

Differential Diagnosis of MELAS and Ischemic Stroke using 3D Pseudocontinuous Arterial Spin Labeling

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PURPOSE

MELAS (mitochondrial myopathy, encephalopathy, lactic acidosis, and a stroke-like episode) is a mitochondrial disorder that the neurological deficits and imaging characteristics resemble features of ischemic stroke. However, the underlying mechanism of MELAS is different from that of the ischemic stroke due to energy failure from defective oxidative metabolic pathways of energy production [1]. Our objective was to evaluate the efficacy of three dimensional pseudo-continuous arterial spin labelling (3D pCASL) in the differential diagnosis between MELAS and ischemic stroke.

METHODS

We analyzed 12 newly appearing lesions in 5 patients (age, 22 ± 7.8 years) with MELAS and 14 acute lesions in 8 patients (age, 26 ± 8.4 years) with ischemic stroke. The perfusion data were obtained using three dimensional pseudocontinuous arterial spin labeled sequence on 3.0-T MR scanner (Discovery 750, GE Medical Systems). The post labeling delay time (PLD) of 2.0 seconds was acquired. The cerebral blood flow (CBF) values were measured in the central part and the peripheral part of the lesions on GE ADW 4.5 workstation [2].

RESULTS

Compared with the hypo-perfusion in all acute infarctions, MELAS demonstrated hyper-perfusion in 10 acute lesions, especially the peripheral part of the lesions (Fig 1 and Fig 2). The relative CBF values of 12 lesions in MELAS were 11.20-16.99 ml/min/100g in the central part and 65.33-76.87 ml/min/100g in the peripheral part. The relative CBF values of 14 lesions in ischemic stroke were 12.32-18.77 ml/min/100g in the central part and 11.66-18.37 ml/min/100g in the peripheral part. There is significant difference of CBF in peripheral part of the lesions of two groups ($P < 0.05$).

CONCLUSION

The whole-brain 3D pCASL technique is useful in differentiating MELAS from ischemic stroke when clinical symptoms and conventional MRI manifestations overlap in these two conditions.

REFERENCES

- 1 Tsujikawa T, et al. Pathophysiologic evaluation of MELAS strokes by serially quantified MRS and CASL perfusion images. *Brain Dev* 2010;32:143-149.
- 2 Wu B, et al. Intra- and inter-scanner reliability and reproducibility of 3D whole-brain pseudo-continuous arterial spin-labeling MR perfusion on 3T, *JMRI*. 2013, May 30, doi:10.1002/jmri.24175, Epub.

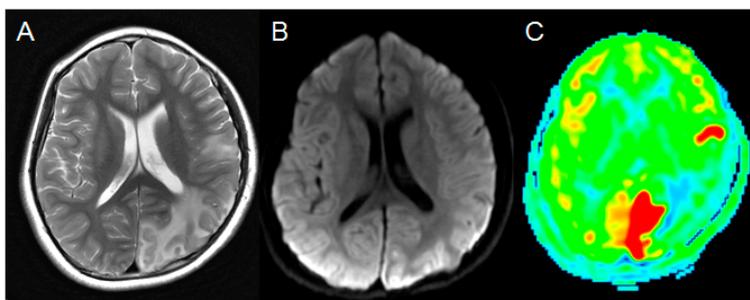


Fig 1. A 12-year-old patient with MELAS. The lesion demonstrated hyper-signal intensity on T2WI (A), slightly hyper-signal intensity on DWI (B), and hyper-perfusion in the peripheral part of the lesion on 3D pCASL.

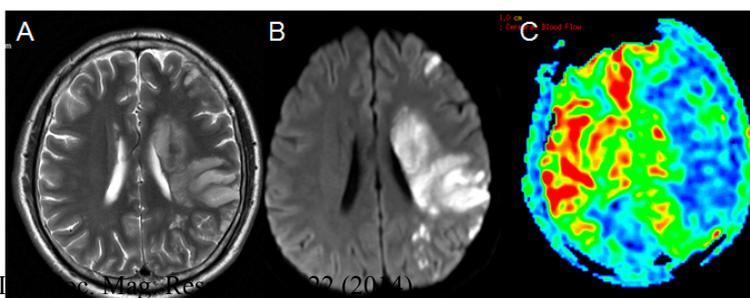


Fig 2. A 22-year-old patient with acute ischemic stroke. The lesion demonstrated hyper-signal intensity on T2WI (A) and DWI (B), and hypo-perfusion in the peripheral part and central part of the lesion on 3D pCASL.