3.0T MR diffusion-weighted imaging in monitoring diffusion changes in lung carcinoma after chemoradiation

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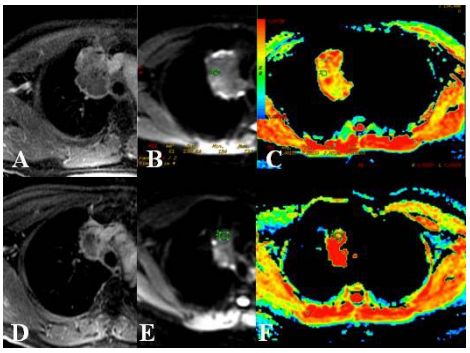
Purpose: To evaluate the clinical value of diffusion-weighted imaging (DWI) in monitoring response of lung carcinoma to chemoradiation by measuring tumor apparent diffusion coefficient (ADC).

Materials and methods: Diffusion-weighted images were obtained prior to and post chemoradiation in 15 patients with lung cancer. The MR examinations were performed with a 3.0T MR scanner by using 8 channel coil. DWI was performed in axial plane using echo planar imaging sequence with b value of 0 and 600 sec/mm^2. The quality of diffusion weighted images was evaluated on 3-level grades as good, moderate and poor. ADCs of which the diffusion weighted images were graded as good and moderate were measured from ADC maps. The region of interest with diameter of approximately 1.0 cm was positioned at the hot-point of the solid area of lung carcinoma on the ADC map. ADCs of pre- and post-chemoradiation were compared by using a paired *t*-test.

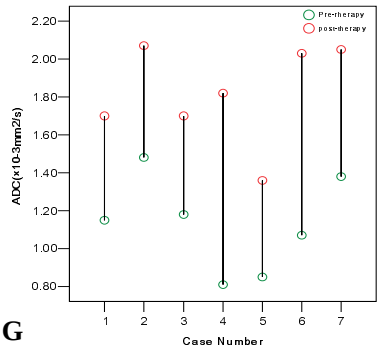
Results: The diffusion weighted images of 7 patients were graded as good or moderate pre- and post-chemoradiation. ADCs were 1.13×10^{-3} mm^2/s ± 0.25×10^{-3} mm^2/s for pre-therapy, and 1.81×10^{-3} mm^2/s ± 0.25×10^{-3} mm^2/s for post-therapy. ADCs of post-chemoradiation showed a significant increase to those of pre-chemoradiation (*P*=0.000).

Discussion: The ADC value refers to specific diffusion capacity of tissue and depends largely on presence of barriers to diffusion within the water microenvironment. Apoptosis can occur immediately following onset of chemoradiation with intercellular space increasing. Post-chemoradiation increasing of ADCs might due to the microenvironment change in tumor after chemoradiation.

Conclusion: This study demonstrated the therapy-induced ADC changes via therapy-induced alterations in tumor water mobility, which were markedly increased after chemoradiation. Our results indicate that DWI may have potential value for monitoring early response of lung cancer after chemoradiation. But image quality of DWI was not good enough for routine clinical application.



A 53-year-old man with squamous-celled carcinoma in right superior lobe of lung. A, B and C are of pre-chemoradiation. D, E and F are of post-chemoradiation. .A and D: enhanced-LAVA sequence shows the tumor is enhanced in anterior solid region. B and E: DW images. C and F: ADC maps. ADC is 1.53×10^{-3}mm^2/s for pre-therapy , but increase to 2.05×10^{-3} mm^2/s after therapy.



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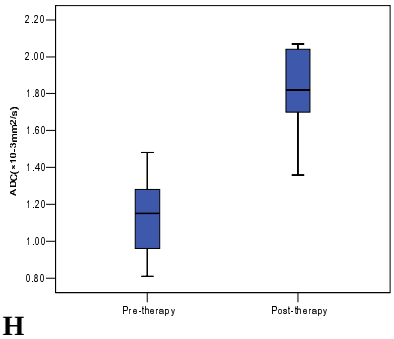

H

G: ADC of post-chemoradiation is higher than those of pre-chemoradiation in each patient.

H: ADCs are 1.13×10^{-3} mm^2/s ± 0.25×10^{-3} mm^2/s for pre-chemoradiation, and 1.81×10^{-3} mm^2/s ± 0.25×10^{-3} mm^2/s for post-chemoradiation. ADCs of post-chemoradiation show a significant increase to those of pre-chemoradiation (P=0.000).