Recent techniques of MRI in detection of pancreatic neoplasm

Essay submitted for partial fulfillment of Master Degree in diagnostic radiology

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التقنيات الحديثة للرنين المغناطيسى فى تشخيص أورام البنكرياس

رسالة

توطئة للحصول على درجة الماجستير في الأشعة التشخيصية

مقدمة من

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بكالوريوس الطب والجراحة

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LIST OF ABBREVIATIONS

ADC	Apparent diffusion coefficient
AST	aspartate aminotransferase,
b-FFE	Balanced Fast Field Echo
CBD	common bile duct
CHESS	chemical shift selection
cho	Choline
CNR	contrast-to-noise ratio
cr	Creatine
CT	Computed Tomography
DCE	Dynamic contrast enhanced
DWI	Diffusion Weighted Images
eGFR	estimated glomerular filtration rate
ERCP	Endoscopic retrograde cholangiopancreatography
FFE	fast-field echo
FRFSE	fast recovery fast spin-echo
FWHM	Full- wave at half maximum
GE	Gradient Echo
GRE	Gradient Echo
HASTE	Half Fourier Acquired Single Shot Turbo Spin Echo
IPMN	Intraductal Papillary Mucinous Neoplasm
IR	Inversion recovery
LAVA	liver acquisition with volume acceleration
LDH	lactic dehydrogenase
MCN	Mucinous Cystic Neoplasm
MDCT	Multi-detector computed tomography
MEN	Multiple endocrine neoplasm
MIP	Maximum Intensity Projection
MPD	main pancreatic duct
MPR	Multiplanar reconstruction
MRA	Magnetic resonance angiogram

MRCP	Magnetic Resonance cholangiopancreatography
MRI	Magnetic Resonance Imaging
MRS	Magnetic Resonance Spectroscopy
MVD	microvascular density
NET	Neuroendocrine tumors
OC	one compartement
PACE	prospective acquisition correction encoding
PTC	percutaneous transhepatic cholangiogram
SAR	Specefic absorption rate
SAR	specific absorption rate
S-MRCP	Secretin-enhanced MR cholangiopancreatography
SNR	Signal to noise ratio
SPACE	sampling perfection with application optimized contrasts using different flip-angle evolutions
SPAIR	spectral adiabatic inversion recovery
SSFP	Steady State Free Precession
SSFSE	Single Shot Fast Spin Echo
SSh	Single Shot Short Half Fourier
STIR	Short time inversion recovery
T	Tesla
TC	two compartements
TE	Time of echo
THRIVE	T1-weighted high-resolution isotropic volume examination
TR	Time or repetition
True FISP	True Fast Imaging With Steady State Free Precession
TSE	turbo spin-echo
VIBE	volume interpolated breath-hold F-GRE
WBC	white blood count,
WIs	weighted images

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INTRODUCTION

The pancreas is a tongue shaped organ, approximately 12 -15 cm in length, that lies within the anterior pararenal compartment of the retroperitoneum. ***(Brant et al, 2012)***

Pancreatic cancer is the fifth leading cause of cancer related death in both men and women and is responsible for 5% of all cancer-related deaths in the United States. ***(Yoon et al, 2010)***

The most recent classification divides pancreatic disorders into primary tumors including epithelial endocrine and exocrine as well as non-epithelial neoplasms, secondary neoplasms, and tumor-like conditions ***(Kloppel et al, 2004)***.

Compared with CT, MRI has the advantage of being able to detect cystic changes within pancreatic masses and to provide more accurate morphological detail on these changes. ***(Yoon et al, 2010).***

MRI plays a triple role in the evaluation of the pancreas: Diagnosis, staging, and detection of complications. The role of MRI has increased, especially in imaging patients with suspected pancreatic neoplasms ***(Olivia et al,2006).***

To evaluate pancreatic lesions accurately, the use of multiple pulse sequences that provide complementary information is required, and, in

general, a combination of T1-weighted (T1W) and T2-weighted (T2W) sequences is obtained. ***(Olivia et al,2006).***

The intravenous (IV) administration of an extracellular contrast agent (gadolinium chelate) is a useful adjunct in the MRI examination of the pancreas. It can help differentiate hypervascular pancreatic masses that may simulate cystic lesions on noncontrast scans. ***(Olivia et al,2006).***

MR Spectroscopy has been used as a tool in the differentiation of pancreatic cancer from chronic focal pancreatitis and in the detection of hepatopancreaticobiliary cancer. Pancreatic cancer and chronic focal pancreatitis are difficult to discriminate initially because of their similar clinical and radiologic features at presentation. ***(Shah et al, 2006).***

Diffusion weighted (DW) imaging allows detection of pancreatic adenocarcinomas with high sensitivity and specificity. Previous studies have found that pancreatic adenocarcinoma appears hyperintense compared with the rest of the gland on DW images, and DW imaging might have potential to become the imaging modality of choice for screening patients at high risk for pancreatic adenocarcinoma. ***(Fukukura et al, 2012).***

In oncologic studies, dynamic contrast agent–enhanced MR imaging may be performed to provide information concerning tumor microvasculature, and it has been used as a biomarker for tumor response to treatment. ***(Bali et al, 2011)***

AIM OF WORK

The aim of this study is to highlight the role of the new techniques of MRI in evaluation pancreatic neoplasm.

ANATOMY OF THE PANCREAS

The pancreas is a tongue shaped organ, approximately 12 -15 cm in length that lies within the anterior pararenal compartment of the retroperitoneum. It is composed of four parts (head, body, neck and tail). ***(Brant et al., 2012)***

PARTS

Head:

The head of the pancreas lies to the right of the midline, anterior and to the right side of the vertebral column, within the curve of the duodenum. Superiorly it lies adjacent to the first part of the duodenum. The inferior border lies superior to the third part of the duodenum and is continuous with the uncinate process. 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 that contains the union of the superior mesenteric and splenic veins as they form the portal vein. ***(Standering et al., 2008)***

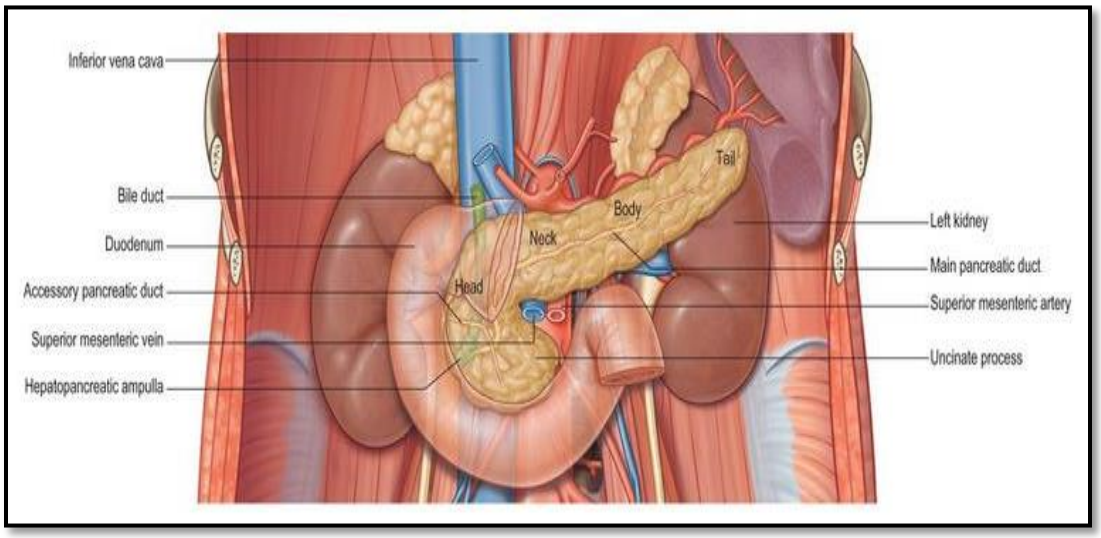

Fig.1 relations of the pancreas ***(Standering et al., 2008)***

Neck:

The neck of the pancreas is approximately 2 cm wide and links the head and body. It is often the most anterior portion of the gland and is defined as the portion of the pancreas that lies anterior to the portal vein, which is closely related to the upper posterior surface (see **Fig. 2**). The lower part of the neck lies anterior to the superior mesenteric vein just before the formation of the portal vein. ***(Standering et al., 2008)***