The diagnostic utility of susceptibility weighted imaging (SWI) in amyotrophic lateral sclerosis.

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<Purpose>

To evaluate the clinical feasibility of susceptibility weighted images (SWI) for diagnosis of amyotrophic lateral sclerosis (ALS) and determine whether the low signal intensity of precentral gyral cortex on T2WI is due to susceptibility effect.

<Patients and methods>

MR images of clinically diagnosed nine ALS patients (two males and seven females, mean age: 52 years old) and 30 non-ALS subjects were compared. All images were obtained using a 1.5T MR unit (Magnetom Symphony, Siemens, Germany) with a 12 channel head and neck coil. Axial fast spin echo T2WI (TR/TE/ETL=5000/90/15) and three-dimensional (3D) susceptibility weighted images (SWI, TR/TE/FA=50/40/15) covering the frontoparietal convexity were obtained. Parallel imaging factor was 2 for both images. On each image signal intensity measurement was performed in white matter and gray matter of precentral gyrus and contrast ratio was calculated as: Contrast Ratio = (SIw-SIg)/(SIw+SIg)

Where SIw and SIg represent signal intensity of the white matter and gray matter respectively. The calculated values were compared between ALS and non ALS groups both T2WI and SWI. Subjective analysis was also performed using a 4-point-scale by two radiologists. Diagnosis of ALS was made when the signal intensity of gray matter of precental gyrus was obviously higher than that of white matter.

<Results>

On SWI, all ALS patients showed decreased signal intensity of precentral gyral cortices and gray matter-white matter contrast ratio was significantly higher than that of non ALS patients ($p<0.001$). The difference on T2WI was not significant ($p=0.07$). When cut off value was set at 0.13, sensitivity, specificity, and accuracy of SWI were 66.7%, 100%, and 92.5% respectively. Subjective analysis also provided higher diagnostic values of SWI (sensitivity/specificity/accuracy = 75%/94%/90%) compared with those of T2WI (sensitivity/specificity/ accuracy = 13%/97%/80%).

<Discussion and conclusion>

ALS is a progressive, fatal neurodegenerative disease caused by the degeneration of motor neurons of central nervous system. Although no cure has been found yet, Riluzole is believed to reduce damage to motor neurons by decreasing the release of glutamate and early diagnosis is important. Oba et al. showed decreased signal intensity of precentral gyral cortex on T2WI and suggested the possibility of iron deposition in this area (1). On the other hand recent report showed no observable signal loss in the precental gyral cortex of ALS patients on T2* weighted images, denying the mechanism of iron deposition (2). Our results showed superior contrast between the white matter and gray matter on SWI, suggesting the cause of the contrast was due to susceptibility effect, possibly by iron deposition. Both on objective and subjective analysis, SWI was superior to T2WI for diagnosis of ALS.

<References>

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