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# Introductory Chapter: Gastroesophageal Reflux Disease

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## 1. Introduction

Gastroesophageal reflux disease (GERD) occurs frequently in developed countries. The number of cases, in fact, is increasing in the Middle East countries. In western countries, its occurrence ranges from 10 to 20% of the population who may present with typical or atypical symptoms or with complications. Although GERD was described by Asher Winkelstein, an American gastroenterologist, in 1935, it had appeared among patients earlier than that time. Nowadays, cases of GERD are common among obese individuals, patients with gallbladder disease, and those individuals under stress. It has also become a common clinical problem that commonly affects young adults, both male and female, of 40 years old.

## 2. History of GERD

1855—Bowditch Rokitansky reported that esophagitis was due to gastroesophageal reflux. Allison and Barrett found the association between hiatus hernia and gastroesophageal reflux.

1828—Charles Millard in Paris noticed the first case of esophagitis in child.

1879—Heinrich Quincke reported that ulceration in the esophagus was due to gastroesophageal reflux.

1906—Tilston described the typical symptoms of esophagitis.

1920—Joseph Sheehan described the endoscopic findings of esophagitis.

1921—Porter Vinson noted the association between stricture and esophagitis.

1934—Hampel introduced the term peptic esophagitis.

1956—Rudolf Nissen performed a successful fundoplication for patient, who suffered from GERD, with hiatus hernia. Patient was cured from the complaint.

## 3. Anatomy and Physiology

At the lower end of the esophagus is a sphincter which is formed by a change in the muscles of the esophagus. This sphincter controls the flow of esophageal contents to the stomach. Different factors related to the anatomy and physiology of the sphincter prevent the reflux of gastric contents into the esophagus. Among these factors include the following:

1. High pressure zone: Pressure at the lower esophageal sphincter area is high than stomach pressure (gastric pressure is +4 to +6, at the lower esophageal sphincter is +24 mmgh, and in the thoracic esophagus is -6). Because of the high

pressure at the sphincter, reflux is prevented. There are specific factors which will increase the tone of the sphincter, as well as factors like taking fatty meals, chocolate, smoking, and oral contraceptives that will reduce the tone of the sphincter.

2. The length of the lower esophageal sphincter is 3 cm which is divided into abdominal part and thoracic part. If the abdominal part is less than 2 cm, patient will get reflux. Other factors like change of mucosa, the muscular coat of the stomach which will have oblique muscles in addition to the other two types of circular and longitudinal, crural effect and angulation of the esophagus to the stomach which is called Angle of His are not important in the prevention of the gastroesophageal reflux.
3. Other factors that increase the effect of acid on the esophagus. Among these factors include the delayed gastric emptying. The increasing amount of the food in the stomach will lead to absorption of the sphincter and will increase the reflux. Reduced mucus and reduced saliva will lead to reduced bicarbonate which will reduce the effect of the acid refluxate.

#### **4. Clinical presentation of gastroesophageal reflux disease**

GERD appears with typical symptoms or rarely by atypical symptoms, which resemble cardiac symptoms and have been called cardiac symptoms.

##### **4.1 Typical symptoms**

Typical symptoms which appear among 70% of patients include the following:

1. Retrosternal pain (i.e., heart burn): It is the most common symptom which will be more manifested when patient is lying down or after meal and is seen among 80% of patients.
2. Regurgitation: It is a symptom observed when gastric or esophageal content comes in the mouth effortlessly. Regurgitation of gastric content will reach tracheobronchial tree and will induce hoarseness of voice which is usually experienced in the morning. This hoarseness could be due to reflux of gastric content into the larynx or due to vagal irritation and will induce reflex spasm of the vocal cords. This symptom is seen among 50% of patients [1–6].
3. Dysphagia: This is observed among 20% of patients with gastroesophageal reflux disease.

Some rare presenting complaints, with rate of occurrence among patients, are as follows:

1. Abdominal pain: 30%
2. Belching: 30%
3. Coughing: 20%
4. Wheezing: 10%

## 4.2 Atypical symptoms

Atypical symptoms are those where the patient will present with symptoms not related to gastrointestinal system: coughing, wheezing, recurrent pharyngitis, laryngitis, and chest pain. Its acute onset may resemble acute myocardial infarction.

**Patient may present with complicated gastroesophageal reflux disease—**some symptoms include the following: stricture, Barrett esophagus, lung damage in the form of pneumonia, and lung fibrosis if condition goes chronic.

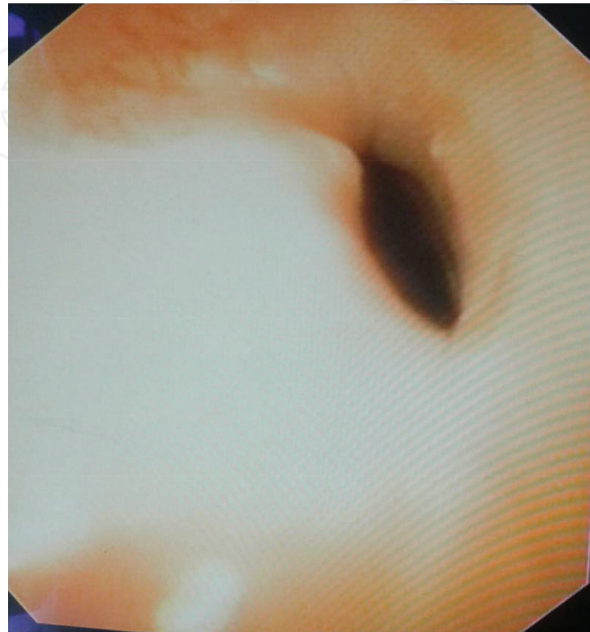
## 5. Investigations

1. **Upper gastrointestinal endoscopy:** Upper gastrointestinal endoscopy is very important to exclude other serious disease which may mimic reflux, like tumors [7]. Upper gastrointestinal endoscopy can confirm hiatus hernia (**Figure 1**). Esophagitis will be experienced by 50% of patients with GERD. It can also diagnose Barrett esophagus and esophageal peptic stricture (**Figure 2**).
2. **Contrast barium study:** It is applied to detect hiatal hernia and esophageal stricture [8]. Barium contrast study can show hiatus hernia which can be small or large sac (**Figures 3–5**).
3. **PH monitoring:** 24 pH monitoring is very important in atypical presentation of gastroesophageal reflux disease [9, 10]. It can confirm or exclude the disease, with a diagnostic rate of 70–90%. It is not indicated in patients with esophagitis.



**Figure 1.**  
*The use of upper gastrointestinal endoscopy showing hiatus hernia in patient with GERD.*

**4. Gastroesophageal scintigraphy:** Where drink like orange juice or milk is labeled with technetium and is used to study reflux, this test is rarely used for diagnosis of GERD. It is used in small children where we can study the reflexate to the lung, and the test is easy in small babies in comparison to other invasive tests. Gastroesophageal scintigraphy is used for patient who presents with atypical reflux symptoms like recurrent upper respiratory symptoms.



**Figure 2.**  
*The use of upper gastrointestinal endoscopy showing peptic stricture.*



**Figure 3.**  
*Barium meal showing hiatus hernia.*



**Figure 4.**  
*Barium meal showing child hiatus hernia.*



**Figure 5.**  
*Hiatus hernia with esophageal spasm.*

**5. Multichannel impedance pH monitoring:** It is a gold standard technique for diagnosis of GERD; it is more superior and more sensitive in diagnosing GERD than usual pH monitoring.

6. **Manometry:** It is a very important investigation to exclude motility disorders like achalasia and is indicated in patient who presents with atypical symptoms of gastroesophageal reflux disease. High-resolution manometry is more sensitive and superior than ordinary manometry in diagnosing esophageal motility disorders.

## 6. Treatment

Reasons for treating GERD:

1. Heart burn is a troubling symptom and affects patient life.
2. Complications of GERD may cause esophagitis which will result to bleeding. Predisposition to Barrett esophagus that may turn to malignancy is 40–60 times seen in patient with reflux esophagitis-induced Barrett [11–13].

### 6.1 Nonsurgical treatment of gastroesophageal reflux disease

#### 1. Change of lifestyle

- a. Avoid having late meals, heavy meals, spicy or fatty meals, drinking alcohol, and smoking.
- b. Reduce weight; avoid tight clothes around the waist.
- c. Avoid drugs which reduce the tone of sphincter.

#### 2. Medical

Medical treatment where drugs are used to neutralize the effect of the reflux on esophageal mucosa:

- a. **Antacids:** Drugs that will neutralize the acid effect include the following—calcium, aluminum, and magnesium compounds. These are best taken after meals. Their effect is brief; and once they get emptied from the stomach, the symptoms may come back. These need to be given on an hour base to neutralize the acid effect.
- b. **Histamine antagonists:** There are receptors on the acid-producing cells which are stimulated by histamine to produce acid. These receptors are blocked by histamine-blocking drugs which act on H<sub>2</sub> receptors. These drugs are best taken before meals. These include cimetidine which can be given 400–800 mg daily, ranitidine given 150 mg twice daily, and famotidine given 20–40 mg twice daily.
- c. **Proton-pump inhibitors:** These include omeprazole, esomeprazole, lansoprazole, pantoprazole, and rabeprazole. Their dosages range from 20 to 40 mg daily. PPI will cure the esophagitis up to 90%; 80% will recur within 1 year if treatment is stopped [14–17].

## 7. Surgery

Indication of surgery:

1. Failure of medical treatment.
2. Development of complications of the drugs.
3. Association with large hiatal hernia.
4. Atypical presentation with positive 24 h pH records.
5. Patients do not like to take drug for long life to control the symptoms.

### 7.1 Surgery for GERD

It can be done by lengthening the lower esophageal sphincter to create valve-like action to prevent refluxing of gastric contents in the esophagus. Procedure is done by wrapping the stomach around the lower esophagus [18–20], either full wrap of 360° (which is named after Nissen) or partial wrap of 270°, either done posteriorly or anteriorly.

Fundoplication was previously performed by open surgery. Nowadays, most operations are done laparoscopically (**Figures 6** and **7**), with excellent outcome on short-term and long-term follow-ups.

Patient will stop taking the drugs. All patients should be seen by gastroenterologist, ENT specialist, and surgeons before surgery, especially for those patients who come with atypical symptoms of GERD.

For many years, open surgery has been used for hiatus hernia but was rarely applied for GERD without hernia. Many operations can be done, either abdominal approach or thoracic approach. The common operation is the Nissen fundoplication which has been used since 1950, with a success rate of 80–90%. Its complication rate ranges from 10 to 15% and includes difficulty in swallowing and flatulence which may go for some time than ease off.

### 7.2 Endoluminal surgery (NOTES)

It is also called incisionless surgery. Endoscopic treatment of GERD is still under investigation:

1. Natural orifices transendoscopic surgery [21–25]
2. Endoscopic augmentation of lower esophageal sphincter, either by radio frequency application or injection of ethylene vinyl alcohol in the region of the lower esophageal sphincter [26–30].

### 7.3 Esophageal magnet ring

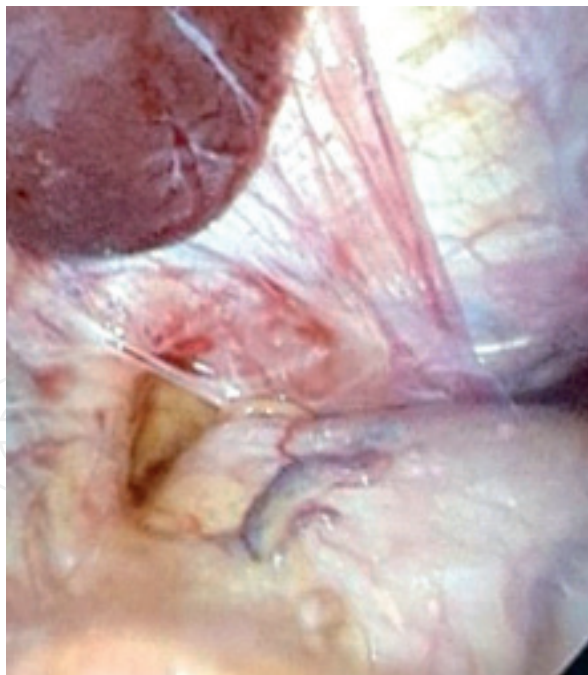
It is a new technique where there is no need to make wrapping around the lower esophagus by the stomach. This is a magnet ring fixed around the lower esophagus [31, 32]. It is not widely used and still under trial where magnet ring is fixed laparoscopically around the esophageal sphincter. It moves out once food comes in, and it comes back when the food enters the stomach. It has benefit



over Nissen fundoplication. The patient can belch, vomit, and have no gas bloat syndrome, and it is reversible. The technique, however, is still under long-term trials.



**Figure 6.**  
*Laparoscopic view of big hiatus hernia in patient presented with GERD.*



**Figure 7.**  
*Laparoscopic view of hiatus hernia in patient came with GERD symptoms.*

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## References

- [1] Gao Y et al. A study of esophageal function and reflux characteristics of gastroesophageal reflux disease in patients presenting with chronic cough. *Zhonghua Nei Ke Za Zhi*. 2011;**50**(11):931-934
- [2] Gyawali CP, Fass R. Management of gastroesophageal reflux disease. *Gastroenterology*. 2018;**154**(2):302-318
- [3] Broers C, Tack J, Pauwels A. Review article: Gastro-oesophageal reflux disease in asthma and chronic obstructive pulmonary disease. *Alimentary Pharmacology & Therapeutics*. 2018;**47**(2):176-191
- [4] Bor S et al. Prevalence of gastroesophageal reflux disease in patients with asthma and chronic obstructive pulmonary disease. *Journal of Gastroenterology and Hepatology*. 2010;**25**(2):309-313
- [5] Iliaz S et al. Does gastroesophageal reflux increase chronic obstructive pulmonary disease exacerbations? *Respiratory Medicine*. 2016;**115**:20-25
- [6] Chen Y, Xiong L, Zeng J, Wei YG, Tan Y. Gastroesophageal reflux disease is associated with high risk of obstructive sleep apnea syndrome. *Zhonghua Nei Ke Za Zhi*. 2018;**57**(11):824-829
- [7] Gyawali CP, Kahrilas PJ, Savarino E, Zerbib F, Mion F, Smout A, et al. Modern diagnosis of GERD: the Lyon Consensus. *Gut*. 2018;**67**(7):1351-1362
- [8] Khatami A et al. A comparison between gastroesophageal ultrasonography vs. barium swallow in determining the pattern of gastroesophageal reflux in a pediatric population. *Medical Ultrasonography*. 2015;**17**(1):22-27
- [9] Vardar R, Keskin M. Indications of 24-h esophageal pH monitoring, capsule pH monitoring, combined pH monitoring with multichannel impedance, esophageal manometry, radiology and scintigraphy in gastroesophageal reflux disease? *The Turkish Journal of Gastroenterology*. 2017;**28**(Suppl. 1):S16-S21
- [10] Gokturk S et al. Gastroesophageal reflux in asymptomatic patients with diabetes: An impedance study diabetes, obesity and gastroesophageal reflux. *Experimental and Clinical Endocrinology & Diabetes*. 2018;**2018**:22
- [11] Wetscher GJ, Gadenstaetter M, Klingler PJ, Weiss H, Obrist P, Wykypiel H, et al. Efficacy of medical therapy and antireflux surgery to prevent Barrett's metaplasia in patients with gastroesophageal reflux disease. *Annals of Surgery*. 2001;**234**(5):627-632
- [12] Corey KE, Schmitz SM, Shaheen NJ. Does a surgical antireflux procedure decrease the incidence of esophageal adenocarcinoma in Barrett's esophagus? A meta-analysis. *The American Journal of Gastroenterology*. 2003;**98**(11):2390-2394
- [13] Lord RV. Does antireflux surgery prevent progression of Barrett's esophagus? *Minerva Chirurgica*. 2011;**66**(1):1-6
- [14] Saifullah AM, Ahmed F, Shil BC, Banik RK, Saha SK, Chowdhury M, et al. Comparative study of Alginate and Omeprazole in symptomatic treatment of non-erosive gastroesophageal reflux disease. *Mymensingh Medical Journal*. 2018;**27**(4):771-775
- [15] Higuera-de-la-Tijera F. Efficacy of omeprazole/sodium bicarbonate treatment in gastroesophageal reflux disease: A systematic review. *Medwave*. 2018;**18**(2):e7179
- [16] Freston JW. Therapeutic choices in reflux disease: Defining the criteria

for selecting a proton pump inhibitor. *The American Journal of Medicine*. 2004;**117**(Suppl. 5A):14s-22s

[17] Azzam RS. Are the persistent symptoms to proton pump inhibitor therapy due to refractory gastroesophageal reflux disease or to other disorder? *Arquivos de Gastroenterologia*. Nov 2018;**55**(Suppl 1):85-91

[18] Pappas PK, Keenan RJ, Yeane WW, Caushaj PF, Gagne DJ, Landreneau RJ. Effectiveness of laparoscopic fundoplication in relieving the symptoms of gastroesophageal reflux disease (GERD) and eliminating antireflux medical therapy. *Surgical Endoscopy*. 2003;**17**(8):1200-1205

[19] Wetscher GJ, Glaser K, Gadenstaetter M, Profanter C, Hinder RA. The effect of medical therapy and antireflux surgery on dysphagia in patients with gastroesophageal reflux disease without esophageal stricture. *American Journal of Surgery*. 1999;**177**(3):189-192

[20] Shaw JM, Bornman PC, Callanan MD, Beckingham IJ, Metz DC. Long-term outcome of laparoscopic Nissen and laparoscopic Toupet fundoplication for gastroesophageal reflux disease: A prospective, randomized trial. *Surgical Endoscopy*. 2010;**24**(4):924-932

[21] Mayor MA, Fernando HC. Endoluminal approaches to gastroesophageal reflux disease. *Thoracic Surgery Clinics*. 2018;**28**(4):527-532

[22] Cadiere GB, Buset M, Muls V, Rajan A, Rosch T, Eckardt AJ, et al. Antireflux transoral incisionless fundoplication using Esophy X: 12-month results of a prospective multicenter study. *World Journal of Surgery*. 2008;**32**(8):1676-1688

[23] Testoni PA, Testoni S, Mazzoleni G, Vailati C, Passaretti S. Long-term efficacy of transoral incisionless

fundoplication with Esophyx (Tif 2.0) and factors affecting outcomes in GERD patients followed for up to 6 years: A prospective single-center study. *Surgical Endoscopy*. 2015;**29**(9):2770-2780

[24] Huang X, Chen S, Zhao H, Zeng X, Lian J, Tseng Y, et al. Efficacy of transoral incisionless fundoplication (TIF) for the treatment of GERD: A systematic review with meta-analysis. *Surgical Endoscopy*. 2017;**31**(3):1032-1044

[25] Richter JE, Kumar A, Lipka S, Miladinovic B, Velanovich V. Efficacy of laparoscopic Nissen fundoplication vs transoral incisionless fundoplication or proton pump inhibitors in patients with gastroesophageal reflux disease: A systematic review and network meta-analysis. *Gastroenterology*. 2018;**154**(5):1298.e7-1308.e7

[26] De Moura EGH et al. Endoscopic polymer injection and endoluminal plication in treatment of gastroesophageal reflux disease: Evaluation of long-term results. *Endoscopy International Open*. 2018;**6**(5):E630-E636

[27] Kinoshita Y et al. Gastroesophageal reflux after endoscopic injection sclerotherapy. *The American Journal of Gastroenterology*. 1992;**87**(3):282-286

[28] Deviere J et al. Endoscopic implantation of a biopolymer in the lower esophageal sphincter for gastroesophageal reflux: A pilot study. *Gastrointestinal Endoscopy*. 2002;**55**(3):335-341

[29] Deviere J et al. Nonresorbable copolymer implantation for gastroesophageal reflux disease: A randomized sham-controlled multicenter trial. *Gastroenterology*. 2005;**128**(3):532-540

[30] Yeh RW, Triadafilopoulos G. Endoscopic antireflux therapy: The Stretta

procedure. *Thoracic Surgery Clinics*.  
2005;**15**(3):395-403

[31] Skubleny D, Switzer NJ, Dang J, Gill RS, Shi X, de Gara C, et al. LINX® magnetic esophageal sphincter augmentation versus Nissen fundoplication for gastroesophageal reflux disease: A systematic review and meta-analysis. *Surgical Endoscopy*. 2017;**31**(8):3078-3084

[32] Aiolfi A, Asti E, Bernardi D, Bonitta G, Rausa E, Siboni S, et al. Early results of magnetic sphincter augmentation versus fundoplication for gastroesophageal reflux disease: Systematic review and meta-analysis. *International Journal of Surgery*. 2018;**52**:82-88

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