Imaging in Fatty Liver (Steatosis) - Radiological Methods

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ABSTRACT

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Hepatic fatty metamorphosis or steatosis is the metabolic complication of a variety of toxic, ischaemic and infectious insults to the liver. It is the abnormality most frequently seen in liver biopsies of alcoholics and this abnormality can be seen in 50% of patients with diabetes mellitus. With increasing frequency of obesity in the population hepatic steatosis has become a major source of hepatic dysfunction. Macrovesicular fatty disorders of the liver encompass a spectrum of histological disease including macrovesicular fatty liver, non alcoholic steatohepatitis (NASH), steatohepatitis with fibrosis and cirrhosis liver.

On sonograms the fatty liver appears diffusely echogenic and the degree of echogenicity is roughly proportional to the level of steatosis. The sonographic changes parallel biochemical and clinic dysfunction. The brightness of the parenchymal echoes is increased and there are more number of echogenic foci within the parenchyma. There is increased attenuation of the Ultrasound beam with poor visualization of deep hepatic structures and the hepatic venous system.

Imaging in hepatitis is usually done to ensure that there is no obstructive component to patient's hepatic dysfunction, to rule out hepatocellular carcinoma etc.

Keywords: Fatty liver, Steatosis, Sonography, CT scan, MRI

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The liver has quite accurately been called the custodian of the 'milieu interieur'. Imaging plays a critical role in overcoming the inadequacies of laboratory and physical examination in patients with hepatic dysfunction. Dramatic advances in cross sectional imaging have lead to significant improvement in non invasive diagnosis of diffuse hepatic disorders. Hepatic fatty metamorphosis or steatosis is the metabolic complication of a variety of toxic, ischaemic and infectious insults to the liver. It is the abnormality most frequently seen in liver biopsies of alcoholics and this abnormality can be seen in 50% of patients with diabetes mellitus. With increasing frequency of obesity in the population hepatic steatosis has become a major source of hepatic dysfunction. Macrovesicular fatty disorders of the liver encompass a spectrum of histological disease including macrovesicular fatty liver, non alcoholic steatohepatitis (NASH), steatohepatitis with fibrosis and cirrhosis liver.

CLINICAL FEATURES

Usually silent, liver function tests also may be normal. Liver enlargement may not be specific. It may occur in obesity and diabetes. Vague upper quadrant tenderness and pain with hepatomegaly associated with abnormal liver function tests are seen in alcoholic patients. One third of alcoholic patients without any symptoms have a fatty liver. In acute fatty liver associated with pregnancy, carbon tetrachloride exposure, or an alcoholic binge, patients may present with jaundice, acute hepatic failure and even encephalopathy.

Pathologically lipid accumulates within the cytoplasm of the hepatocyte predominantly in the centrilobular zone. With progressive lipid accumulation, these small vacuoles coalesce, creating large, clear macrovesicular spaces that virtually transform the Hepatocyte into lipocytes with compressed and peripherally displaced nuclei. Water and protein retention lead to the cellular enlargement. Most often these changes are reversible, once the toxin is discontinued. Non alcoholic steatohepatis seen in patients with hyperlipidemia, and diabetes may lead onto cryptogenic cirrhosis. Fat deposition seen on cross-sectional imaging may be diffuse, focal, focal sparing, multifocal perivascular or subcapsular. Diffuse fat deposition is by far the commonest.[1]

Radiology

Plain films are insensitive to fatty changes in liver.

Ultrasound

On sonograms the fatty liver appears diffusely echogenic and the degree of echogenicity is roughly

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proportional to the level of steatosis. The sonographic changes parallel biochemical and clinic dysfunction. The brightness of the parenchymal echoes is increased and there is more number of echogenic foci within the parenchyma. There is increased attenuation of the Ultrasound beam with poor visualization of deep hepatic structures and the hepatic venous system. Portal and hepatic veins are visualized lesser in number than in normal liver. Focal areas of fatty metamorphosis appear as ovoid, spherical, sheet like hypoechoic mass in an otherwise echogenic liver (D/ D Hemangioma).[1,2]

Computed Tomography

The attenuation of normal liver is generally 50 to 70 HU and appears homogenous with spleen 8-10 HU less. In fatty infiltration liver is enlarged. Liver to spleen attenuation ratio is around 0.66. Caudate to left lobe ratio is normal. The liver attenuation is lower than normal. In more advanced cases the liver may appear less dense than the portal and hepatic veins, simulating a contrast enhanced liver.[1]

Magnetic Resonance Imaging

Proton Chemical shift imaging or the Opposed Phase Gradient echo imaging. This technique capitalizes on the difference in precession frequency between fat and water protons (3.7 ppm) and can be used in SE or GRE techniques. On In- phase images the fat and water signals are additive. On Opposed phase images fat signal is subtracted from the water signal. Lesions containing fat and water will therefore show a loss of signal intensity on opposed phase imaging thus readily identifying lesions containing fat. Hepatocellular carcinoma containing macroscopic fat may be misdiagnosed, by this technique.[1]

Imaging in hepatitis is usually done to ensure that there is no obstructive component to patient's hepatic dysfunction, to rule out hepatocellular carcinoma etc. Scintigraphic techniques with 99m Tc labeled Imonodiabetic acid (IDA) agents have allowed high count images of a radiopharmaceutical tracer for measuring liver function.[3]

END NOTE

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