

The value of Mr DWI and MRS imaging in the diagnosis of prostate cancer

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Abstract: objective: to investigate the diagnostic value of combined diffusion-weighted magnetic resonance imaging (DWI) and magnetic resonance spectroscopy (MRS) in prostate cancer (PCa). **Materials and methods:** A total of 25 patients in group A, ranging in age from 67 to 85 years, had diffuse lesions in 3 of them and bone metastases (ilium, pubis, etc.) in 5 of them were confirmed by final examination. All the patients in group A had higher TPSA levels than the reference standard of 4ng/ml within 7 days before mri examination, and the lowest concentration in one patient was 5.02ng/ml. Results greater than 100ng/ml were measured in 5 patients. The sensitivity, specificity and accuracy of DWI, MRS and DWI combined with MRS for PCa diagnosis were analyzed. **Results:** the mean ADC values of PCa area, peripheral band and central gland in patients with BPH were $(0.83 \pm 0.12) \times 10^{-3} \text{mm}^2/\text{s}$, $(1.82 \pm 0.26) \times 10^{-3} \text{mm}^2/\text{s}$ and $(1.46 \pm 0.16) \times 10^{-3} \text{mm}^2/\text{s}$ ($F=31.1$, $P < 0.05$), respectively. The mean (Cho+Cr)/Cit values in PCa region, peripheral zone and central gland of BPH patients were 1.55 ± 0.11 , 0.53 ± 0.16 and 0.64 ± 0.13 , respectively ($F=18.2$, $P < 0.05$). There was a statistically significant difference between PCa and BPH patients' peripheral zone and central gland (Cho+Cr)/Cit ($P < 0.05$), while there was no statistically significant difference between BPH patients' peripheral zone and central gland (Cho+Cr)/Cit ($P > 0.05$). The sensitivity, specificity and accuracy of PCa diagnosed by DWI were 79.17%, 80% and 79.63% respectively. The sensitivity, specificity and accuracy of PCa were 87.5%, 86.67% and 87.03% respectively. The sensitivity, specificity and accuracy of DWI combined with MRS in diagnosing PCa were 91.67%, 93.33% and 92.59%, respectively. **Conclusion:** DWI combined with MRS is better than DWI and MRS alone in the diagnosis of PCa.

Keywords: magnetic resonance DWI; MRS imaging; Diagnosis of prostate cancer;

Publication date: June, 2019

Publication online: 30 June, 2019

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Prostate cancer is especially common in middle-aged and elderly patients, which seriously affects the physical and mental health of middle-aged and elderly men, and is one of the major lethal tumor diseases in men. Prostate cancer is very common in Western Europe and the United States, the incidence of the disease is relatively high. The statistical results of scholars show that the incidence of prostate cancer in the United States has been in the first place, the specific reason is not clear. In recent years, with the aging of the population and the continuous improvement of examination equipment, the incidence of malignant tumors in China has been increasing, which requires us to diagnose the disease as soon as possible and accurately.

In recent years, more and more domestic and foreign scholars have applied different mri techniques to diagnose prostate cancer. This inspection has been widely used, and the development of inspection equipment is inseparable. Typical is the application of high magnetic field equipment. Magnetic resonance imaging can be observed more clearly. Functional magnetic resonance imaging can examine and diagnose the lesion site noninvasively, and can reflect the molecular diffusion and substance metabolism of the lesion site for early diagnosis. In this study, DWI and MRS were used to diagnose and differentiate the two groups of cases, and the differences between the two groups could be found obviously, with statistical significance. When testing for prostate cancer, it would be more advantageous to add this test to a definitive

diagnosis of the disease.

1 Materials and methods

1.1 general information

Patients who underwent 3.0t mri due to prostate diseases in our hospital from November 2014 to January 2016 were collected. A total of 36 patients (aged from 59 to 85) were collected, including 25 patients with prostate cancer in group A and 11 patients with BPH in group B. All patients received complete postoperative pathological results or biopsy results within two months (5-46 days) after mri examination. No invasive examination of the prostate was performed within 2 months prior to the mri. Before the scan, the patient must explain the matters needing attention during the examination and the purpose of the examination with the patient, fully obtain the understanding and support of the other party, and sign the informed consent. Exclude the following cases : (1) patients with stents or metal objects implanted in the body; (2) patients with claustrophobia and abnormal mental disorder; (3) patients who underwent prostate puncture in recent 2 months; Patients were not included after surgery and endocrine treatment.

1.2 inspection method

All subjects underwent prostate exams using a philips 3.0t magnetic resonance imaging (mri) device equipped with a heart-specific 8-channel coil. The patient shall make necessary preparations before entering the scanning room (the day before the examination, ask the patient to eat a little, empty the stool in the evening, empty the stomach before the examination the next day, empty the stool and urinate again), enter the scanning room, lie on his back, cross his hands on his chest, help the patient prepare for the examination, and wear special earphones for the patient. Accurate positioning of the patient and preparation for a formal scan.

1.2.1 DWI imaging technology:

A scan sequence: the inspection was performed using the se-epi method by placing two symmetrical diffusion-sensitive gradient pulses before and after the 180° pulse. These two gradients cause changes in the protons that are the basis of this imaging method.

B scan parameters: TR, TEshorest, FOVAP260mm, RL260mm, FH88mm, Slicethickness (mm) 4.

1.2.2 MRS imaging technology:

A scan sequence: magnetic resonance PRESS sequence

was used, and the receiving coil was matched with a magnetic resonance special cardiac coil. All subjects wear special headphones to reduce the discomfort caused by machine running noise, and instruct the subjects not to move as much as possible during the examination, so as to reduce motion artifacts. The lesion should be positioned properly before the examination, and the examination should be carried out after the automatic homogenization field reaches the reference standard for examination.

B scan parameters: TR1400ms, TE140ms, layer thickness 5mm, FOV60, 72, 60mm, VOXEL12, 12, 12mm, VOI25, 30, 20mm, NSA2.

1.2.3 1 post-processing of h-mrs images and statistics of CC/C values

Automatic processing is carried out on the post-mr workstation, including time region preprocessing, Fourier transform, frequency domain processing including accurate phase and baseline correction, etc. Then the corresponding voxel region was selected according to the specific situation of the lesion, and the corresponding MRS was finally generated for statistics. In the detection of CC/C value, the central part of the lesion was selected to avoid the influence of surrounding fat and normal tissues, and the spectral baseline of some data was unstable, so statistical content was not included. The CC/C results of the two groups were statistically analyzed.

2 Statistical methods

SPSS17.0 statistical software was used for analysis, and the results were expressed as mean \pm standard deviation ($X \pm S$). The mean values of the two groups were tested by independent sample t test, and the test level was $\alpha=0.05$.

3 Research results

3.1 PSA laboratory examination of group A and group B PSA laboratory examination is often used as an auxiliary examination for prostate cancer, and TPSA can be regarded as one of the observation items in prostate cancer experimental examination. The examination results of the two groups are as follows:

3.1.1 in group A, there were 25 patients, ranging in age from 67 to 85 years, among whom 3 had diffuse lesions and 5 had bone

metastases (ilium, pubis, etc.) confirmed by final examination. All the patients in group A had higher TPSA levels than the reference standard of 4ng/ml within 7 days before mri examination, and the lowest concentration in one patient was 5.02ng/ml. Results greater than 100ng/ml were measured in 5 patients.

3.1.2 a total of 11 patients in group B, ranging in age from 59 to 82 years, underwent PSA laboratory examination within 7 days after mri examination. TPSA level of 10 patients was higher than the reference standard of 4ng/ml, the highest was 31.07ng/ml and 1 patient was lower than the reference standard of TPSA had a TPSA concentration of 0.54ng/ml.

3.2 comparison of ADC values between groups A and B

ADC values of patients in groups A and B were 60 and 43, respectively. ADC image observation showed that there were some similarities between the imaging manifestations of lesion sites in the two groups. Conventional MRI images and ADC images are difficult to distinguish these two kinds of lesions. In fact, there is a large difference between the two groups, and it is difficult to accurately diagnose the disease simply by observation. This is also the main disadvantage of conventional inspection methods, the application of certain difficulties. In this study, the ADC values of the two groups of patients were significantly different, which had higher diagnostic and differential significance. When $b=1000s/mm^2$, ADC values in group A and group b were statistically significant, and ADC values in group A were less than ADC values in group b, indicating that ADC values in cancerous sites were lower than those in proliferative sites.

4 conclusion

DWI and MRS play a very complementary role in the diagnosis of PCa and can give full play to

their respective advantages. DWI scan time is short, the patient needs less cooperation, and the spatial resolution is relatively high, which can accurately display small lesions that are difficult to be found by routine examination. MRS was less affected by artifact interference, and for lesions that were not significantly reduced by ADC, MRS could provide metabolite information to further diagnose the lesions. Combining the tissue structure information measured by DWI with the metabolic information measured by MRS can further improve the sensitivity, specificity and accuracy of the examination. In this study, the sensitivity, specificity and accuracy of DWI combined with MRS in the diagnosis of PCa were 91.67%, 93.33% and 92.59%, respectively, which were higher than that of DWI and MRS alone, indicating that DWI combined with MRS had higher diagnostic value for PCa. This is consistent with the results of other scholars. Some scholars also believe that the best qualitative method for image diagnosis of PCa is multi-parameter examination, that is, conventional plain scanning, DWI, MRS and dynamic contrast enhancement are combined and the results are comprehensively analyzed. However, there is a lack of uniform scan sequence and diagnostic criteria for various examination methods. This study is only a preliminary study with a small number of cases, so a large number of cases need to be studied to obtain the best scan parameters, diagnostic bounds and relatively stable and reliable conclusions.

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