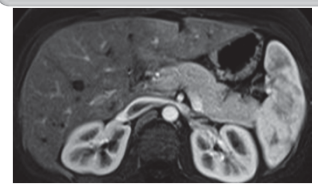
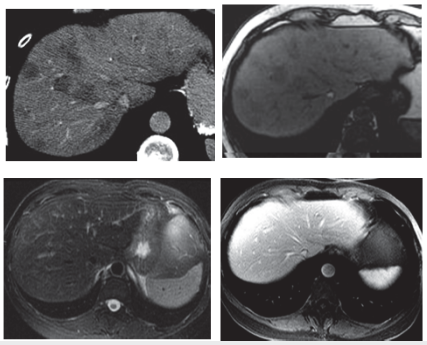
MRI OF FOCAL LIVER LESIONS: NON-CIRRHOTIC LIVER



Kartik S Jhaveri, MD
Director, Abdominal MRI
Director,CME program

LESION CHARACTERIZATION –CT VS MR



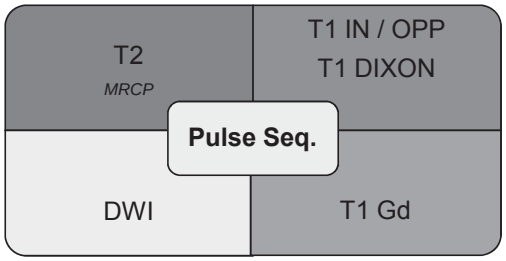
MULTIFOCAL NODULAR FAT INFILTRATION

OVERVIEW

- Why Liver MR ?
- Liver MR Techniques: Old & New
- Liver Specific MR Contrast
- MR Interpretation Algorithm
- Review of Common Focal liver Lesions
- Conclusion

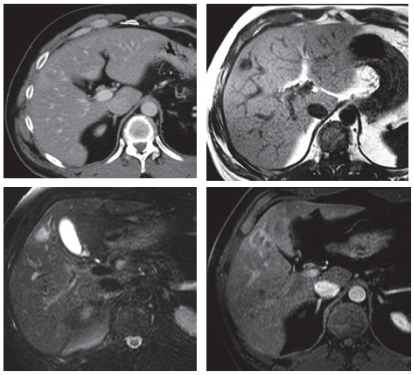
2

OPTIMAL MR PROTOCOL

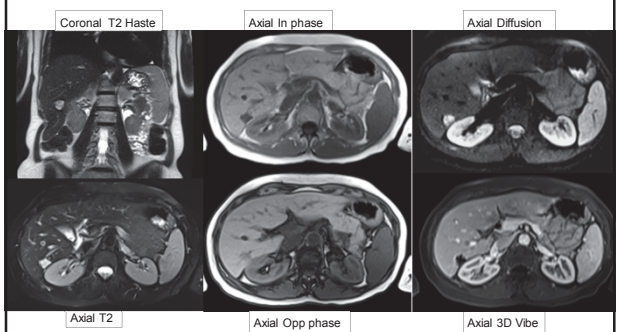


5

LESION DETECTION -CT VS MR

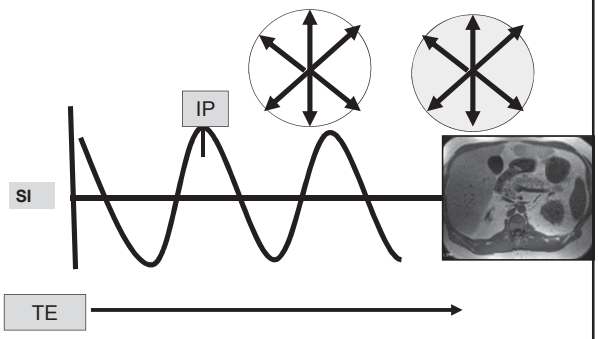


STANDARD LIVER PROTOCOL

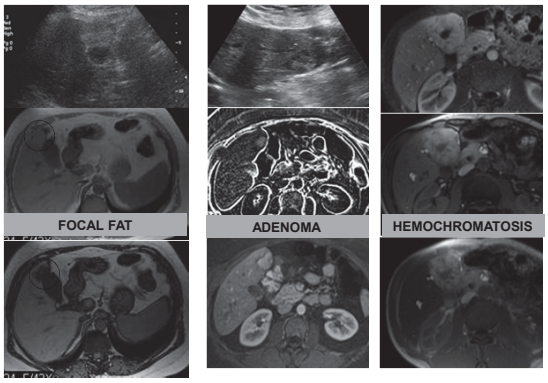


CHEMICAL SHIFT

DIXON- 1984 WATER FAT

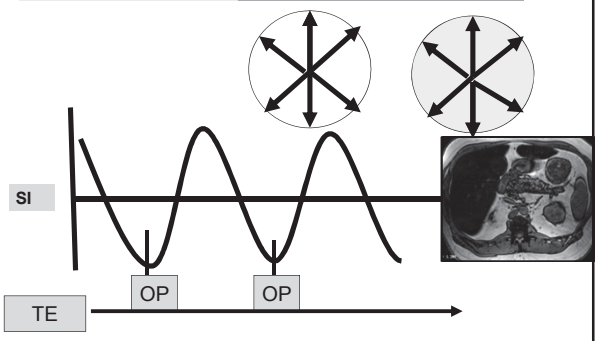


T1 IN-OPP PHASE IMAGING

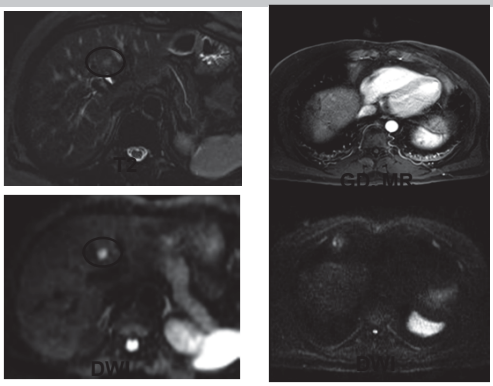


CHEMICAL SHIFT

DIXON- 1984 WATER FAT

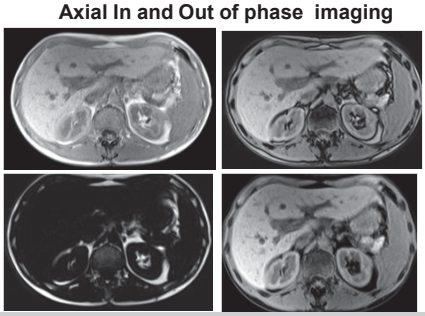


DWI- LESION DETECTION



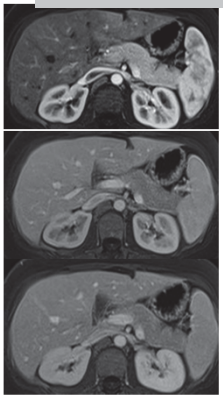
MR PULSE SEQUENCES

Axial In and Out of phase imaging



Dixon VIBE - Additional Fat and Water Image

Liver Enhancement Phases

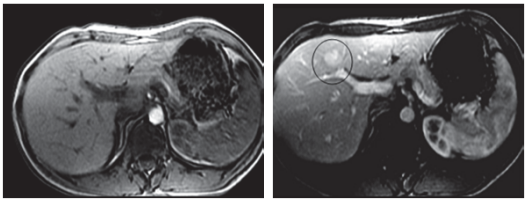


HEPATIC ARTERIAL
20-25 s

PORTAL VENOUS
40-50s

HEPATIC VENOUS
70-90s

OPTIMAL ARTERIAL PHASE



TOO EARLY OPTIMAL

TIMING CRITICAL !

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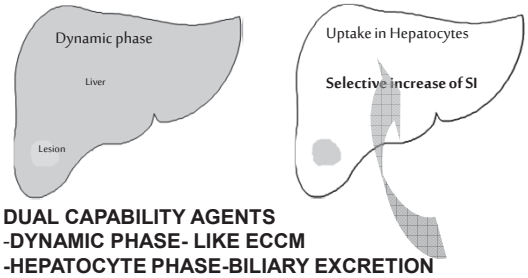
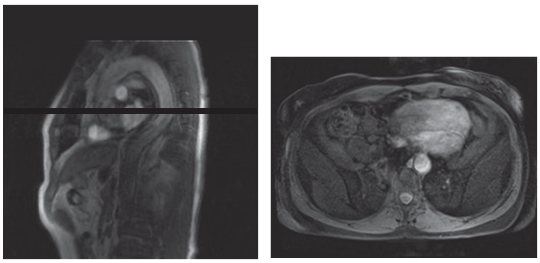
LIVER SPECIFIC CONTRAST AGENTS

PRIMOVIST (GD-EOB-DTPA
MULTIHANCE (GD-BOPTA)



DUAL CAPABILITY AGENTS
-DYNAMIC PHASE- LIKE ECCM
-HEPATOCYTE PHASE-BILIARY EXCRETION

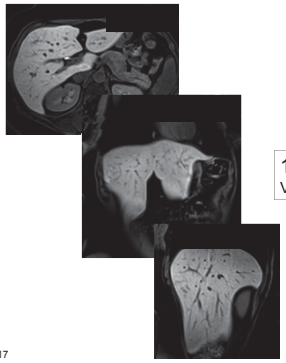
DYNAMIC PHASE TIMING



MR FLUORO TRIGGER IDEAL ART. PHASE TIMING

14

HEPATOBILIARY PHASE



15-20min

10min Post Injection
Van Kessel CS et al Eur Radiol 2012

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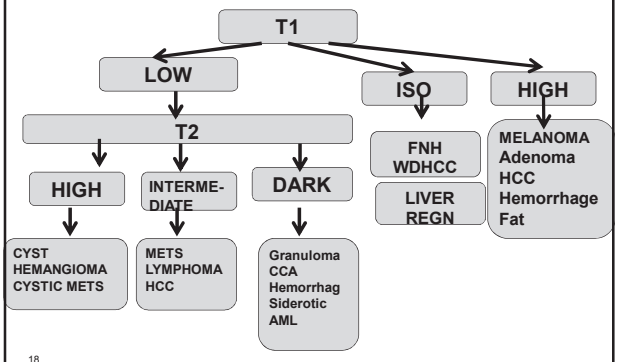
CONTRAST ENHANCED LIVER MRI

MR INTERPRETATION - BASICS



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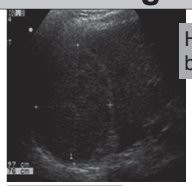
MR INTERPRETATION - PATTERNS

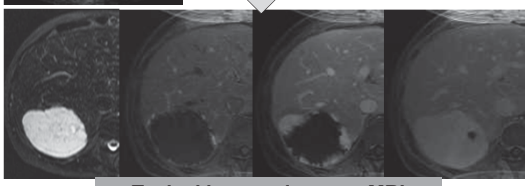
Gd Enhancement

Morphology Pattern		Temporal Pattern	
Puddle	Hemangioma	Progressive	Hemangioma Mets CCA
Rim	Abscess Mets	Persist	Hemangioma
Homogeneous	FNH Adenoma	Fade	FNH Adenoma
Heterogenous	HCC Adenoma Mets	Washout	HCC Mets

Hemangioma vs Metastasis



Hypoechoic mass in a patient with breast cancer **(? Metastases)**



2/1
2/2
015

Typical hemangioma on MRI

Common Solid Liver Lesions

BENIGN

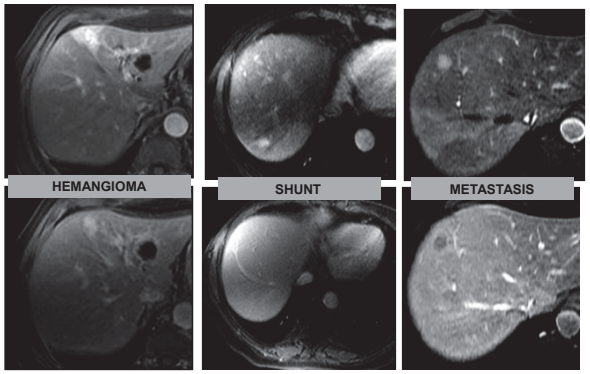
- Hemangioma
- Focal Nodular Hyperplasia (FNH)
- Hepatic Adenoma(HA)

MALIGNANT

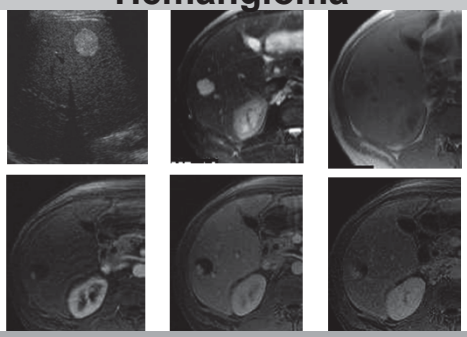
- HCC
- Cholangiocarcinoma
- Metastasis

20

Hemangioma vs Shunt vs Metastasis

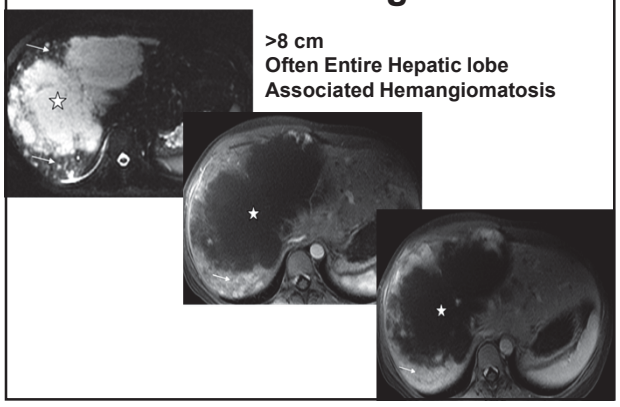


Hemangioma



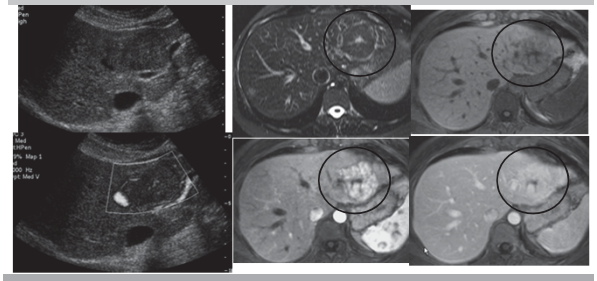
Hemangioma:- Bright on T2 with progressive peripheral discontiguous nodular centripetal fill-in post gadolinium.

GIANT Hemangioma



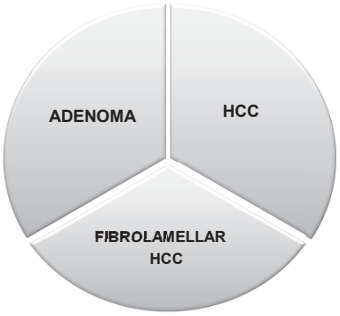
>8 cm
Often Entire Hepatic lobe
Associated Hemangiomatosis

Focal Nodular Hyperplasia(FNH)

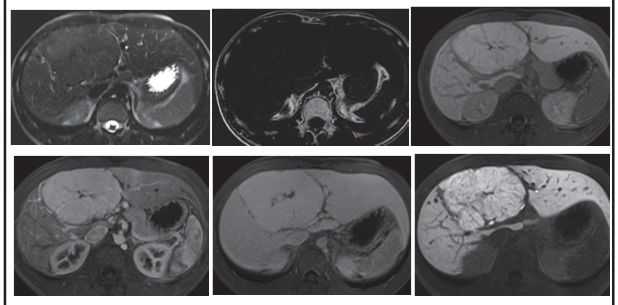


FNH:- Iso on T1 and T2, intense arterial enhancement and no washout. Central scar is a typical feature

FNH - Differential Diagnosis



FNH



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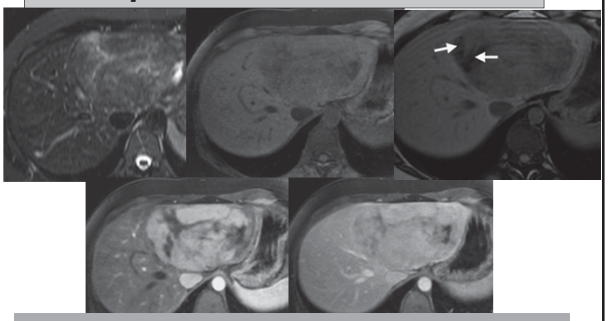
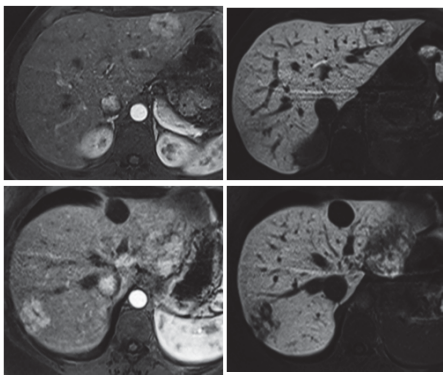
Hepatocellular Adenoma



Adenoma : Heterogeneous lesion with fat (arrows), arterial enhancement and venous phase iso to mixed signal

FNH- HBP PATTERNS



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Hepatic Adenoma-Classification

- **HNF1 inactivated (35%): fatty** lesions, **low risk for HCC**
- B**-catenin activated (10%): high risk for *HCC***
- **Inflammatory (50%): Telangiectatic ,risk for HCC, bleeding**

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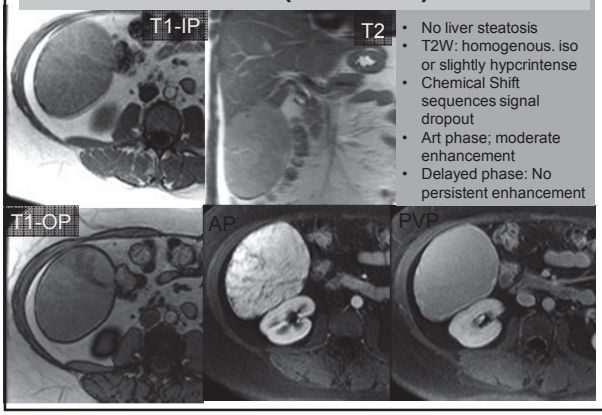
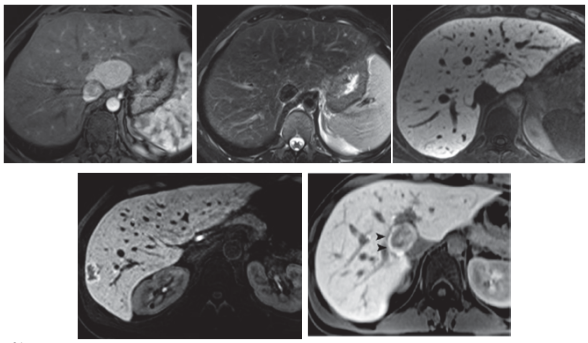
HNF1 Inactivated (Steatotic) Adenoma



- No liver steatosis
- T2W: homogenous. iso or slightly hypcrintense
- Chemical Shift sequences signal dropout
- Art phase; moderate enhancement
- Delayed phase: No persistent enhancement

ADENOMA- HBP PATTERNS



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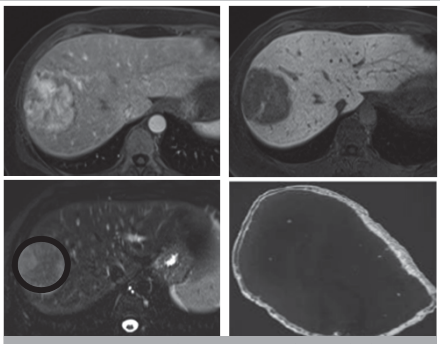
INFLAMMATORY ADENOMA



32 T2 HYPERINTENSE RIM "ATOLL" SIGN

FNH VS ADENOMA

- FNH
  1. Strong Arterial Phase Enhancement
  2. Central Scar
  3. Iso or Hyper on HBP

  1+3 = Sens 83.8% and Specificity 98.5%
- Adenoma
  1. Lipid/Fat
  2. Mild to Moderate Arterial Phase Enhancement
  3. Hypo on HBP

  2+ 3 = Sens 83.7 and Specificity 100%

Grazioli L .Radiology 2012;262:520-29

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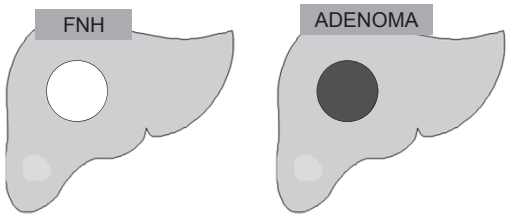
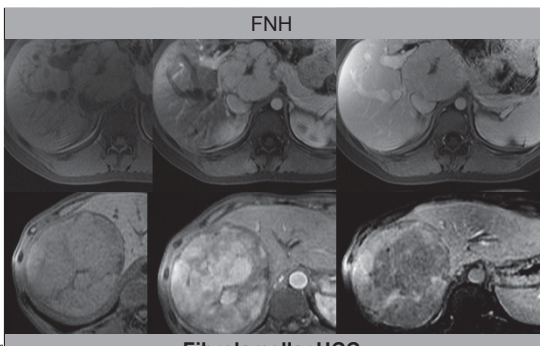
FNH vs Adenoma



LIVER SPECIFIC MR CONTRAST EXAM

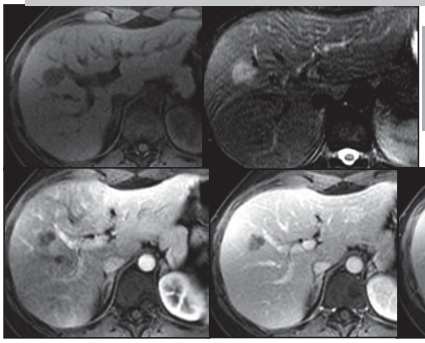
*Grazioli L. Radiology 2005; 236:166-77.
**Giovanoli O. AJR Am J Roentgenol 2008; 190:W290-3.

FIBROLAMELLAR HCC



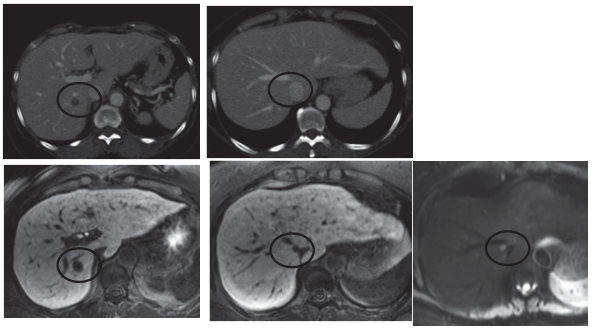
36 Fibrolamellar HCC

Metastases



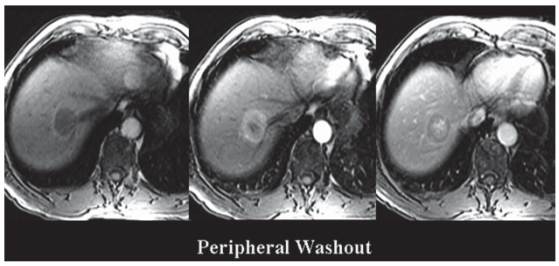
T1-Hypo
T2-Intermediate
Art- Hypo, Rim
Portal- Hypo, Rim

SURGICAL PLAN - LOCATION



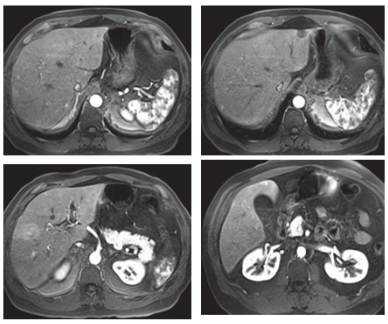
40

Metastases

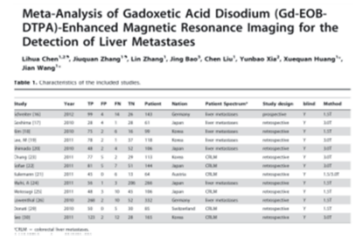


Peripheral Washout

Neuroendocrine Tumor



Metastatic Colorectal Carcinoma



Meta-Analysis of Gadoxetic Acid Disodium (Gd-EOB-DTPA)-Enhanced Magnetic Resonance Imaging for the Detection of Liver Metastases

Lihua Chen[1,2☯], Jiuquan Zhang[1☯], Lin Zhang[1], Jing Bao[2], Chen Liu[1], Yunbao Xia[1], Xuequan Huang[1*], Jian Wang[1*]

Table 1. Characteristics of the included studies.

13 studies
1900 CRLM
Pooled weighted
Sensitivity 93%
Specificity 95%
AUROC 0.98

PLOS ONE | www.plosone.org November 2012 | Volume 7 | Issue 11 | e48681

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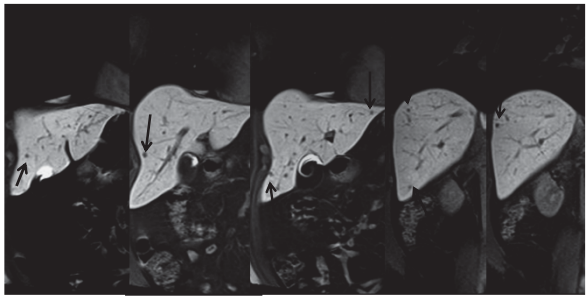
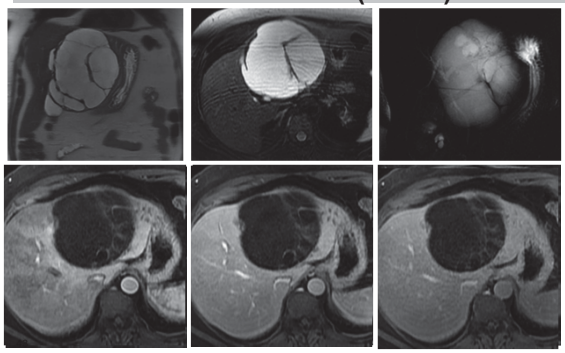
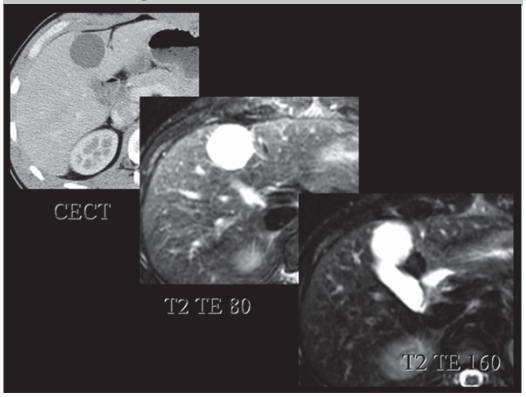
Hepatobiliary MRI



BILIARY CYSTADENOMA(BCA) / CYSTADENOCA(BCAC)



Cystic Metastases



BILIARY CYSTADENOMA(BCA) / CYSTADENOCA(BCAC)

- Arise from ectopic rests of embryonic cells or peribiliary glands
- Intrahepatic(<10% extrahepatic)
- BCAC de novo or malignant transformation of BCA
- Obstructive jaundice rare and no correlation to malignant change
- **<u>BCAC – Mural nodules ,papillary projections, debris, intrahepatic biliary dilatation</u>**
- **DD- Hyadtid cyst,hemorrhagic cyst,abscess**

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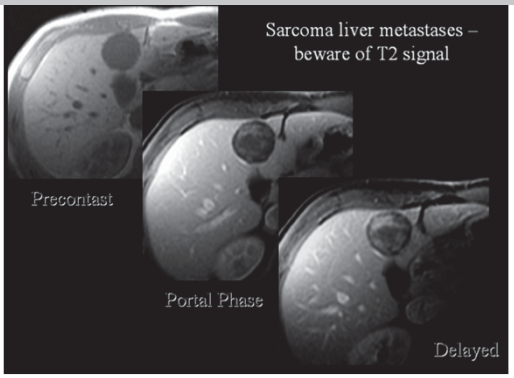
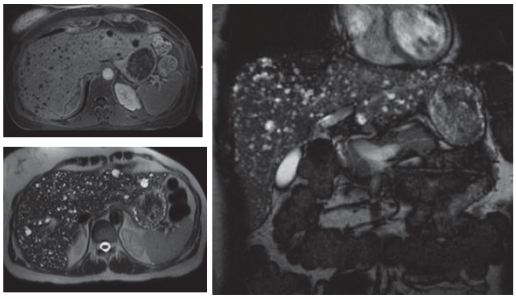
Cystic Metastases



Biliary Hamartomas



CONCLUSION

- ***MR provides Superior Results for Liver Lesion Detection and Characterization vs US and CT***
- ***Optimize Liver Protocol performing required Pulse sequences and Contrast Timing Techniques***
- ***Follow Basic Rules of Interpretation to avoid Diagnostic Errors***
- ***DWI- Detection of focal liver lesions(metastases)***
- ***Consider Liver specific MR contrast for FNH vs Adenoma , Preoperative liver metastases staging***

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