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Comparison of the MRI sequences in ideal fiducial marker based radiotherapy for prostate cancer

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Purpose: Contouring the prostate using CT alone is difficult. To overcome the uncertainty, MRI is used in registration of CT and MRI using fiducial markers. However, visualization of the marker itself can be difficult in MRI. The aim of this study was to determine the optimal MRI pulse sequence to define the marker, as well as the prostate gland by comparing five sequences.

Methods & Materials: A total of 21 consecutive patients with prostate cancer were enrolled. Two gold fiducial markers were placed before a CT/MRI examination. We obtained five sequences of T1-weighted spin-echo ([TR]/[TE]): (400-650/8) (T1WI), T2-weighted fast spin-echo (4000/80) (T2WI), T2*-2D-weighted gradient echo (700/18) (T2*2D), T2*-3D-weighted gradient echo [TR/TE1/deltaTE] (37/14/7.3) (T2*3D) and contrast-enhanced T1-weighted spin-echo (400-650/8) (CE-T1WI). A qualitative image analysis of the sequence was also performed by three observers. These observers subjectively scored all images according to the following five evaluation items: Definition of the outline of the prostate; apex vs. soft tissue; base vs. bladder; base vs. seminal vesicle and gold fiducial marker detection. A score of 1 to 3 (1=poor, 2=moderate, 3=good) was assigned to all items. A higher score indicated better visualization.

Results: T2WI was significantly superior to the other sequences in terms of prostate edge definition. T2*2D and T2*3D were strongly superior to other sequences and significantly superior in terms of fiducial marker definition.

Conclusion: T2*2D and T2*3D are superior to the other sequences for accurately determining the fiducial marker. T2WI exhibits the greatest precision in detecting the prostate outline, whereas T2*2D and T2*3D were superior to the other sequences for contouring the prostate and identifying the marker. Therefore, we recommend that T2*3D and T2*2D examinations are initially performed.

Biography

Osamu Tanaka has completed MD from Gifu University School of Medicine. He has studied at various university hospitals like Gifu University Hospital, Cancer Institute Hospital and Kizawa Memorial Hospital. He published more than 15 papers in reputed journals. He has received the Award of Umegaki in 2007 which is given to only one young researcher from Japanese Society of Radiation Oncology Biology and Physics.

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