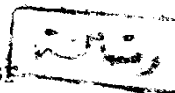


THE STUDY OF SODIUM AND POTASSIUM IONS CONCENTRATIONS IN GASTRIC JUICE IN DIFFERENT GASTRODUODENAL DISORDERS

THESIS

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INTRODUCTION AND AIM OF THE WORK



INTRODUCTION & AIM OF WORK

The gastrointestinal tract is composed of compartments separated by sphincters, for example lower oesophageal sphincter separating the oesophagus from the stomach, the pyloric sphincter, separating the stomach from the duodenum and the ileocaecal valve, separating the ileum from the caecum.

Each compartment has its distinct characteristics suitable for its viability, the gastric compartment is acidic, while the duodenal compartment is alkaline. Alterations in the internal environment of a compartment as in duodenogastric reflux (DGR), can result in mucosal damage and disease.

The phenomenon of DGR may be a physiological event in healthy individual. When the degree of reflux changes from a physiological event to a pathological one, is a matter of controversy.

In this present study, we would like to clarify these points by using a simple and reliable method for diagnosing DGR. Sodium, potassium ion concentration and pH will be studied as markers of DGR in the different gastrointestinal diseases.



REVIEW OF LITERATURE



ANATOMY OF THE STOMACH

General Anatomic Consideration

The stomach is a capacious, saccular organ, that is connected superiorly with the termination of the oesophagus, and inferiorly with the first portion of the duodenum. It is the most dilated region of the gastrointestinal tract, although its shape and capacity may vary substantially with age, body habitus, and degree of distension. The stomach is J-shaped in most normal individuals. Its capacity in the adult approximates 1500ml . The stomach is located in the superior part of the abdomen, extending from the left hypochondrium into the epigastrium and reaching the umbilicus. It is relatively fixed at its upper and lower connections with the oesophagus and duodenum, but quite mobile between these sites of fixation. The stomach has two curvatures, which have been designated the lesser and greater curvatures. The greater curvature, which extends to the left from the gastroesophageal junction, is four to six times as long as the opposing lesser curvature. The stomach and proximal duodenum are attached to the lesser omentum (hepatoduodenal ligament) and to the greater omentum (*McGuigan and Ament, 1989*).

Regions of the Stomach

A) Anatomically the stomach has been separated into various regions. That portion of the stomach which immediately adjoins the oesophagus has been termed the cardia (cardiac portion) of the stomach. The cardia is located approximately 2.5 cm to the left of the midline at the level of the ninth thoracic vertebra.

The gastric fundus is the dome -shaped portion of the stomach that extends to the left and superiorly from the cardia.

The gastric body or corpus, is the major portion of the stomach and extends inferiorly from the fundus and the cardia to the region of the incisura angularis which is a notch like indentation located in the lower part of the lesser curvature.

The antrum of the stomach is the distal portion of the stomach which extends from the incisura angularis to the proximal limit of the pylorus.

When the extent of the antrum is delineated functionally or by histologic features of its mucosa it includes the pylorus and the demarcation between the antrum and the corpus is variably higher on the lesser curvature of the stomach and may extend up to two thirds of the length of the lesser curvature.

The pylorus is the most distal and narrowly tubular part of the stomach, with a thick muscular wall forming the pyloric sphincter. The lumen passing through the pyloric sphincter is termed the pyloric canal and is approximately 2.5 cm in length (*McGuigan and Ament, 1989*).

B) Histologically, there are three principal gastric regions. The first region, which is 1.5 to 3 cm in length, contains the cardiac glands and corresponds with the gastric cardia. The second region (the oxyntic, or acid secreting portion of the stomach) constitutes the fundus and the body (the proximal two thirds of the stomach) which contains the oxyntic, fundic or parietal cell glands. The third region of the stomach contains the pyloric, or antral glands corresponds principally with the antrum of the stomach, and comprises the distal portions of the stomach, including the pylorus, and extends further superiorly along the lesser than greater curvature (*Dodge, 1986*).

Tissue Layers of the Stomach

The stomach, is composed of four tissue layers mucosa, submucosa, muscularis propria and serosa. The mucous membrane lining the lumen of the stomach is thick and vascular, with a smooth, soft and velvety surface.

The lining of the stomach is grayish pink in colour and is thrown into numerous folds or rugae, which, for the most part, are longitudinally directed (*Lillibridge, 1984*).

The mucosa of the cardia, antrum, and pylorus is paler than that of the rest of the stomach. In the filled or distended stomach, the folds flatten out and may be stretched evenly and smoothly. Numerous, barely visible gastric pits (foveolae gastricae) may be seen to invaginate the gastric mucosa (*Bloom and Fawcett, 1975*).

The major muscular component (muscularis propria) of the gastric wall, separated from the gastric mucosa by the intervening submucosa, is composed of three muscle layers: outer longitudinal, middle circular and inner oblique.

The outer longitudinal fibres, adjacent to the serosa, are most concentrated along the greater and lesser curvatures of the stomach. The middle circular fibres encircle the body of the stomach and are thickened at the pylorus to form the pyloric sphincter. The inner most oblique muscle fibres loop over the fundus and pass down over the anterior and posterior walls of the stomach.

Arterial Blood Supply, Venous and Lymphatic Drainage of the Stomach:

The arterial supply to the stomach is extremely rich and comprises, the left gastric artery from the coeliac axis; the right gastric artery from the hepatic artery; the right gastro-epiploic artery from the gastro-duodenal branch of the hepatic artery; the left gastro-epiploic artery from the splenic artery; and the short gastric arteries from the splenic artery.

The corresponding veins drain into the portal system (*McGuigan and Ament, 1989*).

The lymphatic drainage of the stomach, accompanies its blood vessels. The stomach can be divided into three drainage zones:

Area I : the superior two -thirds of the stomach drain along the left and right gastric vessels to the aortic nodes.

Area II: the right two -thirds of the inferior one third of the stomach drain along the right gastro-epiploic vessels to the sub-pyloric nodes and then to the aortic node.

Area III: the left one third of the inferior one third of the stomach drains along the short gastric and splenic vessels lying in the gastro-splenic and lieno-renal ligaments, then via the supra-pancreatic nodes to the aortic group (*Coller et al, 1989*).

Innervation of the Stomach.

The stomach is innervated by both sympathetic and parasympathetic components of the autonomic nervous system. The sympathetic innervation of the stomach is supplied by postganglionic fibers arising from the celiac plexus through nerve plexuses located adjacent to the sympathetic fibers arise from the sixth through the eighth thoracic segments of spinal cord. The sympathetic nerves to the stomach contain afferent pain-transmitting nerve fibers as well as motor fibers to the pyloric sphincter. The para sympathetic nerve supply to the stomach derive from the vagus nerve. The anterior and posterior vagi enter the abdomen through the oesophageal hiatus. The anterior nerve lies close to the stomach wall but the posterior and larger nerve is at a little distance from it (*Kimura, 1986*).

The anterior vagus supplies branches to the cardia and lesser curve of the stomach and also a large hepatic branch which, in turn, donates a pyloric branch to the upper border of the pylorus and antrum.

The posterior vagus gives branches to both the anterior and posterior aspects of the body of the stomach, but the bulk of the nerve forms the coeliac branch. This runs along the left gastric artery to the coeliac ganglion for distribution to the intestine, as far as the mid-transverse colon, and the pancreas (*Kimura, 1986*).

ANATOMY OF THE DUODENUM

The duodenum is a tubular organ, approximately 30 cm in length, which is in continuity with the stomach, and for the most part is located retroperitoneally.

It is shaped approximately in the form of the letter C, with its cavity towards the left and the head of the pancreas resting in this concavity.

The first portion of the duodenum is approximately 5 cm in length, begins at the pylorus, and runs upwards, backwards, and to the right at the level of the first lumbar vertebra. The first 2.5 cm of the duodenum are freely movable and clothed by the same layers of peritoneum that envelop the stomach; The distal 2.5 cm are covered only anteriorly by peritoneum and thus are retroperitoneal.

The second, or descending, portion of the duodenum is approximately 8 cm in length. Just inferior to the mid-portion of the descending duodenum is the ampulla of Vater, at which the major pancreatic and common bile ducts gain entry into the intestinal lumen. The accessory pancreatic duct may enter 2 cm superior (proximal) to the ampulla of Vater. The third, or horizontal portion of the duodenum is approximately 10 cm long and crosses transversely anterior to the inferior vena cava and aorta. The fourth portion of the duodenum, which is about 5 cm in length, ascends along the left side of the aorta and then descends abruptly at the ligament of Treitz as the jejunum (**McGuigan and Ament, 1989**).

The duodenum is a muscular tube with outer longitudinal and inner circular smooth muscle layers. Its lumen is lined by mucosa, which in many respects is similar to that of other portions of the small intestine, although there are minor gross and microscopic differences between the duodenum, jejunum, and ileum, each of the three parts of the small intestine has the same general organization, and transitions between these components are gradual.

The duodenal glands, or Brunner's glands, begin in the vicinity of the gastric pyloric mucosa and are usually present, in gradually diminishing numbers, in the proximal two-thirds of the duodenum. They are not usually found in the jejunum or ileum. Brunner's gland secretion is clear in appearance, viscous and alkaline (pH. 8.2 to 9.3) (*Grossman, 1985*).

The superior pancreatico-duodenal artery arise from the gastrop -duodenal artery; the inferior pancreatico duodenal artery originates as the first branch of the superior mesentric artery. These vessels both lie in the curve between the duodenum and the head of the pancreas, supplying both structures (*McGuigan and Ament, 1989*).

Gastro-duodenal Junction

The presence of a true sphincter between the stomach and duodenum is unsettled. There is a definite difference in the contractile activities of the stomach on one side and of the duodenum on the other side . One contracts at a frequency of 3-5 cycle per minute and the other at 10-12 cycle per minute. What is unsettled is whether there is a definite ring of circular muscle between the two organs that behaves independently (*Weisbradt., 1984*). In man, some investigators have demonstrated a zone of elevated pressure between the stomach and duodenum (an indication of sphincter activity), others however, have not found such area. If a sphincter does exist it could play a role in the regulation of gastric emptying by changing the resistance to flow of gastric content into the duodenum (*Meyer, 1987*).

Based on an early observation by *Thomas and Grider 1935*,