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FNH-Like Nodules May Mimic HCCs in Patients with Cardiac Cirrhosis – a Multimodality **Pictorial Review**

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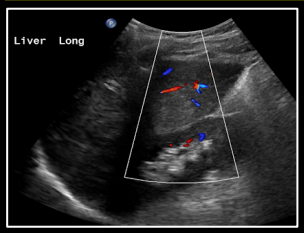
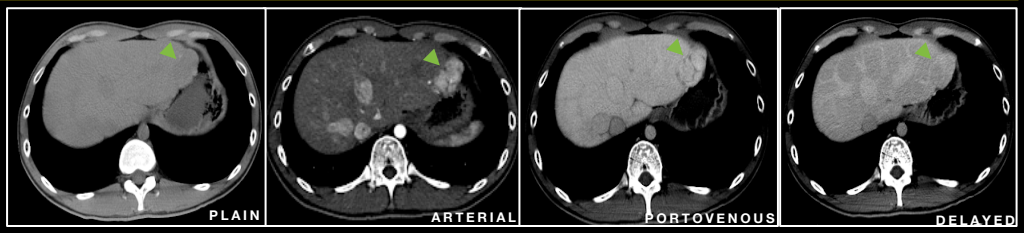
OBJECTIVES: To illustrate multimodality features of FNH-like nodules in cardiac cirrhosis, with emphasis on diagnostic pitfalls associated with hepatocellular carcinoma (HCC).

METHODS: Literature review with departmental case illustrations across ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), liver-specific contrast MRI (Primovist), positron emission tomography (PET), nuclear imaging (NM) and hepatic angiography (DSA).

DISCUSSION: FNH-like nodules are macroscopically, microscopically and immunohistochemically identical to classical FNH except they are described in cirrhotic livers (c.f. FNH nodules in non-cirrhotic livers). In cardiac cirrhosis, there is a higher predisposition for development of hepatocellular carcinoma (HCC), which are sometimes radiologically difficult to differentiate from FNH-like nodules. Awareness between two entities are crucial to avoid unnecessary invasive procedures eg. biopsy or surgical resection, in these patients who are often young and has higher bleeding risks (cirrhotic livers, use of anticoagulation).



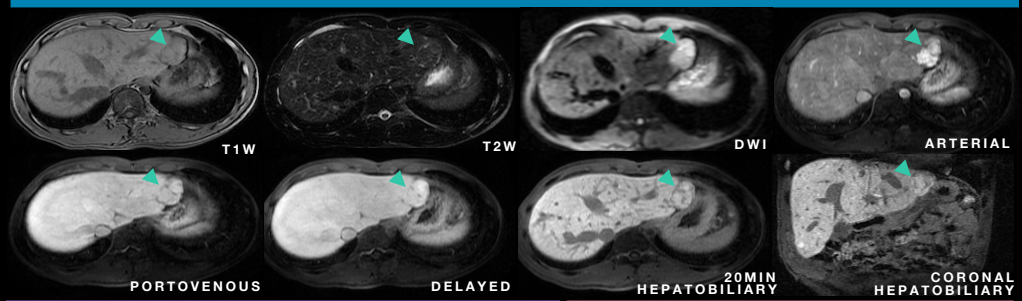


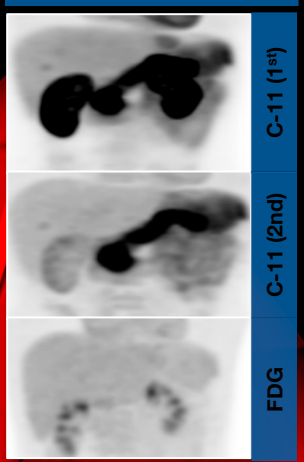
ULTRASOUND: Good screening, but poor diagnostic performance. Figure (above) shows a hyperechoic liver nodule confirmed to be a FNH-like nodule.

MULTIPHASIC CONTRAST-ENHANCED CT AND MRI (WITH EXTRACELLULAR AGENT): FNH-like nodules typically shows intense homogenous arterial enhancement, centrifugal enhancement and sustained enhancement without delayed washout. Classical feature is presence of a central scar, which often shows delayed enhancement. Note that they tend to also have a lobulated appearance. However, atypical FNH-like nodules (<10%) can exhibit delayed washout or absence of central scar (especially <3cm), which can mimic HCC especially in cirrhotic livers.

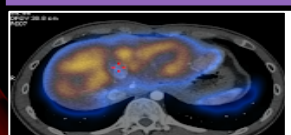
PET/CT: FNH-like nodules can cause false positive uptakes of both F-18 FDG and C-11 acetate tracers, mimicking HCC. Recent study using dual phase C-11 imaging has found that HCC shows dynamic increase in tracer uptake (c.f. FNHs show decreased metabolic uptake).

LIVER-SPECIFIC AGENT MRI: Use of Primovist (or Eovist in U.S.) has enhanced diagnostic value in diagnosing FNH-like nodules which often retains contrast (due to functioning hepatocytes) and shows as high signal intensity (SI) on the hepatobiliary phase (HBP). HCC is often low SI, but 12% may still have high SI (due to overexpression of OATP).





NUCLEAR MEDICINE: Less literature available on describing FNH-like nodules. With presumptions on similarities with FNH nodules, they are expected to show normal or increased uptake of Tc99m-sulphur colloid and increased uptake on delayed Tc99m-mebrofenin (HIDA) scan.



Tc99m-sulphur colloid: multiple cold nodules

Tc99m-mebrofenin: uptake, suggestive of FNH-like nodule.

ANGIOGRAPHY: Hepatic angiographic findings are non-specific. Like HCC, FNH-like nodules are hypervascular and may have dense uptake of lipiodol agent too.

Ref: [1]Park, Y. S. (2016). World Journal of Gastroenterology; [2]Kim, T.H. (2018). Insights into Imaging; [3]Choi, Y.J. (2011) Journal of Gastroenterology and Hepatology; [4]Huo L (2014) PLoS ONE; [5]Lee, Y.H. (2007). American Journal of Roentgenology; [6]Wong, S.C. (2017) Hong Kong Journal of Radiology