A Pictorial Review of the Less Common but Interesting Liver Lesions

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Focal liver abnormalities are commonly seen in radiology practice and may demonstrate characteristic imaging features that point to the underlying diagnosis, without the need for biopsy. Those that do not however, pose a diagnostic conundrum that can require multi-modal imaging and ultimately pathological assessment.

Here we present some unusual cases we have encountered, and describe the imaging features and final diagnosis.

- **Objectives:** To review the imaging features of some rare but interesting liver lesions.

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Case 1: 79 year old male presenting with sepsis and right-sided abdominal pain. Initially, a portal venous CT abdomen was performed.

Focal isolated bile duct dilatation (hepatic segments VI/VII) with associated patchy enhancement and ill defined low attenuation (possibly representing a mass)
Case 1: Hepatobiliary contrast agent enhanced MRI

T2
Early arterial
Late arterial
Portal venous
Delayed
20 minute delayed
Case 1: Sclerosing Hemangioma

Right hepatectomy pathology report: “The sections show a sclerosing hemangioma. There is dense fibrous tissue and numerous collapsing small blood vessels embedded within the collagenous stroma. The tumor appears centered on some ectatic medium-sized bile ducts with benign biliary epithelium”.

- Sclerosing (also known as thrombosed or hyalinised) hemangiomas are a rare manifestation of typical lesions that have undergone degeneration and fibrous replacement.

- Reported imaging features include:
  - variable T2 intensity (less than a typical hemangioma)
  - T1 hypointensity
  - volume loss (capsular retraction or concavity)
  - a geographic pattern
  - rim enhancement in the late phase
  - nodular regions of mild enhancement
  - typical hemangiomas elsewhere within the liver

- Differentials: malignant hepatic tumors (biopsy or excision is recommended as imaging features are not diagnostic).
Case 2: 32 year old female presenting with abdominal pain. Indication for CT was “right lower quadrant pain, rule out appendicitis”.

CT examination was normal other than a hypodense focus within segments VII/VIII

A faintly hyperechoic focus was seen on ultrasound
Case 2: Hepatobiliary contrast agent enhanced MRI

Arterial
Late arterial
Portal venous

20 minute delayed
T2
Case 2: Inflammatory Adenoma

- Inflammatory adenomas are a pathological subtype of hepatic adenomas (and are at greatest risk of spontaneous haemorrhage)
- Associated with the oral contraceptive pill (OCP) and often regress when it is discontinued
- They present with inflammatory features (fever, elevated white cells and CRP) and elevated liver function tests
- Imaging features:
  - typically T1 isointense with arterial enhancement
  - Enhancement fades on portal venous and delayed phases
  - T2 hyperintense, sometimes with the “atoll sign” (rim of increased T2 hyperintensity)
- Differentials: other types of adenoma, HCC, FNH, hypervascular metastases

The atoll sign can help distinguish adenomas from FNH
Case 3: 62 year old dialysis patient with echogenic liver masses seen on ultrasound

Selected images are shown from the subsequent portal venous phase CT examination.
Case 3: MRI findings

T1

T1 Out of Phase

T2

T2 fat sat
Case 3: Subcapsular Hepatic Steatosis

- Rind-like areas of fat are a unique appearance in patients undergoing continuous ambulatory peritoneal dialysis (CAPD) with intraperitoneal insulin therapy.
- Insulin is absorbed into the portal venous system via the visceral peritoneum.
- Subcapsular hepatocytes are exposed to higher concentrations of insulin (which prevents the normal oxidation of free fatty acids). This leads to esterification into triglycerides in subcapsular hepatocytes.
- Imaging features: focal (subcapsular) increased echogenicity on ultrasound, focal areas of low attenuation on CT, focal increased T1 signal and evidence of signal drop-out on in-and-out of phase imaging on MRI.
- Differentials: Wilson’s disease (perihepatic fat on a background of liver cirrhosis), abscesses or metastases - but the location is typical and there is no (or very mild) mass effect or distortion of hepatic vessels.
- The changes can be reversible.
Case 4: 39 year old female with a two week history of abdominal pain and nausea. Multiple hypoechoic liver lesions seen on ultrasound. Images from the subsequent CT examination are shown, demonstrating arterial phase hypervascularity and persistent enhancement in the portal venous and delayed phases.
Case 4: Gadolinium-based contrast agent (Gadobutrol) enhanced MRI in the same patient

T2  T1  Arterial  Portal Venous
Case 4: Hepatic Peliosis

- Hepatic peliosis is a rare benign condition in which multiple vascular lesions form within the liver (and less commonly the spleen or bone marrow).
- Appearances can mimic malignancy
- It is usually asymptomatic
- Associated with infection (including HIV), drugs/toxins (steroids, oral contraception, tamoxifen), chronic illness (malignancy, TB, diabetes), cardiac or renal transplant
- Imaging features: non-specific with variable contrast enhancement patterns. Can show centrifugal enhancement (from inside radiating to the peripheries) which can help to differentiate from hemangioma
- Differentials: cavernous hemangioma, HCC, FNH, adenoma, metastases, hepatic abscesses
- Care must be take not to confuse peliosis with hepatic abscesses as drainage can cause catastrophic haemorrhage
- Treatment depends on the underlying cause
Case 5: A 22 year old woman with an echo-poor mass seen in the left lobe of the liver on US. Hepatobiliary contrast agent enhanced MRI images are shown.
Case 5: A follow-up CT was performed 4 months later
Case 5: Epithelioid Hemangioendothelioma (EHE)

- Rare tumor of vascular origin, composed of dendritic and epithelioid cells
- Low to intermediate grade malignancy (long-term survival is possible, therefore important to distinguish from adenocarcinoma/angiosarcoma)
- Imaging features: multi-focal nodules or confluent masses (also known as “diffuse”, representing a later stage), often peripheral location (extending to the capsule), capsular retraction, parenchymal calcification, hypertrophy of uninvolved hepatic parenchyma, shunting of blood supply from involved to uninvolved areas, features of portal hypertension
- MRI appearances: low T1/heterogeneous T2 lesions, can have targetoid appearance with peripheral enhancement and a thin, non-enhancing rim (avascular zone between normal parenchyma and the nodule)
- Differentials: wide differential including HCC, cholangiocarcinoma, metastases, malignant melanoma and angiosarcoma
- Extra-hepatic disease: involvement of the omentum, mesentery and peritoneal lymph nodes
- Treatment: resection, liver transplantation, chemotherapy (metastases)
Case 6: Echogenic right lobe mass on ultrasound. Selected MRI images are also shown.
Case 6: Gadolinium-based contrast agent (Gadobutrol) enhanced MRI

Early arterial, late arterial, portal venous and delayed images are shown (in sequence) demonstrating gradual peripheral enhancement and progressive in-filling
Case 6: Hepatic Angiosarcoma

- Angiosarcoma is the third most common primary liver tumor (but remains very rare)
- Prognosis is poor (survival from diagnosis is typically less than one year)
- Arise from malignant spindle cells (endothelial origin)
- More common in men (4:1), 60-70 years
- Can present with symptoms of mass effect or spontaneous rupture/haemorrhage
- Associated with NF1 & hemochromatosis
- Imaging features: nodular enhancement is common with progressive in-filling, fluid-fluid levels may be present (haemorrhage), lesions are typically FDG PET avid
- Differential: hemangioma, hypervascular metastases, atypical HCC
Case 7: 50 year old male, ultrasound examination to assess for abdominal aortic aneurysm

Ultrasound revealed an incidental 10 cm diameter heterogeneous lesion within the right lobe. CT abdomen was recommended, demonstrating a fat- and calcium-containing mass.
Case 7: Hepatic Adrenal Rest Tumor (HART)

- Histologically similar to adrenocortical tumours
- Tumors arise from a focus of aberrantly located adrenocortical tissue (“adrenal rest”)
- Most tumors are non-functioning
- Malignant transformation is rare
- Imaging features:
  - typically rounded, well-circumscribed lesions, more commonly seen in the right hepatic lobe
  - fat content is typical (as demonstrated in this case)
  - hypervascularity is also characteristic
  - may contain calcification (as demonstrated)
  - often subcapsular in location
- Differentials: HCC with fatty content and angiomyolipoma
Case 8: 55 year old female with recurrent hypoglycaemic attacks. Selected CT images are shown:

- Arterial phase
- Portal venous phase
- Bilateral adrenal masses
Case 8: The patient underwent left hepatectomy in 2009. Follow-up MRI images from 2014 are shown.

- There is a large tumor recurrence at the surgical resection margin.
- Progressive arterial enhancement is demonstrated.
Case 8: Malignant Solitary Fibrous Tumor (with hyperinsulinaemia syndrome)

- Solitary fibrous tumors are typically benign and intra-thoracic in location
- They sometimes demonstrate malignant features (approximately 10-15% of cases) and rarely occur outside the thoracic cavity
- Hyperinsulinaemia associated with a solitary fibrous tumour is an unusual paraneoplastic phenomenon (also known as “Doege-Potter Syndrome”)
- The tumors produce insulin-like growth factor (ILGF-2)
- Less than 5% of fibrous tumors are associated with hypoglycaemia (larger tumors with high mitotic rates are at increased risk)
- Imaging features: heterogeneously-enhancing mass on CT, low T1 with heterogeneous enhancement and T2 hyperintensity, avid FDG uptake
- Differential: HCC, hepatic leiomyoma, hemangiopericytoma, angiomyolipoma
- Removal of the tumor usually causes the symptoms to resolve
Case 9: 22 year old female presenting with jaundice and abdominal pain. Hilar tumour diagnosed at 11 years old. Ultrasound and selected CT images are shown.
Case 9: 22 year old female with known hilar tumour, selected contrast-enhanced MRI sequences are shown.

Additional small T1 hyperintense liver lesion

No significant contrast enhancement
Case 9: Hepatic Inflammatory Pseudotumor

- Inflammatory hilar mass encasing portal structures (hepatic artery, portal vein and common duct), complicated by portal vein thrombosis
- The patient underwent treatment with biliary stenting and chemotherapy (Vinblastine and methotrexate)
- Surgery (transplantation) was considered but not undertaken as the patient was managing well
- On-going care with 6 monthly follow-up scans and biliary stent changes (in the event of biliary sepsis)

Filling defects, in keeping with intra-ductal stones
Case 9: Hepatic Inflammatory Pseudotumor

- Typically young adults (male preponderance)
- More common in Asian countries
- May occur secondary to infection (e.g. appendicitis with seeding via portal vein), trauma/surgery, autoimmune disease or IgG4 sclerosing disease
- Associated with recurrent pyogenic cholangitis and retroperitoneal fibrosis
- Imaging features: well-defined encapsulated mass, low attenuation on CT, T1 hypointense and T2 hyperintense on MRI with variable contrast enhancement
- Differential: HCC, cholangiocarcinoma, metastases
- Definitive diagnosis is made by biopsy or sometimes FNA
- Treatment options can include antibiotics, corticosteroids and surgical resection
- Rarely, the lesions can regress spontaneously
Summary

Liver lesions are frequently encountered in radiology practice; when the imaging features do not conform to one of the more common conditions (such as HCC, FNH, hemangioma or adenoma), they present a diagnostic conundrum.

Rare liver lesions can also mimic more common hepatic diseases and it is important to consider them in the differential. Gaining familiarity with unusual cases may aid earlier recognition in future, thus helping to guide further investigations and imaging.

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