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## Endoscopic findings in patients with gastroesophageal reflux disease referred to antireflux laparoscopic surgery

Andrei Scureac, \*Serghei Cumpata, Evghenii Gutu

Department of General Surgery and Semiology

Nicolae Testemitanu State University of Medicine and Pharmacy, Chisinau, the Republic of Moldova

Authors' ORCID iDs, academic degrees, and contributions are available at the end of the article

\*Corresponding author – Serghei Cumpata, e-mail: [serghei.cumpata@usmf.md](mailto:serghei.cumpata@usmf.md)

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### Abstract

**Background:** Gastroesophageal reflux disease (GERD) is nowadays a highly prevalent, chronic condition, with 10% to 30% of Western populations affected by weekly symptoms. The patient who does not respond to the empiric antisecretory treatment, with alarming symptoms, or referred to surgery should undergo an esophagogastroduodenoscopy (EGD).

**Material and methods:** This was a retrospective and descriptive study of patients with GERD admitted for antireflux laparoscopic surgery from 2012 to 2019. All endoscopic data were analyzed with the following variables: age, gender, reflux esophagitis and its severity, esophageal ulcers and strictures, Shatzky's ring, Barrett's esophagus (BE), incompetence of the esogastric junction; hiatal hernia.

**Results:** A total of 152 patients were included in the study. The age of the patients ranged from 19 to 76 years, averaging 52 years. Among them, 97 (63.8%) were women and 55 (35.38%) men. A wide variety of endoscopic features has been found: non-erosive GERD (6.57%); reflux esophagitis (Savary-Miller) – I (21.05%), II (44.07%), III (23.68%); esophageal ulcer (1.31%), BE (1.97%). The majority of patients present axial hiatal hernia (92.76%) corresponding to Hill grade IV incompetence of the flap valve. Hill grade III was present in 4.6% of cases, grade II – 2.63%.

**Conclusions:** The patients with GERD may have a wide range of endoscopic features (from normal to esophagitis, hiatal hernia, strictures and EB). Considering the multitude of data provided by endoscopic examination in patients with GERD, it can be certainly stated that EGD is one of the most important investigations in these patients, and is mandatory in those selected for surgical treatment.

**Key words:** gastroesophageal reflux disease, endoscopic findings.

### Cite this article

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### Introduction

Gastroesophageal reflux disease (GERD) is one of the most common gastrointestinal diseases of the western world, with increasing morbidity and treatment costs over the last two decades [1, 2]. In a systematic review, El Serag et al. estimated the prevalence of GERD to be 18.1–27.8% in North America, 8.8–25.9% in Europe, and 2.5–7.8% in East Asia. However, because of the common use of over-the-counter GERD drugs, the true incidence of the disease is probably underestimated [3].

The economic impact of GERD is significant with direct costs of almost \$ 10 billion, and indirect costs related to declining productivity – \$75 billion [1]. Its impact on quality of life is no less devastating, especially in the case of untreated, refractory, or complicated gastroesophageal reflux (erosive esophagitis, esophageal stricture, aspiration, asthma, Barrett's esophagus, esophageal adenocarcinoma).

The standard therapy for GERD is conservative, which includes the use of proton pump inhibitors (PPIs) and H<sub>2</sub>-blockers, antacids/alginate, prokinetics, etc. [4]. However,

their frequent failure, the recent highlighting of side effects, and the high costs associated with long-term PPI therapy have led to the increasing role of surgical treatment [5]. Surgical treatment of GERD is effective and long-lasting, being the only one capable of restoring the esogastric barrier (anti-reflux anatomical-physiological mechanisms). At the same time, the application of the laparoscopic method in anti-reflux surgery has led to a decrease in perioperative morbidity, length of hospital stay, and costs compared to open interventions [6].

GERD is diagnosed in routine clinical practice based on typical clinical symptoms and treated empirically with a proton pump inhibitor (PPI) trial unless a patient has alarming symptoms, which include dysphagia, anemia, weight loss, hematemesis, and odynophagia [7-8]. The patient who does not respond to the empiric PPI trial or those with alarming symptoms should undergo an esophagogastroduodenoscopy (EGD) to evaluate for complications like Barrett's esophagus (BE), esophagitis, peptic esophageal ulcer, or esophageal cancer [9]. Some of the complications, like squamous cell dysplasia, Barrett's esophagus with dysplasia, and

early adenocarcinoma, can be missed with regular EGD due to subtle changes in the mucosa [10]. Advanced diagnostic endoscopic techniques like high-resolution, high-magnification endoscopy, confocal laser endo-microscopy, wireless capsule endoscopy, autofluorescence imaging, narrow-band imaging, and chromoendoscopy have been developed to improve the accuracy of the endoscopic diagnosis.

EGD is one of the mandatory investigations that need to be performed in patients with GERD expected for laparoscopic fundoplication (LF). Commonly, the endoscopic examination is performed for the diagnosis and management of GERD, with typical reflux symptoms (24%) and dysphagia (20%) being the commonest indications [11]. The indications for endoscopy in GERD, proposed by the American Society for Gastrointestinal Endoscopy [12] and finally, established at the Lyon GERD consensus meeting in November 2017 [9], are following:

- Persistent or progressive GERD symptoms despite appropriate medical therapy;
- Atypical GERD symptoms;
- Evaluation of patients with suspected extraesophageal manifestations of GERD;
- Alarm symptoms;
- Dysphagia or odynophagia;
- Involuntary weight loss, evidence of gastrointestinal bleeding, or anemia;
- Finding of a mass, stricture, or ulcer on imaging studies;
- Screening for BE in selected patients (as clinically indicated);
- Evaluation of patients before and with recurrent symptoms after endoscopic or surgical antireflux procedures.

In this context, the present study had the purpose of describing and analyzing the endoscopic features of the patients with GERD referred to LF.

### Material and methods

This was a retrospective and descriptive study of 152 patients with GERD admitted for LF to *Gheorghe Paladi* Municipal Hospital, *Nicolae Testemitanu* State University of Medicine and Pharmacy, Chisinau, the Republic of Moldova, 2012-2019.

The preoperative endoscopic examination was performed on an outpatient basis, in different medical institutions, by different specialists. At the same time, in most cases, the preoperative endoscopy was repeated in the institution. Upper digestive endoscopy was performed according to the standard method, with a Pentax 2790K video endoscope (Pentax, Japan), with typical anesthesia (10% lidocaine spray), without sedation. The investigation was performed in the morning, after 6-8 hours of hunger (on an empty stomach). The esophagus was carefully evaluated and all endoscopic images were recorded and stored in a computer database. All patients had been receiving PPIs at standard doses for at least 1 month at the time of endos-

copy. However, the other medications of patients could not be noted because of the study's retrospective design.

Data on preoperative endoscopic examination of patients were evaluated, and the following variables were analyzed: the presence and severity of reflux esophagitis, esophageal ulcer, Barrett's esophagus, Shatzky's ring, esophageal strictures; appreciation of the degree (Hill classification) of the incompetence of the esogastric junction; assessment of the presence of hiatal hernia with its type, size and degree.

The descriptive analysis was performed according to the nature of the variables: continuous variables were expressed as means and medians with standard deviation, while categorical variables were summarized as frequencies and percentages.

### Results and discussion

One hundred fifty-two patients, who presented to our clinic with typical and atypical reflux symptoms, selected for LF and underwent EGD, were included in the study. The age of the patients ranged from 19 to 76 years, averaging 52 years. There were 39 (25.65%) patients over the age of 60 years. Of the 152 patients included in the study, 97 (63.8%) were women and 55 (35.38%) men. Women were the majority in all age groups after the age of 30, with a maximum female/male ratio (2.75/1) in the 61-70 age groups.

Impairment of esophageal clearance functions prolongs the reflux contact with the esophageal mucosa, thus increasing the degree of injury, which can be documented during endoscopy. Therefore, patients with GERD may have a wide range of endoscopic manifestations (from normal to esophagitis and EB). All endoscopic manifestations in patients with GERD in this study are shown in table 1.

The presence of mucosal damage and positive endoscopic findings are not a prerequisite for the diagnosis of GERD. GERD can accurately be diagnosed by history of classical symptoms of heartburn and/or regurgitation and a positive response to antisecretory therapy [13]. Almost 2/3 of patients with GERD have a non-erosive disease and a normal endoscopy [1]. In this study, the rate of patients with non-erosive GERD is much lower – 6.57%. This is explained by the fact that these patients respond quite well to PPI therapy, rarely develop complications of GERD, and thus less often require laparoscopic anti-reflux surgery.

Most patients undergoing LF showed endoscopic data of erosive esophagitis in the distal esophageal mucosa (fig. 1). The severity of esophagitis was assessed according to the modified Savary-Miller classification (1988) [14-15], commonly used in Europe:

**Grade I** – Single or isolated erosive lesion(s) affecting only one longitudinal fold;

**Grade II** – Multiple erosive lesions, noncircumferential, affecting more than one longitudinal fold, with or without confluence;

**Grade III** – Circumferential erosive lesions;

**Grade IV** – Chronic lesions: ulcer(s), stricture(s) and/or short esophagus. Alone or associated with lesions of grades I-III;

**Grade V** – Columnar epithelium (Barret’s esophagus) in continuity with the Z line, noncircular, star-shaped, or circumferential. Alone or associated with lesions of grades I-IV.

The presence of esophagitis is 90–95% specific but not sensitive for the diagnosis of GERD [16]. In the given study, 2/3 of patients presented a severe degree of esophagitis (II-III), refractory to medical treatment that served as an indication for LF. In 4 cases (2.63%), esophagitis was accompanied by the presence of the Shatzky ring (fig. 2), but without stricture of the esophagus.

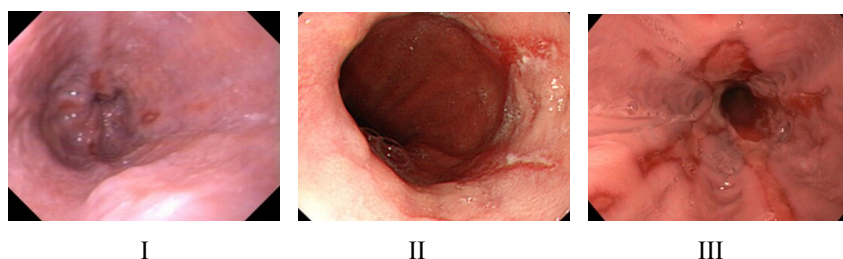
It is important to note that in all descibed cases the healing of erosive esophagitis occurs 6 weeks postoperatively after LF. More severe complications of GERD referred to Savary-Miller grade IV-V, such as esophageal peptic ulcers and BE were rarer endoscopic manifestations, constituting only 3.28% – 5 cases (fig. 2). Both cases of peptic esophageal ulcer were associated with upper gastrointestinal bleeding and required endoscopic hemostasis. Following the fundoplication, the absence of symptoms and the healing of ulcers were found.

BE is a metaplastic change of the esophageal lining from the normal squamous to specialized columnar epithelium caused by chronic acid damage. Approximately 10% of patients with chronic heartburn symptoms have BE [11]. In all 3 cases of BE from this study, it was a non-dysplastic form of columnar metaplasia, associated clinically with typical GERD symptoms. According to literature data, most (90%) patients with BE have a nondysplastic disease and a very low rate of progression to esophageal adenocarcinoma at a rate of 0.3 to 0.4 per patient-year [17]. The role of LF in

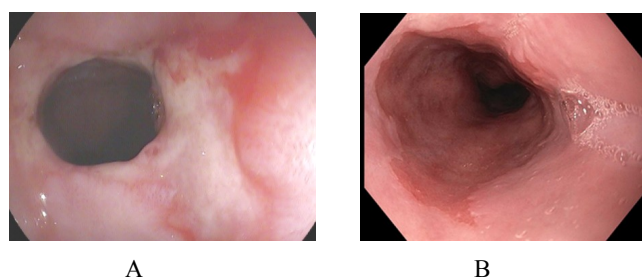
patients with BE remains uncertain at this time. However, numerous studies reported excellent results in patients with GERD and BE, with 95% of subjects reporting persistent symptomatic improvement after LF [18].

**Table 1. Endoscopic findings of patients with GERD referred to LF**

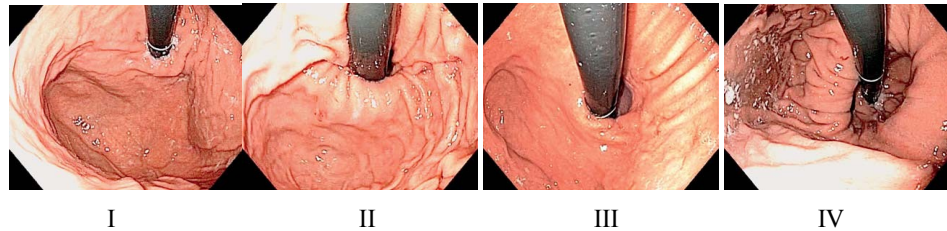
Endoscopic manifestations	Number of cases
Non-erosive GERD	6.57% (10)
Reflux esophagitis (modified Savary-Miller)	90.78% (138)
I	21.05% (32)
II	44.07% (67 – 2 with Shatzky ring)
III	23.68% (36 – 2 with Shatzky ring)
IV (complicated – strictures, ulcers), peptic esophageal ulcer	1.31% (2)
V – Barret’s esophagus	1.97% (3)
Incompetence of esogastric junction (Hill classification)	
Hill Grade I	0
Hill Grade II	2.63% (4)
Hill Grade III	4.60 (7)
Hill Grade IV (hiatal hernia)	92.76% (141)
Hiatal hernia	
Absent	7.23% (11)
< 2cm	24.34% (37)
2-5cm	60.52 % (92)
>5cm	7.89 % (12)



**Fig. 1. Severity of erosive esophagitis (Savary-Miller)**



**Fig. 2. A – Esophageal peptic ulcer; B – Barret's esophagus**



**Fig. 3. Hill classification**

Another important endoscopic aspect is the appreciation of the competence of esogastric junction (flap valve), according to Hill's classification [19] (fig. 3):

Grade I: a prominent fold of tissue along the lesser curvature next to the endoscope.

Grade II: the fold is less prominent and there are periods of opening and rapid closing around the endoscope.

Grade III: the fold is not prominent and the endoscope is not tightly gripped by the tissue.

Grade IV: there is no fold, and the lumen of the esophagus is open, often allowing the squamous epithelium to be viewed from below. An axial hiatal hernia is always present.

Studies have shown an association between higher Hill grades and the frequency of GERD [20, 21]. Higher Hill grades are also associated with lower LES pressure [20], increased prevalence of hiatal hernia [20], and can predict poor response to proton pump inhibitor treatment [22]. The Hill classification has been proven to be reproducible and provides useful information when evaluating patients with suspected GERD who are undergoing endoscopy [20].

In the same context, EGD allows to assess the presence of hiatal hernia, its type and size. Lord and coauthor. demonstrated not only that the severity of GERD correlates with the functional and anatomical qualities of the gastroesophageal barrier against reflux, with the presence of HH and that a defective SEI is significantly more common in patients with erosive esophagitis or BE [23]. At the same time, LF which resolves the hernia and increases the pressure of the SEI, offers good or excellent results in the same way, regardless of the presence of inflammatory lesions of the mucosa and the severity of GERD [23].

The high rate of Hill grade IV (92.76%) – axial hiatal hernia, followed by Hill grade III (4.6%) – incompetent flap valve, is explained by the necessity of LF to patients with more pronounced impairment of the competence of the esogastric junction (flap valve), the surgery being the only one capable of restoring the eso-gastric barrier (anti-reflux anatomical-physiological mechanisms).

For subsequent laparoscopic antireflux surgery, it is of major importance to assess during EGD the type of hiatal hernia (axial, paraesophageal, mixed), its size, correlation with adjacent anatomical structures (fixed/free), suspicion of a short esophagus (congenital/acquired). These data have a primary role both in the diagnostic plan and in the assessment of some operative peculiarities, such as difficulties in mobilizing the herniated stomach in the

mediastinum, the use of synthetic mesh to reinforce crura, the need for a Collis gastroplasty, etc.

It should be noted that EGD is irreplaceable in the post-operative assessment of the neo-valve (Nissen, Toupet). All patients in the present study were examined endoscopically at 4-6 weeks postoperatively, a regaining competence of the esogastric junction being confirmed (similar to Hill grade I).

### Conclusions

The patients with GERD may have a wide range of endoscopic features (from normal to esophagitis, hiatal hernia and EB). Considering the multitude of data provided by endoscopic examination in patients with GERD, it can be certainly stated that EGD is one of the most important investigations in these patients, and is mandatory in those selected for surgical treatment.

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#### Authors' ORCID iDs and academic degrees

Andrei Scureac, MD, PhD Student, Assistant Professor – <https://orcid.org/0000-0002-6904-9326>

Serghei Cumpata, MD, PhD Student, Assistant Professor – <https://orcid.org/0000-0003-3472-6152>

Evghenii Gutu, MD, PhD, Professor – <https://orcid.org/0000-0003-4590-4735>

#### Authors' contributions

AS was responsible for performing of EGD and recording of the endoscopic images; SC interpreted the data and performed the analytical part of the work, drafted the first manuscript; EG conceptualized the project, designed the research and revised the manuscript critically.

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#### Ethics approval and consent to participate

The research project was approved by the Research Ethics Committee of *Nicolae Testemitanu* State University of Medicine and Pharmacy (Protocol No 84, 20.06.2017).

#### Conflict of Interests

No competing interests were disclosed.

