Role of MRI in Imaging of pancreatitis and its complications

Essay

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Introduction

Pancreatitis is a main cause for abdominal pain and hospitalization in the world. Incidence of pancreatitis is increasing in the recent years. Imaging plays an important role in the management of pancreatitis ***(Manikkavasakar et al.,2014).***

Acute pancreatitis is caused by acute chemical injury of the pancreas, and the leakage of activated pancreatic enzymes leads to autodigestion of the pancreatic parenchyma and peripancreatic tissues. Choledocholithiasis and alcoholism are the most common etiological factors for this disease ***(Xiao and Zhang,2010).***

Chronic pancreatitis is characterized by continued inflammation and destruction of the pancreas that lead to irreversible morphological changes in the pancreatic parenchyma and its ducts These changes finally result in abdominal pain, malabsorption, malnutrition and diabetes mellitus ***(Balci,2011).***

Imaging has an important role in management of acute pancreatitis. Ultrasonography (US) is considered the simplest technique as it is relatively inexpensive and available in most centers. However, visualization of the pancreas may be disturbed by overlying gastrointestinal gas, which is an important limitation for US applications in this disease. Contrast-enhanced computerized tomography (CT) is usually used to aid the diagnosis of pancreatic necrosis and help assess the presence and development of local complications in acute pancreatitis. However, CT has the potential exacerbation of pancreatic injury that results from the use of

iodinated contrast media and an increased radiation burden that may result from follow-up scans ***(Xiao and Zhang,2010).***

The diagnosis of chronic pancreatitis depends on clinical symptoms, pancreatic exocrine function testing and imaging. Endoscopic exocrine function testing is considered the most dependable diagnostic method for chronic pancreatitis. Endoscopic ultrasonography (EUS) is considered a reliable imaging method for determining parenchymal and ductal changes. However, EUS is invasive and not available at all centers. Computed tomography (CT) and ultrasonography (US) are less sensitive than MRI for the assessment of chronic pancreatitis ***(Balci,2011).***

As with the development of high-field-strength magnetic resonance imaging (MRI), it has been settled that several techniques such as abdominal rapid gradient-echo breath-hold, magnetic resonance-cholangiopancreatography (MRCP) and three-dimensional dynamic contrast-enhanced sequences are performed to describe satisfactorily the normal pancreas and pancreatic pathologies ***(Xiao and Zhang,2010).***

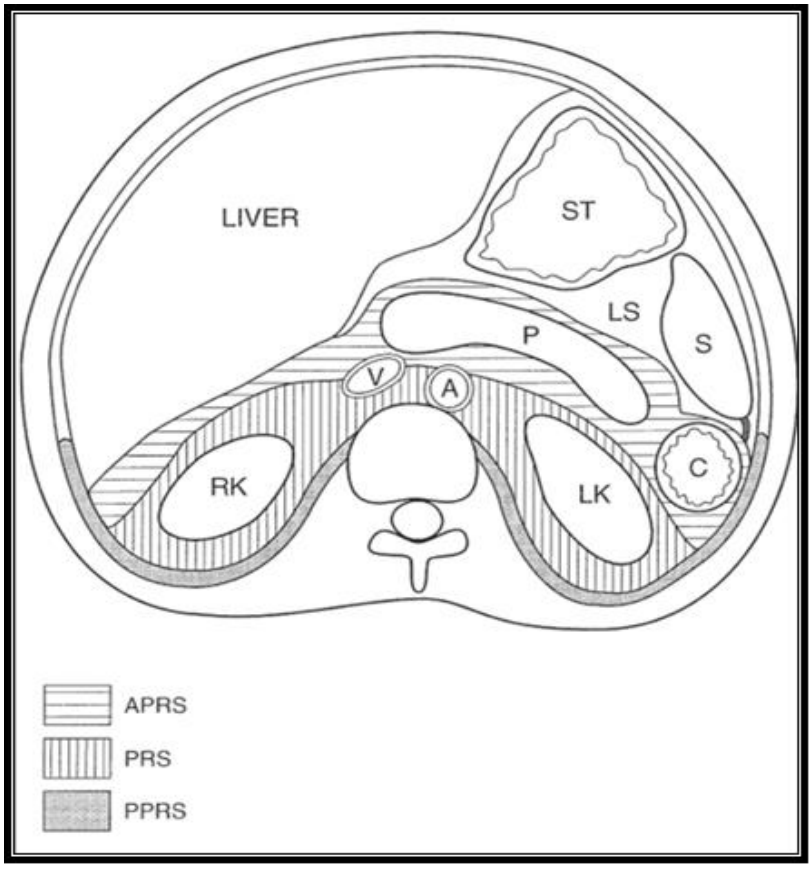
In addition, the recent development of motion resistant pulse sequences and new respiratory gating techniques make magnetic resonance imaging (MRI) a very accurate investigation modality for evaluating patients with pancreatitis ***(Manikkavasakar et al.,2014).***

Aim of the work

To assess the role of MRI in imaging pancreatitis and its complications.

Anatomy Of The Pancreas

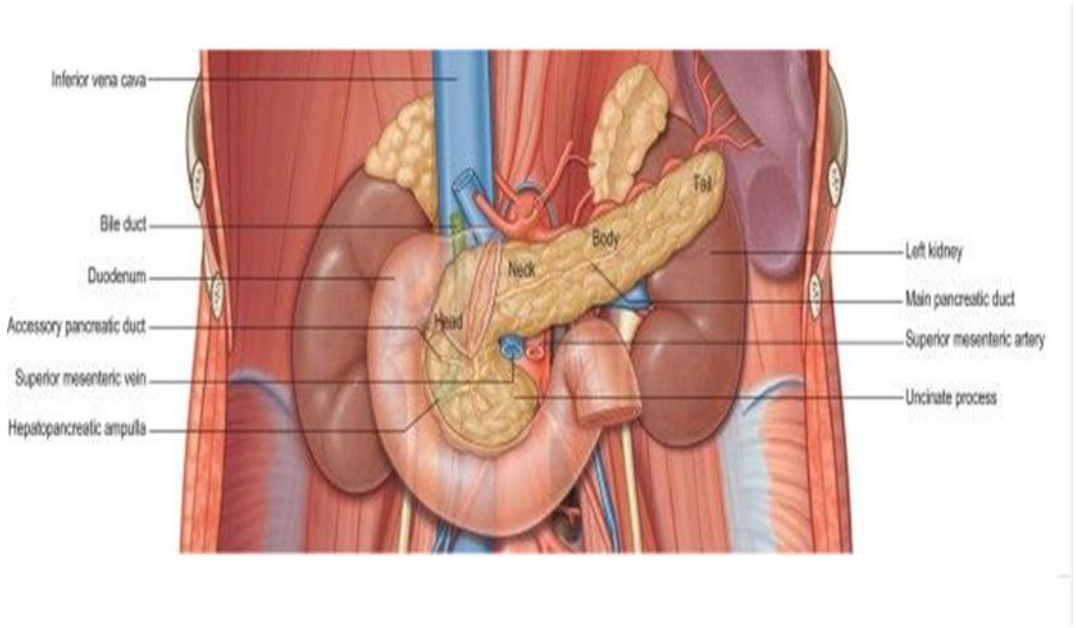
The pancreas lies in the most anterior of the three retroperitoneal compartments, the anterior para-renal space (Fig 1). Ventrally this is bounded by the posterior parietal peritoneum. Dorsally the space is bounded by the anterior renal or Gerota's fascia and more laterally by the lateral conal fascia ***(Adam & Morgan, 2008)***.



(Fig. 1) Retroperitoneal compartments the pancreas (p) lies in the anterior pararenal space (APRS) together with the ascending and descending colon © and duodenum. ST – stomach, S-spleen, RK-right kidney, LK-left kidney, A-aorta, V-inferior vena cava, LS-lesser sac, PRS-pararenal space, PPRS-posterior pararenal space (Adam & Morgan 2008).

It is situated on the posterior abdominal wall at approximately L1 level and described as having a head, neck, body and tail (Fig. 2). It is retroperitoneal with the exception of the tail, which lies in the spleno-renal ligament. It is over 15 cm long and lies transversely and

slightly obliquely, with the tail higher than the head ***(Ryan et al, 2011)***.



(Fig 2):Relations of the pancreas. (Gray, 2008)

HEAD

The head of the pancreas lies to the right of the midline, anterior and to the right side of the vertebral column. It is the thickest and broadest part of the pancreas but is still flattened in the anteroposterior plane. It lies within the curve of the duodenum. Superiorly it lies adjacent to the first part of the duodenum, but close to the pylorus the duodenum is on a short mesentery, and here the duodenum lies anterior to the upper part of the head. The duodenal border of the head is flattened and slightly concave, and is firmly adherent to the second part of the duodenum. The inferior border lies superior to the third part of the duodenum and is continuous with the uncinate process ***(Gray, 2008).***

Close to the midline, the head is continuous with the neck. The boundary between head and neck is often marked anteriorly by a groove for the gastroduodenal artery and posteriorly by a similar but

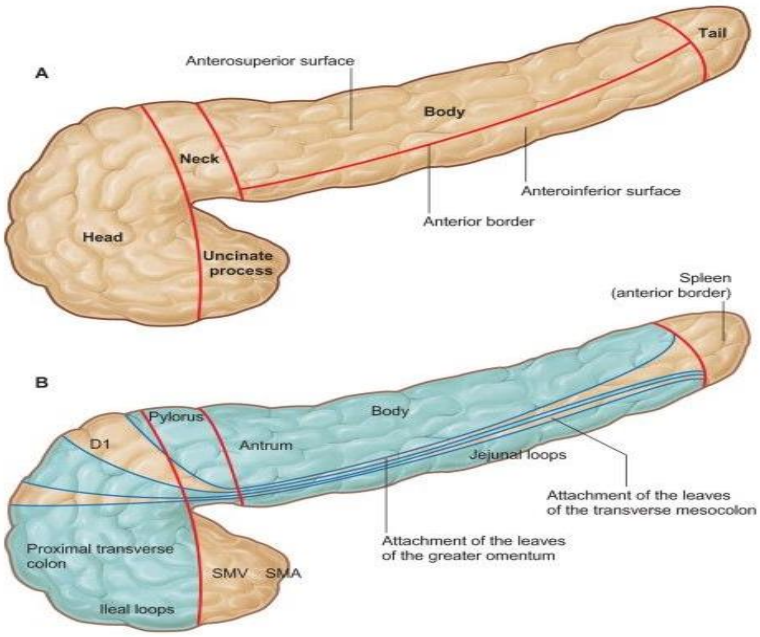
deeper deep groove containing the union of the superior mesenteric and splenic veins to form the portal vein ***(Gray, 2008)***.

Anterior surface

The anterior surface of the head is covered by peritoneum and is related to the origin of the transverse mesocolon (Fig 3) ***(Adam & Morgan, 2008)***.

Posterior surface

The posterior surface of the head is related to the inferior vena cava, which ascends behind it and covers almost all of this aspect (Fig 2). It is also related to the right renal vein and the right crus of the diaphragm ***(Gray, 2008)***.



(Fig3) :A, Regions and anterior surfaces and borders of the pancreas. B, Anterior relations of the pancreas. Areas covered in peritoneum are shown in blue and structures overlying these areas are separated from the pancreas by peritoneal 'spaces'. The spleen in relation to the tail lies anterior to the anterior leaf of the splenorenal ligament and not in direct contact with the pancreatic tissue. D1, first part of the duodenum; SMA, superior mesenteric artery; SMV, superior mesenteric vein *(Gray, 2008)*.

NECK

The neck of the pancreas is only 2 cm wide and links the head and body. It is often the most anterior portion of the gland. It is defined as that portion of the pancreas which lies anterior to the portal vein, and is closely related to the upper posterior surface ***(Gray, 2008)***.

The lower part of the neck lies anterior to the superior mesenteric vein just before the formation of the portal vein. The anterior surface of the neck is covered with peritoneum. It lies adjacent to the pylorus just inferior to the epiploic foramen***(Gray, 2008)***.

BODY

The body of the pancreas runs from the left side of the neck to the tail. It is the longest portion of the gland and becomes progressively thinner and less broad towards the tail. It is slightly triangular in cross-section and is described as having three surfaces: anterosuperior, posterior and anteroinferior ***(Ryan et al, 2011)***.

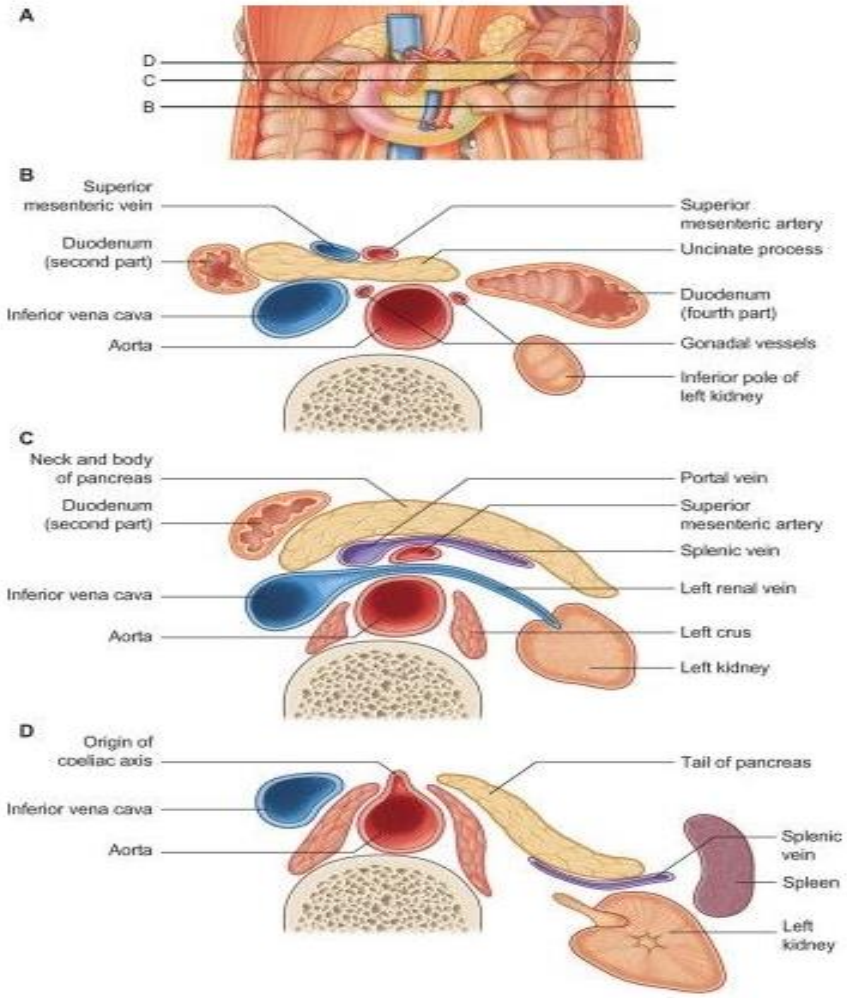
Anterosuperior surface

It is covered by peritoneum, which runs anteroinferiorly from the surface of the gland to be continuous with the anterior, ascending layer of the greater omentum. It is separated from the stomach by the lesser sac ***(Gray, 2008)***.

Posterior surface

The posterior surface of the pancreas is devoid of peritoneum. It lies anterior to the aorta and the origin of the superior mesenteric artery, the left crus of the diaphragm, left suprarenal gland and the left

kidney and renal vessels, particularly the left renal vein. It is closely related to the splenic vein which runs from left to right forming a shallow groove in the gland (Fig 4-C). The splenic vein lies between the posterior surface and the other posterior relations. The left kidney is also separated from the posterior surface by perirenal fascia and fat ***(Ryan et al, 2011)***.



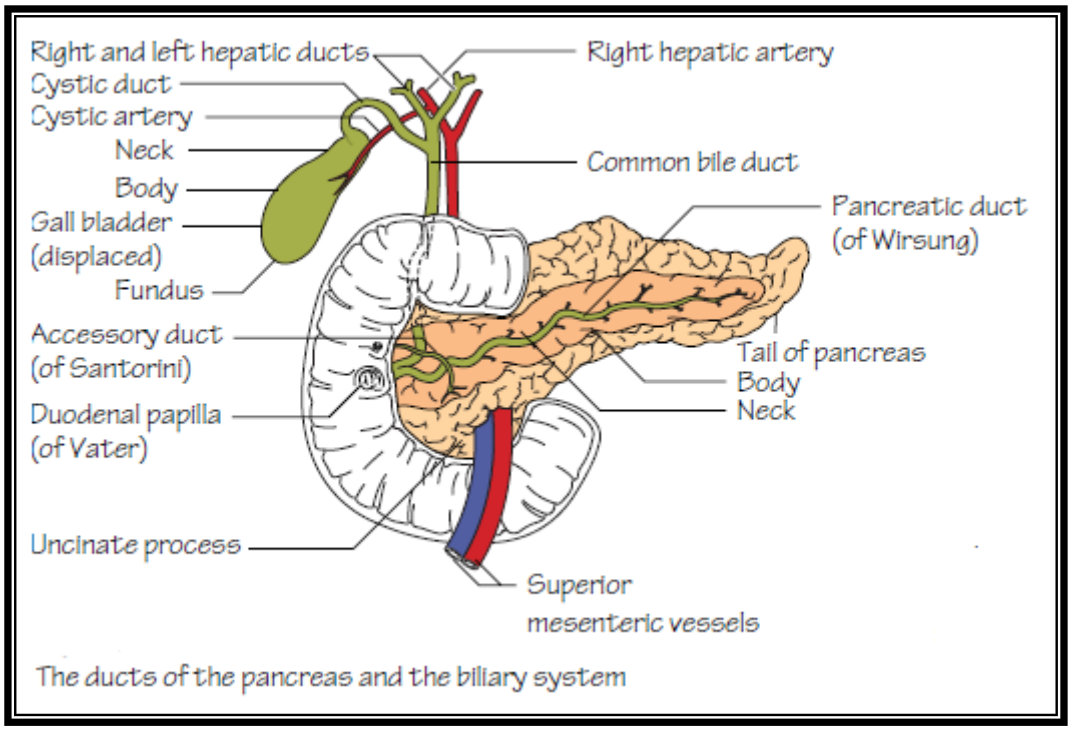
(Fig 4):A, Posterior relations of the pancreas. Cross sections taken at the mid level of the uncinate process (B), head, neck and body (C), and tail (D) of the pancreas. See the coronal view for reference of transverse sections *(Gray, 2008)*.

Anteroinferior surface

It is covered by peritoneum which is continuous with that of the posteroinferior layer of the transverse mesocolon. The fourth part of the duodenum, the duodenojejunal flexure and coils of jejunum lie inferiorly ***(Gray, 2008)***.

PANCREATIC DUCTS

The main pancreatic duct of Wirsung usually traverses the entire length of the gland**.** It is normally 2-3 mm in diameter and increases slightly in caliber from the tail to the head **(Fig. 5)**. Short side branches (20-35) enter the main duct at right angles but usually are not revealed on MRCP unless dilated ***(Linsenmaier et al,2008).***



(Fig.5)Ducts of pancreas and billiary system (Faiz O & Moffat D, 2002).

Although there are great variations in the course of the duct, in 50% of cases it courses cephalad from the pancreatic head, takes a 45" to