

DIFFERENTIATION OF MALIGNANT THROMBUS FROM BLAND THROMBUS OF THE PORTAL VEIN IN PATIENTS WITH CIRRHOSIS: APPLICATION OF INTRAVOXEL INCOHERENT MOTION DIFFUSION-WEIGHTED MR IMAGING

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Target Audience: Abdominal Imaging Radiologists

Background: Recently, parameters extracted from the intravoxel incoherent motion (IVIM) theory [1] have been reported to be of use to differentiate abdominal lesions [2,3]. The IVIM theory predicts an additional component to the monoexponential signal decay measured with diffusion weighted imaging (DWI) due to perfusion.

Purpose: To investigate the utility of IVIM diffusion-weighted (DW) MR imaging in distinguishing bland thrombus from neoplastic thrombus in the portal vein in patients with cirrhosis or hepatocellular carcinoma.

Methods: A retrospective search of MRI database of examinations performed during last 3 years for “cirrhosis” or “hepatocellular carcinoma” and “portal vein thrombus” was performed. The imaging results in 43 patients with portal vein thrombosis (malignant thrombus n = 29 and bland thrombus n = 14) who were examined with gadoxetic acid-enhanced MR imaging including IVIM were reviewed. A thrombus was considered neoplastic if it expanded the vessel or enhanced on MR images. A thrombus was considered bland if the extent of thrombus was reduced or not progressed at follow-up imaging or the thrombus was detected in patients without hepatocellular carcinoma. IVIM DW imaging was acquired with free-breathing axial single-shot echo-planar two-dimensional imaging sequence and the following eight b values: 0, 25, 50, 75, 100, 200, 500 and 800 sec/mm². Diffusion coefficient (D), pseudo-diffusion coefficient (D*), and perfusion fraction (f) were calculated and compared between neoplastic and bland thrombi using t-test.

Results: The mean D, D*, and f of malignant thrombi were 1.03×10^{-3} mm²/sec, 67.51×10^{-3} mm²/sec, and 18.47%, and those of bland thrombi were 1.35×10^{-3} mm²/sec, 9.31×10^{-3} mm²/sec, and 18.46 %. D of bland thrombus was significantly higher than that of malignant thrombus (p = 0.014). However, the mean D difference between the two thrombi was relatively small. D* of malignant thrombus was significantly higher than that of bland thrombus (p < 0.001). There was no significant difference in f between malignant and bland thrombi.

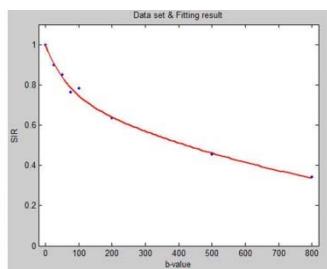
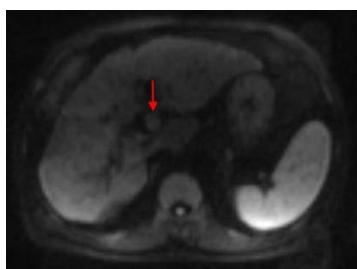


Fig 1. A neoplastic thrombus (arrow) & Biexponential decay

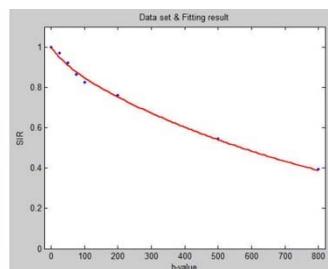
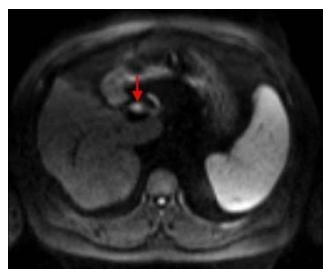


Fig 2. A bland thrombus (arrow) & Biexponential decay

Conclusion: IVIM DW imaging appears to be a promising method for the discrimination between bland and neoplastic portal vein thrombi. Pseudo-diffusion coefficient (D*) of neoplastic thrombus was significantly higher than that of bland thrombus, which might be due to capillary blood flow within neoplastic thrombus.

References

- [1] Le Bihan D et al., Radiology 1988;168(2):497-505.
- [2] Luciani A et al., Radiology. 2008;249(3):748-52.
- [3] Woo S et al., Radiology.2013;270(3):758-767