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Comparative Study of sLASER and PRESS Techniques in Magnetic Resonance Spectroscopy of Normal Brain

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Abstract : Objectives: The commonly used PRESS technique in magnetic resonance spectroscopy (MRS) has a limitation of incomplete water suppression. The recently developed sLASER technique is known for its improved effectiveness in suppressing water signal. However, no prior study has compared both sequences in a normal human brain. In this study, we firstly aimed to compare the performances of both techniques in brain MRS. Materials and methods: From January 2023 to July 2023, thirty healthy participants (mean age 38 years, 17 male, 13 female) without underlying neurological diseases were enrolled in this study. All participants underwent single-voxel MRS using both PRESS and sLASER techniques on 3T MRI. Two regions-of-interest were allocated in the left medial thalamus and left parietal white matter (WM) by a single reader. The SpectroView Analysis (SW5, Philips, Netherlands) provided automatic measurements, including signal-to-noise ratio (SNR) and peak_height of water, N-acetylaspartate (NAA)-water/Choline (Cho)-water/Creatine (Cr)-water ratios, and NAA-Cr/Cho-Cr ratios. The measurements from PRESS and sLASER techniques were compared using paired T-tests and Bland-Altman methods, and the variability was assessed using coefficients of variation (CV). Results: SNR and peak_heights of the water were significantly lower with sLASER compared to PRESS (left medial thalamus, sLASER SNR/peak_height 2092±475/328±85 vs. PRESS 2811±549/440±105); left parietal WM, 5422±1016/872±196 vs. 7152±1305/1150±278; all, P<0.001, respectively). Accordingly, NAA-water/Cho-water/Cr-water ratios and NAA-Cr/Cho-Cr ratios were significantly higher with sLASER than with PRESS (all, P< 0.001, respectively). The variabilities of NAA-water/Cho-water/Cr-water ratios and Cho-Cr ratio in the left medial thalamus were lower with sLASER than with PRESS (CV, sLASER vs. PRESS, 19.9 vs. 58.1/19.8 vs. 54.7/20.5 vs. 43.9 and 11.5 vs. 16.2) Conclusion: The sLASER technique demonstrated enhanced background water suppression, resulting in increased signals and reduced variability in brain metabolite measurements of MRS. Therefore, sLASER could offer a more precise and stable method for identifying brain metabolites.

Keywords : Magnetic resonance spectroscopy, Brain, sLASER, PRESS
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