td>1.02 (1.01-1.02)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sex</td>
<td>1.53 (1.26-1.86)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deep sedation</td>
<td>2.44 (1.97-2.99)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Endoscopist</td>
<td>1.32 (1.09-1.61)</td>
<td>.004</td>
</tr>
</tbody>
</table>

* Variables with \( P < .05 \) determined by univariate logistic regression analysis were included in multivariate logistic regression analysis.

Table 5. Evaluation of Factors Affecting Esophagitis Detection with Univariate and Multivariate Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate Logistic Regression</th>
<th>Multivariate Logistic Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>P</td>
</tr>
<tr>
<td>Age</td>
<td>1.00 (1.00-1.01)</td>
<td>.001</td>
</tr>
<tr>
<td>Sex</td>
<td>1.72 (1.46-2.03)</td>
<td>.001</td>
</tr>
<tr>
<td>Deep sedation</td>
<td>1.77 (1.50-2.09)</td>
<td>.001</td>
</tr>
<tr>
<td>Endoscopist</td>
<td>1.38 (1.17-1.62)</td>
<td>.001</td>
</tr>
</tbody>
</table>

* Variables with \( P < .05 \) determined by univariate logistic regression analysis were included in multivariate logistic regression analysis.

these negative aspects are due to the fact that EGD is performed without sedation. In this regard, we demonstrated in our study that the diagnosis of HH and esophagitis was detected with higher accuracy and significantly reduced missdiagnosis in endoscopy with sedation, and the importance of experience in the detection of HH and esophagitis. Further studies are needed to illuminate this issue.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gazi University (Date: December 12, 2018, Decision No: E.164452).

Peer-review: Externally peer-reviewed.


Declaration of Interests: The authors declare that they have no conflict of interest.

Funding: The authors declared that this study has received no financial support.

REFERENCES
12. Watanabe T, Urita Y, Sugimoto M, Miki K. Gastroesophageal reflux disease symptoms are more common in general practice in Japan. World J Gastroenterol. 2007;13(31):4219-4223. [CrossRef]