

The prognostic value of pre-treatment diffusion-weighted MRI in endometrial cancer

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PURPOSE:

To investigate the value of pre-treatment apparent diffusion coefficient (ADC) of endometrial cancers in predicting long-term survival.

METHODS:

The MR imaging of eighty-seven consecutive endometrial cancer patients from January 2005 to January 2009 were reviewed. These patients were followed up until October 2013. All MR examinations included diffusion-weighted sequences (DWI) with $b=0$ and $b=1000\text{s/mm}^2$. Mean ADC(ADCm) and quartile ADC(ADCq) were acquired on post-processing workstation using voxel-analysis software. Information of pathologic type and grades, depth of myometrial infiltration, and post-operative FIGO stage were recorded from medical records. The relationship of ADC values and clinical-pathological parameters with overall survival were determined by Cox regression analysis and Kaplan-Meier analysis.

RESULTS:

The median follow-up time was 54 months, with 12 patients died. Details of post-operative FIGO stage, pathological grade and myometrial invasion were as follows: stage I (n=48), stage II (n=18), stage III (n=18), stage IV (n=3); grade 1 (n=17), grade 2 (n=40), grade 3 (n=27), grade unspecified (n=3); superficial myometrial infiltration (n=65), deep myometrial infiltration (n=22). ADC value measurements were successfully performed, except 4 (who are still alive) with small volume of tumors which were unable to circle on DWI. By multivariate Cox regression analysis, pathological grades, myometrial invasion depth, ADCm and ADCq were all shown to be moderately related with overall survival. Patients with high grades and deep myometrial invasion were associated with worse survival rate (log-rank test, $p=0.33$ and $p=0.04$ respectively) (fig 1). Those with lower ADCq tended to have better overall survival (log-rank test, $p=0.19$) (fig 2), while ADCm showed no significant differences in Kaplan-Meier analysis.

DISCUSSION:

The existence of tumor heterogeneity explains that even patients with same stage and same histological type may behave differently. DWI was well proved to have potentials in tumor differentiating and outcome predicting. The relationship of pathological grades and myometrial invasion with overall survival are within general knowledge. Quartile ADC value, created to reflect intra-tumor heterogeneity of water movement, were shown to have a profound relationship with invasiveness of endometrial carcinoma¹. In this study, it also showed usefulness in predicting long-term outcomes of endometrial cancer patients. Tumors that were more heterogeneous inside tended to have poor survival rates. Mean ADC value, which are used more commonly, only reflecting the average level of water movements inside a tumor, was not able to well predict the long-term survival in this study.

CONCLUSION:

Endometrial cancers with higher quartile ADCs on pre-treatment DWI were associated with poorer long-term survival, while mean ADCs did not predict well in this cohort. Quartile ADC, representing intra-tumor heterogeneity, may serve as a better index of cancer behavior.

Reference: 1. Cao K, Gao M, Sun YS, et al. Apparent diffusion coefficient of diffusion weighted MRI in endometrial carcinoma-Relationship with local invasiveness. Eur J Radiol. 2012 81(8):1926-30.

