Dynamic contrast-enhanced T1-weighted MRI combined with MR spectroscopic imaging in patients with prostate cancer - initial experience

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Introduction

Cancer of the prostate is one of the major causes of cancer–related death in men in most western countries. Because of limited contrast in this organ, common morphologic MRI techniques are inadequate for conclusive diagnostics and staging of this tumor entity. Dynamic contrast–enhanced MRI (DCE–MRI) and MR spectroscopic imaging (SI) yield physiological maps that are sensitive to tissue differences. In this clinical study, the diagnostic potential of combined T_{2w} morphologic imaging, DCE–MRI, and ^{1}H SI for detecting small lesions in multifocal prostate cancer was investigated by directly matching the non invasive data with the histopathology of exised prostates.

Patients, material and methods

Six patients with prostate cancer were examined in a 1.5–T tomograph (Magnetom Symphony; Siemens Medical Solutions, Erlangen, Germany) using endorectal coils (Medrad, Indianola, PA). Informed consent was obtained from each patient; all examinations were in accordance with the ethical guidelines of our institution.

T_{2w} MRI was performed with TSE (T_R/T_E = 4000/129, slice thickness 4 mm, FOV 112×140 mm^2, matrix 416x512), DCE–MRI with T_{1w} FLASH (T_R/T_E = 125ms/3.11ms, temporal resolution = 11.25s), and ^{1}H SI with 3D PRESS (T_R/T_E = 650/120, water and lipid signal suppression, nominal voxel size 6×6×6 mm^3, total acquisition time 10–12 min) [1].

Cancer regions were localized by histopathology of whole mount sections after radical prostatectomy and compared to MR findings. T_2 hypointense regions were considered as suspicious for cancer. For these regions pharmacokinetic (amplitude A, exchange rate k_{ex}) [2] and spectroscopic parameters (integral of choline, creatine, and citrate signals, and intensity ratio R = [Cho+Cr]/Ci [3]) were determined.

Results and discussion

Histology revealed a total number of 30 lesions in 6 patients. Nine lesions had a diameter >6 mm. T_{2w} images showed cancer–suspicious areas in 10/30 lesions. Three lesions with diameter >6mm could not be detected (1 far–lateral peripheral zone, 2 central gland). The small lesions (n = 4) were all found in the peripheral zone. Of the 9 lesions with diameter >6mm, 6 were confirmed by SI yielding R between 0.92 and 4.97. One of the lesions was localized in the central gland. DCE–MRI detected all 9 lesions >6mm and additionally 5 lesions <6 mm. Two of these lesions detected by DCE-MRI were located in the central gland.

	Lesions Ø < 6 mm	Lesions Ø > 6mm	Total number
Histology	21	6	30
T_{2w}	4	6	10/30
SI	6	0	6/30
DCE–MRI	5	9	14/30

Conclusions

In this preliminary study DCE-MRI showed best potential to discriminate small lesions in the prostate and higher detection rate than morphologic imaging. However a higher number of patients has to be investigated before these results can be generalized.

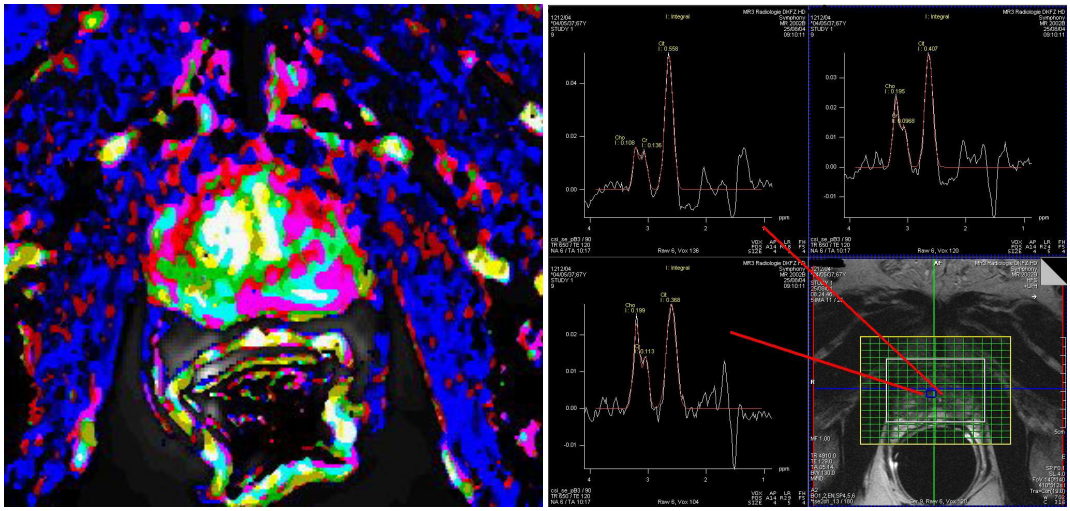

Fig. 1: DCE-MRI with a tumor in the central gland and left peripheral zone (white colour). Corresponding SI data of the central tumor shows decreased citrate resulting in a high [Cho+Cr]/Ci ratio.

References

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