Gastroesophageal Reflux In Different Age Groups.

Thesis submitted for the partial fulfillment
of the requirements of Doctor Degree of surgery.

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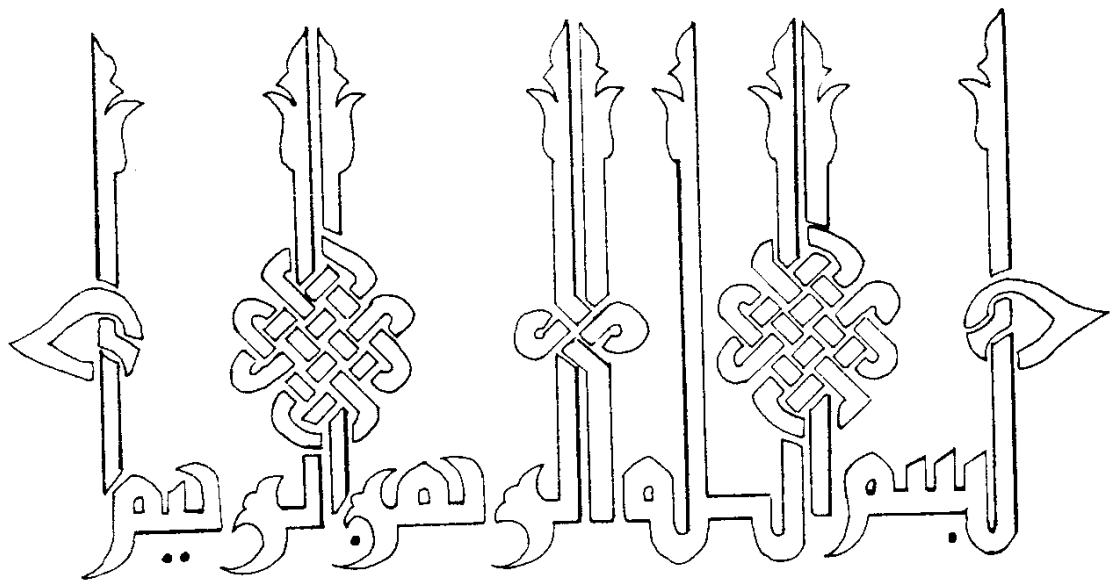

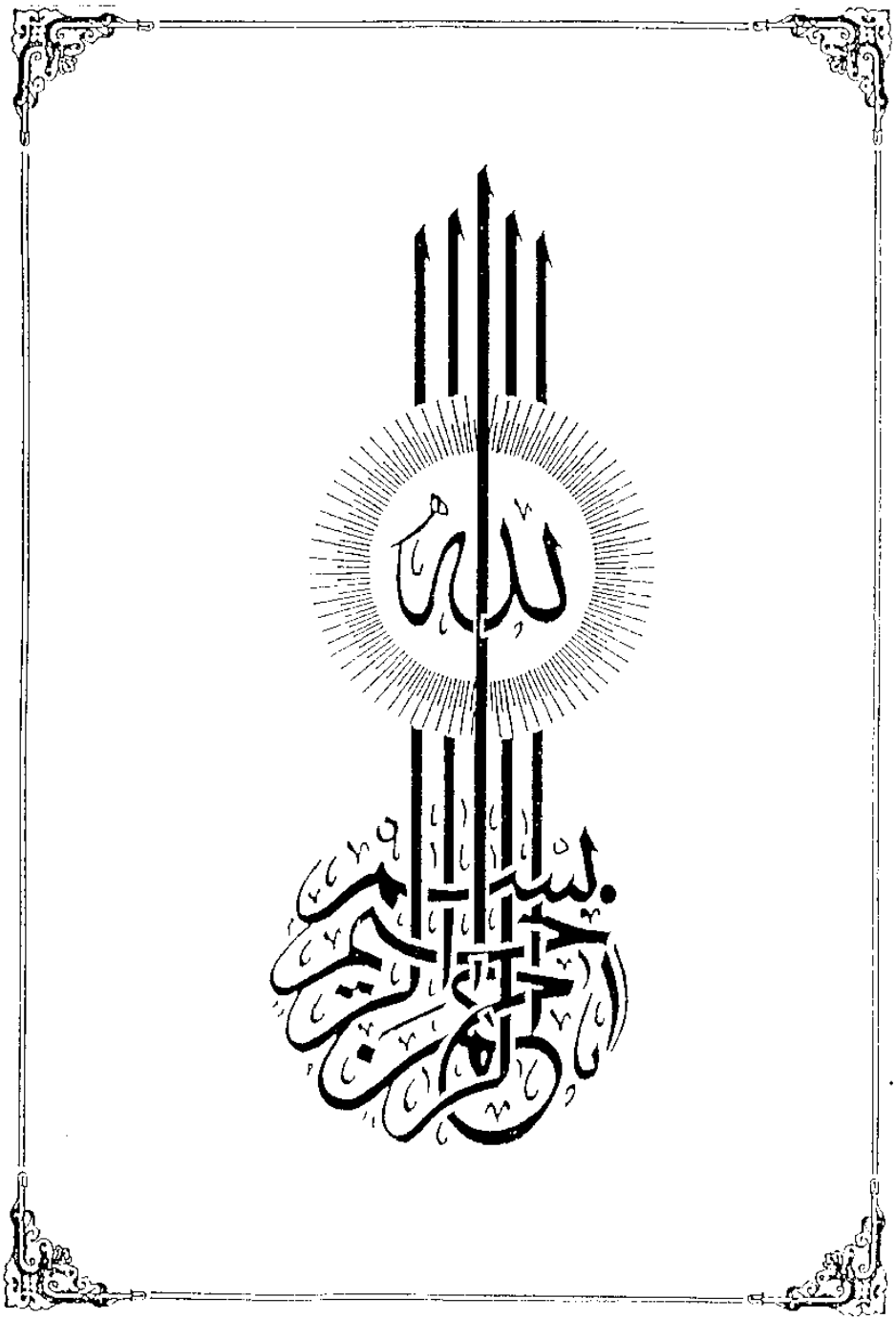

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CONTENTS

* **Introduction.**

* **Review of Literature:-**

- Normal anatomy 4
- Physiology 9
- Etiology 14
- Pathology 25
- Complications 28
- Clinical Picture 36
- Diagnosis & Investigations 44
- Medical Treatment 59
- Operative Technique 62

* - Patients & Methods
- Results 97
- Discussion 132
- Conclusion 141
- Reference 143
- Summary . . . . . .
- Arabic Summary

INTRODUCTION & HISTORY

Introduction

Gastro-esophageal reflux (GER) refers to the retrograde entrance of gastric and duodenal contents into the distal esophagus. This phenomenon is quite common specially post-prandially. Esophageal pH measurement has shown that daytime GER is physiological leading to occasional heartburn which is essentially a universal experience. This physiologic GER happens due to transient relaxation of the cardia necessary for a normal person, in order to be able to: belch, relieve his gastric distension from swallowed air and finally to be able to vomit.

(Mughal & Bancewicz,1991)

GER is also considered to be physiological in infants till the age of 6 weeks, when the lower esophageal sphincter and other anti-reflux frontiers mature.

(Boix-Ochoa,1986)

History:

Bright in 1836 was the first to call attention to partial stomach herniation. In the early years of this century the entities of hiatal herniation, peptic esophagitis and esophageal stenosis were described indiscriminately.

GER syndrome was first described in 1935 by Winkelstein. In 1950 Barrett described reflux esophagitis and what was called Barrett's esophagus as complications of GER disease.

In pediatric world, Neuhauser & Berenberg (1947)- as radiologists used the roentgenographic techniques, for the first time in children, to demonstrate sliding hiatus hernia (H.H.) unfortunately they suggested a term, cardiac chalasia, to describe hypotensive cardia. This term has for longtime been discarded to avoid mixing with achalasia of the esophagus.

In 1953 Allison described GER as a separate entity, outlining its pathogenesis and complications, also to him the credit should go for suggesting an anatomical repair as a solution of this problem.

The 1960's were characterized by the appearance of various surgical procedures by:-

Nissen (1961) who suggested a 360° i.e. complete fundoplication approach. In 1967 Hill invented the posterior gastropexy approach, and Belsey in 1969 suggested 270° i.e. partial fundoplication.

However the past two decades have witnessed the greatest evolution of the subject through the various modern investigations that ushered in a new era of GER diagnosis & management.

Esophageal manometry - first invented by Ingelfinger & Code in 1953- in now used pre-operatively and also devised to intra-operative use in order to assess the degree of competency of the wrap.

(Jolley et al; 1989)

Esophageal pH-metry have been computerized by Demeester et al; since 1976 to measure esophageal pH over the 24 hours. Esophagoscope and biopsy, esophageal clearance and "Acidity" test, as well as esophageal scintigraphy all are subjects of recent research and publications in order to raise the diagnostic accuracy of GER to 100% .

GER is a common problem to the extent that a recent study showed that 60% of the population suffer or have suffered from dyspepsia of whom 70% have GER.

(Mughal & Bancewicz,1991)

However GER becomes pathologic only if it is excessive, resulting in serious symptoms or complications, it is then called GER disease (GERD). Esophagitis is often, but not invariably associated with GERD. Similarly hiatus hernia may or may not be relevant Therefore GERD, esophagitis and H.H. are not synonymous as it was used to be believed.

Pathophysiology of GER is based mainly on the study of inflammation, ulceration and scarring occurring in the distal esophagus, secondary to acid and bile reflux.

Longstanding GER leads to many hazardous conditions starting by injuring the esophageal mucosa, esophagitis setting up a viscous-self-perpetuating cycle, with the patient suffering from unrelenting chest pain,aspiration pneumonia and eventually dysphagia.

(Gott & Polk,1991)

Aim of the work:-

In this thesis efficacy of Nissen fundoplication-the operation of choice world widely used as a method of surgical management of GER-is going to be assessed. Patients who are candidates for this operation are going to be thoroughly investigated both pre & post-operatively using:-

upper gastrointestinal endoscopy, radiology, intra-esophageal pH determination as well as radionuclide scanning of the esophagus.

The study includes GER diagnosis & management in various age groups. The results are going to be based on the follow-up of the patients, subjectively by symptomatic relief & objectively by repeating the above mentioned investigation methods.

REVIEW OF LITERATURE

Review of Literature

Functional anatomy of Gastro-esophageal (GE- junction);-

Gastro-esophageal reflux (GER) or the retrograde flow of gastric contents into the esophagus is normally prevented by anti-reflux barrier. A series of combative forces converge at the GE-junction to generate this pressure barrier.

Anatomical anti-reflux barriers :-

* **The presence of intra-abdominal segment of the esophagus.**

This segment lies at the level of 11 th-12 th thoracic vertebra, perhaps little higher in short subjects and lower in tall asthenic ones. The abdominal esophagus varies in lenght between 1.5 - 3 cm according to stomach contents & Esophageal muscle tone.

(Hollander & Meyer,1985)

This segment is the key to the whole system. It functions as a "flutter valve" once the lower esophagus is swept by the final peristaltic wave at the end of a normal swallow. Any rise of intra-abdominal pressure will be hydrostatically transmitted to the serosal aspect of the abdominal segment of the esophagus collapsing it, and thus GER is hindered at times when gastric pressure rises.

(Wernley et al; 1980)

Thoracic suction leads also to collapse of the lower esophagus due to negative intrathoracic pressure, therefore strengthening the valve closure.

(Bardaji & Boix Ochoa;1986)

Another way by which abdominal esophageal segment acts as an anti-reflux barrier is :-

according to Laplace's law, the presuure in a tube is indirectly related to its radius. Thus the narrower and longer the esophagus is the higher the pressure needed to open it and although it is easy to blow through such a tube, it is impossible to suck through it.

The presence of sufficient length of sub-diaphragmatic esophagus is undoubtly crucial in GER prevention. Any surgical technique ignoring the shortened abdominal length of the esophagus will fail to control reflux.

(Boix-Ochoa;1986)

Demeester et al;1979 showed that the optimal length of this segment is 2 - 2,5 cm. In order to be constantly collapsed and functions-together with the lower esophageal sphincter (LES)- as the high pressure zone (HPZ) .

* **Gastro-esophageal angle (Angle of His)**

The obliquity of the esophageal entry through the lesser curve of the stomach creates an angle of junction, known as the "Angle of His". This angle amounts to 50 - 60° in the supine adult with the diaphragm in an intermediate position. The gastric fundus - being dome shaped-sharpens the acuteness of this angle. Thus on distension of the fundus the adjacent abdominal esophageal segment is collapsed, and the "flutter-valve mechanism" is further reinforced.

(Bardaji & Boix-Ochoa;1986)

* **The pinchcock effect of the fibres of the right crus of the diaphragm :-**

The looping fibres of the right diaphragmatic crus surrounds the lower esophagus like a collar. This helps in creating a "clamping" effect exerted over the lower esophagus. This is an emergency mechanism preventing GER if the cardiac sphincter gives way under increased intra-abdominal pressure. In this occasion these quick acting striated muscles spring into instant action.

(Last;1984)

The margins of the esophageal hiatus are formed by the arms of the diaphragmatic crura and the median arcuate ligament. The muscle fibres forming the crura arise from the 2 nd,3 rd and 4 th lumbar vertebrae and inserted into the central tendon of the diaphragm. Usually the hiatus is formed entirely by the decussation of the right crus which is slightly reinforced by the left one. (Type I) Frequently it is solely formed by the right crus.(Type II) However many variations do exist e.g.:-

In 40% of cases the left crus forms a variable degree of the hiatus.(Type III & IV) **(Fig.2)**

(Duplessis;1975)

The "pinch-cock" action of the right crus of the diaphragm on the lower esophagus has recently been confirmed by manometric studies which show a rise in the LES pressure during deep inspiration. Thus the action of the right crus in controlling GER is dual; during breathing it exerts an external compressing effect on the LES. At the same time it helps stabilize the cardia through the phreno esophageal membrane, allowing the distal esophagus to be subjected to the collapsing positive intra-abdominal pressure.

(Bardaji & Boix-Ochoa;1986)

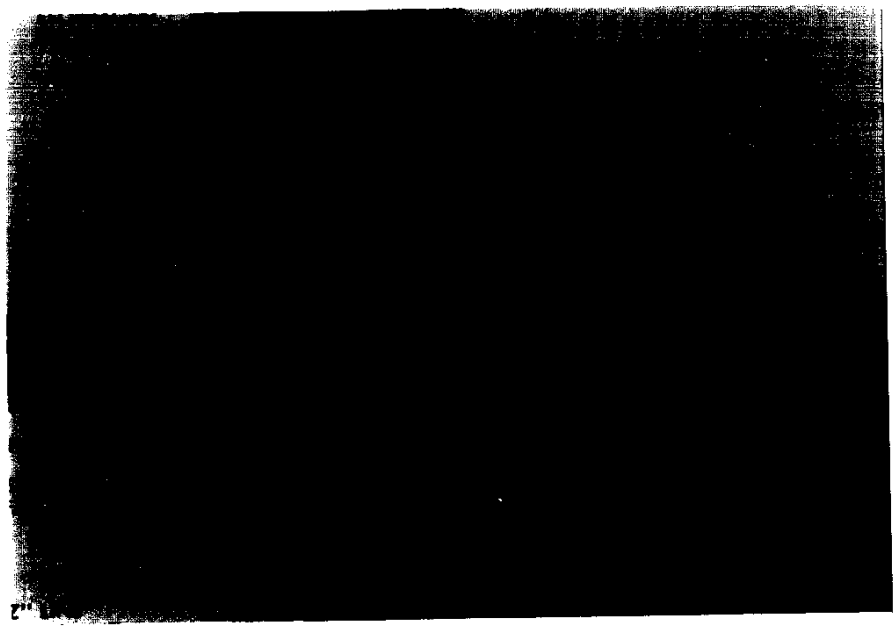

Fig 1 . Anatomy of GE- junction

(After GIT - CIBA atlas 1961)

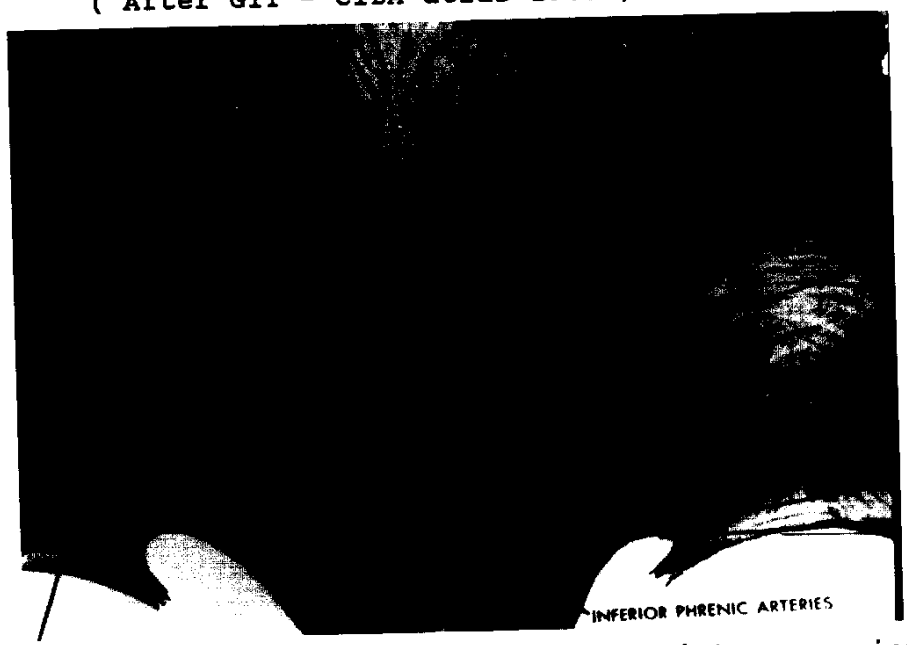

Fig.2 Esophageal hiatus region & diaphragmatic crura

(After CIBA - Atlas 1961)

* The phreno-esophageal ligament :-

This ligament surrounds the esophagus like a collar which is strong, air tight & flexible permitting about 2 cm. of cranio-caudal mobilization of the abdominal esophagus.

The ligament is a continuation of the endo-abdominal fascia, passing through the hiatus & becomes inserted in the adventitia & the inter-muscular tissue of the lower esophagus along its whole circumference. It receives minor contribution from the pleura above the diaphragm.

(Bombeck et al;1966)

The ligament is formed of 2 limbs, the superior one is inserted into the lower 3 cm. of the esophagus, and the inferior into the cardia. Elastin forms the main constituent of the ligament's lamellae, thus allowing for both its strength & resilience. The pherno-esophageal membrane becomes quite apparent during esophageal mobilization for abdominal vagotomy. Its damage by rough dissection predisposes to reflux disease.

(Cushieri;1988)

* **Gastric Sling Fibres :-**

The sling distribution of the fundic inner muscle fibers passing across the cardiac incisura accounts for some sphincteric control over the lower esophagus. Together with the middle horizontal coat they form a muscular ring known as collar of Helvetius. The pattern of the circular muscles of the esophagus can be considered as series of parallel apolar springs attached between two fixed points. The anchoring fibers of which will assume the role of the spiral constrictor of the GE-Junction.

(Mann et al;1964)

* **Mucosal Rosette: -**

Finally, the mucosal folds thrown into rosette distribution at the GE-junction forms the mucosal valve. This plugs the cardiac orifice to make a water tight seal. These mucosal folds are not passive but controlled by the muscularis mucosa and LES, drawing the folds together & keeping them is close apposition.

(Boix-Ochoa;1986)