

Advanced Cervical Cancer: Quantitative Assessment of Early Response with Intravoxel Incoherent Motion Diffusion-weighted Magnetic Resonance Imaging after Neoadjuvant Chemotherapy

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PURPOSE: To investigate the feasibility of Intravoxel Incoherent Motion (IVIM) Diffusion-weighted magnetic resonance imaging (MRI) in predicting and monitoring the response of cervical carcinoma to neoadjuvant chemotherapy (NACT).

Introduction: Nowadays, NACT of cervical cancer is widely employed in clinical [1]. Unfortunately, non-responsive NACT may increase the risk of tumor progression. As adjustment of the treatment strategy might be needed when non-responsive NACT occurs, hence early predictions to evaluate NACT respondents before treatment is necessary. In this study, the use of IVIM for such purpose is investigated.

Method and Material: This study was approved by an institutional review board; informed consent was obtained from all patients.

Thirty-two patients with primary cervical carcinoma were recruited for the study. IVIM MRI was performed in all patients during three periods (prior to NACT, 3 weeks after the first NACT, and 3 weeks after the second NACT). Treatment responded was determined according to Response Evaluation Criteria in Solid Tumors (RECIST) [2] in 3 weeks after the second NACT, based on which the subjects were categorized into responded and non-responded group. Standard ADC, Dslow, Dfast and f were measured.

Results: According to RECISTs, Patients were divided to responded group (n=18) (Fig1 A-C) and non-responded group (n=14) (Fig 1D-F). Before the treatment, Dslow and standard ADC in responded group were significantly higher than that of non-responded group ($P=0.003, 0.007$). F value of the responded group was significantly lower compared with that non-responded group ($P=0.031$), but there was no difference was observed in Dfast. The receiver operating characteristic curves (ROC) indicated that the area under the curve (AUC) of Dslow and standard ADC was 0.804, 0.768, but f made little sense (AUC0.272) (Fig2 A) At 3 weeks after the first and second NACT, Dslow and standard ADC in responded group were still significantly higher than that of non-responded group ($P=0.024, 0.041$ and $p=0.019, 0.009$). Dfast and f values were no differences ($p=0.328, 0.476$ and $0.776, 0.133$). The ROC indicated that AUC of Dslow and standard ADC at these two points was 0.748, 0.710 and 0.75, 0.766, respectively (Fig2 B.C).

Discussion and conclusion: comparing to the DWI with only two b values, IVIM could better reflect the perfusion and microcirculation of the organization. IVIM may detect the modifications in cervical cancer after NACT. Dslow, standard ADC measured may be used as robust early predictors to evaluate NACT respondents before treatment. Dslow, standard ADC values may be used to monitor the respondedness of NACT after therapy.



Fig 1 Images (A.B.C) in 56-year-old woman with cervical squamous cell cancer, complete response (CR) after the all NACT. Images (D.E.F) in 37-year-old woman with cervical squamous cell cancer, stable disease (SD) after the all NACT. (A.D) prior to NACT; (B.E) 3 weeks after the first NACT; (C.F) 3 weeks after the second NACT.

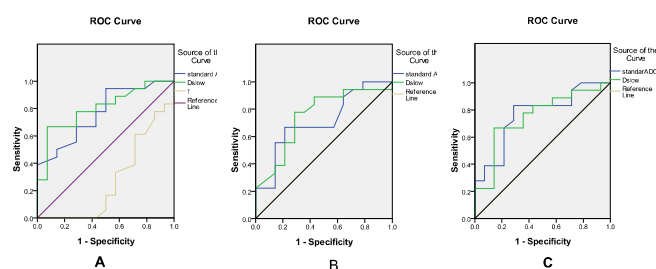


Fig2: ROC curve A for Dslow, standard ADC and f in differentiating responded from non-responded group at Pre-NACT. B for Dslow and standard ADC in differentiating responded from non-responded group at 3 weeks after the first NACT. C for Dslow and standard ADC in differentiating responded from non-responded group at 3 weeks after the second NACT.

Reference [1].Shoji, T., et al. Oncol Lett, 2010. [2] Nishino M, et al. Am J Roentgenol.2010.