ROLE OF MDCT IN EVALUATION OF PANCREATIC TUMORS WITH PREDICTION OF VASCULAR INVASION AND RESECTABILITY.

ESSAY
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فتقييم اورام البنكرياس و التنبوء بدرجة تشعبها الدموى والقدرة على استئصالها

بحث

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Introduction

Contrast-enhanced helical CT is the most commonly used imaging modality for the detection and preoperative staging of pancreatic tumors. It has proved to be highly specific for the determination of non – resectability , when it enables the identification of tumor extension into the adjacent peripancreatic structures. However , the accuracy of helical CT for predicting respectability is between 70%- 80%, in part because of its lower specificity.** ***(McNulty NJ, Francis, 2001).

***Thin-sections single phase MDCT is an accurate technique for the**

diagnosis and assessment of the resectability in patient with a suspected pancreatic neoplasm. This technique correlates optimal tumor to pancreas contrast enhancement and maximal pancreatic parenchymal and peripancreatic vascular enhancement. It allows visualization of the entire liver and the whole upper abdomen during the portal phase for accurate identification of liver metastases and peritoneal seeding. ***(Imbriaco M. Megibow, 2005 & G. A. Zamboni, 2007).***

*** Previous studies have reported negative predictive values ranging from 45%-79%. In other words, 21-55% of patients were incorrectly diagnosed as having resectable tumor on CT only to be found to have un-**

resectable tumor at surgery ,most often , this type of misdiagnosis is due to undetected vascular invasion , small Peritoneal implants , or small hepatic metastases.

(Rafael Vargas, Matilde Nino-Murica, 2004).

***In addition MDCT facilitates the generation of multiplanar reconstructions, such as curved planar reformations, providing the potential to improve the detection and staging of pancreatic tumors.**

(Sahni and mortele, 2009).

AIM OF THIS WORK:

***The aim of this work is to describe pancreatic lesions and evaluate the role of MDCT in prediction of vascular invasion and resectability.**

MDCT findings of normal Pancreas

The pancreas is located in the anterior retroperitoneal space which is bounded in front by the parietal peritoneum and behind by Gerota's fascia. The tail of the pancreas usually sweeps upward, and ends intraperitoneally within the splenorenal ligament (figure11). The normal pancreatic parenchyma has CT attenuation values in the range of 30–60HU. Pancreatic attenuation decreases due to fatty infiltration (which occurs normally with aging) and is increased in hemochromatosis **(Schaefer and Prokop, 2007).**

The size and shape of the pancreas are highly variable and depend on age and fat content (normal upper values for the transverse diameter: 3cm in the head, 2.5cm in the body, 2 cm in the tail). A more important criterion of normal pancreatic morphology is an even tapering of the pancreas from the head to the tail. The tail of the pancreas usually sweeps upward, but in 25% of cases it turns downward and can mimic a renal or adrenal mass, or a recurrent tumor following nephrectomy. Atrophy or fatty infiltration may give the pancreas a lobulated appearance.

The uncinate process is embedded in the duodenal loop **(Schaefer and Prokop, 2007).**

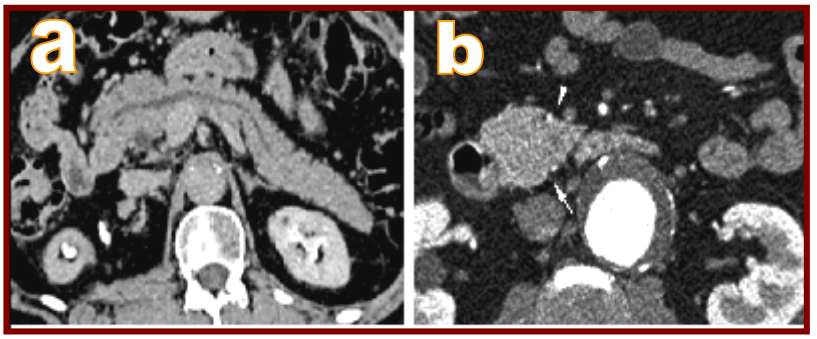

Figure (11) Normal CT anatomy of the pancreas:
(a) Axial reformatted computed tomographic (CT) image shows the typical size, location, and lobulated appearance of the normal pancreas. (b) CT scan shows the normal triangular appearance of the uncinate process (arrow), with a straight posteromedial border and a gently concave anteromedial border (arrowhead) **(Mortele et al., 2006).**

The gland can be divided into four parts: head, neck, body, and tail. The pancreatic head is located within the curve of the duodenum, to the right of the superior mesenteric vein. The uncinate process is a prolongation of the caudal part of the head, which is oriented toward the left. It has a triangular appearance, and its anteromedial border can be straight or concave. The pancreatic neck is the constricted portion to the left of the head and ventral to the superior mesenteric vein. The pancreatic body and tail

are located behind the lesser sac and the stomach. The border between the body and tail is not clearly defined but can be determined using one-half of the distance between the neck and the end of the pancreas **(Mortele´ et al, 2006)**.

The shape, position, and orientation of the pancreas are variable depending on age, body habitus, and position of the spleen and left kidney. In patients who have abundant retroperitoneal fat, the peripancreatic planes are well delineated on CT scan. The pancreatic head bears a constant relationship with the second stage of the duodenum and the uncinate process with the third stage of the duodenum. The neck and body of the pancreas are related anteriorly to the stomach, from which they are separated by the potential space of the lesser sac. Adequate distension of the stomach and duodenum with water is necessary to display this intricate relationship of the pancreas to bowel in the staging of malignancy. The tail of the pancreas is intraperitoneal and situated within the splenorenal ligament. It is variable in position depending on the location of the spleen and left kidney. The transverse mesocolon is attached to the anterior surface of the pancreas, and the root of small bowel mesentery is inferior to the body of the pancreas. MDCT with multiplaner

reconstruction (MPR) can demonstrate the spread of inflammatory and neoplastic processes of the pancreas to the transverse mesocolon and small bowel mesentery **(Schaefer and Prokop 2007).**

Main Pancreatic duct (MPD):

The main pancreatic duct (of Wirsung) extends along the central axis of the pancreas, its distal portion having a diameter of 3– 5mm near the papilla. The duct can be visualized in most patients up to the tail only with thin-section spiral or multislice CT (3mm thickness or less). The main pancreatic duct should not be confused with the fine fatty layer that runs parallel to the splenic vein. A diameter greater than 4mm is considered pathologic. The accessory duct (of Santorini) is detectable only with thin section CT **(Schaefer and Prokop, 2007).**

The diameter of the MPD is normally 3.5 mm in the head, 2.5 mm in the body, and 1.5 mm in the tail and the length of the MPD varies from 9.5 to 25 cm. There are approximately 27 possible ductal configurations. Typically, the MPD has 20–30 side branches that enter the duct at a right angle. The duct of Wirsung unites with the common bile duct (CBD) and drains into the major papilla. The duct

of Santorini or accessory duct drains the anterior and superior portion of the head into the minor papilla. The distal CBD and duct of Wirsung traverse the sphincter of oddi (which consists of three separate smooth muscles) to enter the duodenum **(Meyers, 2000).**

In most cases (80%–90%), the CBD and duct of wirsung unite within this sphincteric segment, with the muscular wrap being 10–15 mm in length. This common channel may be long (Y-type configuration) or short (V type). A high junction (above the sphincter) may theoretically allow reflux of pancreatic secretions into the bile duct. Such reflux is one of the proposed causes for the development of some types of choledochal cysts. There are three possible anatomic relationships between the CBD and the pancreatic head: The CBD is partially covered posteriorly by pancreatic tissue in 51.5% of the population, totally covered in 30%, and not covered at all in 16.5% occasionally, the CBD courses lateral to the pancreatic head **(Mortele´ et al, 2006).**

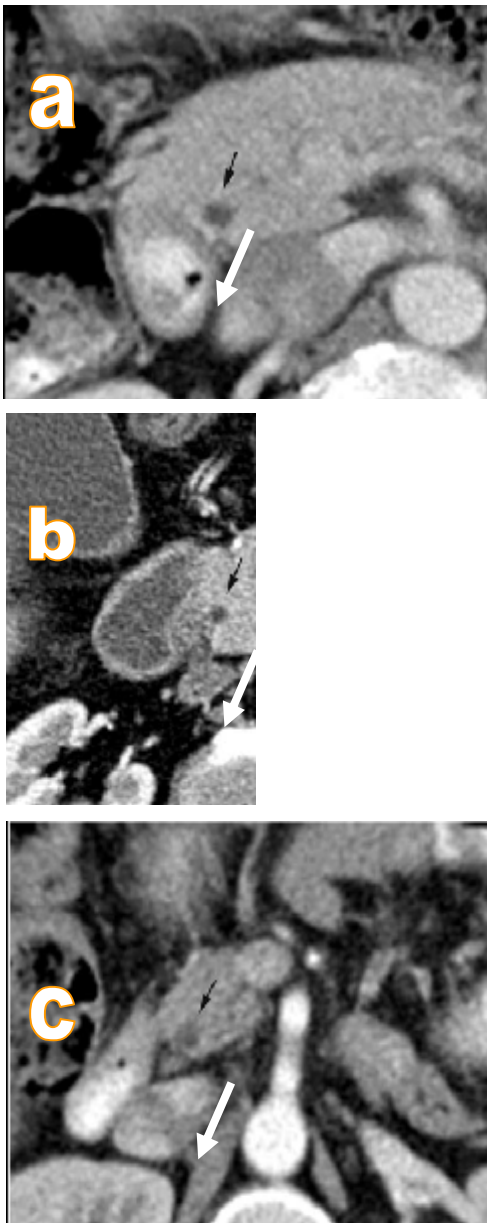

Figure (12): CT scans show the three possible anatomic relationships between the CBD (arrow) and the pancreas: (a) Partial coverage of the CBD by pancreatic tissue (b) Total coverage (c) No coverage **(Mortele et al., 2006).**

Peri-pancreatic vessels:

The arterial blood supply to the pancreas is derived from the branches of the celiac trunk and the superior mesenteric artery (SMA). The celiac trunk is located superior to the body of the pancreas, and the splenic artery courses along the superior margin of the pancreas. The SMA arises from the aorta posterior to the neck of pancreas at its origin and runs inferiorly, anterior to the uncinate process along with the superior mesenteric vein (SMV). this important relationship of the superior mesenteric vessels with the pancreas seen displayed in sagittal MPR. The anterior and posterior superior pancreaticoduodenal branches of the gastroduodenal artery anastomose with the corresponding inferior pancreaticoduodenal branches of the SMA to form an arterial arcade around the head of the pancreas. The splenic vein runs along the posterior and superior aspects of the pancreas along with the splenic artery and forms an important landmark for the posterior surface of the pancreas (figure 13). The splenic vein joins the SMV behind the neck of the pancreas to form the portal vein. Coronal oblique maximam intensity projection (MIP) and curved planner reformat (CPR) demonstrate the

peripancreatic vessels in the staging of pancreatic carcinoma **(Paspulati. 2005).**

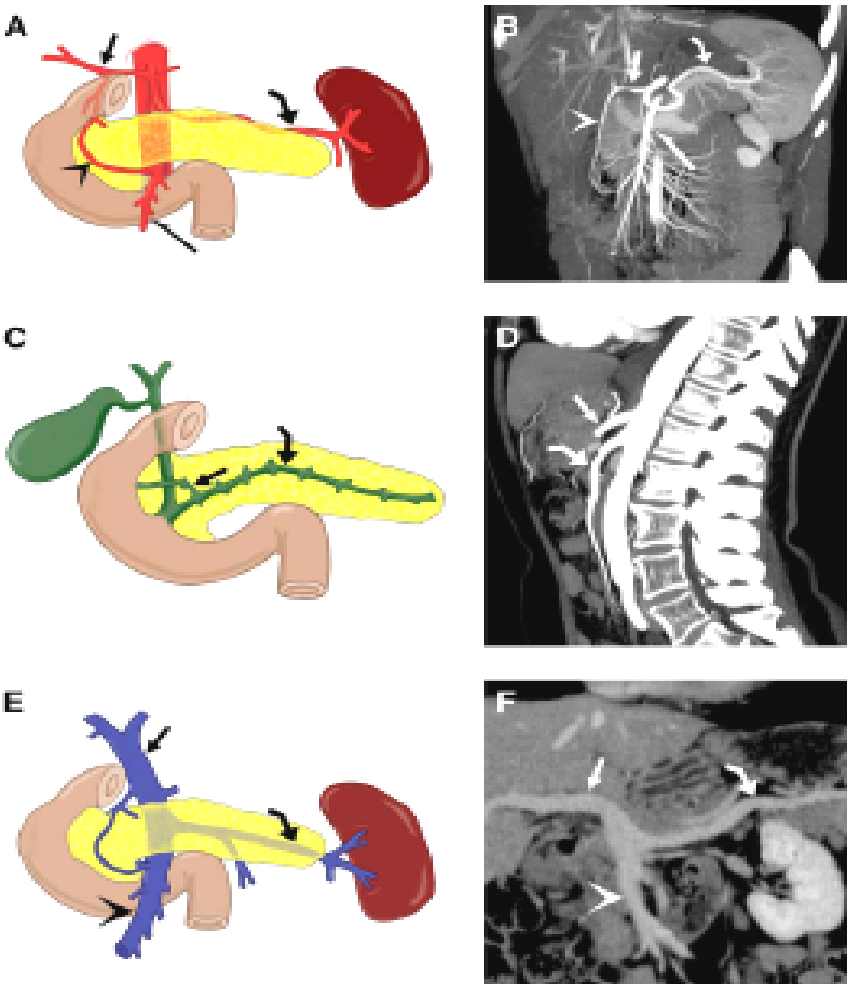

Figure (13): (A) Line diagram of the peripancreatic arteries shows the hepatic artery (straight arrow), splenic artery (curved arrow), SMA (half arrow), and gastroduodenal artery (arrowhead). **(B)** Corresponding coronal MIP CT image of the peripancreatic arteries. **(C)** Line diagram demonstrates the distal common bile duct, main pancreatic duct (curved arrow), and accessory pancreatic duct (straight arrow). **(D)** Sagittal MIP CT image shows the celiac axis (straight arrow) and SMA (curved arrow). **(E)** Line diagram shows the main portal vein (straight arrow), splenic vein (curved arrow), and SMV (arrowhead). **(F)** Corresponding coronal oblique MIP of the peripancreatic veins **(Paspulati. 2005).**