A review of anatomy of lower end of esophagus

V Anitha, 1Antoine Berty A
1Associate Professor of Anatomy & 2Assistant Professor of Surgery,
Kanyakumari Government Medical College, Aasarpallam, Nagercoil, Tamil Nadu

Abstract
The lower end of esophagus of 60 patients (40 males and 20 females) was viewed during the endoscopic examination of gastro intestinal tract (GIT) by using a gastroscope. The relationship between hiatus hernia and gastroesophageal reflex disease (GERD) remains controversial. In hiatus hernia, lower esophageal sphincter (LES) is displaced from the crural diaphragm into the chest, which reduces basal LES pressure and results in GERD. Sliding hiatal hernia in which the cardiac end of stomach, herniates through the hiatus is most common. The endoscopic examination depends upon the reliable anatomical landmarks that can be utilized in all patients to document the location of oesophageogastric junction (OGJ). The criteria for locating the OGJ must be reliable for making a reasonably practical decision during the endoscopy that will serve to enhance the proper diagnosis both by direct inspection and biopsy sampling.

Key Words: lax LES, lax hiatus, hiatus hernia, GERD, gastroscope

Introduction
Where the esophagus ends and the stomach begin has been a bone of contention for decades between the histologists, physiologists, gastroenterologists, radiologists and surgeons. The esophageo-gastric junction is an important anatomical region because of its essential functions in relation to swallowing and as a structural defect, inflammation, metaplasia and neoplasia.

Various factors contribute towards guarding against the reflux of gastric contents
a) Contraction of Right crus fibres
b) Angle of entry of esophagus into stomach
c) Longitudinal folds of esophageal mucosa
d) A high pressure zone in the lower three cm of esophagus1.

The esophagus in the average adult is about 25 cm long. It passes through the diaphragmatic hiatus at approximately 38 cm from the incisor teeth and joins the stomach at about 40 cm level. The lower esophageal sphincter (LES) consists of two components,
- The intrinsic segment
- The crural segment

There is undoubtably a functional intrinsic sphincter like mechanism at the cardia although it cannot be demonstrated anatomically. This is expressed as a zone of high intra luminal pressure which prevents regurgitation from stomach2.

At the point of closure of the proximal end of the sphincter there may be several mucosal folds that disappear into the center of the closed lumen.

The closure of the more distal or crural segment of the oesophageogastric junction (OGJ) results primarily from extrinsic pressure produced by compression from the diaphragmatic crus at the hiatus as well as the surrounding structures3.

The esophageal aperture of the diaphragm is an elliptical opening bounded by muscle fibers that originates in the medial part of right crus and cross the midline4. There is no direct continuity between the esophageal muscle wall and the muscles around the esophageal opening.

The crura are tendinous at their origin, where they blend with the anterior longitudinal ligament of the vertebral column.

The right crus typically forms the right and left sides of the esophageal hiatus, sending a well developed bundle of muscle fibers towards the left, between the aortic and esophageal hiatus5.

The fascia on the inferior surface of the diaphragm is rich in elastic fibers and extends upwards into the
opening as a flattened cone to blend with the wall of the esophagus, 2 to 3 cm above the esophageo-gastric junction. This peri esophageal areolar tissue is referred to as phreno esophageal ligament. This ligament connects the esophagus flexibly to the diaphragm permitting some freedom of movement during swallowing and respiration and at the same time limiting the upward displacement of esophagus.

Materials and methods

The lower end of esophagus of 60 (40 males and 20 females) cases was viewed over a period of three months using gastroscope. After proper premedication, the patients were asked to lie on their left side with the head bent and slightly flexed. A mouth guard was placed to protect the teeth from the endoscope and vice versa. Then the lubricated tip of endoscope was guided into the mouth and gently the tongue was pressed out of the way. The patient was asked to swallow the tube along. The LES was localized normally between 38-40 cms from the incisor teeth. After the endoscope was passed into the proximal stomach a retroversion manoeuvre (J-maneuvre) was performed to view the fundus from below.

Observations

Normally the LES is closed. At the point of closure of the proximal end of the sphincter, there may be several mucosal folds that disappear into the center of the closed lumen.

This closure produces the rosette appearance with the lumen being precisely centered at the point where these longitudinal folds converge.

As the normal LES is approached with the endoscope, it will relax with gentle scope pressure and with the passage through the stomach there is no detectable resistance.

As the intrinsic sphincter zone relaxes one can identify the squamo-columnar mucosal junction about 2 cm beyond.

The length of the intrinsic sphenicter segment measured during endoscopy is between 10 and 15 mm.

The squamo - columnar junction (SCJ) comes promptly into the view during ante grade endoscopy about 2 cm beyond the intrinsic LES and located at a level just below the diaphragmatic hiatus.

The squamous mucosa of the esophagus is pinkish grey color and contrasts sharply with the reddish orange (salmon) color of the gastric columnar epithelium.

The SCJ appears slightly irregular or undulating line, the so called Z line (zigzag line). This irregularity is due to the small peninsula like projections of the gastric columnar epithelium that extends 5 mm, cephalad along the margins of the squamous mucosa.

The crural segment of the LES is identified by noting an accentuation of the lumen compression as the diaphragmatic crura slowly descends during inspiration.

Assessing normal LES

In normal setting, the insertion of tube of the endoscope can be seen exhibiting a snugly fitting into the abdominal crural segment of the LES. This snug fit in this region is sustained throughout respiration and moderate insufflations.

Discussion

Under normal circumstances, the distal end of esophagus is attached to the diaphragm and is kept in place by the ligamentous and membranous soft tissue. Disruption of this attachment can cause part of distal esophagus to slide superiorly into the posterior mediastinum. When the esophageo-gastric junction slides into the thorax, it is known as Sliding Hiatus Hernia.

In hiatus hernia, LES is displaced from the crural diaphragm into the chest. Hiatus hernia reduces the basal LES pressure and shortens the length of the high pressure zone, primarily because of the loss of intra abdominal LES segment. Both these effects are caused by the loss of extrinsic support of the diaphragmatic crura resulting in increased gastro-esophageal reflux.

Table 1: Patient Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients examined</td>
<td>60</td>
</tr>
<tr>
<td>Normal study</td>
<td>16.7%</td>
</tr>
<tr>
<td>Lax LES only</td>
<td>1.7%</td>
</tr>
<tr>
<td>Lax hiatus only</td>
<td>3.3%</td>
</tr>
<tr>
<td>Lax hiatus and LES with hiatus hernia</td>
<td>3.3%</td>
</tr>
<tr>
<td>Patients with other pathologies (GERD, Ca. etc.)</td>
<td>75%</td>
</tr>
</tbody>
</table>

**Types of hiatus hernia**

**Type I-sliding hiatus hernia**

Occurs when the distal esophagus and stomach are not adequately secured in place.

**Type II-paraesophageal or rolling hernia**

Occurs when the phrenico-esophageal ligament is intact but the proximal stomach is not.

**Type III-a combination of types I and II**

---

**Fig. 1. Normal LES**

**Fig. 2. Normal Hiatus**

**Fig. 3. Lax LES**

**Fig. 4. Lax Hiatus**

**Endoscopically** Cephalad displacement of OGGJ that presents the gastric mucosa as a straight circumferential line is seen in hiatus hernia. In hiatus hernia, during inspiration there is crural depression of gastric wall due to upward displacement of LES.

**Conclusion**

The junction between the esophagus and stomach has been defined in several ways usually depending on the specialty interest of the person providing the definition.

The endoscopy depends upon the reliable anatomical landmarks that can be utilized in all patients to document the location of OGGJ. The criteria for locating the junction must be reliable for making a reasonably practical decision during the endoscopy that will serve to enhance the proper diagnosis both by direct inspection and biopsy sampling.
Kirklin’s experiment\textsuperscript{11} | Hernia at the esophageal hiatus is relatively common being found in 1\% of all roentgenographic examinations of stomach and accounting for 98\% of all diaphragmatic hernias.

Talley NJ & Martin CJ\textsuperscript{12} | Sliding hiatus hernia in 10-15\% of population and often asymptomatic.

Davidsons principles and practice of medicine\textsuperscript{13} | Most patients with oesophagitis do have a hiatus hernia which contributes to the impaired functions of lower oesophageal sphincter.

References

Address for communication:

Dr. V. Anitha
Associate Professor of Anatomy,
Kanyakumari Government Medical College,
Asaripallam, Nagercoil - 629 201. Tamil Nadu.
Mobile : 9626087334.
e-mail ID : dranitharamesh@gmail.com,