Common CT Findings Secondary to Liver Tumors

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Liver Tumors

PRIMARY **SECONDARY**

Some quick facts on Liver Tumors…

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Primary Tumors: Hepatocellular Carcinoma (HCC)

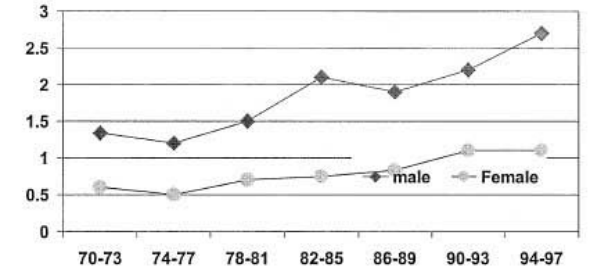
- Hepatocellular carcinoma accounts for 80% to 90% of all liver cancers.
- It occurs more often in men than women and occurs mostly in people 50 to 60 years old. The disease is more common in parts of Africa and Asia than in North or South America and Europe.
- The cause of liver cancer is usually cirrhosis, or scarring of the liver. Cirrhosis may be caused by viral hepatitis, primarily hepatitis B and C, alcohol abuse, hemochromatosis, certain autoimmune diseases of the liver, and a whole host of other diseases that result in chronic inflammation of the liver leading to scarring. The most common cause for cirrhosis in the U.S. is alcohol abuse.

Incidence of HCC is still high:

Worldwide, HCC is the fifth most common cancer and the third most common cause of cancer-related death. In the U.S., 18,510 new cancers of the liver are expected in 2006

Mortality from HCC has been rising:

Mortality from HCC increased from 0.94 to 1.84 per 100,000 population (rate ratio = 1.94, CI = 1.87–2.03)



Mortality rate for HCC (per 100,000 persons) in men and women from 1970–1973 to 1994–1997.

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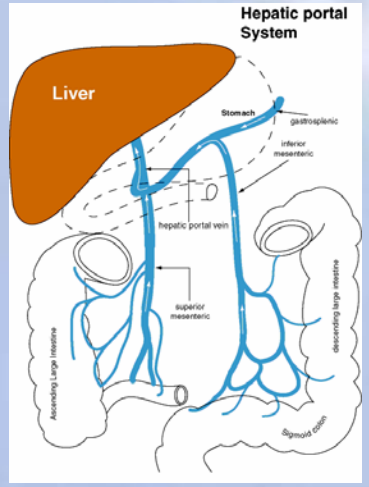
Secondary Tumors: Metastases

- Most common source of liver metastases: Colon cancer.
- Liver metastases are present in some 25% of patients at the time of initial colorectal resection and over 50% of patients will eventually develop them. Some 90% of patients who die from colorectal cancer have liver metastases.
- The proportion of colorectal cancer patients with synchronous liver metastases ~14.5%.



← Portal circulation (70% of circulation)

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Detection

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Advantages and Disadvantages of each imaging test:

Ultrasound:

- Ultrasonography (US) is inexpensive and easily available. It is an excellent test to screen the liver for biliary obstruction or gall bladder disease and to assess vascular patency. It is highly sensitive at differentiating a cyst from a solid liver lesion. However, it is not as sensitive as computerized tomography (CT) or magnetic resonance imaging (MRI) at detecting focal, solid liver lesions
- The main limitations of US are high operator dependency, inability to detect lesions <1 cm in size, and low specificity. The presence of diffuse liver disease also lowers the sensitivity of US for the detection of focal lesions.
- Less Expensive

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Advantages and Disadvantages of each imaging test:

Computed Tomography (CT):

- CT offers the best spatial resolution and the ability to study the entire liver in a single breath-hold. It is an ideal screening examination for the entire abdomen and pelvis. Technological advances in CT technology have further improved the performance of CT scanners in terms of speed of acquisition, resolution, and the ability to image the liver during various phases of contrast enhancement more precisely than was possible previously .
- Its limitations include the need for a high radiation dose and a low sensitivity for the detection and characterization of lesions smaller than 1 cm. Contrast-enhanced CT is contraindicated in patients with a history of anaphylaxis from contrast agents and renal failure.
- Expensive

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Advantages and Disadvantages of each imaging test:

Magnetic Resonance Imaging (MRI):

- The main advantages of contrast-enhanced MRI include a high spatial resolution, better contrast sensitivity, better lesion detection and characterization than with CT, and lack of ionizing radiation.
- The main drawbacks of MRI include its a long procedure time, and the need for the patient to hold his breath for longer periods.
- Very expensive

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Advantages and Disadvantages of each imaging test:

Positron Emission Tomography (PET):

- This procedure is highly sensitive; however, any focal area of hypermetabolism can give false-positive results. The advantages are its high sensitivity and the ability to survey the entire body at a single sitting
- The main disadvantages include its high cost, poor availability, poor lesion localization, and limited sensitivity for lesions smaller than 1 cm
- Technology is new – more studies are needed (2004)

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Recommendations for the initial imaging test following detection of primary tumor.

(ACR Appropriateness Criteria®)

Radiologic Exam Procedure	Appropriateness Rating
CT, abdomen, helical in PVP	8
CT, abdomen, helical in HAP and portal venous phase (PVP)	8
CT, abdomen, helical without contrast followed by HAP and PVP	6
MRI, abdomen, spin-echo then gradient-echo with extracellular contrast e.g. gadolinium chelates	6
PET	6
MRI, abdomen, with reticulo-endothelial contrast e.g., iron-oxide	5
CT, abdomen, without contrast	4
MRI, abdomen, spin-echo, without contrast	4
US, abdomen	4
US, abdomen, with color Doppler	4
NUC, liver scan with reticulo-endothelial agent	4
NUC, Immunoscintigraphy	3

The imaging findings in patients with primary liver malignancy were evaluated retrospectively to determine the sensitivity and appearances of the tumour by each method.

- **Ultrasound** gave a correct solitary/ multiple/ diffuse classification in 85%,
- **CT** in 88%
- **Arteriography** in 71%
- **Scintigraphy** in 71%

Liver lesions are still missed!

- 30% of patients with liver mets have normal LFTs
- Small Mets <1cm may be overlooked by imaging studies

What should we do?

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Proposal:

Use common extrahepatic manifestations secondary to liver masses as an indicator of a possible malignant process.

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Index Case:

- 60 year old Asian American male.
- Last visit to doctor: 10 years ago.
- Increased Alpha-Fetoprotein: 1000+ nanograms/ milliliter
  - Normal: 0–20 nanograms per milliliter
- *"Rule out liver cyst"*

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Protocol:

CT Abdomen with and without contrast

- 3-4 cc / sec of contrast for a total of 100 cc.
- Scanned at 35 and 75 secs for the liver.

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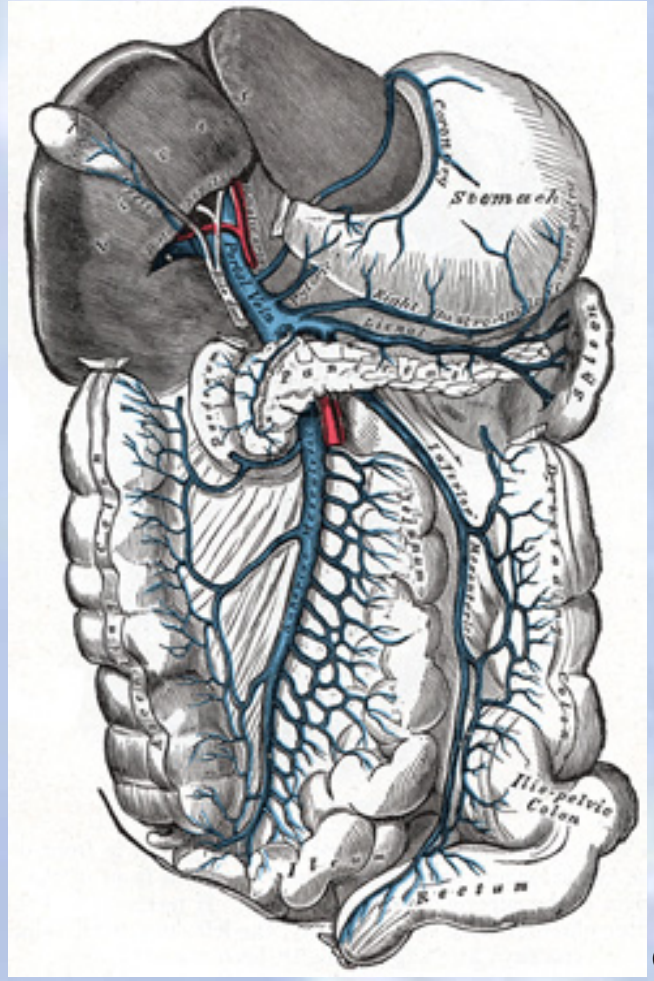
Anatomy: Abdomen



Gray's Anatomy

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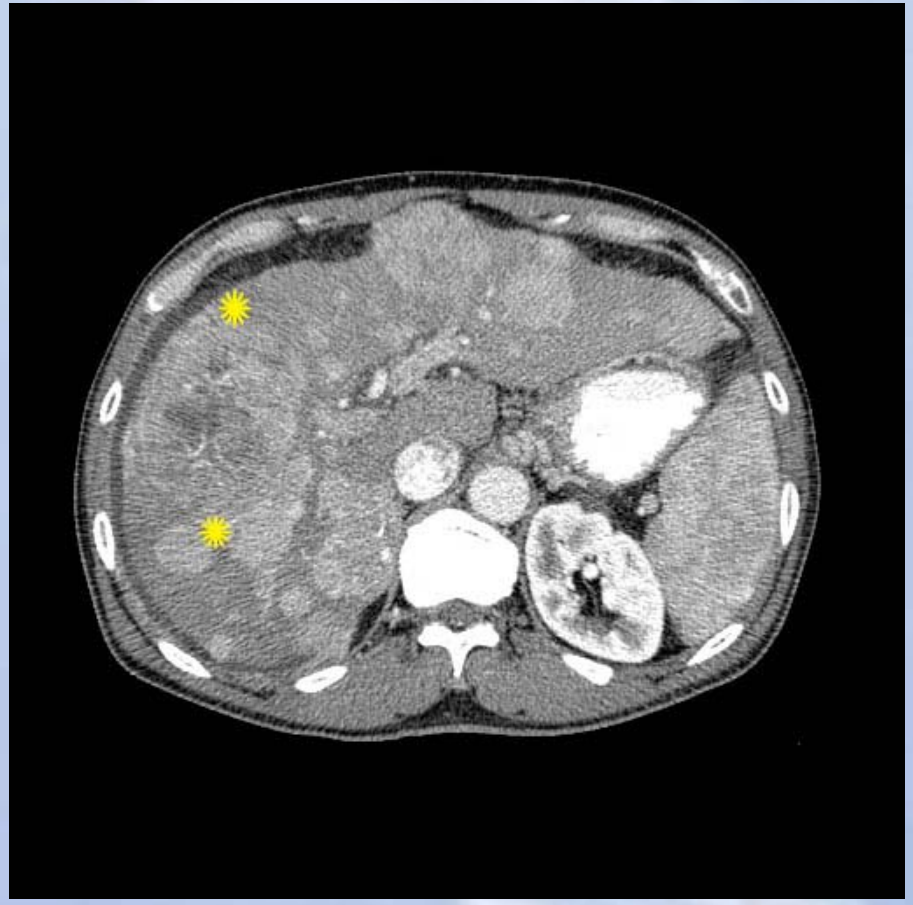

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Liver Masses (1 of 2)

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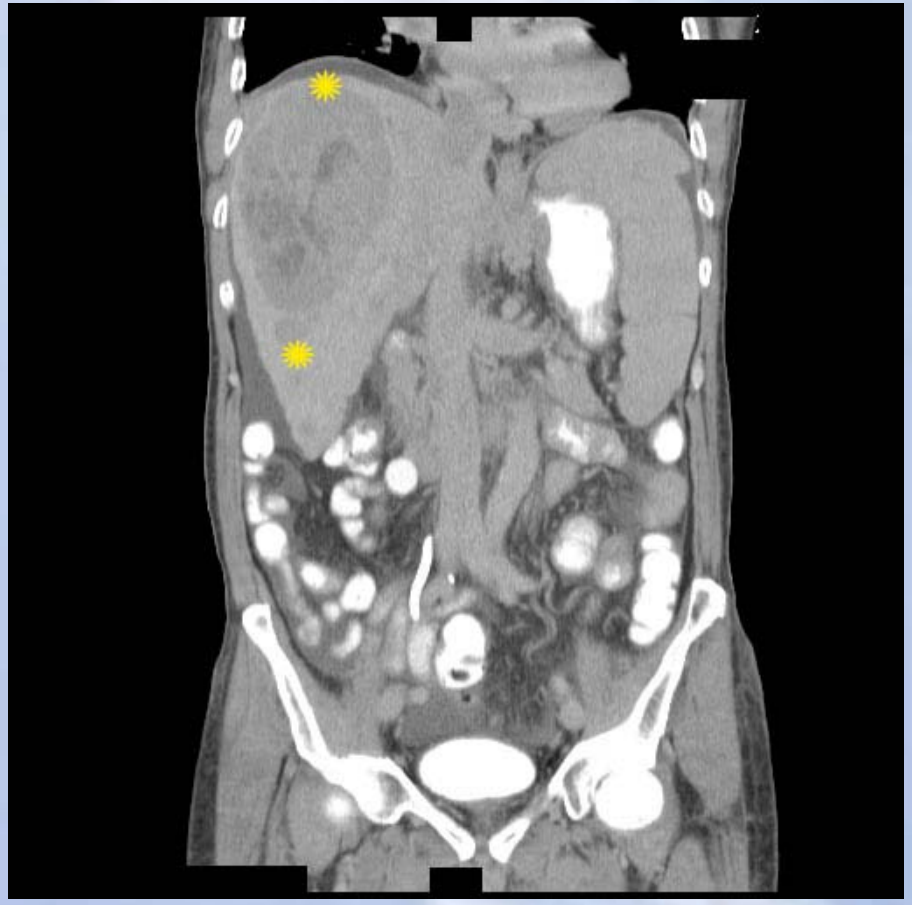

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Liver Masses (2 of 2)

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Hypersplenomegaly

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Pulmonary Embolism (1 of 2)

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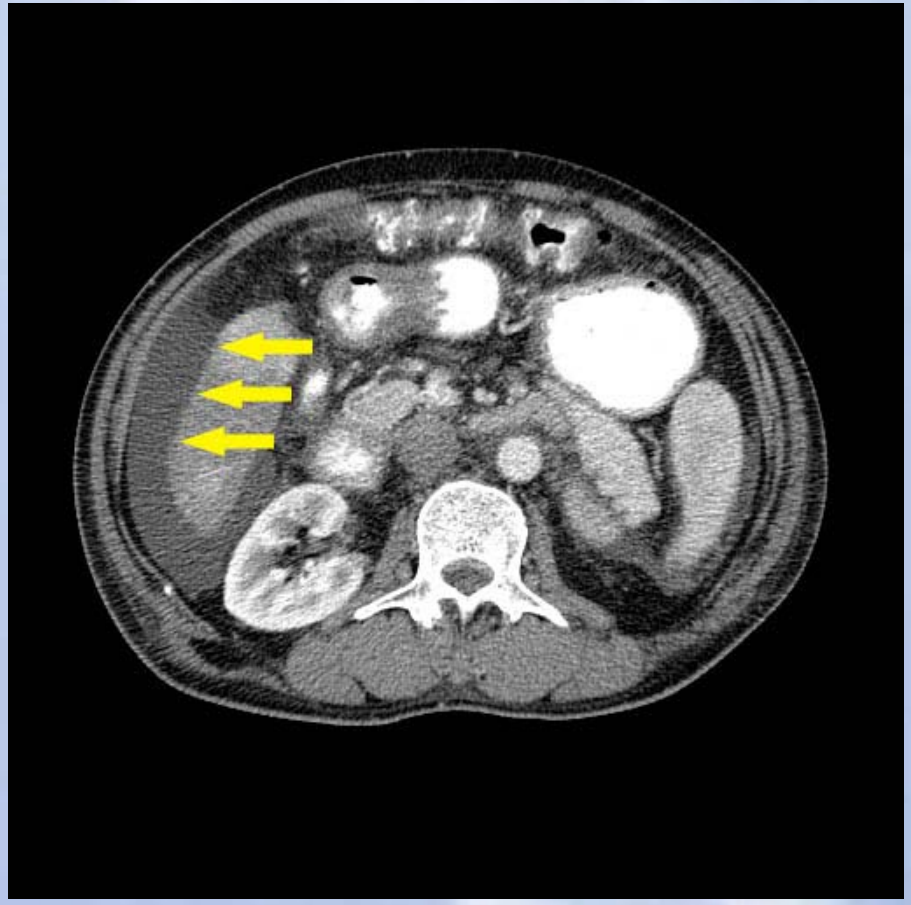
Pulmonary Embolism (2 of 2)



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IVC Infiltration (1 of 2)

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IVC Infiltration (2 of 2)

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The future of detection…

- Fusing PET / CT scans.
  - A PET scan demonstrates the biological function of the body before anatomical changes take place, while the CT scan provides information about the body's anatomy such as size, shape and location.
- The detection rate of PET plus CT fusion images, PET, CT, and bone scintigraphy was **98.2%**, 89.6%, 91.2% and 68.7% respectively.

Conclusion:

The fusion of PET plus CT images may be useful in detection

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