Whole Body MRI for tumor staging in patients with renal cell carcinoma

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Purpose: Renal cell carcinomas (RCC) have an incidence of 4-8/100.000 and account for 2 % of all solid malignant tumors in the western world. Therapeutic options as well as the patient prognosis strongly depend on the extent of the disease. Despite recent advances in MR imaging, CT is still the recommended imaging modality for whole body tumor staging in patients with RCC. Aim of this study was to compare the diagnostic accuracy of MDCT and whole-body MR for tumor staging in patients with RCC.

Patients and Methods: The study was approved by our institutional review board. Nineteen patients with stage IV RCC (12 males, 7 females; 65±11years) were imaged from head to ankle in a dedicated 1.5T 32-channel whole-body MR scanner (Avanto, Siemens Medical Solutions) and in a multi-detector CT (MDCT; Sensation 16, Siemens Medical Solutions). Whole body MR imaging included coronal T1-weighted spoiled gradient-echo (GE) and STIR sequences. Sequences for the lung, the liver and the abdomen included axial STIR, axial and coronal T2-weighted turbo-spin-echo (TSE) sequences, and axial contrast-enhanced (CE) 2D- and 3D-T1-weighted GE. MDCT and MR sequences were evaluated independently by two radiologists and finally compared to a reference standard (RS), considering all imaging modalities, clinical information and follow-up. Comparative analyses were performed and sensitivity, specificity, and predictive values were determined.

Results: The RS revealed 971 lesions, 586 (60%) being malignant and >50% within the lung. MDCT showed good agreement to the RS (Kappa 0.767) with sensitivity, specificity, NPV and PPV values of 83% (406/487), 98% (271/277), 77% (271/352), and 99% (406/412). Coronal STIR imaging alone revealed comparably good agreement (Kappa 0.700) and sensitivity, specificity, NPV and PPV values of 79% (402/506), 93% (323/347), 76% (323/427), and 94% (402/426). Overall sensitivities for the detection of pulmonary nodules in MDCT and axial STIR were 80 and 70%. Sensitivities of MDCT, axial T2-TSE and CE axial 3D T1-GE for the detection of liver metastases were 89, 94 and 89%.

Discussion: Following recent developments in MR-hardware, such as faster magnetic resonance gradients, moving table technology, and multi-element coil designs, MR imaging of the entire body in a single session is being increasingly utilized as an attractive alternative to CT for whole body tumor staging. However, for whole body tumor staging of patients with RCC the recommended imaging modality is still CT. The results of this study indicate that compared to MDCT whole-body MR is at least equally accurate for local tumor staging and for N-staging and superior regarding the detection of hepatic and soft tissue metastases. Based on a lesion per lesion analysis whole-body MR is less accurate in the detection of pulmonary metastases, which in this study had however no influence on the patient based whole-body tumor staging or patient treatment. In conclusion, whole body MR allows for accurate whole body staging in patients with renal cell carcinoma, however adapted protocols are necessary.

Figure 1a-c:
48year-old female patient with stage IV renal cell cancer and history of right nephrectomy. Whole body MR was requested for as the patient developed new neurological symptoms and treatment options had to be discussed. Besides a left perietooccipital cerebral metastases (fig. 1a) multiple pulmonary metastases were detected (the largest is displayed in fig. 1b) and two soft tissue metastases (fig. 1 c) were detected.

Figure 1a

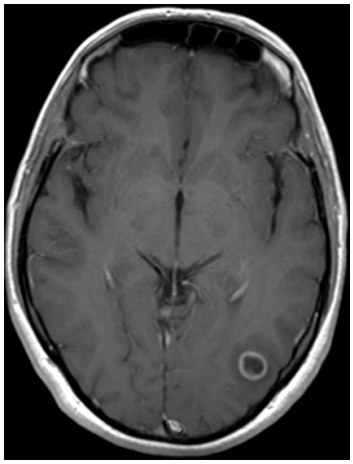


Figure 1b

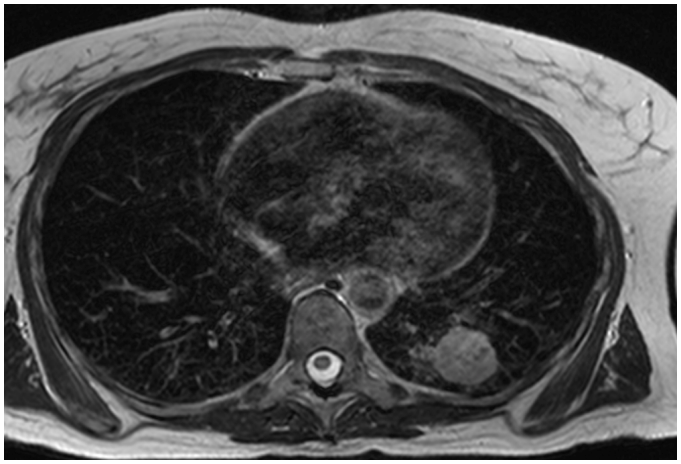
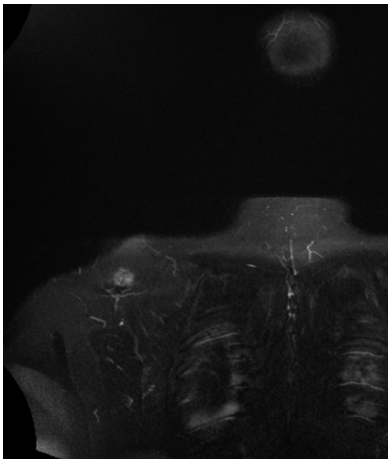


Figure 1c



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