

# **Magnetic Resonance Imaging of Focal Liver Lesions**

*Essay*

*Submitted for the Partial Fulfillment for the Master Degree  
in Diagnostic Radiology*

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Ain Shams University  
2016**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العليم

صدق الله العظيم

سورة البقرة الآية: ٣٢



*Before all, Thanks to **Allah**, The Most Kind  
and The Most Merciful.*

I would like to express my profound gratitude to **Prof. Dr. Mohamed Amin Nassef**, Professor of Diagnostic Radiology, Faculty of Medicine- Ain Shams University, for his most valuable advices and support all through the whole work and for dedicating much of his precious time to accomplish this work. I really have the honor to complete this work under his generous supervision.

Also I'm deeply grateful to **Dr. Nermeen Nasry**, Lecturer of Diagnostic Radiology, Faculty of Medicine- Ain Shams University for her valuable help, assistance, encouragement and supporting me through devoting her time to facilitate the production of this work.

Last but not least, I can't forget to thank all members of my **Family**, for pushing me forward in every step in the journey of my life.

 **Mostafa Emara**

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## List of Abbreviations

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

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

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

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**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*).