New trends in the management of

GASTRO-EOSOPHAGEAL REFLUX DISEASE (GERD)

Essay submitted for partial fulfillment of master degree in general surgery

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بسم الله الرحمن الرحيم

((وَمَا تَوْفِيقِي إِلاَّ بِاللّهِ

عَلَيْهِ تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ))

صدق الله العظيم

Introduction

Gastroeosophageal reflux disease (GERD) is defined as the failure of the anti reflux barrier, allowing abnormal reflux of gastric contents into the esophagus. ***(Jeffery et al., 2003)***

It is a mechanical disorder which is caused by a defective lower esophageal sphincter, a gastric emptying disorder or failed esophageal peristalsis. These abnormalities result in spectrum of disease ranging from "heart burn" to esophageal tissue damage with subsequent complications. While the exact nature of the anti reflux is not completely understood, the current view is that the lower esophageal sphincter, the diaphragmatic crura, and the phrenoesophageal ligaments are the key component**. *(Little, 1992)***

Medical tests & diagnosis methods

Diagnosis is done symptomatically.However; the following tests are carried out to confirm diagnosis:

- Physical examination of the throat and larynx.
- X-ray by barium swallow with the patient lying in different positions.
- Endoscopy.
- Esophageal acid testing.
- Esophageal motility testing.
- Acid perfusion test or Bernstein test. ***(jay marks, 2007)***

Management of gastro-esophageal reflux disease

Depends mainly on age, concomitant illness, severity of symptoms and signs and outcome of initial treatment.

Anti reflux surgery

The principle of every surgical procedure, whether open or laparoscopic repair, is to restore anti-reflux barrier by creating a sufficient pressure gradient in the distal esophagus and to close the hiatal hernia either by:-

Open surgery:

The conventional methods Nissen fundoplication, Toupet procedure, floppy Nissen ….etc ***(Salminen et al., 2007)***

Laparoscopy:

The laparoscopic Nissen fundoplication approach is considered as the procedure of choice in surgical management of Gastroeosophageal reflux due to the higher incidence of incisional hernias and defective fundic wraps in an open approach group at long term follow up study ***(Salminen et al., 2007)***

Robotic surgery:

Robotic surgery is an emerging technology.

After adoption of robotic surgery for cholecystectomy in 1997, various general surgical procedures have been performed using surgical robot, such as Nissen fundoplication, Heller myotomy and Roux-en-Y gastric bypass.

Most reports proved that application of robotic technology for general surgery is technically feasible and safe with the help of improved dexterity, better visualization and high level of precision. ***(Hyung. 2007)***

Endoscopic management:

- The ***Endocinch procedure*** uses a sewing capsule attached to an endoscope to stitch the junction between the esophagus and stomach, narrowing the opening to prevent acid reflux.
- The Plicator is a device that is passed through the mouth into the stomach, where it places a single suture-based implant near the junction between the esophagus and the stomach to help restor the anti-reflux barrier.
- The stretta procdure dstroies te nerves in the LES and creates scar tissue, keeping the LES from opening repeatedly, which prevents acid reflux**.** ***(Harewood and Gostout.2004)***

Dedicated To

The soul of my mother,

My father and

My family.

Acknowledgment

*First of all, thanks to **"ALLAH"** the kind and merciful, who gave me the power to perform and complete this work.*

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Amr Mohamed Hassan Emam

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List of abbreviations

- In : inch
- Cm : centimeter
- LES : lower esophageal sphincter
- UES : upper esophageal sphincter
- 3D : three dimensional
- µm : micrometer
- DMN : dorsal motor nucleus
- CGRP : calcitonin gene-related peptide
- TLESR : Transient Lower Esophageal Sphincter Relaxation
- NTS : nucleus tractus solitarius
- GERD : gastro esophageal reflux disease
- MMC : migrating myoelectrical complex
- T1–L2 : thoracic segment 1- lumber segment 2
- HRV : heart rate variability
- SAP : symptom association probability
- PPI : proton pump inhibitors
- BMI : body mass index
- EGJ : esophago gastric junction
- BE : Barrett's esophagus
- CLE : columnar lined esophagus
- IM : Intestinal Metaplasia
- LGD : Low-grade Dysplasia
- HGD : High-grade Dysplasia
- CPAP : continuous positive airway pressure
- FDA : food and drug administration

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Esophagus

The esophagus is a muscular tube 25 cm (10 in) long, which connects the pharynx to the stomach. It begins in the neck, at the lower border of the cricoid cartilage and the sixth cervical vertebra. It descends largely anterior to the vertebral column through the superior and posterior mediastina, passes through the diaphragm, at the tenth thoracic vertebra, and ends at the gastric cardiac orifice at the eleventh thoracic vertebra. Generally vertical in its course, the esophagus has two shallow curves. It starts in the median plane, but inclines to the left as far as the root of the neck, gradually returns to the median plane near the fifth thoracic vertebra, and at the seventh thoracic vertebra deviates left again, before it pierces the diaphragm. The esophagus also bends in an anteroposterior plane to follow the cervical and thoracic curvatures of the vertebral column. It is constricted at the beginning 15 cm (6 in) from the incisor teeth, where it is crossed by the aortic arch 22.5 cm (9 in) from the incisor teeth, where it is crossed by the left principal bronchus 27.5 cm (11 in) from the incisors and as it passes through the diaphragm 40 cm (16 in) from the incisors. These measurements are important clinically with regard to the passage of instruments along the esophagus. ***(Long and Orlando 2002)***

Cervical Esophagus

The cervical esophagus is posterior to the trachea and attached to it by loose connective tissue. The recurrent laryngeal nerves ascend on each side in or near the groove between the trachea and the esophagus. Posteriorly are the vertebral column, longus colli muscle and prevertebral layer of deep cervical fascia. Laterally on each side are the common carotid artery and posterior part of the thyroid gland. In the lower neck, where the esophagus deviates to the left, it is closer to the left carotid sheath and thyroid gland than it is on the right. The thoracic duct ascends for a short distance along its left side. ***(Shah 2008)***

Thoracic Esophagus

The thoracic part of the esophagus at first a little to the left in the superior mediastinum between trachea and vertebral column passes behind to the right of the aortic arch to descend to the posterior mediastinum along the right side of the descending thoracic aorta. Below as it inclines to the left it crosses anterior to the descending thoracic aorta. It enters the abdomen through the diaphragm at the level of the 10th thoracic vertebra ***(Skandlakis 2000).***

Abdominal Esophagus

The abdominal esophagus emerges from the right diaphragmatic crus, slightly to the left of the midline and at the tenth thoracic vertebra, grooving the posterior surface of the left lobe of the liver. It forms a truncated cone, 1 cm long, curving sharply to the left, its base continuous with the cardiac orifice of the stomach. Its right side continues smoothly into the lesser curvature, whereas the left is separated from the gastric fundus by the cardiac notch. Covered by peritoneum on its front and left side, it is contained in the upper left part of the lesser omentum. The peritoneum reflected from its posterior surface to the diaphragm is part of the gastrophrenic ligament, through which esophageal branches of the left gastric vessels reach it. The left crus and left inferior phrenic artery are posterior. The relations of the vagus nerves vary as the oesophagus traverses the diaphragm. Usually, the left vagus is composed of two or three trunks, which are firmly applied to the anterior aspect of the oesophagus. The right vagus is usually single, a thick cord some distance from the posterior aspect of the esophagus***. (Shah 2008)***

Vascular Supply and Lymphatic Drainage

Arteries

The cervical esophagus is supplied by the inferior thyroid artery. The thoracic esophagus is supplied by bronchial arteries and esophageal arteries. There are four or five esophageal arteries, which arise anteriorly from the aorta and descend obliquely to the esophagus. They form a vascular chain on the oesophagus that anastomoses above with the esophageal branches of the inferior thyroid arteries and below with ascending branches from the left phrenic and left gastric arteries **Fig.1.** ***(Fass 2004)***

Veins

Blood from the esophagus drains into a submucous plexus and then into a periesophageal venous plexus. The esophageal veins originate from this venous plexus. Those from the thoracic oesophagus drain predominantly into the azygos veins and, to a lesser extent, the hemiazygos and intercostal veins. There is some drainage into the bronchial veins. The cervical esophagus drains into the inferior thyroid vein. The left gastric vein drains the lower esophagus at the oesophageal opening near the lesser curvature and then drains into the portal vein this being one of the anastmosis between portal and systemic veins **Fig.2.** ***(Williams et al., 1989)***

Arteries of the esophagus

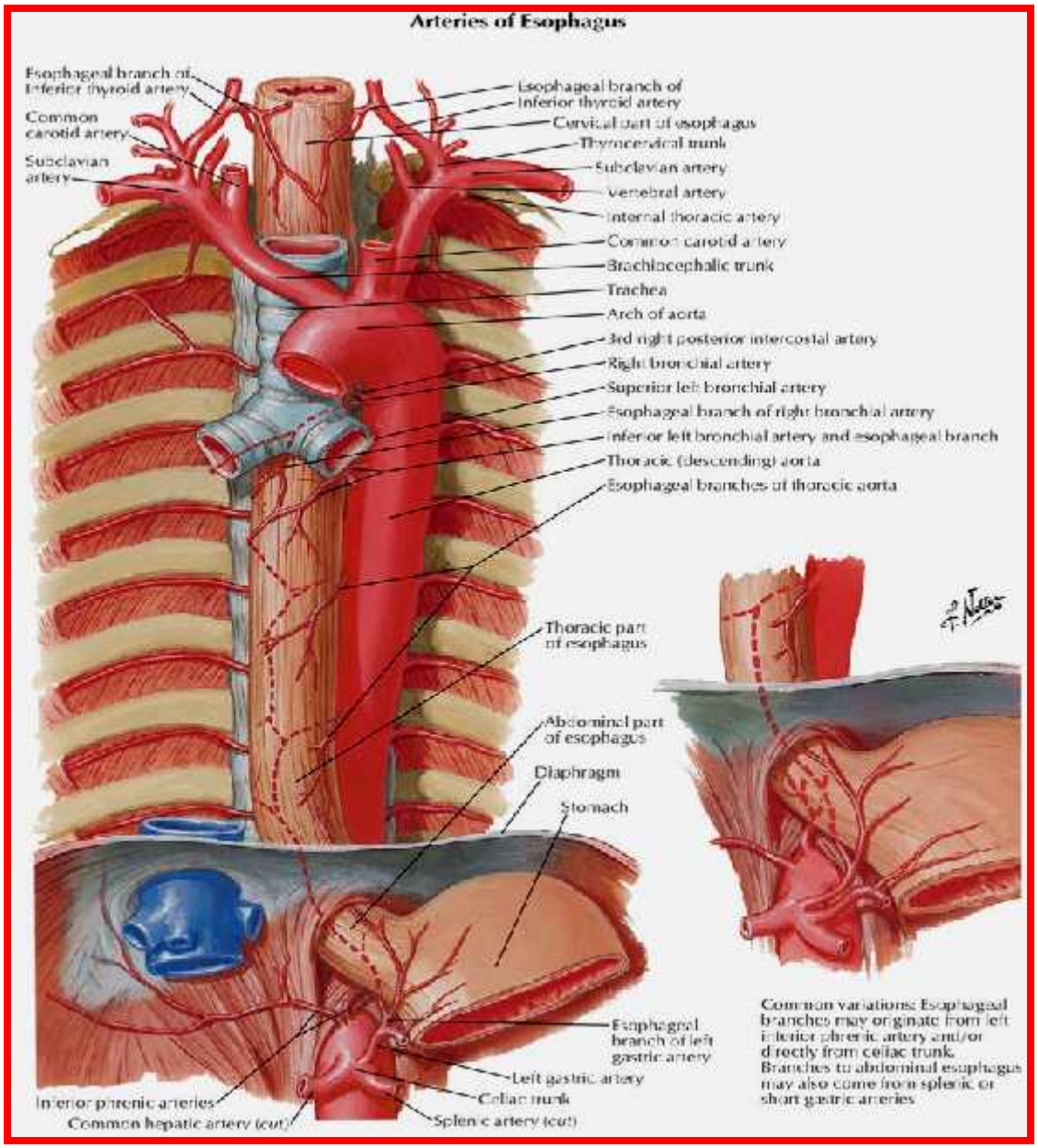

Fig.1 ***(Kuo and Urma 2006)***

Veins of the esophagus

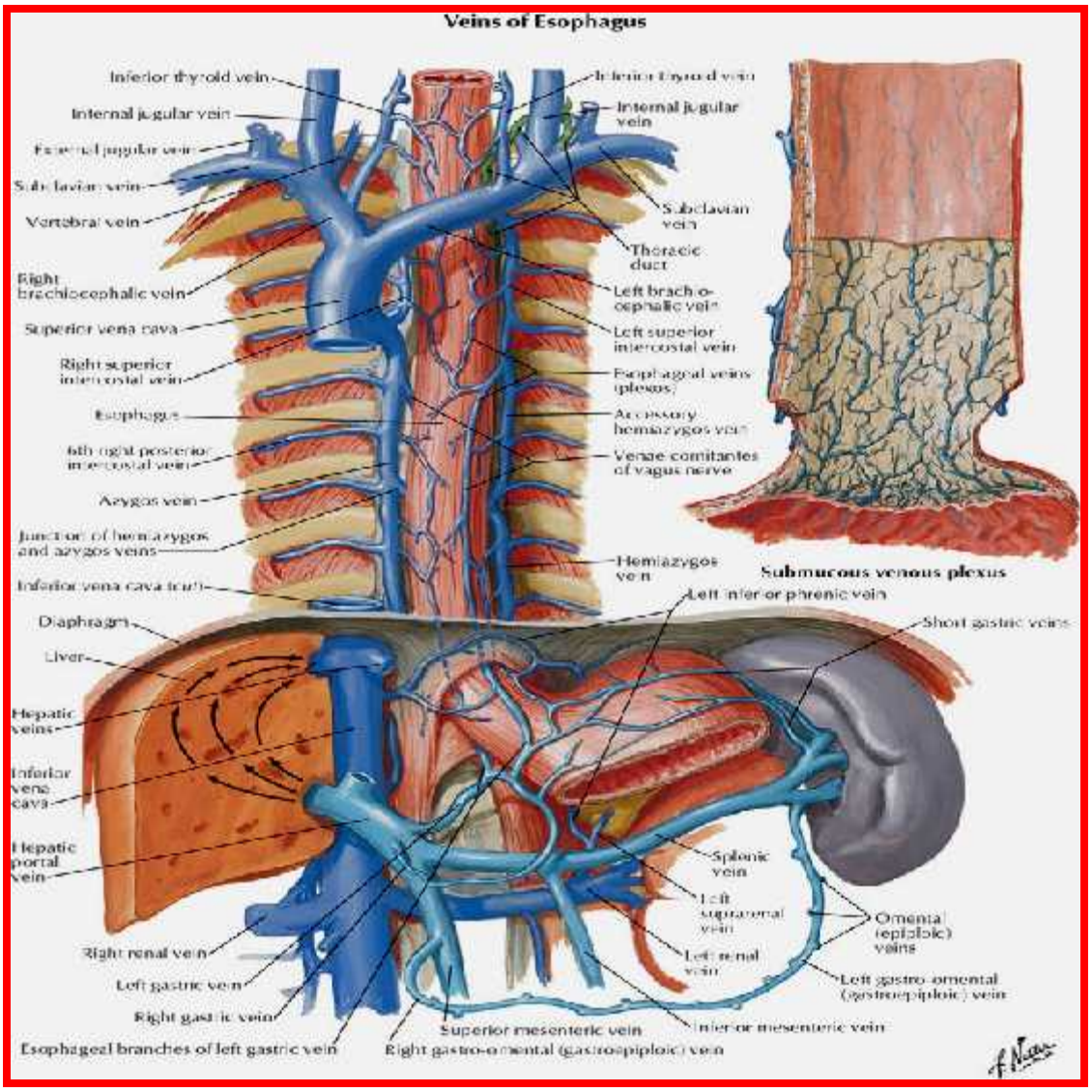

Fig.2 ***(Kuo and Urma 2006)***

Lymphatic Drainage

The esophagus has an extensive submucosal lymphatic system. Efferent vessels from the cervical esophagus drain to the deep cervical nodes either directly or through the para-tracheal nodes. Vessels from the thoracic esophagus drain to the posterior mediastinal nodes and those from the abdominal esophagus drain to the left gastric lymph nodes. Some may pass directly to the thoracic duct. In general, lymph drainage from upper two thirds of the esophagus occurs in a proximal direction towards the cervical region, where the lower third drains into the sub diaphragmatic and coeliac lymph nodes **Fig.3.** ***(Cuschieri 2002)***

Lymph vessels and nodes of the oesophagus

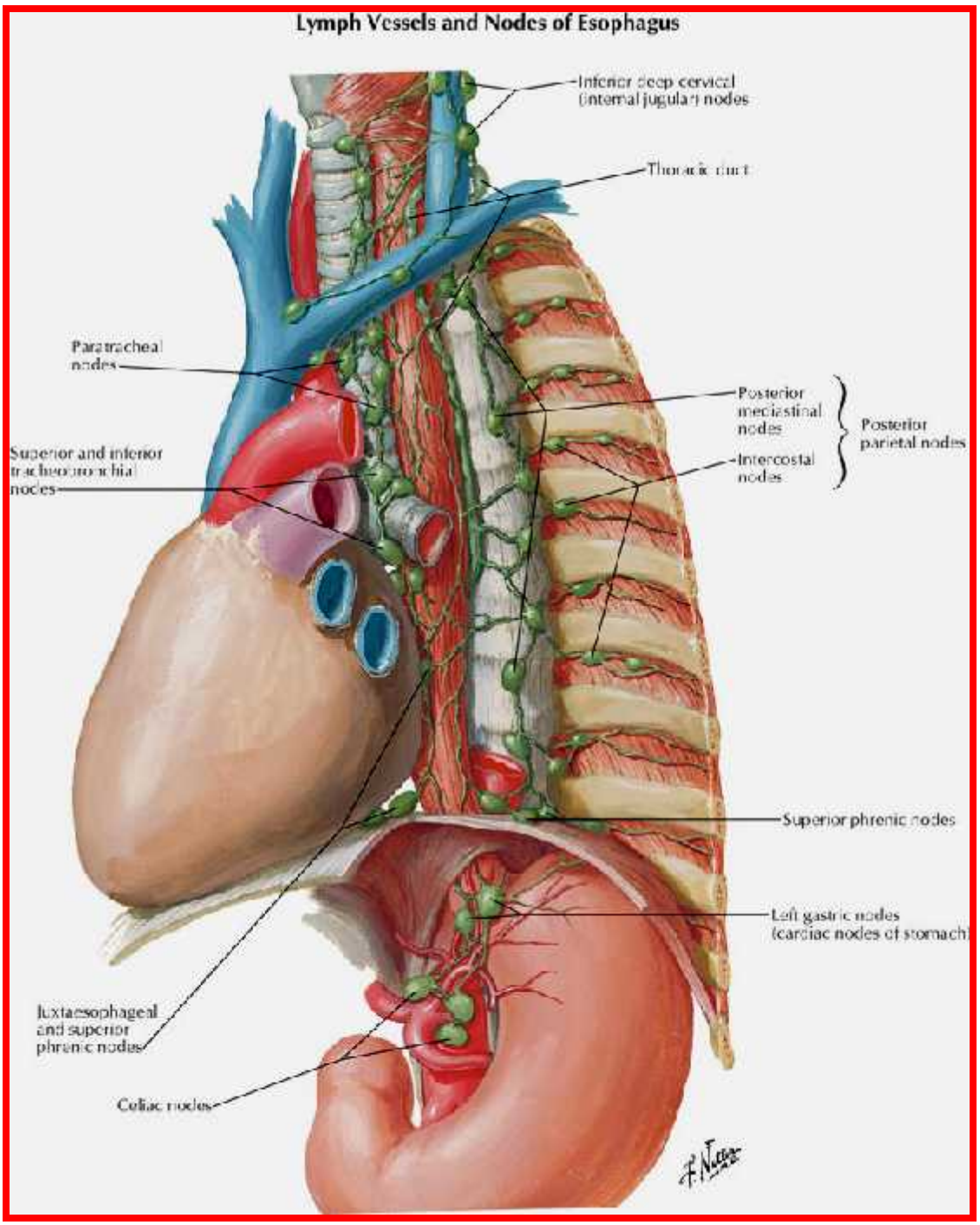

Fig.3 ***(Kuo and Urma 2006)***