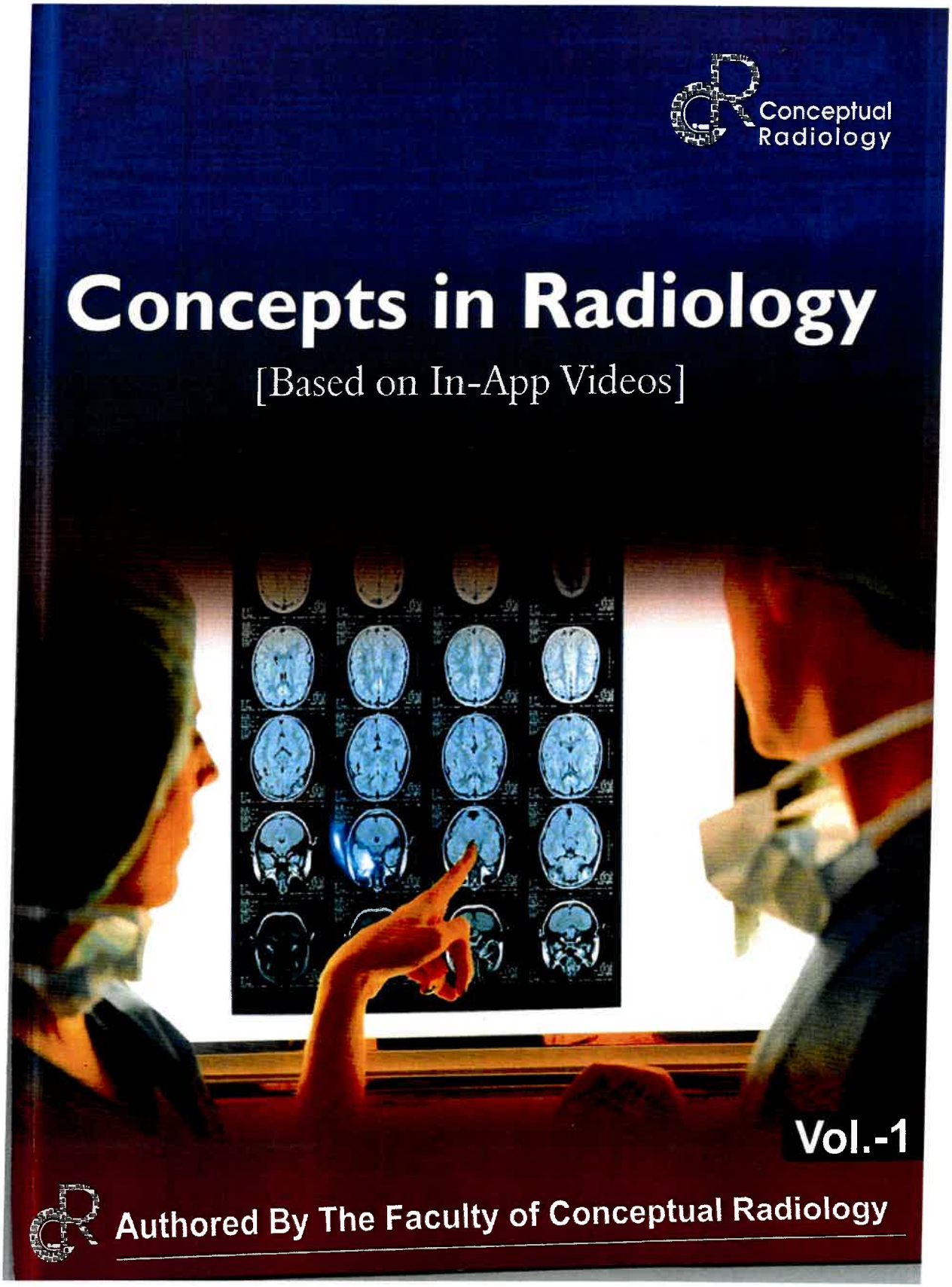
Conceptual Radiology

Concepts in Radiology

[Based on In-App Videos]



Vol.-1

Authored By The Faculty of Conceptual Radiology

Concepts In Radiology

[Based on In-App Videos]

FOREWORD

It is with great pleasure that I introduce this collection of lecture notes, a comprehensive resource drawn from the collective expertise of esteemed faculty members of Conceptual Radiology, spanning various subspecialties within the field of radiology. This compilation is designed to serve as a vital reference for students embarking on their journey to understand the complexities of medical imaging and radiological diagnosis.

Radiology, with its vast and ever-evolving landscape, has become a cornerstone in modern medicine. The integration of advanced imaging techniques, from diagnostic radiology to interventional radiology, neuroradiology, musculoskeletal, and beyond, has revolutionized how we perceive and treat diseases. For students, mastering the nuances of each subspecialty can be daunting. This book distills key concepts, clinical insights, and imaging principles into accessible, focused notes that are both comprehensive and concise.

What sets this compilation apart is the collaboration between experts who have generously shared their knowledge and experience. Their combined efforts ensure that each chapter not only provides theoretical foundations but also bridges the gap between classroom learning and clinical application.

As you delve into these pages, I encourage you to approach radiology not merely as a tool for diagnosis but as an art that requires attention to detail, a deep understanding of anatomy and pathology, and, most importantly, a commitment to patient care.

I trust that this collection will serve as an invaluable guide for your studies and a lasting resource throughout your medical career.

Table of Content

Section 1

Abdominal Radiology

CHAPTER

1.1

Approach to Liver Lesions

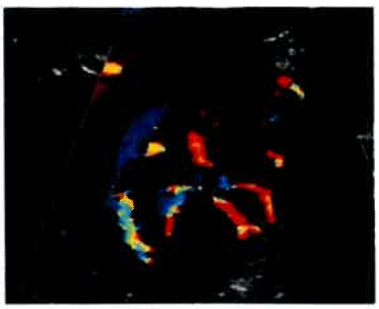
Clinical features

- Age
- Sex – benign lesions mc in females, malignant lesions & cirrhosis mc in males.
- Symptoms
- Viral infection (Hep B/ Hep C)
- Exposure to drugs
- AFP – positive in 50-60% HCC
- PREVIOUS IMAGING

1) Imaging modalities – USG

- US - initial examination
- Some common benign lesions (cysts; hemangiomas) - characteristic appearance on US
- Color Doppler - real-time -vascular versus nonvascular nature of liver lesions

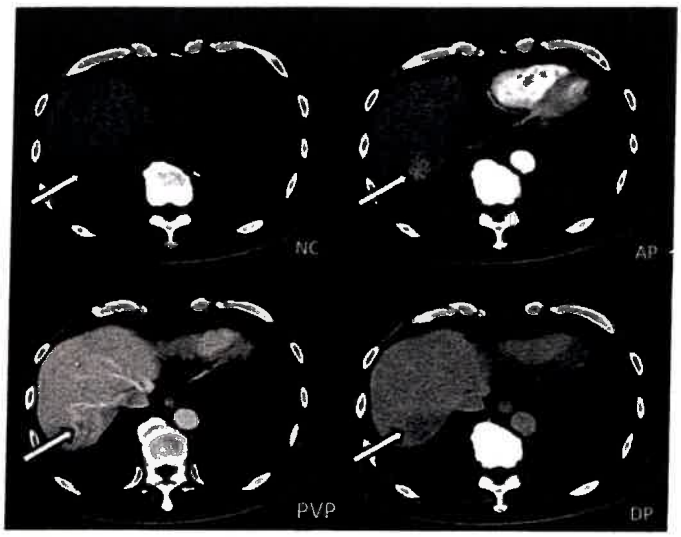




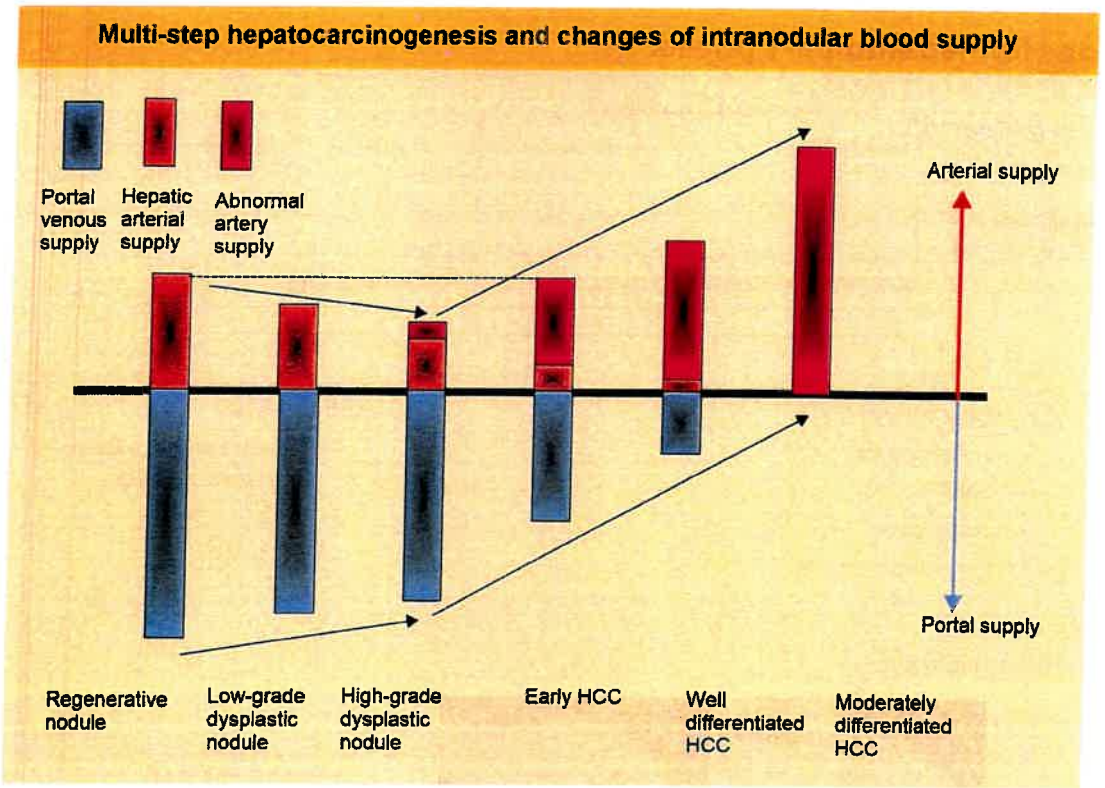
2) Imaging modalities – MPCT

- NCCT/ Virtual Non contrast images: baseline
  - Diffuse changes - Fat infiltration, iron deposition
  - Focal changes - Subtle calcification, Hemorrhage, Focal fat
- Contrast study:
  - Late Arterial phase: 30-40secs
  - Portal phase: 60-70secs
  - Delayed: 3-5min
- Washout:
  - Retention in blood pool: Hemangioma
  - Retention in fibrous tissue: intrahepatic cholangiocarcinoma /FNH

Scan the QR code(s) on this page with any QR scanner or the eConceptual App to directly access related study materials, providing more insights and a deeper understanding of the topic. Alternatively, you can search on the eConceptual App using the code starting with '#' located below the QR code for quick access to the related content.



- Blood supply



3) Imaging modalities – MRI

- Advantages over CT:
  - Higher soft tissue contrast resolution
  - Greater sensitivity to IV gadolinium-based contrast agents
  - Excellent depiction of fluid (biliary tree, or cystic lesions)
  - Absence of ionizing radiation
- Limitations

Approach to Liver Lesions

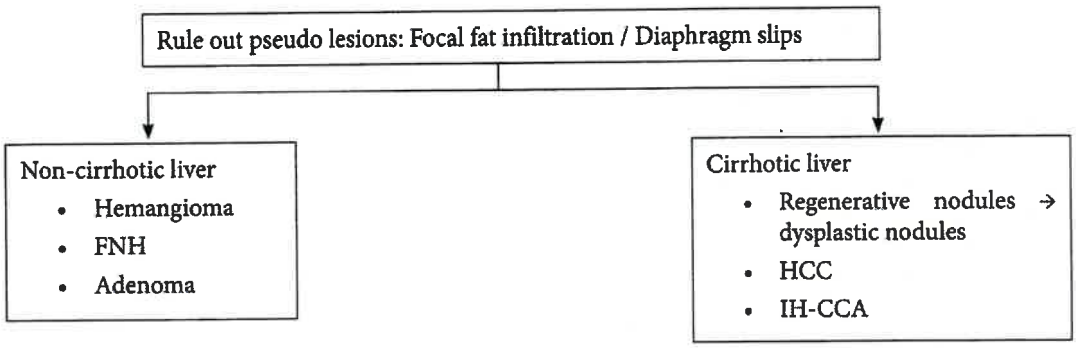
  - Long acquisition time
  - Less spatial resolution
  - Ascites gross – dielectric artefact
- SEQUENCES: Breath-hold or respiratory triggered sequences
- Initial TRUFisp/HASTE for planning
- Axial Fat suppressed FSE T2W
- In & opposed phase T1W GRE – microscopic fat: HCC & Hepatic adenoma
- Diffusion weighted imaging – HCC and shine through hemangioma
- Contrast Enhanced 3D-GRE sequence (VIBE)
  - +/- Subtraction
  - +/- Hepatobiliary phase
  - +/- MRCP

Contrast agent	Biliary Excretion	Hepatocellular phase time
Gadoxetic acid (EOVIST)	50%	20 min
Gadobenate dimeglumine (MULTIHANCE)	5%	1-2 hours

Indications for hepatobiliary phase:

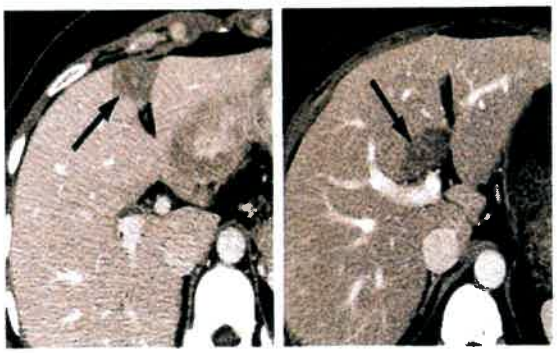
- FNH
- Well differentiated HCC — functional hepatocytes
- Metastasis

- Approach



- **CASES:**

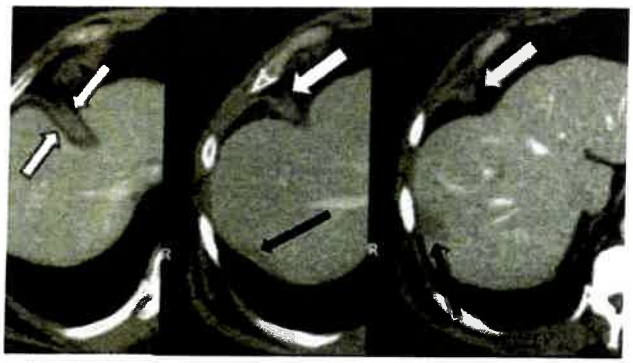
1) Focal fatty infiltration



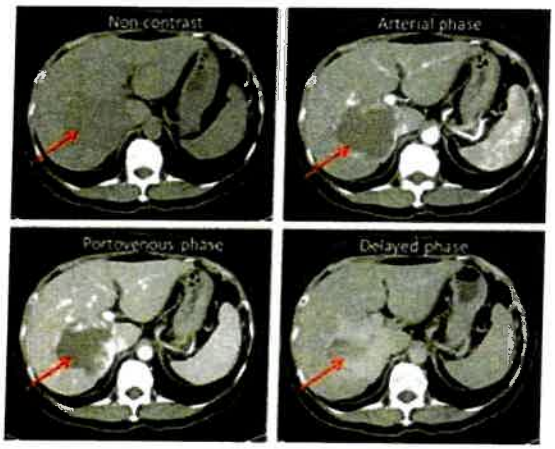
a. b.

- Posterior aspect of segment IV
- The lesion appears hypoattenuating, with no mass effect, and contains normal vessels.

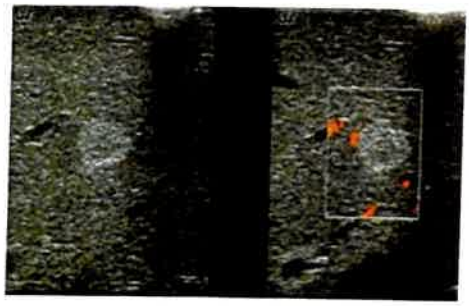
2) Diaphragm slips



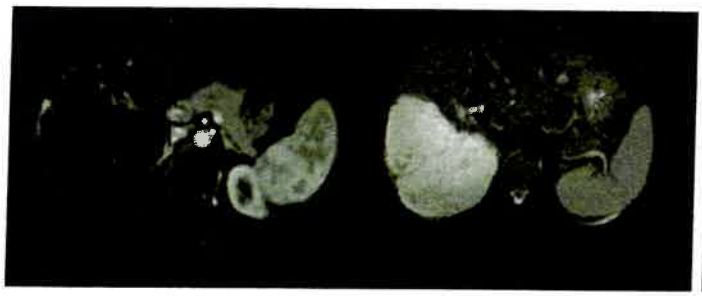
3) Hemangioma



Arterial phase: peripheral nodular non continuous enhancement → venous phase: centripetal filling in Matches blood pool



USG – hyperechoic with posterior acoustic enhancement

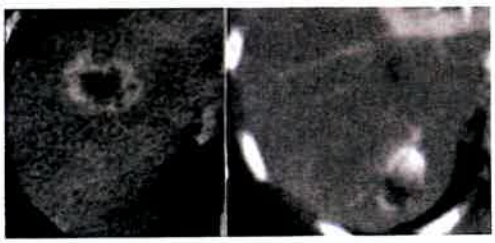


T2W – light bulb sign

DWI – T2 shine through

- Hemangioma –
  - Most common primary liver tumor.
  - Complications – Giant hemangiomas - >10 cm
    - Rupture
    - Kasabach-Merritt syndrome – consumption coagulopathy
    - DWI – shine through
    - T2W - hyperintense
    - Hemangioma enhancement patterns:

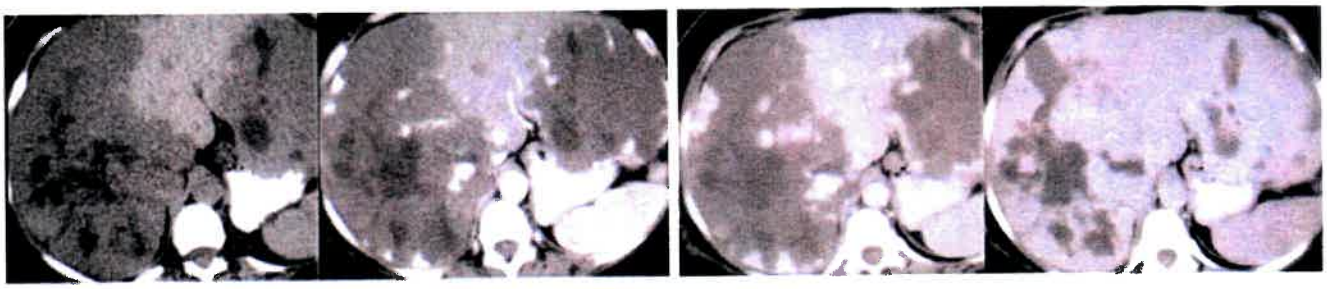
Approach to Liver Lesions



Both are arterial phase.

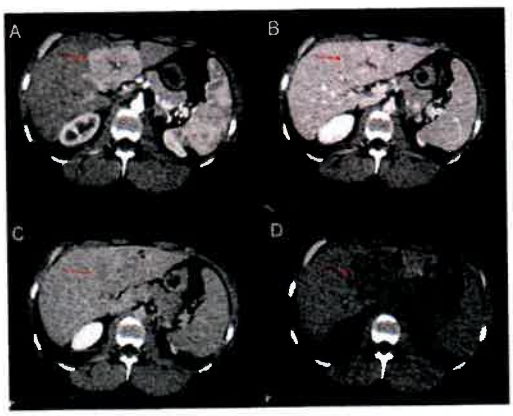
A- Metastasis from Ca breast -Continuous ring/rim enhancement

B- Nodular /patchy

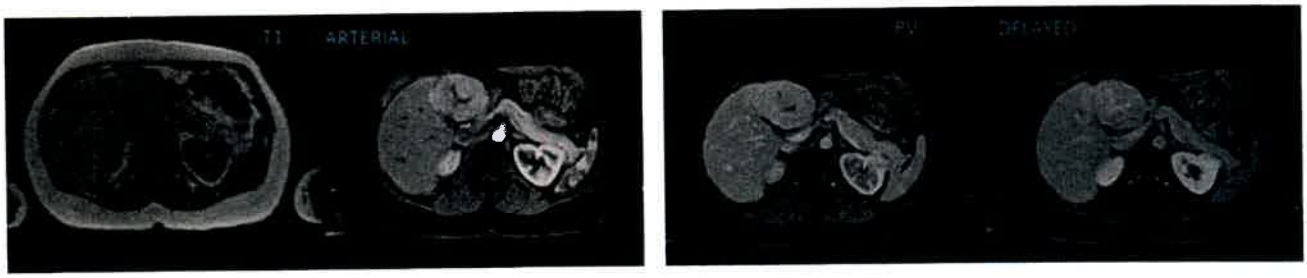


Atypical hemangioma

4) Focal nodular hyperplasia: FNH



Arterial enhancement + scar enhancement delayed



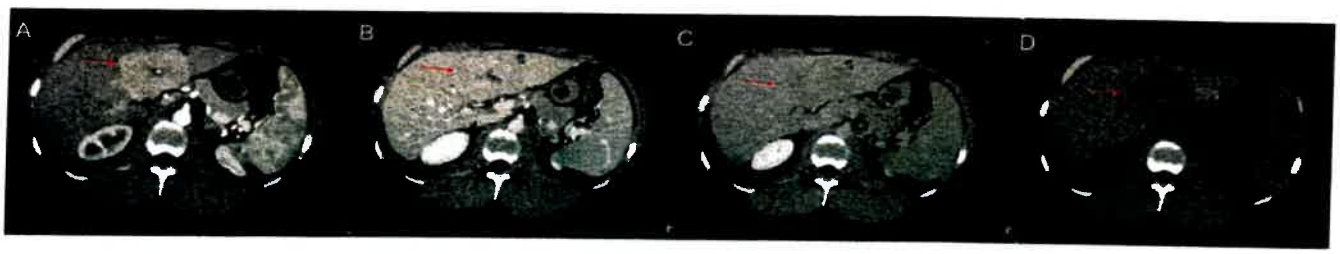
- FNH –
  - Female >> male
  - Reactive change to abnormal dystrophic vessels in central scar
  - Normal hepatocytes +
  - Solitary mass without a capsule.
  - Often beneath the surface of liver.
  - Associated with vascular abnormalities- Budd-Chiari, HHT
  - HEPATOCYTE SPECIFIC PHASE – hyperintense

Spoke wheel pattern

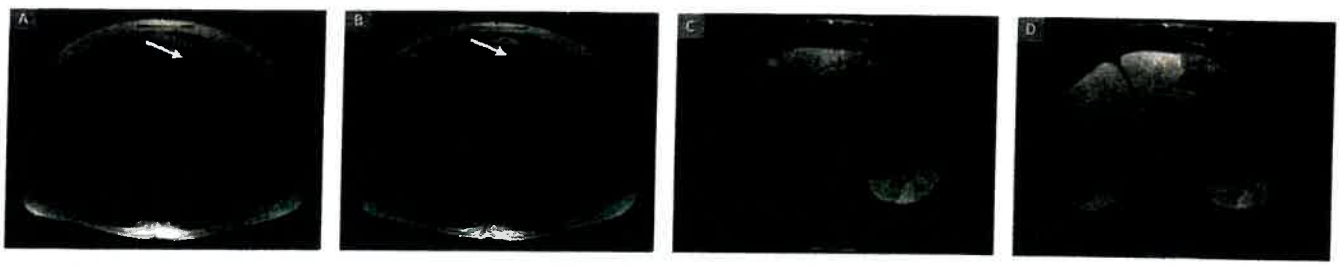
A- Arterial
B- Venous
C- Delayed

5) Fibrolamellar HCC –

- Younger age
- Normal AFP
- Central fibrous scar
- Punctate calcification 50%
- MRI: low signal scar on T1W and T2W hypointense (in contrast to FNH)
- Delayed enhancement of scar
- DD – FNH, HCC with scar



6) Hepatic adenoma



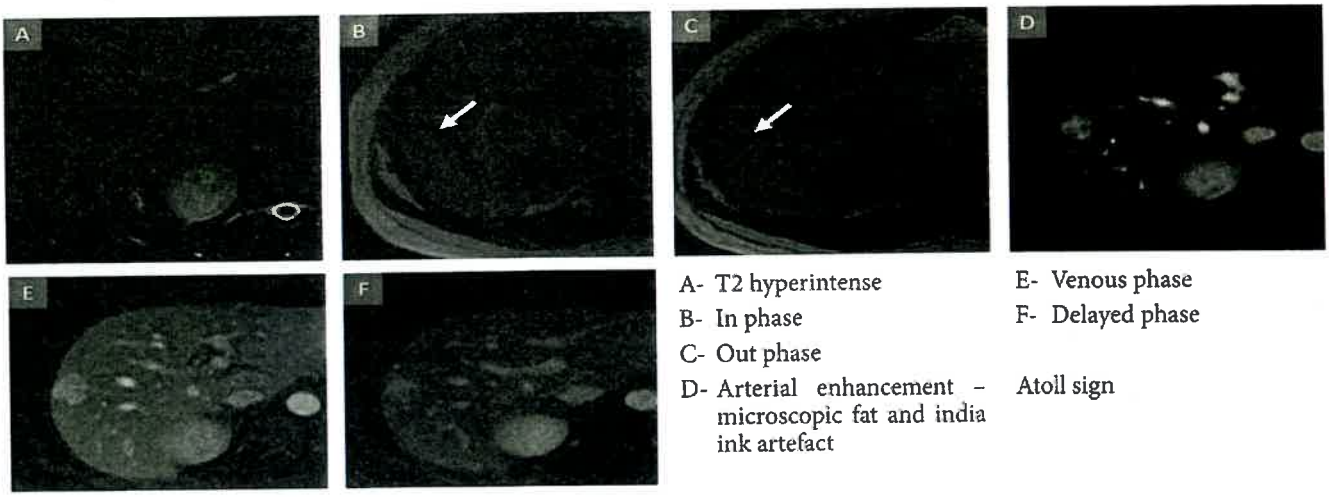
HNF1 mutated Adenoma

Approach to Liver Lesions

- Adenoma
  - Solitary (80%); Females (90%).
  - Predisposing factors - oral contraceptives, anabolic steroids, Von gierke's disease
  - Contains - fat & glycogen
  - Complications – Rupture, bleeding, necrosis
  - Malignancy in 5% cases

	Inflammatory	HNF-1 alpha mutated	B-catenin mutated	Unclassified
T1 weighted imaging	Isointense to mildly hyperintense	Isointense to hyperintense	Isointense to hyperintense	No known specific findings
T2 weighted imaging	Marked T2 hyperintense Atoll Sign: incomplete T2 hyperintense rim	Isointense to hyperintense	Poorly demarcated T2 hyperintense	
Post-contrast imaging	Arterial enhancement that persists on late phases	Variable arterial enhancement that does not persist on later phases	May mimic HCC with arterial enhancement with washout poorly demarcated scar that enhances in the portal venous phase	
			Isointense or hyperintense on hepatobiliary phase	
In-phase and out-of -phase imaging	May have focal mild signal loss	Diffuse signal loss on out- phase images	Commonly no signal loss	
Prevalence rate Risk for malignant transformation	40% - 50% of cases	30%-40% of cases have No to low risk	15%-20% of cases Up to 46%	10% 14%

- Diagnosis –Inflammatory Adenoma



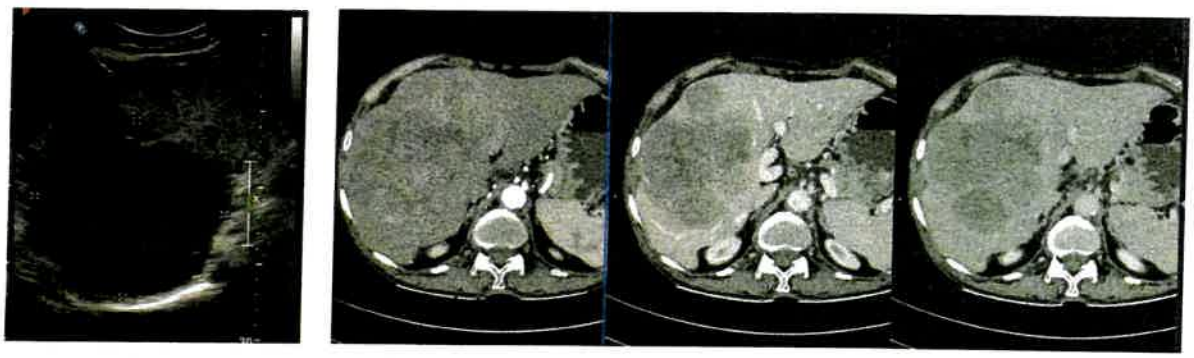
A- T2 hyperintense
B- In phase
C- Out phase
D- Arterial enhancement – microscopic fat and india ink artefact
E- Venous phase
F- Delayed phase

Atoll sign

7) Biliary Cystadenoma

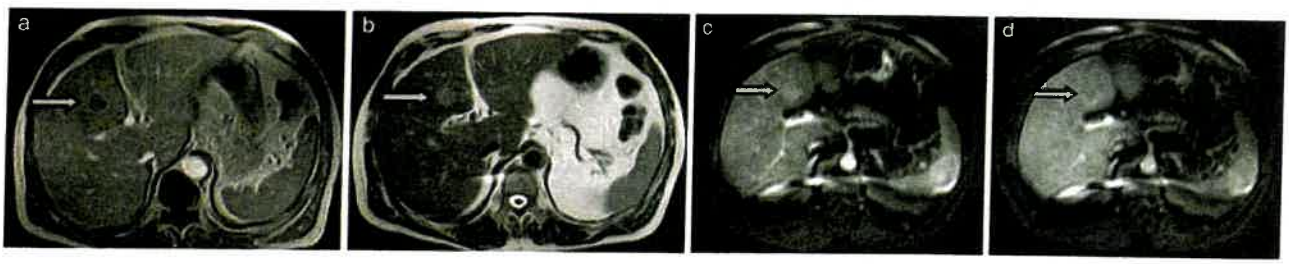
- Biliary cystadenoma
  - Multi locular cystic liver mass;
  - Originates from bile duct.
  - Usually right hepatic lobe.
  - Adults, Females >> males.
  - Malignant transformation to cystadenocarcinoma.

8) HCC



USG **Arterial Enhancement** **Venous Washout** **Delayed Capsule**

- Diagnosis –HCC



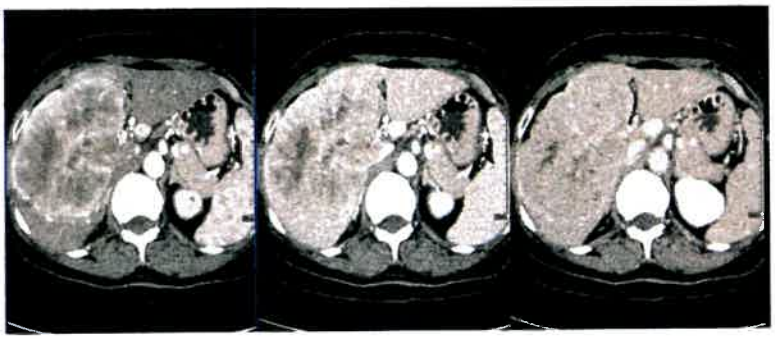
- HCC
  - AFP elevated in 30-60%
  - 3 Patterns - Solitary; multifocal, diffusely infiltrating

Solitary **Multifocal** **Infiltrating**

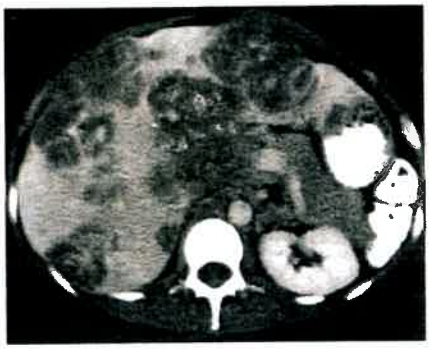
Approach to Liver Lesions

9) Mass forming intrahepatic Cholangiocarcinoma –

- 10% of all cholangiocarcinomas
- Ductal dilatation peripheral to mass
- Capsular retraction
- Peripheral arterial enhancement
- Delayed and persistent enhancement + peripheral washout
- Satellite lesions
- Peripheral Diffusion restriction

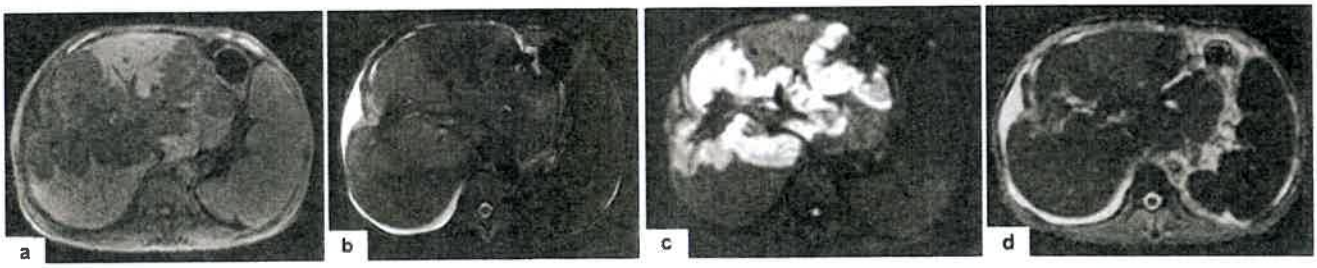


10) Hemangioendothelioma



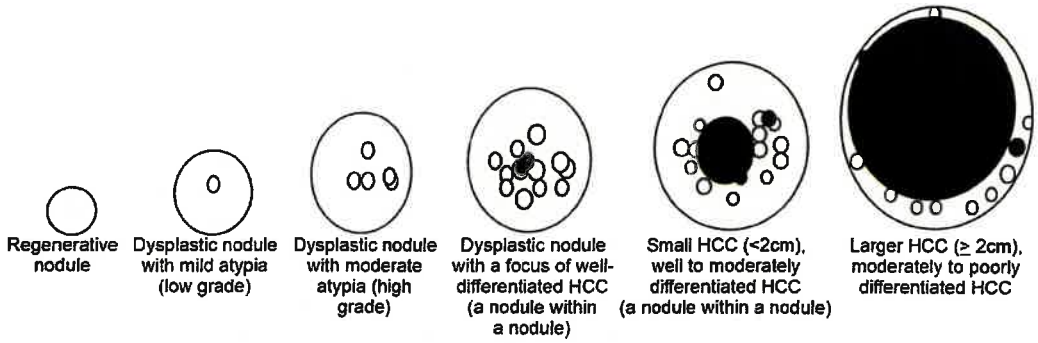
Peripheral lesion
Central supply
Lollipop appearance
Capsular retraction → pseudocirrhosis seen in Ca breast metastasis

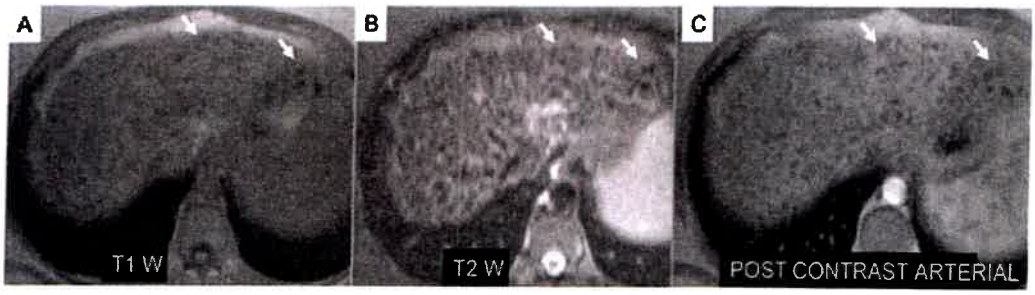
11) Lymphoma



12) Hepatocellular nodules in Cirrhosis

Lesion	T 1 W image	T2 W image	Contrast enhancement pattern
Regenerative nodule	Variable	Hypointense	Enhances during portal venous phase
Dysplastic nodule	Hyperintense	Hypointense	Enhances during portal venous phase
HCC (small)	Hypointense	Hyperintense	Enhances during arterial phase
HCC (large)	Heterogeneous	Hyperintense	Enhances during arterial phase

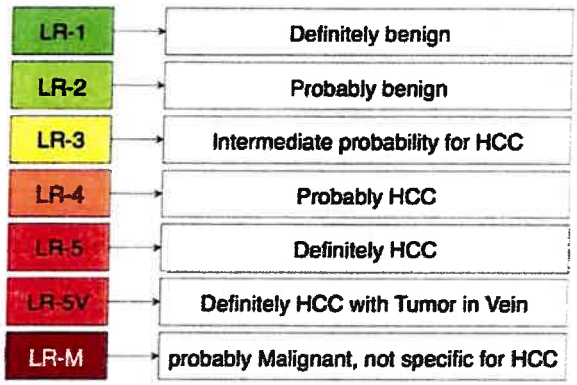




Regenerative nodule: no enhancement

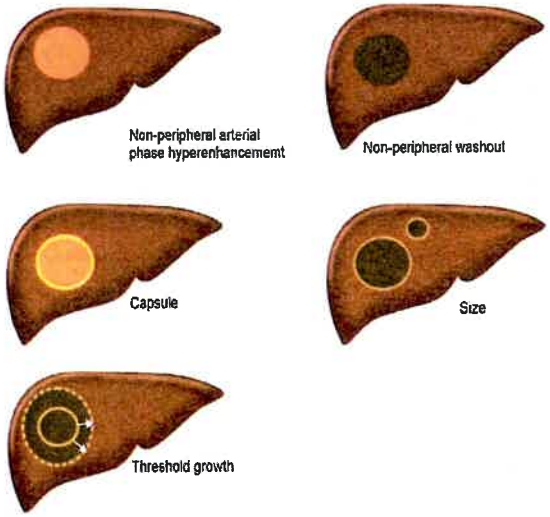
LIRADS

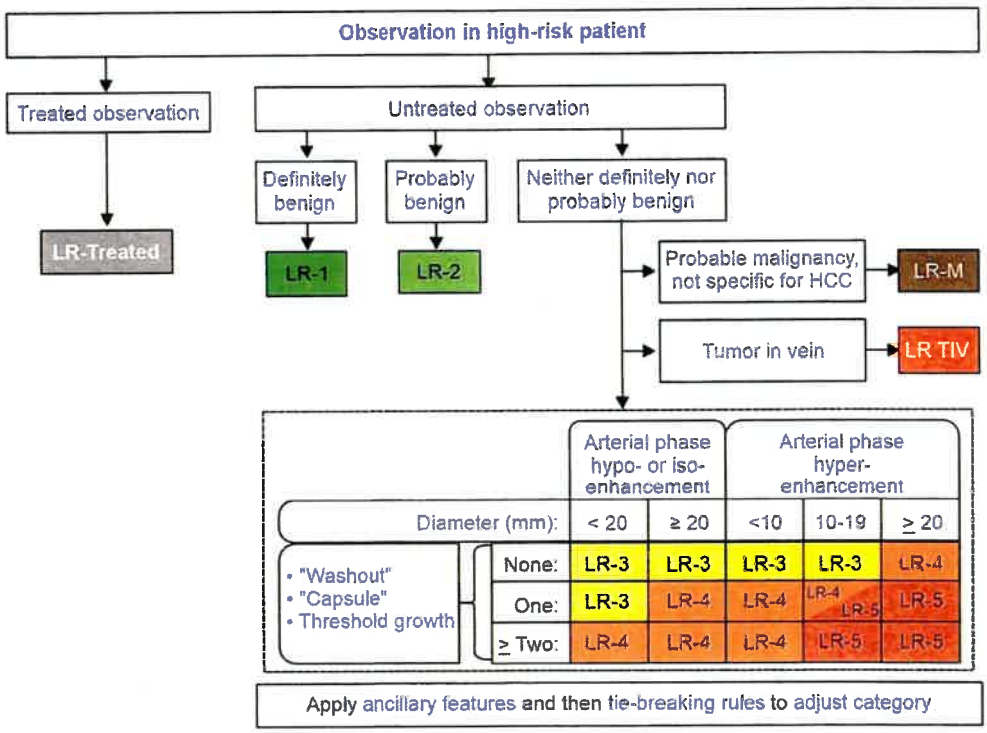
Use LI-RADS	Do not use LI-RADS
Cirrhosis **Hep B- virus** **Current or prior HCC**	< 18 years Cirrhosis due to congenital hepatic fibrosis Cirrhosis caused by vascular disorder: • Budd-Chiari • Portal vein occlusion • Diffuse nodular regenerative hyperplasia • Cardiac congestion



Major feature	Definition
Arterial phase hyperenhancement	Enhancement in the arterial phase that unequivocally is greater than that of liver.
Arterial phase hypo- or iso-enhancement	Enhancement in the arterial phase that is less than that or equivalent to that of liver.
Diameter	The largest dimension (outer edge to outer edge) of an observation.

Washout appearance ("washout")	Visually assessed temporal reduction in enhancement relative to liver from an earlier to a later phase resulting in portal venous phase hypoenhancement or delayed phase hypoenhancement.
Capsule appearance ("capsule")	Peripheral rim of smooth hyper-enhancement in the portal venous phase or delayed phase that unequivocally is thicker or more conspicuous than the rims surrounding background nodules.
Threshold growth	Diameter increase of a mass by a minimum of 5 mm and, depending on the time interval between examinations, by the following amounts: Time interval — Diameter increase ≤ 6 months — ≥ 50% >6 months — ≥ 100% A new ≥ 10 mm mass also represents threshold growth, regardless of the time interval. A new < 10 mm mass does not represent threshold growth.





- **51-year-old man with cirrhosis status post –liver biopsy –**