MR IMAGING OF HYPERVASCULAR LESIONS IN THE CIRRHOTIC LIVER

Essay

Submitted for the partial fulfillment of the master degree in radiodiagnosis

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List of Abbreviations

2D	Two dimensional
3D	Three dimensional
3D-GRE	Three Dimensional Gradient Recalled Echo
ADC	Apparent diffusion coefficient
AFP	Alpha-fetoprotein
CCA	Cholangiocarcinoma
CNR	contrast to noise ratio
CHA	Common hepatic artery
DWI	Diffusion-weighted imaging
ECF	Extracellular fluid
ETL	Echo train length
FLC	Fibrolamellar carcinoma
FNH	Focal nodular hyperplasia
FOV	Field of vision
FRFSE	Fast recovery FSE
FSE	Fast spin echo
Gd	Gadolinium
Gd-BOPTA	Gadobenate dimeglumine
GRE	Gradient Recalled Echo
HBV	Hepatitis B virus
HCA	Hepatocellular adenoma
HCC	Hepatocellular carcinoma
HCV	Hepatitis C virus
HASTE	Half-Fourier acquisition single-shot turbo spin-echo
Hz	Hertz
IP	In-phase
IVC	Inferior vena cava

MIP	Maximum intensity projection
MDCT	Multi detector CT
NEX	number of excitations
NRH	Nodular regenerative hyperplasia
OP	Out-of-phase
PI	Parallel imaging
PV	Portal vein
RES	Reticuloendothelial system
RF	Radio-frequency
ROI	Region of interest
RT-FSE	Respiratory triggered FSE
SGE	Spoiled gradient echo
SMA	Superior mesenteric artery
SNR	Signal to-Noise Ratio
SPIO	Super Paramagnetic Iron Oxide
SSFSE	Single-shot fast spin-echo
T	Tesla
TE	Time of Echo
THED	Transient hepatic enhancement difference
TR	Time of Repetition
US	Ultrasound

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Contents

1) Introduction and aim of the work.

2) Anatomy of the liver.

3) Pathophysiologic process of carcinogenesis in cirrhotic liver.

4) Technique of MR imaging protocol of the spectrum of hyper vascular lesions in cirrhotic liver.

5) MRI features and illustrative cases of hyper vascular lesions in cirrhotic liver.

6) Summary and conclusion.

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Introduction

Cirrhosis is characterized by a spectrum of hepatocellular nodules that mark the progression from regenerative nodules to low- and high- grade dysplastic nodules, followed by small and large hepatocellular carcinomas (HCCs). ***(Daniella B. Parente et al 2012)***
Vascularity patterns change gradually as the nodules evolve, with an increasing shift from predominantly venous to predominantly arterial perfusion. ***(Daniella B. Parente et al 2012)***

Worldwide, HCC is the third most common cause of death from cancer. ***(Edwards BK et al 2010)***

The annual incidence of HCC among cirrhotic patients is 2.0%–6.6%, When it is detected after the onset of symptoms, patients with HCC have a dismal prognosis (5-year survival rate, 0%–10%); however, patients with small HCCs may be cured (5-year survival rate, >50%). ***(Daniella B. Parente et al 2012)***
The widespread practice of surveillance, which is recommended for patients with cirrhosis, has increased the number of patients who are diagnosed with early-stage HCC, when curative options may be pursued. ***(Bruix J et al 2011)***

As a result of major advancements in field gradient technology and multichannel surface coils, magnetic resonance (MR) imaging is playing an increasingly greater role in the accurate, noninvasive detection and characterization of hepatic lesions. Because MR imaging displays the same lesion contrast enhancement patterns asCT, but with superior lesion-to-liver contrast and without the use of ionizing radiation, In addition, the use of newer pulse sequences.***(Alvin C et al 2009)***

In several studies, including a meta-analysis, the specificities of MR imaging and CT were found to be comparable for depicting HCC in the cirrhotic liver, although other studies have reported that MR imaging has higher sensitivity than CT (81% versus 68%, 70% versus 50%, 77% versus 54%, and 85% versus 68% for MR imaging and CT, respectively). ***(Daniella B. Parente et al 2012)***

Krinsky et al reported that MR imaging is sensitive in only 33% of patients with known HCC before transplantation. When the nodules were stratified by size, the sensitivity of MR imaging was 100% for lesions larger than 2 cm, 52% for 1–2-cm lesions, and only 4% for lesions smaller than 1 cm, findings that illustrate the difficulty in detecting small lesions. ***(Krinsky GA et al 2002)***

Although MR imaging usually has higher sensitivity than CT, depicting and characterizing hyper vascular lesions in patients with cirrhosis is challenging at any modality, especially when lesions are small. Differentiating HCC from other hyper vascular lesions is a key step in treating patients and is the responsibility of the radiologist. ***(Hanna RF et al 2008)***

Aim of work:

- To discuss and illustrate the most relevant and common MR imaging features of frequently encountered hyper vascular liver lesions.

Chapter One

Introduction

Chapter (1): Introduction

Cirrhosis is characterized by a spectrum of hepatocellular nodules that mark the progression from regenerative nodules to low- and high- grade dysplastic nodules, followed by small and large hepatocellular carcinomas (HCCs).

(Parente et al 2012)

Vascularity patterns change gradually as the nodules evolve, with an increasing shift from predominantly venous to predominantly arterial perfusion.

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The annual incidence of HCC among cirrhotic patients is 2.0%–6.6%, When it is detected after the onset of symptoms, patients with HCC have a dismal prognosis (5- year survival rate, 0%–10%); however, patients with small HCCs may be cured (5- year survival rate, >50%). ***(Parente et al 2012)***

The widespread practice of surveillance, which is recommended for patients with cirrhosis, has increased the number of patients who are diagnosed with early-stage HCC, when curative options may be pursued. ***(Bruix et al 2011)***