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Measurement of hypoperfused lesion volume using automated perfusion MRI analysis software: comparison of time-to-maximum (Tmax) and time-to-peak (TTP) maps

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PURPOSE: Although time-to-maximum (Tmax) maps of the residue function has been suggested as a very promising parameter, processing for Tmax map is complex. In clinical routine, non-deconvoluted time-to-peak (TTP) maps are used to calculate hypoperfused area. We evaluated the correlation of TTP maps to calculate hypoperfused lesion volume by comparison with Tmax maps.

MATERIALS AND METHODS: MRI was performed in 44 patients with acute ischemic stroke (within 6 hours after stroke onset). The volume of hypoperfusion defined by increasing TTP thresholds (relative TTP delay of > 4, > 6 and > 8 seconds) were compared with the volume of hypoperfusion assessed by Tmax (Tmax delay of > 4, > 6, > 8 seconds). For the calculation of lesion volume, the mean value of gray matter (TTP_{GM}), white matter (TTP_{WM}), and gray-white combined area (TTP_{meanGW}) covering the contralateral MCA territory were subtracted from the absolute TTP values. Comparisons were performed with Pearson correlation coefficients and paired t-test.

RESULTS: The mean hypoperfusion volume at Tmax > 6 and TTP_{meanGW} > 6 seconds was 80.81 $\pm$ 65.54 and 77.69 $\pm$ 62.89 cm^3 respectively. There is no statistically significant difference between the two values ($p > 0.411$). The hypoperfusion volume at TTP_{meanGW} > 6 seconds best correlated with hypoperfusion volume at Tmax 6 ($r = 0.925$).

CONCLUSION: TTP maps still remained suitable for evaluation of hypoperfused lesion volume for clinical routine studies.