

Characterization of focal renal masses evaluated only with DW imaging and non-enhanced MR sequences

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Objective: To evaluate the accuracy of sequences without gadolinium in conjunction with diffusion-weighted sequences in differentiating benign from malignant renal lesions.

Methods: A total of 116 renal masses measuring >1cm (27 hemorrhagic cysts, 29 pathologically-proven renal cell carcinomas, 1 pathologically-proven oncocytoma, 32 simple cysts, and 27 angiomyolipomas) underwent a complete abdominal MR study including routine pre- and post-gadolinium sequences and b-values 50 and 500 sec/mm²DWI. An abdominal radiologist blinded to the gadolinium sequences and diagnoses retrospectively reviewed all cases only evaluating the non-enhanced sequences (axial T1-weighted, T2-weighted, in and opposed phase). Additionally, b-values 50 and 500 sec/mm² ROIs were recorded from DWI to generate ADC values. The size, location and signal characteristics of each renal lesion were noted. The reader predicted the diagnosis for each lesion based only on the reviewed non-enhanced sequences, including DWI. The following diagnoses were considered: simple cyst, hemorrhagic cyst, AML and renal carcinoma.

Results: 115 of the 116 were correctly classified based on their non-gadolinium enhanced sequence signal characteristics. The only lesion “misclassified” was an oncocytoma, labeled renal cell carcinoma; this would not affect management, as it is also a surgical lesion. The mean ADC measurements were as follows: simple cyst 3.4 (SD 0.7), hemorrhagic cyst 2.8 (SD 0.8), AML 1.3 (SD 0.6) and RCC 2.0 (SD 0.6). The mean ADC values were significantly different among the 4 groups ($p < 0.0001$) and the pair-wise comparisons between any of the 2 groups were also significant at the 0.05 level.

Discussion: Accurate noninvasive assessment of renal masses is necessary to evaluate whether lesions require surgical intervention or imaging follow up. Early reports suggest that diffusion-weighted imaging is useful for detection of renal cell carcinoma (1-2). With the recently discovered serious clinical implications of NSF, new restrictions on gadolinium usage have been implemented which warrant an altered approach to use of MR in a select subset of patients. Differentiation of benign from malignant renal lesions and accurate evaluation of renal masses is possible with unenhanced sequences when evaluated in conjunction with diffusion weighted MR imaging. Solid tumors demonstrate restricted diffusion, with correct differentiation between RCC and AML based on T1 and T2-weighted sequences and lower mean ADC values for AML. Findings indicate that MR imaging will remain an important diagnostic tool for evaluation of focal renal masses even in cases where gadolinium cannot be administered.

References: (1). Cova M, et al. Br J of Rad 2004;77:851-7. (2). Yoshikawa T, et al. AJR 2006;187: 1521-30.

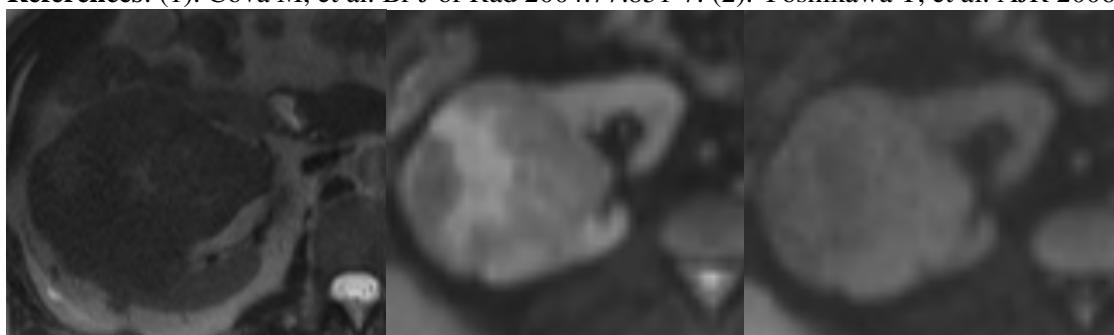


Fig 1. T2 weighted image, diffusion-weighted images ($b = 50$ and $b = 500$ sec/mm²) respectively of a 4 cm right renal clear cell carcinoma.

Type	Number	Mean	Minimum	Maximum	Std Dev
AML	27	1.3	0.2	3.0	0.6
RCC	30	2.0	0.7	3.1	0.6
Simple Cyst	32	3.4	1.9	6.0	0.7
Hemorrhagic Cyst	27	2.8	1.1	4.5	0.8

renal clear cell carcinoma. ADC values are significantly different between any two groups (p -value <0.0001).

Fig 2. Mean