Magnetic Resonance Imaging of Focal Liver Lesions

Essay

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Mostafa Emara

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List of Abbreviations

Abb.	Mean
ADC	Apparent diffusion coefficient
ATP	Adenosine triphosphate
BC	Biliary cystadenoma
CCA	Cholanagioncarcinoma
CE	Contrast enhanced
CHESS	Chemical Shift Selective Imaging Sequence
Cho	Choline containing compounds
Cr	Creatine/ phosphocreatine
CT	Computed tomography
CTA	Computed tomography angiography
CTP	Cytidine triphosphate
DNA	Deoxyribonucleic acid
DV	Distribution volume
DWI	Diffusion-weighted imaging
Fa	Arterial blood flow
FLC	Fibrolamellar Carcinoma
FLL	Focal liver lesions
FNH	Focal nodular hyperplasias
Fp	Portal blood flow
Ft	Total blood flow
Gd	Gadobenate dimeglumine
GRE	Gradient echo
GTP	Guanosine triphosphate
HA	Hepatic artery
HASTE	Half-Fourier acquisition single-shot turbo spin-echo

Abb.	Mean
HCA	Hepatocellular Adenoma
HCC	Hepatocellular carcinoma
HPI	Hepatic perfusion index
ICC	Intrahepatic cholangiocarcinoma
IVC	Inferior vena cava
MnDPDP	Mangafodipir trisodium
MRI	Magnetic resonance imaging
MRS	MR spectroscopy
MTT	Mean transit time
MUMC	Maryland University Medical Center
PCLD	Polycystic liver disease
PCr	Phosphocreatine
PDE	Phosphodiesters
PET	Positron emission tomography
Pi	Inorganic phosphate
PME	Phosphomonoesters
PRESS	Point-resolved spectroscopy
PTC	Percutaneous transhepatic cholangiography
PV	Portal vein
RARE	Rapid acquisition with relaxation enhancement
RES	Reticuloendothelial system
SE	Spin-echo
SGE	Spoiled Gradient-Echo
SI	Single intensity
SMV	Superior mesenteric vein
SPIO	Superparamagnetic iron oxide

Abb.	Mean
SSFP	Steady state free precision
STEAM	Stimulated-echo acquisition mode
TACE	Transarterial chemo-embolization
tCho/Lip	Total choline/lipid
TE	Echo time
TR	Repetition time
TSE	Train spin echo
US	Ultrasound
USPIO	Ultra small superparamagnetic iron oxides
UTP	Uridine triphosphate
VOI	Voxel of interest

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Magnetic Resonance Imaging of Focal Liver Lesions

Abstract

Background: The incidence of incidentally detected focal liver lesions (FLL) parallels growth in imaging utilization. The majority of FLL arising in non-cirrhotic livers are benign. Hemangiomas, focal nodular hyperplasias (FNH), and adenomas (HCA) are the most commonly encountered solid benign lesions. The main goals of MRI liver techniques are detection & characterization of equivocal hepatic focal lesions with indeterminate results by other diagnostic modalities e.g. US or CT. The goal of MRI in liver oncologic patients includes liver tumor detection & characterization. It also has revealed a good performance especially regarding differential diagnosis of liver neoplasms. MRI provides multiplanar information in great range of liver lesions & makes successful diagnosis when other modalities fail, it provides details of vessels & bile ducts giving the best way to diagnose, stage hepatic tumors & assess their blood supply. Nowadays dynamic contrast-enhanced 3D GRE MR imaging is excellent for the evaluation of various hepatic tumors. Dynamic contrast enhanced MRI provides the most information about lesion characterization in general, & it is most helpful in distinguishing liver lesions types & in assessing their response to therapy. Magnetic resonance imaging, MRI has more advantages than ultrasound, computed tomography, CT, positron emission tomography, PET, or any other imaging modality in diagnosing focal hepatic masses. With a combination of basic T1 and T2 weighted sequences, diffusion weighted imaging, DWI, use of different contrast agents, most liver lesions can be adequately diagnosed.

Keywords: DWI: Diffusion-weighted imaging, CT: computed tomography, MRI: Magnetic resonance imaging, PET: positron emission tomography

Introduction

The incidence of incidentally detected focal liver lesions (FLL) parallels growth in imaging utilization. The majority of FLL arising in non-cirrhotic livers are benign. Hemangiomas, focal nodular hyperplasias (FNH), and adenomas (HCA) are the most commonly encountered solid benign lesions.

The most commonly encountered malignant lesions in non-cirrhotic livers are metastases. Hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (ICC) occur in the setting of chronic liver disease ***(Fowler et al., 2011).***

A tremendous development of new imaging techniques has taken place during these last years. Maximizing accuracy of imaging in the context of FLL is paramount in avoiding unnecessary biopsies, which may result in post-procedural complications up to 6.4%, and mortality up to 0.1% ***(Matos et al., 2015).***

Ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) are the main liver imaging modalities.

A meta-analysis comparing contrast-enhanced ultrasound, CT, and MRI in evaluating incidental FLLs demonstrated similar diagnostic performance with specificities ranging from 82%-89% and no significant difference in the summary receiver operating characteristic between modalities.

Given the lack of ionizing radiation and relative non-availability of ultrasound contrast in the U.S., MRI is the imaging test of choice for FLL characterization, demonstrating similar if not superior performance to CT ***(Fowler et al., 2011).***

Magnetic resonance imaging (MRI) of the abdomen has been routinely performed to further characterize indeterminate lesions seen on other cross sectional imaging, such as ultrasound (US) and computed tomography (CT). However, MRI is increasingly used as the principal diagnostic modality, especially for staging and restaging of oncologic patients. With advancement of technology and development of newer imaging techniques, MRI of the abdomen allows for near optimal evaluation of, not only the liver, but also most of the other organs in the abdomen, retroperitoneal structures and even the peritoneum ***(Maniam and Szklaruk, 2010).***