Can 3D pCASL be another predictor to evaluate the collateral Perfusion in Patients with severe intracranial arterial stenosis?

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PURPOSE

DSA remains the method that can best measure collateral extents, but it is relatively time-consuming, invasive, and costly. Determining the presence and adequacy of collateral blood flow is important in patients with severe intracranial stenosis or occlusion due to collateral flow can maintain cerebral circulation and may be another potential therapeutic target in acute ischemic stroke [1]. Therefore, we explored whether a non-invasive imaging modality, three dimensional pseudo-continuous arterial spin labelling (3D pCASL), could be used to detect the presence of collateral flow by comparing the cerebral blood flow (CBF) map in symptomatic and asymptomatic patients with unilateral middle cerebral artery (MCA) severe stenosis.

METHODS

Thirty-two symptomatic patients (male, 26, age, 41 ± 8.1 years) and 11 asymptomatic patients (male, 7, age, 43 ± 7.8 years) with severe unilateral MCA stenosis (>70%) were enrolled in this study. The perfusion data were obtained using 3D pCASL sequence on 3.0-T MR scanner (Discovery 750, GE Medical Systems). The 3D pCASL data with two post labeling delay time (PLD) of 1.5 and 2.5 seconds was acquired. The hypo-perfusion areas of PLD 1.5 S and 2.5 S were evaluated and compared on GE ADW 4.5 workstation [2].

RESULTS

Twenty-three with right MCA and 9 with left MCA severe stenosis in symptomatic patients, 6 with right MCA and 5 with left MCA severe stenosis in asymptomatic patients. Hypo-perfusion regions of 3D pCASL on PLD of 1.5 S were larger than PLD of 2.5 S, particularly in regions of gray matter in all patients. All asymptomatic patients showed clear regions of differences between PLD 1.5 S and 2.5 S, and 12 of 32 symptomatic patients showed clear regions of differences between two PLDs (Fig 1 and 2). There is significant difference of hypo-perfusion areas compared with two PLDs in symptomatic and asymptomatic patients ($P<0.05$).

CONCLUSION

Multi-PLD 3D pCASL technique may be a useful non-invasive tool to evaluate the collateral perfusion in patients with intracranial arterial stenosis.

REFERENCES

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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.

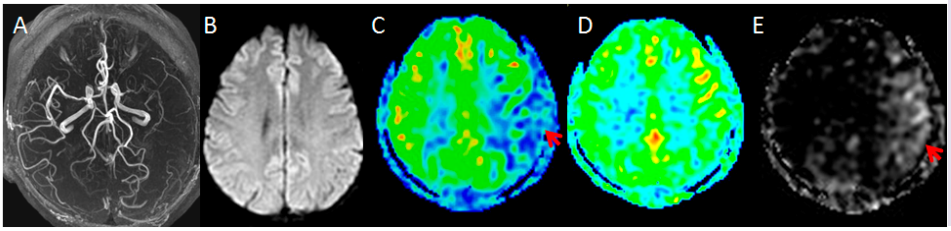

Fig 1. Left MCA with severe stenosis was showed on 3DTOF (A) in a 32-year-old asymptomatic patient. DWI (B) was normal. Hypoperfusion was noted on 3D pCASL with PLD 1.5 S (C, arrow) but normal on PLD 2.5 S (D). High signal on subtraction image between PLD 1.5 S and 2.5 S was clear may be indicated collateral perfusion (E, arrow).

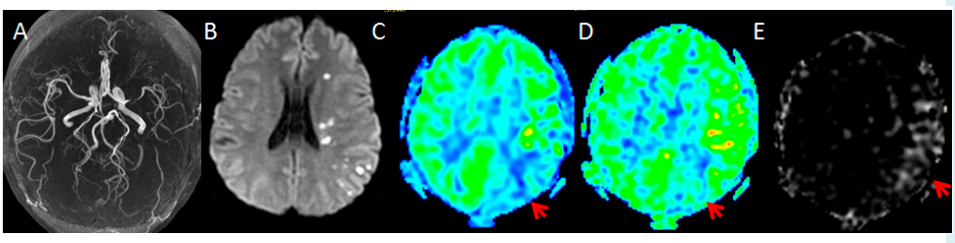

Fig 2. Left MCA with severe stenosis was showed on 3DTOF (A) in a 34-year-old symptomatic patient. DWI (B) showed high signal in territory of left MCA. Hypoperfusion was noted on 3D pCASL with PLD 1.5 S (C, arrow) and 2.5 S (D, arrow). High signal on subtraction image between PLD 1.5 S and 2.5 S was smaller than the former (E, arrow).