Preoperative local staging of gastric adenocarcinoma with 3D multi-detector row computerized tomography

Essay

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Contents

List of abbreviations

US	Ultrasonography
CT	Computed tomography
MDCT	Multidetector computed tomography
MPRs	Multiplanar reformations
EGC	Early gastric cancer
TNM	Tumor, node, metastasis
SSD	Surface shaded display
MA	Milliampere
KV	Kilovolt
3D CT	Three dimensional computed tomography
VR	Volume rendering
LOCM	Low osmolar contrast medium

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Introduction and aim of the work

Introduction

Despite its declining incidence, gastric cancer remains an important cause of cancer death in Japan and elsewhere **(Forman et al, 2000).**

To reduce mortality, it is essential to choose an optimal therapeutic approach, and this, in turn, depends on early detection and accurate preoperative staging. Indeed, prognosis is related to the depth of invasion of the gastric wall and lymph node involvement **(Msika, 1998)**.

Survival is improved with curative resection and palliative chemotherapy **(Gill et al, 2003)**. A small early gastric cancer confined to the submucosa (T1 stage) can be treated with non surgical endoscopic mucosal resection. Preoperative radiotherapy or chemotherapy is recommended for advanced gastric cancer. Accurate preoperative staging, therefore, can help increase cure rates and quality of life **(Ohashi et al, 1999)**.

Preoperative staging has often included endoscopic ultrasonography (US) and computerized tomography (CT), but hydrodynamic helical CT might replace preoperative endoscopic US in (T) and (N) staging **(Habermann et al, 2004).**

Multidetector row CT with thin collimation offers near-isotropic imaging of the stomach and allows high quality multiplaner reformations (MIPs) and endoluminal three dimensional virtual gastroscopy of gastric images. with adequate distention of the stomach with using water as negative contrast, dynamic contrast material –enhanced CT images offer superior differentiation of tumor tissue from normal mucosa. Also MPRs have advantages for assessing both intra- and extraluminal processes of gastric wall for evaluating more distant regions, such as para-aortic lymph nodes and abdominal organs.

Adding multiplaner reformatted images to transverse CT images also improves the capability of distinguishing T3 from T4 gastric cancer and prediction of adjacent organ invasion **(Kim et al, 2009).**

Contrast enhanced CT can be also used successfully to preoperatively evaluate the staging of remnant gastric cancer in patients who have undergone previous gastric resection **(Lee et al, 2010).**

The aim of this study is to evaluate the accuracy of multidetector row CT images for preoperative staging of gastric adenocarcinoma.

Basic and radiological anatomy of the stomach

Basic anatomy of the stomach

The stomach is the most distensible organ of the body. It is usually J shaped but varies in size and shape with volume of its contents, with erect and supine position and even with inspiration and expiration **(Ryan and McNicholas, 2004).**

The stomach has two orifices; the cardiac orifice at eosophagogastric junction and the pylorus. It has two curvatures, the greater curvature and lesser curvature. The incisura is an angulation of the lesser curvature. The part of the stomach above the cardia is called the fundus. Between the cardia and incisura is the body of the stomach and distal to incisura is the antrum. The cardiac orifice and the fundus are relatively fixed and only

move with respiratory movement of diaphragm **(Fig1.1) (Cunningham and Romanes, 2005).**

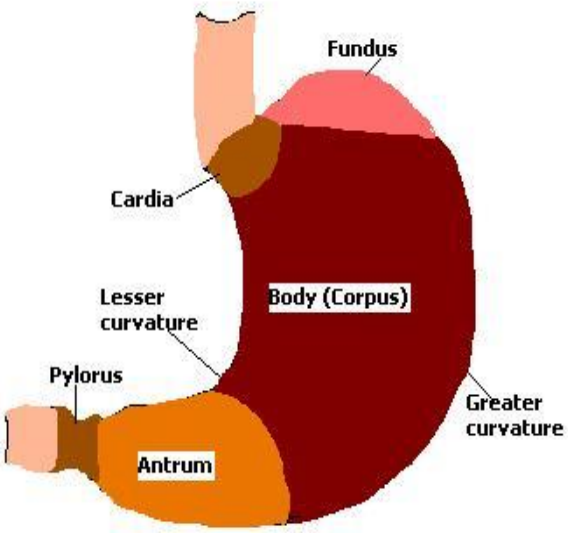

***Fig.1.1*:** Anatomy of the stomach **(Quoted from Cunningham and Romanes, 2005**)

The stomach passes downward and to the right across the supracolic compartment of peritoneal cavity. It tapers from fundus on the left of median plane to narrow pylorus, 2-3 cms to the right of the median plane**.** This pyloric part consists of proximal dilated portion, the pyloric antrum and narrow cylindrical portion, the pyloric canal; 2cm long that is continuous distally with the pylorus. The pylorus is the part of the stomach thickened by increase in the amount of circular muscle to form the pyloric sphincter that controls the rate of discharge of the stomach content into the duodenum **(Fig. 1.2) (Cunningham and Romanes, 2005) .**

The pylorus is highly mobile because the omentum is attached to it. It may lie anywhere between the first and the third lumbar vertebrae. It is further transferred to the right when the stomach is full**.** In its higher position the pylorus is posterior to the quadrate lobe of the liver and is separated from the pancreas by the omental bursa **(Cunningham and Romanes, 2005).**

The fundus abuts on the left dome of diaphragm under the cover of the rib cage and reaches the level of the fifth rib in the midclavicular line anteriorly. The cardiac orifice lies approximately 10 cm posterior to the seventh left costal cartilage**,** 2-3 cm from the median plane between the liver and the diaphragm **(Cunningham and Romanes, 2005).**

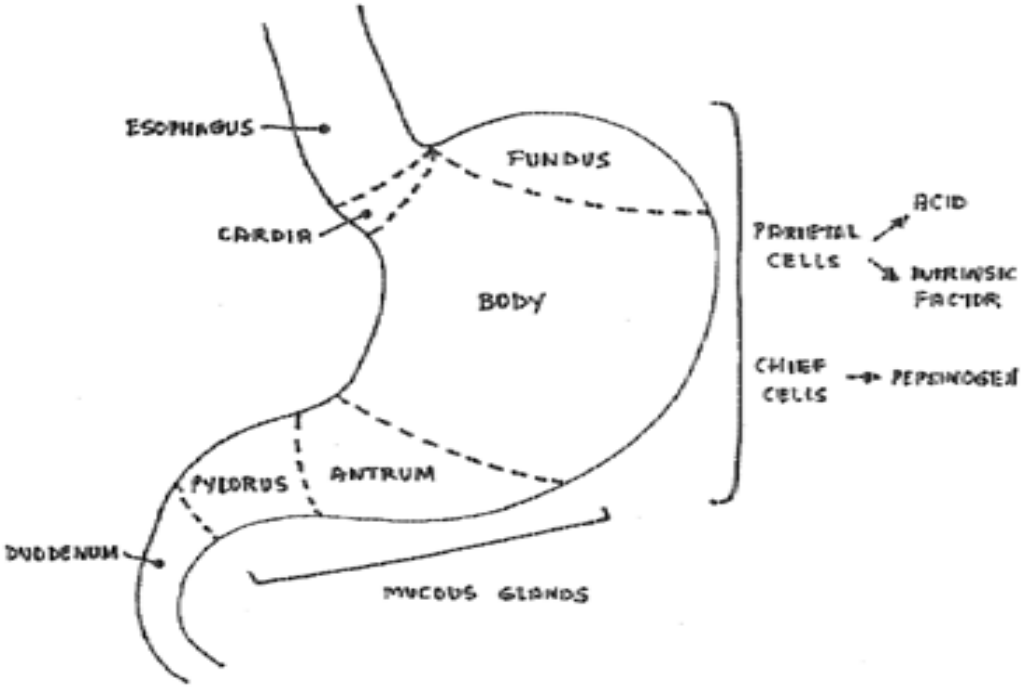

Fig. 1.2**:** Anatomy of the stomach **(Quoted from Ryan and McNicholas, 2004)**

The stomach is lined by mucosa that is tiny nodular elevations called the area gastrica and is thrown into folds called rugae. The longitudinal folds parallel to the lesser curvature called magenstrasse; rugae elsewhere in the stomach are random and patternless **(Ryan and McNicholas, 2004).**

There are three muscle layers in the wall of the stomach, an outer longitudinal, inner circular and incomplete innermost oblique layer **(Fig. 1.3)**. The circular layer is thickened at the pylorus as a sphincter but not at esophagogasteric junction**.** Fibers of oblique layer loop around the notch between the fundus and esophagus and help to prevent reflux **(Ryan and McNicholas, 2004).**

The upper part of the anterior surface of the stomach is covered by the left lobe of the liver on the left and by the diaphragm on the right.

The fundus occupies the left dome of the diaphragm. The abdominal wall covers the remaining part of the anterior wall of the stomach **(Fig. 1.4).** Posterior to the stomach lies the lesser sac, the structures of the posterior abdominal wall that are posterior to this, are referred to as the stomach bed. The pancreas lies across the mid-portion of the stomach bed with the splenic artery partly above and partly behind it, and the spleen at its tail. Above the pancreas are the aorta and its coeliac trunk and the surrounding plexus and nodes, the diaphragm, the left kidney and left adrenal gland. Attached to the anterior surface of the pancreas is the transverse mesocolon which forms the inferior part of the stomach bed **(Fig. 1.5) (Ryan and McNicholas, 2004).**

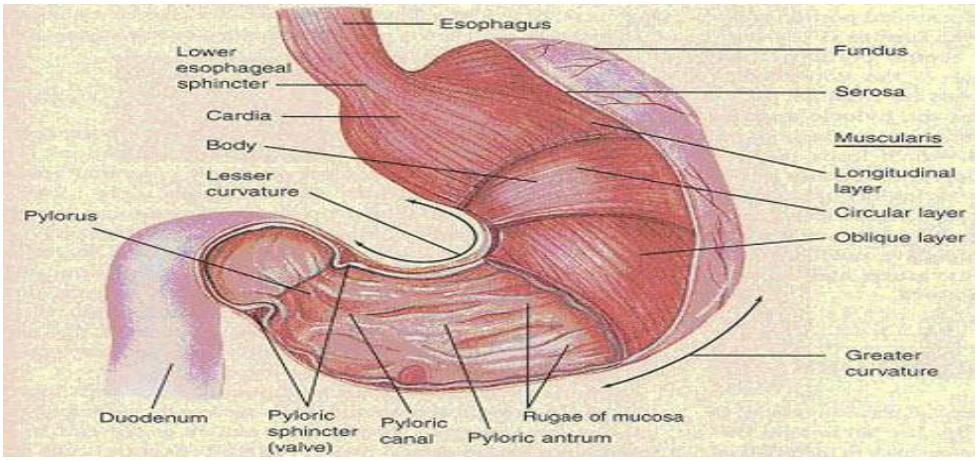

***Fig. 1.3*:**muscle layers of the stomach**(Quoted from Tortora and Grabowski, 2002).**

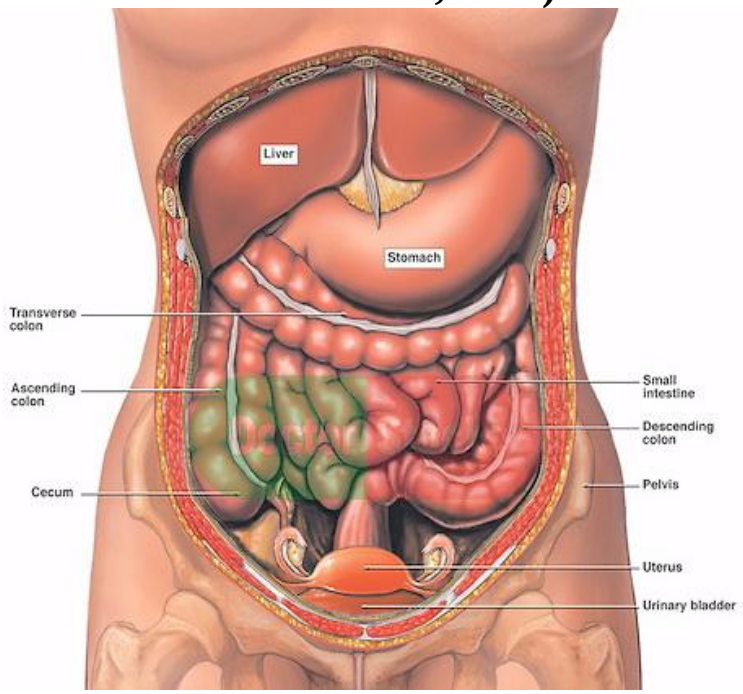

***Fig. 1.4*:** Relations of the stomach **(Quoted from Doctor Stock, 2012)**