

"PYLORIC OBSTRUCTION, A RADIOLOGICAL STUDY"

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Thesis

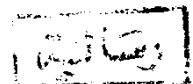
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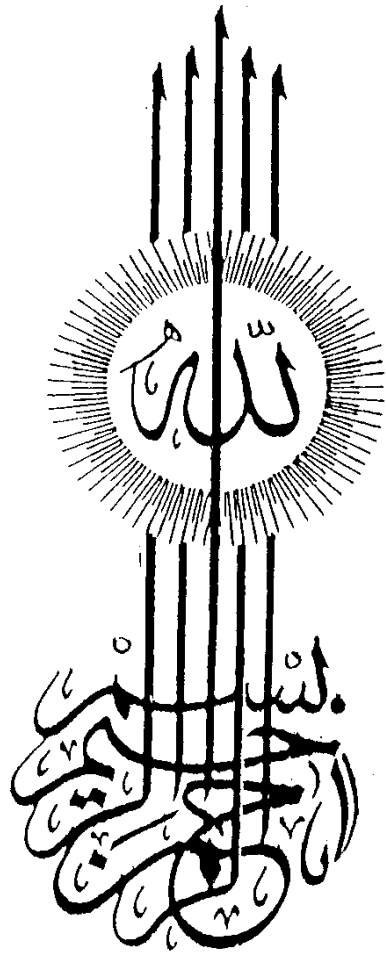
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INTRODUCTION
&
AIM OF WORK

INTRODUCTION AND AIM OF WORK

Pyloric obstruction is now an uncommon clinical entity which needs radiological study to confirm the diagnosis, show its degree and may point to the etiology of the condition, Close meticulous examination is often of value in differentiation of benign from malignant pyloric obstruction.

Besides, ultrasound has come to play a role in the diagnosis and evaluation of cases of congenital infantile pyloric stenosis.

The aim of this study is to describe the different radiological techniques in the investigation of such cases and to describe the different radiological signs encountered particularly in attempt to differentiate benign from malignant lesions.

A brief description of the role of ultrasound in congenital causes is discussed.

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ANATOMY

ANATOMY OF THE STOMACH

The stomach is the most dilated part of the digestive tube, and it is situated between the end of the oesophagus and the beginning of the small intestine.

It lies in the epigastric, umbilical, and left hypochondriac regions of the abdomen, its shape and position being modified by changes within itself and the surrounding viscera and one form or position is typical. Its mean capacity varies with age, being about 30 ml at birth, increasing gradually to about 1000 ml at puberty, and commonly reaching to about 1500 ml in the adult. Most schemes recognize at least three major portions of the stomach:

(1) A cardiac portion (or fundus), (2) A medial portion (or body) and (3) a pyloric portion (or antrum). Some consider the fundus to lie above a horizontal plane joining the incisura cardiaca to the greater curvature while others place it above and to the left of a line drawn straight down through the oesophagus to the greater curvature. There is usually an angulation, either deep or shallow, on the lesser curvature one or two inches proximal to the pylorus, which is called the incisura angularis. The region of the stomach between the fundus and the incisura angularis comprises the medial portion or body of the stomach. The segment distal to the incisura is generally known as the pyloric portion or antrum.

The stomach has two openings, two borders or curvatures and two surfaces.

Openings of the stomach:

The stomach has two openings, the cardiac opening and the pyloric opening. The cardiac orifice communicates the oesophagus with the stomach, and is situated on the left of the median plane, behind the seventh costal cartilage 2.5 cm from its junction with the sternum, and at the level of the eleventh thoracic vertebra. The right margin of the oesophagus is continuous with the lesser curvature of the stomach, while the left margin joins the greater curvature at an acute angle, termed the cardiac notch. The pyloric orifice is the opening of the stomach into the duodenum, and its position is usually indicated by

a circular groove on the surface of the organ, termed the pyloric constriction, which indicates the position of the pyloric sphincter or ring. The pyloric ring or sphincter, while prominent anatomically, has not been demonstrated to have much functional significance in man, and is possibly relatively unimportant from a dynamic standpoint. The pylorus lies about 1.2 cm to the right of the median plane near the level of the lower border of the first lumbar vertebra (transpyloric plane), when the body is in the supine position and the stomach is empty.

Curvatures of the stomach:

The lesser curvature, extends from the cardia to the pylorus, is a curved line, extending downward and slightly inward to the left of the bodies of the vertebrae. Near the first lumbar vertebra it makes a turn to the right and continues parallel to the greater curvature to form the upper part of the pylorus. The most dependent part of the lesser curvature may form a notch, named the angular incisure, which varies somewhat in position with the state of distension of the viscus. It may be used to separate the stomach into right and left parts. The lesser curvature is attached to the two layers of the transverse fissure of the liver and to the fossa for the ductus venosus. Ulcers which perforate near the lesser curvature may become walled off between the lesser omentum. The anterior margin of the left lobe of the liver covers the lesser curvature. Masses involving this curvature are not often palpable because of the high position under the costal cage.

The greater curvature extends downward from the fundus into the left hypochondrium. When the individual is in the prone position, it descends to a point about 1 or 2 inches above the umbilicus. Masses involving the distal half of this curvature are usually accessible to palpation. The entire extent of the greater curvature is attached to the gastrocolic, or greater omentum. The left extremity of the greater curvature is fixed to the spleen by the gastrosplenic ligament. The greater curvature starts from the cardiac orifice at the cardiac notch, it forms an arch backwards, upwards, and to the left, the highest point of the convexity (of the fundus) is on a level with the left fifth intercostal space and lies just below the left nipple, from this level it may be followed downwards and forwards with a slight convexity to the left almost as low as the cartilage of the

The fundus is usually distended with gas, forming the stomach gas bubble. Less commonly, the stomach may lie almost transversely, even in the erect posture, this is known as the "Steer-horn" type of stomach. Intermediate shapes of stomach, between the J-shaped and steer-horn varieties also occur.

Histological structure of the stomach wall:

The wall of the stomach consists of four layers, namely serous, muscular, submucous and mucous layers. The serosa covers the entire surface of the organ, except:

- a) Along the greater and lesser curvatures at the lines of attachment of the greater and lesser omenta, where the two layers of peritoneum leave a small space in which the vessels and nerves lie.
- b) A small area on the postero-inferior surface of the stomach, close to the cardiac orifice, where the stomach is in contact with the under surface of the diaphragm at the site of reflexion of the gastrophrenic and left gastro-pancreatic folds. The muscular layer, this is an external layer called the muscularis externa, and situated beneath the serous covering with which it is closely connected by subserous areolar tissue, it consists of three layers of visceral muscular fibres, namely longitudinal, circular and oblique fibres.

The longitudinal fibres, are the most superficial and are arranged in two sets, the first set consists of fibres continuous with the longitudinal fibres of the oesophagus, and radiate from the cardiac orifice while the second set, continues on the body of the stomach and passes to the right, its fibres becoming more thickly arranged as they approach the pylorus. The circular fibres: form a uniform layer over the whole of the stomach internal to the longitudinal fibres, at the pylorus they are most abundant, and aggregated into a ring which forms the pyloric sphincter. of the oesophagus, but they are sharply marked off from the circular fibres of the duodenum by a connective tissue septum.

which are numerous on the side walls and near the duct of the gland.

(c) Mucous neck cells: which are present scattered between the other types of cell and are particularly numerous around the necks of the glands.

(d) Argentaffin cells: occurs in all types of gastric gland but more commonly in those of the body and fundus than in the pyloric glands, Serotonin is known to be present in such cells throughout the alimentary tract, and it is possible that they play a role in muscular motility.

Gastrin is also thought to be secreted in some regions by these cells.

(e) Undifferentiated columnar cells: are present in smaller numbers, and these appear to be the origin of new cells to replace the existing ones as they are lost.

The pyloric glands : each consists of 2 or 3 short convoluted tubes opening into a conical pit, which occupies about $\frac{2}{3}$ of the depth of the mucous membrane. The epithelial cells are predominantly mucous in type, oxyntic cells being sparse, gastrin is released by mechanical stimuli, and acts to increase stomach motility and the secretory activity of the chief and oxyntic cells.

BLOOD SUPPLY:

1- Arterial supply:

The arteries supplying the stomach are:

(a) The left gastric branch of the coeliac artery, runs towards the cardiac orifice and thence along the lesser curvature, from left to right, to join

(b) the right gastric artery, which arises from the hepatic artery and pursues a course from right to left along the lesser curvature.

(c) The right gastro-epiploic branches of the common hepatic artery.

(d) The left gastro-epiploic artery is the largest branch of the splenic artery.

(f) Short gastric branches of the splenic artery, are five to seven small vessels that spring from the splenic artery towards its termination, and are distributed to the fundus of the stomach.

diaphragm, inconstant branches are given to the stomach from the left thoracic splanchnic nerves and from the thoracic and lumbar sympathetic trunks.

The sympathetic supplies vasomotor fibres to the gastric blood vessels and provides the main pathway for pain fibres from the stomach.

ANATOMY OF THE DUODENUM

The duodenum is the shortest, widest and most fixed part of the small intestine, it has no mesentery, and is only partially covered with peritoneum.

Its length is about 25 cm, its course presents a constant curve, somewhat of the shape of an incomplete circle, which encloses the head of the pancreas.

It begins at the pylorus, passes backward, upwards and to the right for 2.5 cm, under cover of the posterior part of the quadrate lobe of the liver, to the neck of the gallbladder, then it makes a sharp curve (superior duodenal flexure) and descends for about 7.5 cm in front of the medial part of the right kidney, generally to the level of the lower border of the body of the third lumbar vertebra, here it takes a second bend (inferior duodenal flexure), and passes from right to left across the vertebral column just above the level of the umbilicus, having a slight inclination upwards, then it ascends in front and to the left of the abdominal aorta for about 2.5 cm, and ends opposite the second lumbar vertebra in the jejunum.

The duodenum is divided into four parts, all of which run in different directions, the first and second parts are respectively superior and descending, while the third and fourth parts are respectively horizontal and ascending.

The first part "Superior Part":

The first part of the duodenum is about 5 cm long, and is the most movable of the four parts, it begins at the pylorus, and ends at the neck of the gallbladder.

It is in relation above and in front with the Quadrate lobe of the liver and the gallbladder, above with the epiploic foramen, behind with the gastroduodenal artery, the bile duct and the portal vein, and below and behind, with the head and neck of the pancreas.

The second part "descending part":

The second part of the duodenum is about 8-10 cm long descends from the neck of the gall bladder along the right side of vertebral column

Blood Supply and lymph drainage:

The duodenum is supplied by the superior and inferior pancreatico-duodenal arteries, and in its first inch by multiple small branches from the hepatic and gastro-duodenal arteries. It is drained by corresponding veins into the portal vein and superior mesenteric vein. The veins from the multiple arteries to the first inch collect into the prepyloric vein. Its lymph drainage is to the coeliac and superior mesenteric groups of pre-aortic lymph glands.

EMPTYING OF THE STOMACH

The pyloric pump:

Stomach emptying is promoted by peristaltic waves traveling from the stomach to the duodenum, and it is opposed by resistance of the pylorus to the passage of food.

The pylorus normally remains almost but not completely closed because of mild tonic contraction. The rate of emptying of the stomach is determined principally by the degree of activity of the antral peristaltic waves, the antral peristaltic waves, when active, occur almost exactly three times per minute, becoming very strong near the incisura angularis and moving over the antrum, then over the pylorus, and finally into the duodenum. As the wave moves forward, the pyloric sphincter and the proximal portion of the duodenum are inhibited, which is an instance of "receptive relaxation" with each peristaltic wave, several milliliters of chyme are forced into the duodenum. This pumping action of the antral portion of the stomach is sometimes also called the "pyloric Pump".

Regulation of emptying:

The duodenum and other portions of upper intestine control the rate of stomach emptying by (1) the enterogastric reflex and (2) the enterogastrone mechanism. These together to slow down the rate of emptying when (a) too much food is already in the small intestine or (b) when the chyme is excessively acid, contains too much fat, is hypotonic or hypertonic, or is irritating. In this way, the rate of stomach emptying