High-b-value Diffusion-weighted MR Imaging in Hyper-acute Stroke

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Abstract

Purpose- To determine whether high-*b*-value diffusion-weighted MR imaging of b = 2,000 s/mm^2 is better than that of b = 1,000 s/mm^2 for detection of diffusion in hyper-acute ischemic stroke.

Methods- b = 1,000 s/mm^2 and b = 2,000 s/mm^2 Diffusion MR imaging was performed in 85 patients with hyper-acute stroke (within 6 hours after symptom onset). Qualitative assessment of trace diffusion-weighted images (DWI) was performed for detection and estimation of infarct area. Quantitative analysis of apparent diffusion coefficient (ADC), signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and infarct volume measurement was done.

Results- In qualitative assessment, five infarct areas were shown only on b = 2,000 s/ mm^2 DWIs. In quantitative assessment, as gradient strength increased from b = 1,000 to b = 2,000, the mean ADC of the infarct area and contralateral normal area decreased significantly from 6.03 x 10^{-4} mm^2/s to 4.49 x 10^{-4} mm^2/s ± 0.28 in infarct area (P< 0.001) and from 7.64 x 10^{-4} mm^2/s ± 0.93 to 6.27 x 10^{-4} mm^2/s ± 0.12 in contralateral normal area (P< 0.001). The mean SNRs of the infarct area and contralateral normal area significantly decreased with increasing diffusion weighting from 49.9 ± 1.66 to

33.5 ± 1.40 in infarct area ($P< 0.001$) and from 30.9 ± 1.24 to 21.1 ± 0.77 in contralateral normal area ($P< 0.001$). As increasing diffusion weighting, the mean CNRs of the infarct area and contralateral normal area increased significantly from 10.0 ± 1.18 to 12.4 ± 1.16 ($P< 0.001$). As gradient strength increased, the mean total volume of infarct area increased significantly from 21.24 cc ± 5.01 to 29.17 cc ± 6.23. And the volume measured on b = 2,000 image more approximated to the volume measured on follow-up DWI than the volume on b = 1,000 image.

Conclusion- High-b-value diffusion-weighted MR imaging of b = 2,000 s/mm^2 is better than that of b = 1,000 s/mm^2 in detecting hyper-acute ischemia induced diffusion canges.