

TABLE 1: Imaging Characteristics of Common Malignant and Benign Hepatic Masses

Imaging Technique	Hemangioma	Focal Nodular Hyperplasia	Adenoma	Cirrhotic Nodules		HCC	Fibrolamellar HCC	Metastasis	Cholangiocarcinoma
				Regenerative	Dysplastic				
Sonography	Hyperechoic	Homogeneously isoechoic or slightly hypo-/hyperechoic; central scar shows spoke-wheel arterial pattern radiating to periphery	Solitary well-defined hyperechoic mass, but variable; large masses show heterogeneous echogenicity	Isoechoic	Variable echogenicity depending on fat content	Variable; <3-cm masses have hypoechoic rim with slightly hyperechoic center; >3-cm masses have heterogeneous echogenicity	Variable; hyperechoic to heterogeneous echogenicity; central scar may calcify	Variable depending on primary; tumor may show hypoechoic halo	Peripheral, hypoechoic surrounding bile ducts
MDCT									
Unenhanced	Hypodense	Isodense to hypodense; central scar is hypodense	Hypodense; variable depending on hemorrhage and necrosis	Isodense; siderotic nodules are hyperdense	Isodense to occasionally hyperdense	Hypodense to isodense	Heterogeneous, variable; central scar is hypodense, may calcify	Hypodense to isodense	Hypodense to isodense
Arterial phase	Globular discontinuous peripheral enhancement	Homogeneous hypervascular; enhancement; central scar is hypodense	Hypervascular	Isodense	Isodense	Homogeneously hypervascular in smaller lesions; heterogeneous enhancement (mosaic) in larger lesions	Heterogeneous, variable; central scar is hypodense	Isodense to hypervascular depending on primary tumor	Isodense
Portal venous phase	Gradual centripetal fill after blood pooling	Homogenous enhancement; central scar is hypodense	Isodense to nearly isodense	Isodense	Isodense	Hypodense (washout) to isodense	Isodense to hypodense	Homogeneous enhancement	Mild peripheral enhancement
Delayed phase	Continued filling after blood pooling	Isodense; central scar shows delayed enhancement	Isodense	Isodense	Isodense	Isodense	Isodense; central scar is nonenhancing; occasional enhancement	Isodense	Increasing enhancement
MRI									
T1-weighted	Low signal	Isointense to nearly isointense; central scar is low signal	High signal; variable heterogeneity depending on hemorrhage and necrosis	Isointense; rarely nearly isointense; siderotic nodules are low signal	High signal	50% High signal; 50% variably isointense to low signal; capsule is low signal	Low signal	Low signal	Low signal
T2-weighted	High signal	Isointense to nearly isointense; central scar is high signal	High signal; variable heterogeneity depending on hemorrhage and necrosis	Isointense to rarely low signal; siderotic nodules are low signal	Low signal	High signal; capsule is low signal	High signal; central scar is low signal	High signal	High signal
Gadolinium-enhanced									
Arterial phase	Globular discontinuous peripheral enhancement	Hypervascular; central scar is unenhanced	Hypervascular	Isointense	Isointense to occasional mild enhancement	Homogeneously hypervascular in smaller lesions; heterogeneous enhancement (mosaic) in larger lesions	Heterogeneous enhancement	Hypovascular lesions show rim enhancement; hypervascular lesions show homogeneous enhancement	Mild to moderate peripheral enhancement
Portal venous phase	Gradual centripetal fill after blood pooling	Isointense; central scar shows delayed enhancement	Isointense to nearly isointense	Isointense	Isointense	Low signal (washout) to isointense; capsule shows delayed enhancement	Heterogeneous to homogeneous enhancement	Hypovascular lesions show homogeneous enhancement; hypervascular lesions are isointense; delayed images show peripheral washout	Progressive centripetal enhancement from portal venous to delayed phase

	NON-CON	ARTERIAL	PV PHASE	DELAYED	COMMENTS
HEMANGIOMA	-Hypodense	-peripheral discontinuous nodular enhancement -homogenous (flash-fill <2cm)	-progressive centripetal fill-in (central scar if gaint >10cm; washout if flash-fill)	-retains contrast (no washout)	-Hyperechoic w/ increased thru-transmission on U/S -assoc w/ FNH
FNH	-Isodense (can be hypodense) -subcapsular or pedunculated	-homogen enhancement w/ non-calcified central scar	-Isodense	-Central scar enhancement	-T2 bright central scar -hypoecho w/ internal flow
ADENOMA	-Heterogenous 40%hemm=T1 br 7%fat=drop OOP 5%calc -some iso/hypodense	-Heterogen enhancement	-rapidly (w/in 1min) becomes isodense (due to shunting)	-30% may have enhancing pseudocapsule	-young pts (W on OCP, M on steroids) + no cirrhosis + no elev AFP
FLC	-Large mass -Central scar may be calcified in 50%	-Heterogen enhancement (unlike FNH)	-No central scar enhancement	-No central scar enhancement	-20-30yo + no cirrhosis + no elev AFP -no hemm/necr
HCC	-Heterogen (hem/necr; rare calc/fat)	-Enhancement (pseudocap iso/hypodense)	-Washout (hypodense)	-Rim/pseusocap enhancement	-cirrhosis + elev AFP
CholangioCA	-Isodense -Peri biliary dilation -Capsular retraction	-Iso/hypodense	-Iso/hypodense (may have slight peri enhancement)	-10min slow peripheral to central enhancement	
HYPER METS	-Heterogenous	-Early rim enhancement	-Progressive central fill-in	-Progressive central fill-in (with peripheral washout)	<1cm may have homo enh on arterial phase
HYPO METS	-Heterogenous	-Hypodense (may have mild irreg peri enhancement)	-hypodense with some central enhancement	-Continued mild central enhancement	

	T1	T2	Early Gd (Arterial)	Late Gd (Venous and Equilibrium)	Other Features
Benign					
Cyst	↓↓	↑↑	0	0	Well-defined borders
Hamartoma	↓↓	↑↑	Thin rim	Thin rim	<1 cm
Hemangioma	↓↓	↑↑	Peripheral nodules	Nodules coalesce, retain	<1.5 cm lesion may enhance
FNH	↓-∅	∅-↑	Homogeneous intense, nonenhancing scar	Homogeneous washout, late scar enhancement	Central scar liver is commonly fatty
Adenoma	↓-↑	∅-↑	Homogeneous intense	Homogeneous washout	Uniform signal loss on out-of-phase T1, larger lesions may bleed
Bacterial abscess	↓↓	↑-↑↑	Perilesional enhancement, capsule enhances	Perilesional enhancement fades, capsule remains enhanced	Resemble metastases but not progressive lesion enhancement
Regenerative nodules	↓-∅	↓-∅	Negligible	Negligible	Lesions generally <1.5 cm and homogeneous
Malignant OR Premalignant					
Primary Neoplasm					
Mildly dysplastic nodule	↓-↑	—	Minimal	Minimal	Lesions generally <cm and homogeneous
Severely dysplastic nodule	↓-↑	—	Homogeneous intense	Fade to isointense with liver	Lesions generally <1.5 cm, homogeneous, and no capsule
HCC—small (>3 cm) HCC—large (>3-5 cm)	↓-↑↓-↑	∅-↑∅-↑	Diffuse Heterogeneous	Rapid washout Heterogeneous +/- foci showing washout	Larger lesions may appear infiltrative, poorly marginated, and demonstrate portal vein invasion
Fibrolamellar carcinoma	↓	↑-↑↑	Diffuse radiating bands	Slow washout	Usually >5 cm
Cholangiocarcinoma	∅-↓	∅-↑	Negligible	Progressive heterogeneous	Associated liver atrophy intrahepatic duct dilatation
Lymphoma (primary)	↓	↑	Diffuse heterogeneous	Progressive with heterogeneous washout	Resemble HCC, rarely may resemble cholangiocarcinoma
Secondary Neoplasms					
Metastatic	↓	↑	+/-ring, +/-perilesional	Heterogeneous	Mucinous adenoma have ↑↑T2 and more perilesional enhancement
Hypervascular metastases	↓	↑ ↑↑	Heterogeneous	Variable washout	
Lymphoma (secondary)	↓	↑	Ring	Progressive mild	Resemble metastases