Apparent diffusion coefficient measurements in chemoembolized hepatocellular carcinoma

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Introduction: Assessment of viable tumor on follow-up MRI after transcatheter arterial chemoembolization (TACE) for hepatocellular carcinoma (HCC) can be difficult because of the hemorrhagic and necrotic changes with often presence of T1 hyperintensity making assessment for enhancement difficult. When tumors are no completely necrotized, the recurrence rate after TACE is high. Thus accurate diagnosis of residual viable tumor or local recurrence is crucial for subsequent therapeutic planning. However, there is no absolute reliable imaging method for monitoring (1). Current MRI techniques for assessing the treatment response are dynamic Gd-enhanced T1-weighted imaging. Diffusion-weighted imaging (DWI) has been used for characterization of focal hepatic lesions (2), and few recent studies have shown that changes in apparent diffusion coefficient (ADC) values of HCCs are present before and after TACE (3, 4). However, to the best of our knowledge, no studies have focused on tumor viability assessment correlated with DWI and dynamic Gd-enhanced images using subtraction. The purpose of our study was to compare ADC obtained with DWI in viable and non-viable areas of HCC following TACE.

Methods: 17 pathology proven HCCs treated with TACE were evaluated in 16 patients with MRI at 1.5 T. MRI was obtained with a mean interval of 2.2 months following TACE. DWI was obtained using: TR/TE 1300-1400/67-82, matrix 144-256x192-256; FOV 360-400 mm; slice thickness/gap 7/1.4 mm, 10-15 slices, 2-4 averages; b=0, 50, 500 sec/mm²; parallel imaging (GRAPPA) factor 2. Dynamic fat-suppressed Gd-enhanced images were obtained using 3D GRE T1 (VIBE) sequence. The % of necrosis was assessed using image subtraction by consensus reading of 2 observers. ADC values were measured within areas of necrosis (non-enhancing areas on subtracted images), and areas of viable tumor (enhancing areas on subtracted images) using ROIs encompassing the largest section of the entire lesion. Mean ADCs were compared between completely necrotic HCCs and incompletely necrotic HCCs. ADCs of non-viable necrotic areas were compared with those of viable enhancing portions of the tumor within incompletely necrotic HCCs.

Results: A total of 17 HCCs (mean size 5 cm, range 1.2-10 cm) were analyzed. Median % necrosis on post-contrast images of all masses was 80 %. 6 completely necrotic HCCs had a mean ADC of 2.01 x 10^{-3} mm²/sec, whereas 11 HCCs with incomplete necrosis had mean ADC of 1.69 x 10^{-3} mm²/sec when measured throughout the entire tumor (P = 0.38). Within incompletely necrotic HCCs, the ADC of viable tumor was 1.26 x 10^{-3} mm²/sec, compared with 1.86 x 10^{-3} mm²/sec within areas of necrosis (P <0.0001).

Discussion: In our preliminary experience, ADC differs significantly between areas of viable and nonviable tumor following TACE of HCC. Further evaluation is needed to assess the longitudinal patterns of ADC values and validation with pathology data at the time of explant or resection.

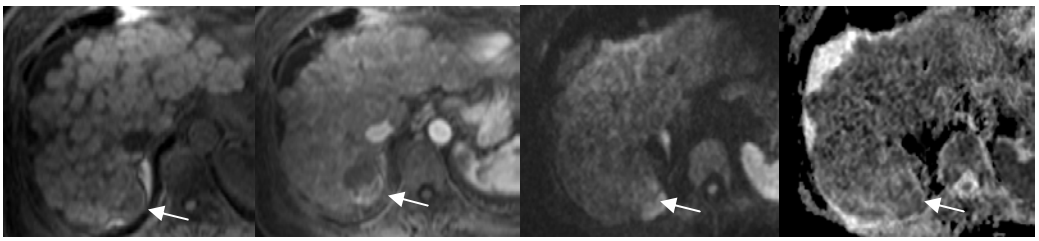

Fig.: From left to right, pre-contrast fat-suppressed T1 weighted image, arterial phase of Gd-enhanced T1, DWI (b=500), and ADC map (b=0-50-500). Postcontrast T1WI demonstrates focal enhancing viable tumor (white arrow) within a chemoembolized HCC in segment 7, which was evaluated as 80% necrosis. DWI shows a bright signal intensity which indicates restricted diffusion in this area. ADC value in this area measures 1.33 x 10^{-3} mm²/sec. ADC value of the rest of tumor representing necrotic area measures 1.95 x 10^{-3} mm²/sec.

References

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