# DUODENAL ULCER

Thesis submitted by

Mohammed Osama Fakhr El-Dein

in partial fulfillment of

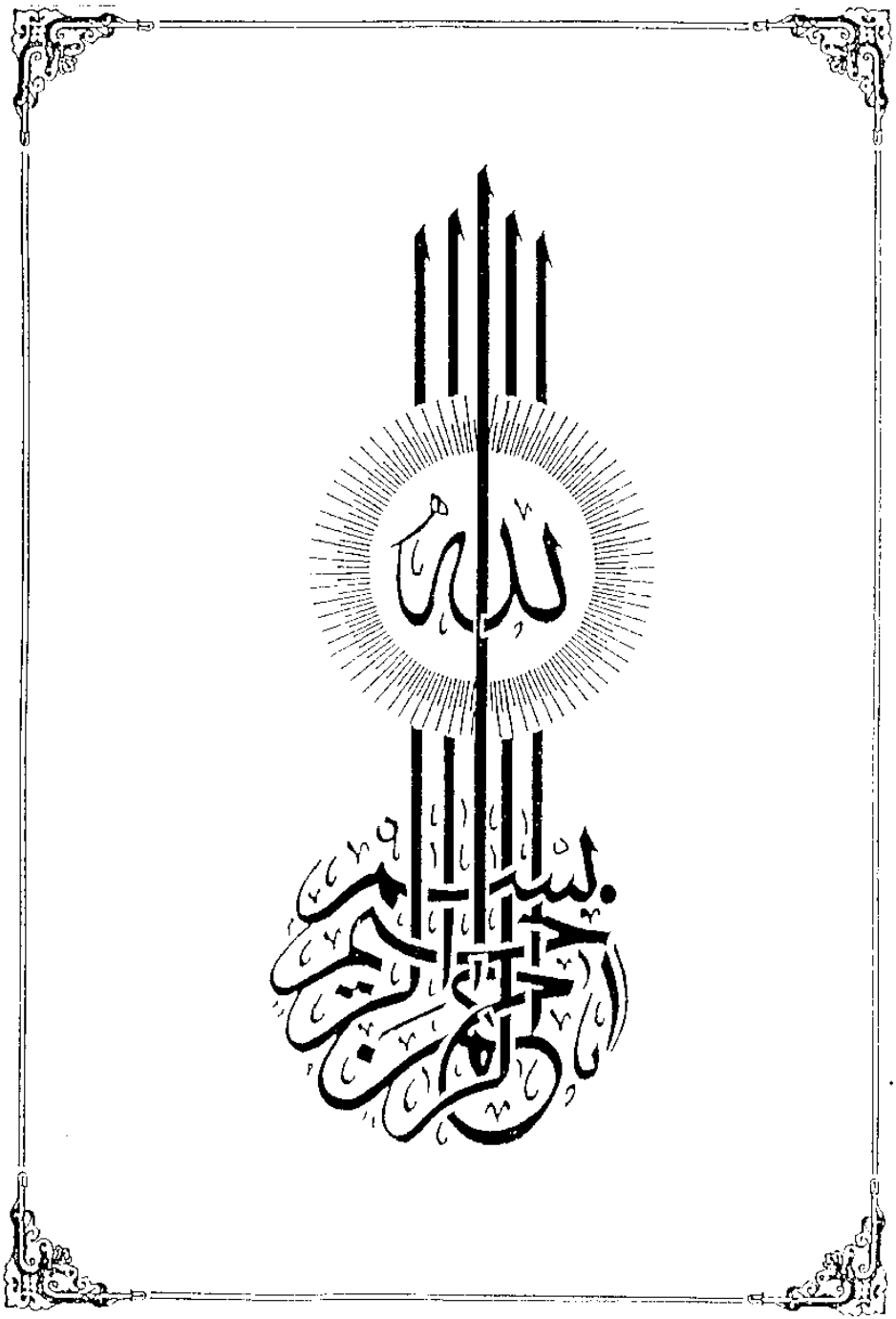
Master Degree in Surgery

under the supervision of

PROFESSOR DR. MAHMOUD NAGIEB

1980

TO MY PARENTS



ACKNOWLEDGEMENT

I wish to extend my sincerest appreciation and gratitude to Professor Dr. Mahmoud Nagieb, for supervising this work. With untiring devotion and kind understanding he guided my footsteps towards the successful completion of this paper. The statements he contributed and the suggestions with which he has kindly supproted this effort, particularly in the Discussion, have been invaluable.

Therefore, to a brilliant surgeon, an honest scientist, and a kind and understanding father do I offer my humble thanks.

C O N T E N T S

# INTRODUCTION

Duodenal ulcer is the commonest disorder of the human gastro-intestinal tract and may be the symbol of our era.

Duodenal ulcer is either acute or chronic. The acute type is less frequent, it has a short course and, on healing, the duodenal mucosa returns to normal again. The chronic duodenal ulcer deserves special medical and surgical attention due to the disabling pain it causes, the long course it takes, the serious complications it may give, the liability of its recurrence and its disturbing effect on the social and economic power of the patient himself and society.

A presumption of the presence of duodenal ulcer may be made from a patient's history, but definitive diagnosis depends mainly upon either radiology of endoscopy or both.

The development in the sciences of chemistry and pharmacology in the last few years led to the introduction of new drugs for the tratment of chronic uncomplicated duodenal ulcer. These drugs, in spite of being still under evaluation, have caused a revolution in the traditional lines of treatment. They may prove in the next few years that they can substitute the surgical lines of treatment of uncomplicated duodenal ulceration.

The aim of this work is to collect and study the literature published about duodenal ulcer, especially the different methods of diagnosis and treatment of uncomplicated chronic duodenal ulcer.

# SURGICAL ANATOMY
# OF THE
# STOMACH AND DUODENUM

THE STOMACH

The stomach is a muscular bag, fixed at both ends, mobile elsewhere, and subject to great variations in size in conformity with the volume of its contents. Much of it lies under cover of the lower ribs. It consists of fundus, body, pyloric antrum and pylorus. The fundus is that part which projects upwards, in contact with the left dome of the diaphragm, above the level of the cardiac orifice. It is usually full of gas. The body extends from the fundus to the level of the incisura angularis, a constant notch in the lower part of the lesser curvature. The pyloric antrum extends from this level, narrowing gradually towards the pylorus; the pylorus is palpably thicker than the rest of the stomach wall. The mucous membrane of the stomach is smooth and very red - in the pyloric antrum it is thrown into longitudinal folds which flatten out when the organ is greatly distended.

The outer longitudinal and inner circular muscle coats completely invest the stomach; they are reinforced by an innermost oblique muscle coat, which is incomplete. Its fibres loop over the fundus, being thickest at the notch between the fundus and esophagus. They pass along the anterior and posterior walls of the organ in a direction oblique to its long axis, but they lie vertically when the body is erect, and thus obtain the best mechanical advantage in supporting the weight of the stomach contents. It is this contraction of the oblique coat which porduces the magenstrasse. This is a pathway along the lesser curvature which allows liquids to pass along it while the body and greater curvature and pinched off. Thus a meal of rice and curry remains undisturbed in the stomach while the following drink of iced water flows directly through the duodenum (Last, 1973).

The stomach is completely invested in peritoneum, which passes in a double layer from its lesser curvature as the lesser omentum and from its fundus and greater curvature as the greater omentum.

The fundus and upper part of the body are fairly constant in shape and size, lying in contact with the diaphragm and upper part of the stomach bed. That part of the stomach below the costal margin,

namely the lower part of the body and the pyloric antrum, is much more variable in size and position, according to the build and habitus of the individual and the varying volume of his stomach contents. The stomach may project but little beyond the costal margin; on the other hand, the lower part of the greater curvature may lie on the pelvic floor. These are extremes and are not common. Most usually the greater curvature lies only a little below the level of the umbilicus, being in any individual highest when the stomach is empty and the body supine, lowest when full and the body erect.

## Relations of the Stomach

The upper part of the lesser curvature is overlapped in front by the sharp inferior border of the left lobe of the liver; elsewhere the anterior surface is in contact with the diaphragm and the anterior abdominal wall. The fundus occupies the concavity of the left dome of the diaphragm.

The convexity of the greater curvature lies in contact with the transverse colon, the gastro-colic omentum being instrumental in making their curvatures conform to each other.

The posterior wall of the stomach lies with its serous coat in contact with the peritoneum of the floor of the lesser sac. If the stomach is removed the stomach bed may be inspected. It extends on the left of the esophageal opening to the highest part of the dome of the diaphragm. The lesser sac is limited by the attachment of the greater omentum to the diaphragm and to the front of the left kidney (the lieno-renal ligament). The upper part of the greater curvature bulges to the left of this ligament and the stomach is here in contact with the spleen. Below this level the posterior surface of the stomach lies upon the downward-sloping transverse mesocolon. Above the attachment of the transverse mesocolon the body of the pancreas lies behind the peritoneum, the crests of the waves of the tortuous splenic artery

appearing above its upper border. In front of the left crus of the diaphragm lies the crescentic left suprarenal gland, closely applied to the medial border of the left kidney. To its right, in the middle line, lies the aorta with the short trunk of the coeliac artery dividing into its three divisions at the upper border of the pancreas. The caeliac artery lies between the coeliac ganglia and is surrounded by the coeliac lymph nodes and the coeliac plexus.

The pylorus has some mobility, for it is enclosed between the peritoneum of the right extremities of both greater and lesser omenta. It hangs down over the head of the pancreas. The pylorus is a sphincter of smooth muscle. Its great thickness is due mainly to thickening of the circular muscle coat of the stomach, but enhanced by the curling back here of many of the longitudinal fibres. Its canal is closed. The first part of the duodenum is widely patent; the duodenal aspect of the pylorus thus resembles the vaginal aspect of the cervix uteri, except that there are no fornices.

## The Arterial Supply of the Stomach

The arteries of the stomach are all branches (directly or indirectly) of the celiac; they form arches which lie along the two curvatures between the layers of the omenta. That at the lesser curvature is formed by the left gastric artery arising from the celiac, and the right gastric artery from the hepatic. Along the greater curvature there are the two gastro-epiploic arteries - the left from the splenic, and the right from the hepatic (through the gastro-duodenal). From these arches branches are given off to both surfaces of the stomach. Four or five short gastric arteries arise from the splenic or from its terminal branches; they pass to the stomach in the gastro-splenic ligament, and supply the fundus and upper part of the body.

## Venous Drainage of the Stomach

It is convenient to study the venous return with the arterial supply, for the two are essentially similar. Right and left gastric, right and left gastro-epiploic veins run with the corresponding arteries. All this blood reaches the liver via the portal vein and, with the arterial blood of the hepatic artery, passes through the liver to be carried via the hepatic veins to the inferior vena cava.

## Lymphatic Drainage of the Stomach

Lymph glands are found in more or less continuous chains related to both curvatures of the stomach, lying between the layers of the greater and lesser omenta. Those along the lesser curvature, which are referred to collectively as the superior gastric glands, may be divided into paracardial glands surrounding the esophago-gastric junction, the left gastric glands in relation to the artery of the same name, and the supra-pyloric glands lying just above the pylorus. The glands along the lowest part of the greater curvature are designated the inferior gastric glands: to the right they are continuous with the infra-pyloric glands lying in front of the head of the pancreas; to the left they are continuous with the pancreatico-lienal glands situated near the hilum of the spleen between the layers of the gastro-splenic ligament.

In general, lymph drainage from the stomach wall takes place towards the nearest glands. Spread from gland to gland in the lesser omentum occurs in an upward direction towards the paracardial glands. In the glands along the lower part of the greater curvature (inferior gastric glands) spread is in the opposite direction towards the infra-pyloric glands. Drainage from the upper part of the greater curvature is towards the pancreatico-lienal glands, and later to the glands along

the upper border of the pancreas. From all these glands further spread takes place in the retroperitoneal tissues to glands around the coeliac axis.

## Innervation of the Stomach

As with other viscera, the nerve supply to the stomach is both parasympathetic and sympathetic. The two vagus nerves (90% sensory and 10% motor) pass through the esophageal diaphragmatic hiatus in close approximation to the esophageal muscle.

The nerves are originally located to the right and left of the esophagus and stomach during embryonic development. When the foregut rotates, the lesser curvature turns to the right and the greater curvature to the left, and corresponding shifts in location of the vagal trunks follow. Hence, the right vagus supplies the posterior and the left the anterior gastric surface. In the region of the gastro-esophageal junction, each trunk bifurcates. The anterior trunk sends a division to the liver which travels in the lesser omentum. The bifurcation of the posterior trunk gives rise to fibres that enter the coeliac plexus and supply the parasympathetic innervation to the remainder of the gastro-intestinal tract as far as the mid transverse colon. Both trunks, after giving rise to their extragastric divisions, send some fibres directly onto the surface of the stomach and others along the lesser curvature (anterior and posterior nerves of Laterjet) which supply the distal part of the organ. All vagal fibres to the stomach anastomose eventually with ganglion cells in the stomach wall between muscle layers (Auerbach's plexus) or in the submucosa (Meissener's plexus). Postganglionic cholinergic fibres are distributed to the cells of the smooth muscle layers and the mucosa. Overall parasympathetic stimulation contracts the stomach, relaxes the pylorus and stimulates glandular secretion. The sympathetic (adrenergic) innervation to the stomach consists of postganglionic fibres that pass along

the arterial vessels from the coeliac plexus. Sympathetic stimulation constricts blood vessels, inhibits motor activity and secretion and contracts the stomach.

THE DOUDENUM

The first inch of the duodenum is contained between the peritoneum of the lesser and greater omenta, but the remainder of this part of the gut is entirely retroperitoneal. The duodenum is a C-shaped tube curved over the convexity of the forwardly projecting aorta and inferior vena cava, while its descending limb lies more posteriorly in the right paravertebral gutter. Appreciation of the directions of the various parts of the duodenum is essential to the interpretation of X-rays of barium meals. The duodenum is divided into four parts, all of which run in different directions. The tube is 10 inches long and the lengths of its parts are 2, 3, 3 and 2 inches.

The first part of the duodenum runs backwards and somewhat upwards from the pylorus; a fore-shortened view is consequently obtained in sagittal X-ray projects. The radiologist knows this view as the "duodenal cap". Its first inch lies between the peritoneal folds of the greater and lesser omenta; it forms the lowermost boundary of the opening into the lesser sac. It lies upon the portal vein and inferior vena cava, and the neck of the gall-bladder touches its upper convexity. The second inch passes backwards and upwards on the right crus of the diaphragm and the right psoas muscle to the medial border of the right kidney. It touches the upper part of the head of the pancreas and is covered in front with peritoneum of the posterior abdominal wall. The inferior surface of the right lobe of the liver lies over this peritoneum.

The second part of the duodenum curves dowards over the hilum of the right kidney. It is covered in front with peritoneum, and crossed by the attachment of the transverse mesocolon, so that its upper half lies in the supracolic compartment to the left of the

hepato-renal pouch (in contact with the liver) and its lower half lies in the right infracolic compartment medial to the inferior pole of the right kidney (in contact with coils of jejunum). It lies alongside the head of the pancreas. Its posterio-medial wall receives the common opening of the bile duct and main pancreatic duct at the duodenal papilla (ampulla of Vater). The papilla lies about halfway along the second part, some 4 inches from the pylorus. It is guarded by the semilunar flap of mucous membrane which surmounts it. An inch proximal to the papilla is the small opening of the accessory pancreatic duct.

The third part of the duodenum curves forwards from the right paravertebral gutter over the slope of the right psoas muscle (gonadal vessels and ureter intervening) and passes over the forwardly projecting inferior vena cava and aorta to reach the left psoas muscle. Its inferior border lies on the aorta at the commencement of the inferior mesenteric artery at the level of the umbilicus. Its upper border hugs the lower border of the pancreas. It is covered by the peritoneum of the posterior abdominal wall just below the transverse mesocolon. It is crossed by the superior mesenteric vessels and by the leaves of the commencement of the mesentery of the small intestine sloping down from the duodeno-jejunal flexure. It lies, therefore, in both right and left infracolic compartments. Its anterior surface is in contact with the coils of the jejunum.

The fourth part of the duodenum ascends to the left of the aorta, lying on the left psoas muscle and left lumbar sympathetic trunk to reach the lower border of the pancreas, almost as high as the root of the transverse mesocolon (L2 vertebra). It is covered in front by the peritoneal floor of the left infracolic compartment and by coils of jejunum. It breaks free from the peritoneum that has plastered it down to the posterior abdominal wall and curves forwards and to the right as the duodeno-jejunal flexure. This pulls up a double fold of peritoneum from the posterior abdominal wall, the mesentery of the small intestine, which slopes down to the right across the third part of the duodenum and posterior abdominal wall.