Al-Azhar University

Faculty of Medicine

Radiodiagnosis Department

The Role of Multidetector Computed Tomography in evaluation of gastric cancer

Essay

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Radiodiagnosis

By

Yosra Ahmed Mohamed Ahmed

(M.B.B.CH) AL Azhar University

Supervised by

Prof. Dr. Mostafa Ahmed Mamdouh ElSharkawy

Professor of radiodiagnosis

Faculty of Medicine

Assuit University

Dr. Ahmed Okasha Mohamed

Lecturer of radiodiagnosis

Faculty of Medicine

Al Azhar University

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Yosra Ahmed Mohamed

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Abbreviations

- EGC…….early gastric cancer
- EUS…….endoscopic ultra sonography
- MALT lymphoma…….Mucosa-associated lymphoid tissue lymphoma
- MDCT…….multidetector computed tomography
- MPR…….multiple planar reconstructions
- mSv…….milli Seivert
- PGA…….pyloric gland adenoma
- SMA…….superior mesenteric artery
- SSD…….Surface Shaded Display
- UGI…….Upper Gastrointestinal Series
- UICC/AJCC…….Union Internacional Contra la Cancrum /American Joint Committee on Cancer.
- VR…….Volume-rendered
- WHO……..World Health Organization
- IVU ……intravenous urography

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INTRODUCTION

Gastrointestinal malignancies are among the leading causes of cancer death. Because of the close correlation between early detection of these tumors and Prognosis they present a special challenge to clinicians **(Valencak and Raderer, 1998).**

Gastric carcinoma and lymphoma are the most common malignant neoplasm of the stomach. Each of these has a variable radiographic appearance. Other malignant neoplasms are considerably less common **(Stabile et al, 2003).**

For many years barium examination and endoscopy were the only diagnostic methods for evaluating diseases of the gastrointestinal tract. In the last 15 years however, CT has been shown to be an essential tool in the diagnostic evaluation of the gastrointestinal tract **(Koehler et al, 1998).**

The wide availability of high resolution fast scanners and the use of the safer Contrast materials, combined with increasing experience in both performing and interpreting, studies have led to the maturity of CT into a vital diagnostic tool in the assessment of the gastrointestinal malignancies especially with the recent use of multidetector CT scanning **(Rogala et al,2001).**

It was found that multidetector CT carries many advantages including shorter acquisition time, retrospective creation of the thinner and thicker sections from the same raw data, better resolution and ease of performance. In addition,

multidetector CT scanners improve the quality of the 3-dimensional CT (3DCT) images that are valuable to the clinicians and surgeons **(Horton and Fishman, 2004).**

Recent advances in computer assisted virtual reality data post processing techniques with rapid image acquisition have led to development of virtual reality imaging. It allows navigation through any hollow air distended viscus with consequent production of endoluminal images that permit visualization of intrinsic lesions **(Rogala et al, 2001).**

The use of 2D multiplanar reconstructions (MPRs) and virtual gastroscopy using a volume-rendering (VR) technique is a promising 3D imaging technique for the preoperative evaluation of gastric cancer.

Application of these techniques for the detection of gastric cancer using MDCT has been reported **(Kumano S et al, 2005).**

Aim of the work

- The aim of this work is to evaluate the role of multidetector CT in evaluation of gastric cancer.

STOMACH

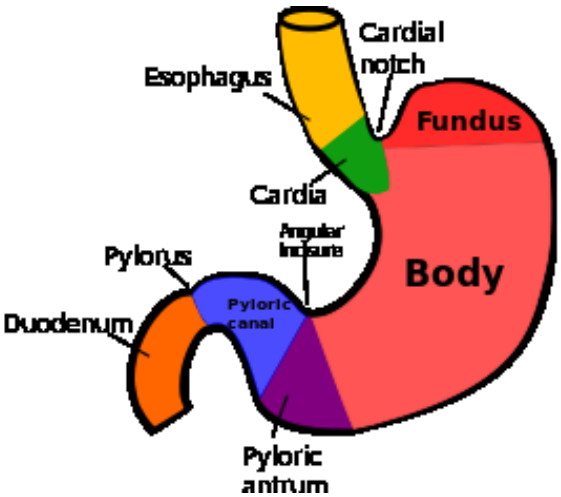
The stomach is the widest part of the alimentary tract and lies between the oesophagus and the duodenum. It is situated in the upper abdomen, extending from the left upper quadrant downwards, forwards and to the right, lying in the left hypochondriac, epigastric and umbilical areas. It occupies a recess beneath the diaphragm and anterior abdominal wall that is bounded by the upper abdominal viscera on either side ***(Susan Standring, 2008)***

Sections

The stomach is divided into four sections, each of which has different cells and functions. The sections are:

Cardia	Where the contents of the oesophagus empty into the stomach
Fundus	Formed by the upper curvature of the organ
Body	The main, central region
Pylorus	The lower section of the organ that facilitates emptying the contents into the small intestine

(Table 1.1) Sections of the stomach ***(Sherwood et al., 2007)***



(Figure 1.1) sections of the stomach ***(Susan Standring, 2008)***

Gastric surfaces

When the stomach is empty and contracted, the two surfaces tend to lie facing almost superiorly and inferiorly, but with increasing degrees of distension they come to face progressively more anteriorly and posteriorly ***(Susan Standring, 2008)***

Anterior (superior) surface

The lateral part of the anterior surface is posterior to the left costal margin and in contact with the diaphragm, which separates it from the left pleura, the base of the left lung, the pericardium and the left sixth to ninth ribs. It lies posterior to the costal attachments of the upper fibres of transversus abdominis, which separate it from the seventh to ninth costal cartilages. The upper and left part of this surface curves posterolaterally and is in contact with the gastric surface of the spleen. The right half of the anterior surface is related to the left and quadrate lobes of the liver and the anterior abdominal wall. When the stomach is empty, the transverse colon may lie adjacent to the anterior surface. The entire

anterior (superior) surface is covered by peritoneum ***(Susan Standring, 2008)***

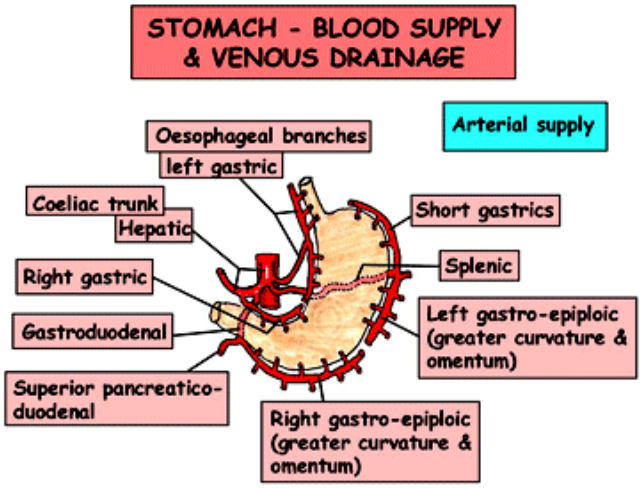
Posterior (inferior) surface

The posterior surface lies anterior to the left crus and lower fibres of the diaphragm, the left inferior phrenic vessels, the left suprarenal gland, the superior pole of the left kidney, the splenic artery, the anterior pancreatic surface, the splenic flexure of the colon and the upper layer of the transverse mesocolon. Together these form the shallow stomach bed: they are separated from the stomach by the lesser sac (over which the stomach slides as it distends). The upper left part of the surface curves anterolaterally and lies in contact with the gastric surface of the spleen. The greater omentum and the transverse mesocolon separate the stomach from the duodenojejunal flexure and ileum. The posterior surface is covered by peritoneum, except near the cardiac orifice, where a small, triangular area contacts the left diaphragmatic crus and sometimes the left suprarenal gland. The left gastric vessels reach the lesser curvature at the right extremity of this bare area in the left gastropancreatic fold. The gastrophrenic ligament passes from the lateral aspect of this bare area to the inferior surface of the diaphragm. ***(Susan Standring, 2008).***

VASCULAR SUPPLY AND LYMPHATIC DRAINAGE

Arteries

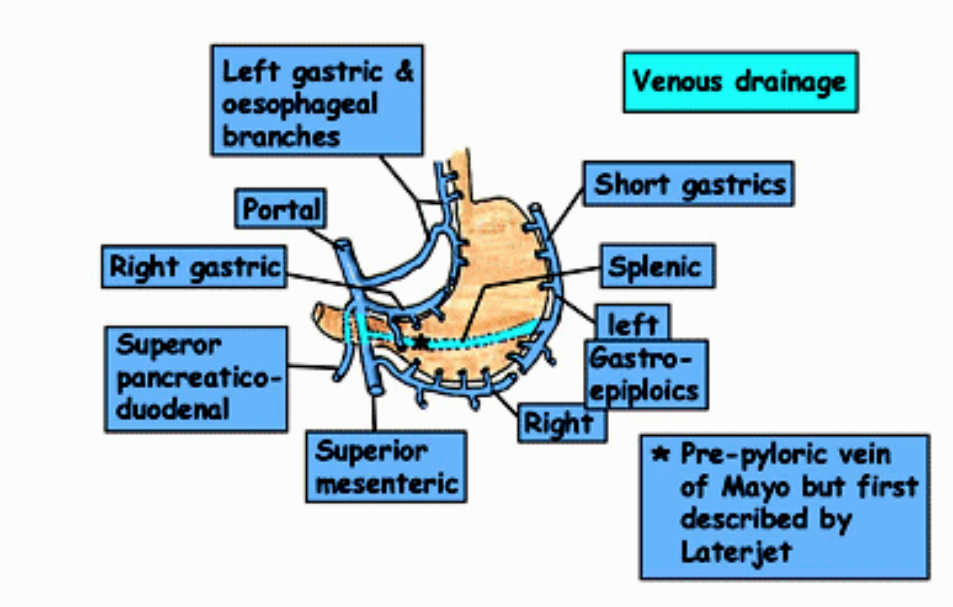
The arterial supply to the stomach comes predominantly from the coeliac axis although intramural anastomoses exist with vessels of other origins at the two ends of the stomach



(Figure1.2) The arterial supply of the stomach (***Ackroff et al., 2005)***

Veins

The veins draining the stomach ultimately empty into the portal vein. A rich submucosal and intramural venous network gives rise to veins that usually accompany the corresponding named arteries and drain into either the splenic or superior mesenteric veins, although some pass directly into the portal vein. The course and distribution of the veins is highly variable even up to the level of the major named vessels (***Ackroff et al., 2005)*.**



(Figure 1.3) Veins of the stomach **(Ackroff et al., 2005)**

Lymphatic drainage

The stomach has a rich network of lymphatics that connect with lymphatics draining the other visceral organs of the upper abdomen. At the gastro-oesophageal junction the lymphatics are continuous with those draining the lower oesophagus, and in the region of the pylorus they are continuous with those draining the duodenum. In general, they follow the course of the arteries supplying the stomach ***(Susan Standring, 2008)***

Innervation

Sympathetic innervation

The gastric sympathetic nerves are vasoconstrictor to the gastric vasculature and inhibitory to gastric musculature (***Ackroff et al., 2005)***

Parasympathetic innervation

The parasympathetic gastric supply is secretomotor to the gastric mucosa and motor to the gastric musculature. ***(Susan Standring, 2008).***

Physiology

Role in digestion

Bolus (masticated food) enters the stomach through the oesophagus via the oesophageal sphincter. The stomach releases proteases (protein-digesting enzymes such as pepsin) and hydrochloric acid, which kills or inhibits bacteria and provides the acidic pH of two for the proteases to work. Food is churned by the stomach through muscular contractions ofthe wall – reducing the volume of the fundus, before looping around the fundus and the bodies of stomach as the boluses are converted into chyme (partially digested food). Chyme slowly passes through the pyloric