NEW MRI TECHNIQUES IN THE EVALUATION OF PANCREATIC TUMORS

Essay

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CONTENTS

LIST OF ABBREVIATIONS.

CBD COMMON BILE DUCT

CHD COMMON HEPATIC DUCT

CNR CONTRAST TO NOISE RATIO

CT COMPUTED TOMOGRAPHY

DWI DIFFUSION WEIGHTED IMAGING

ERCP ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY

FLASH FAST LOW ANGLE SHOT

FSE FAST SPIN ECHO

GRE GRADIENT RECALL

HASTE HALF FOURIER AQUITION SINGLE SHOT TURBO SPIN ECHO

IPMN INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM

LHD LEFT HEPATIC DUCT

MCN MUCINOUS CYSTIC NEOPLASM

MIP MAXIMUM INTENSITY PROJECTION

MPD MAIN PANCREATIC DUCT

MPGR MULTIPLANAR GRADIENT RECALL

MRA MAGNETIC RESONANCE ANGIOGRAPHY

MRCP MAGNETIC RESONANCE CHOLANGIOPANCREATOGRAPHY

MRI MAGNETIC RESONANCE IMAGING

MRP MR PANCREATOGRAPHY

MRS MAGNETIC RESONANCE SPECTROSCOPY

NPV NEGATIVE PREDECTIVE VALUE

PAS PERIODIC ACID –SCHIFF

PI PARRALLEL IMAGING

RHD RIGHT HEPATIC DUCT

ROI REGION OF INTEREST

SAR SPECIFIC ABSORPTION RATE

SCA SEROUS CYSTADENOMA

SE SPIN ECHO

SI SIGNAL INTENSITY

SSFSE SINGLE SHOT FAST SPIN ECHO

SNR SIGNAL TO NOISE RATIO

T1WI T1 WEIGHTED IMAGES

T2WI T2 WEIGHTED IMAGES

TR TIME OF REPITITION

TRICKS TIME RESOLVED CONTRAST KINETICS

TSE TURBO SPIN ECHO

US ULTRASONOGRAPHY

1.5 T 1.5 TESLA

2D TWO DIMENSTIONAL

3D GD-MRA THREE DIMENSIONAL GADOLINIUM ENHANCED MAGNETIC RESONANCE IMAGING

3T 3 TESLA

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Abstract

Magnetic resonance imaging is a powerful imaging technique for evaluating pancreatic neoplasms. Improvements in MR pulse sequences , MRCP and MRA have resulted in a highly reliable means of detecting and staging pancreatic neoplasms and distinguishing malignant from benign pancreatic disease processes. Emerging techniques such as DWI and MRS may help to improve the diagnostic capability of magnetic resonance imaging of the pancreas . The intrinsic SNR improvement from the higher static magnetic field strength, 3T holds considerable promise as a means for early detection of pancreatic tumors and evaluation of other types of pancreatic pathologic change.

Keywords:MRI- pancreatic tumors-MRCP-MRA-DWI-MRS-3T.

INTRODUCTION

Despite the availability of a wide range of applicable diagnostic modalities to visualize the pancreas and upper abdomen, the major proportion of pancreatic cancers will be diagnosed at advanced stages when the tumor is surgically non resectable or the disease is metastatic. In addition, whereas new approaches with chemotherapeutic agents yield only marginal improvements in the treatment of advanced pancreatic cancer, surgery in early stages remains the only therapeutic option in the curative setting. Thus, with a 5-year survival rate of less than 2% . Pancreatic cancer continues to be among the group of tumors with a poor prognosis. (***Tsiotos et al , 1999)***

One crucial consideration in the treatment of patients suspected of having pancreatic tumors is how to proceed diagnostically. So far, ultrasonography (US) and contrast material–enhanced computed tomography (CT) have been widely used to diagnose pancreatic tumors. However, in previous series, differentiating benign lesions from pancreatic cancer was considerably difficult. This dilemma is clinically relevant and to overcome this dilemma, the development of sensitive and specific imaging modalities appears highly desirable. ***(Hänninen et al,2002)***

More recently the use of magnetic resonance imaging (MRI) for detection of pancreatic tumors was demonstrated. In particular, faster sequences reduced motion artifacts substantially and facilitated successful characterization of pancreatic lesions. In addition, one major advantage of MR imaging is the possibility to examine the pancreatobiliary system non invasively. (***Hänninen et al., 2002)***

MRI can be applied to pancreaticobiliary malignancies as conventional MR, as MR angiography/venography or as MR cholangiopancreatography (MRCP). The technique and applications of each method differ***.(Ferucci , 1999)***

MRCP demonstrated a high accuracy in the depiction of diverse abnormalities involving diseases of the pancreaticobiliary system, including duct dilatation, tumors, strictures, and stones. ***(Hänninen et al, 2002)***

The introduction of contrast-enhanced three-dimensional MR angiography with fast gradient-echo (GRE) sequences facilitated the visualization of the vascular anatomy with the breath-hold technique and, thus, permitted multiphase assessment of abdominal arteries and veins with excellent quality. ***(Hänninen et aL, 2002)***

Diffusion-weighted (DW) images can be helpful in detecting the pancreatic carcinoma and accessing the extent of the tumor.The ADC value ($\times 10^{-3}$ mm^2/s) in the carcinoma was 1.44 ± 0.20, which was significantly lower compared to that of normal pancreas (1.90 ± 0.06) and tumor-associated chronic pancreatitis (2.31 ± 0.18).***(Matsuki et al, 2007)***

In vivo H-MRS can be a useful method for making a differential diagnosis between chronic focal pancreatitis and pancreatic carcinoma. ***(Cho et al, 2005).***

Since MR imaging was found to be a widely usable clinical method for the differential diagnosis of retroperitoneal lesions, its use for biopsy guidance has just been the logical next step. In the last few years the speed of MR imaging has been drastically increased and the design of magnets has been modified, so that MR-guided interventions in different organs can now be performed. ***(Zangos et al ,2006)***

Technologic advances such as the introduction of open and short-bore magnet designs, the proliferation of fast imaging sequences, and the availability of MR-compatible instruments have aided the growth of this field. ***(Trumm et al,2009)***