Whole-body STIR imaging versus MDCT in patients with renal cell carcinoma

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Purpose:

Renal cell carcinomas account for 2 % of all solid malignant tumors. In the western world the incidence ranges between 4-8/100.000. Management and prognosis of these patients are not only determined by clinical and laboratory data but also by the degree of dissemination (1) as in one third of all patients distant metastases are detected at the time of initial diagnosis. Therefore accurate staging of the entire body is essential in order to allow for an optimized treatment and survey strategy. Although whole-body MR imaging is emerging, CT is still considered the standard imaging modality for whole body tumor staging. The aim of this study was to evaluate the diagnostic accuracy of a whole-body MR protocol using coronal T2 weighted STIR imaging for staging of patients with renal cell carcinoma in comparison to MDCT.

Patients and Methods:

The study was approved by our institutional review board. 19 patients (11 men, 8 women; mean age 61±14 years) with histology proven stage IV renal cell carcinoma were examined from head to ankle in a dedicated 1.5T 32-channel whole-body MR scanner (Avanto, Siemens Medical Solutions) using a coronal, partially respiratory triggered (station 1 and 2), T2 weighted STIR sequence in 5 overlapping stations with 36 consecutive 6 mm slices. Total examination time was documented for each patient. In addition, a contrast-enhanced MDCT (Sensation 16, Siemens Medical Solutions) of the thorax and the entire abdomen, including the pelvis, was performed for comparison. Coronal T2 weighted STIR and MDCT images were read independently and in a random order by two radiologists in consensus. 22 body regions (head 2, neck 2, thorax 5, abdomen 7, pelvis 1, skeleton 5) were defined and evaluated separately. All detected lesions were documented and judged to be benign or malignant. Lymph nodes were defined pathologic based on established size criteria. MDCT images and regularly performed follow-up studies served as the standard of reference for all patients. For further analysis, only those lesions and lymph nodes, which were judged to be malignant, were included. If one or more malignant findings were detected in a distinct body region, this region was defined positive. Results of the coronal T2 weighted STIR and the MDCT were compared using descriptive statistics.

Results:

Whole-body coronal T2 weighted STIR imaging was tolerated by all patients. The mean total examination time was 18±5 minutes. Overall, results of the MDCT and the coronal T2 weighted STIR regarding the accuracy in the detection of positive body regions compared favorably (Table 1). However, at the thorax the overall performance of the coronal T2 weighted STIR was lower compared to MDCT, as breathing motion artifacts hampered the image quality, especially of the pulmonary parenchyma. In the abdomen the overall performance of coronal T2 weighted STIR imaging and MDCT were comparable, with a minor advantage of coronal T2 weighted STIR imaging. In the pelvis coronal T2 weighted STIR imaging and MDCT were comparable. In addition, whole-body coronal T2 weighted STIR imaging detected 11 malignant skeletal lesions in body regions which were not examined in MDCT.

Body part	**No. of body regions examined**		**No. of body regions**				
	in CT	in MR	**negative** in CT and MR	**positive** in CT and MR	only in CT	only in MR	**total** compared
Thorax	80	95	41	23	11	5	80
Abdomen	103	118	72	12	6	10	100
Pelvis	16	19	10	4	1	1	16
Skeletal system	2	114	2	0	0	0 (11*)	2

Table 1: Results of the coronal T2 weighted STIR compared to the results of MDCT on a body region basis. *MR detected 11 malignant skeletal lesions in body regions which were not examined in MDCT.

Conclusions:

Whole-body MR imaging using coronal T2 weighted STIR allows for robust and accurate staging of patients with stage IV renal cell carcinomas. For staging of the pulmonary parenchyma, however, additional dedicated sequences are recommended.

(1) Rouviere O, Bouvier R, Negrier S, Badet L, Lyonnet D. Nonmetastatic renal-cell carcinoma: is it really possible to define rational guidelines for post-treatment follow-up? Nat Clin Pract Oncol 2006; 3: 200-213.