Assessment of cerebral blood flow in Alzheimer's disease by continuous arterial spin labeling MR imaging

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Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disorder which is the most common cause of dementia in the elderly. PET and SPECT can show regional glucose hypometabolism or hypoperfusion in a similar way[1,2]. Continuous arterial spin labeling (CASL) perfusion magnetic resonance imaging is another method used to assess brain perfusion in dementia[3,4]. In this study, we compared regional cerebral blood flow (CBF) values between AD patients and control subjects to explore the clinical utility of CASL MR imaging for the detection of CBF abnormalities in Alzheimer's disease.

Materials and Methods

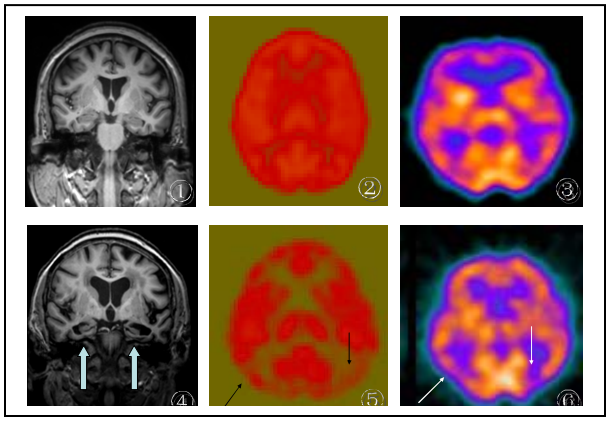
Eighteen subjects with probable AD (M: F=8:10) and 15 aged-matched normal control subjects (M: F=7:8) underwent CASL and structural MR imaging at a 3.0 T whole body MRI scanner (Achieva, Philips Medical system). And 7 AD patients and 6 control subjects were also examined with SPECT. The CASL was used with the following parameters: TR/TE 4500/33ms, FOV 230mm×200mm, matrix 64×47, slice thickness/gap 7mm/1mm, 9slices, dynamic scan times 70, labeling delay 800ms, acquisition time 11min 15s. The CBF images were obtained by processing the CASL perfusion data using IDL 6.1 (Interactive Data Language). The CBF values of bilateral frontal, temporal, temporoparietal, parietal, occipital cortices and hippocampal areas were measured on the CBF images. And the CBF values of cerebral structures between AD and control subjects were compared.

Results and discussion

CASL perfusion imaging in AD patients revealed marked hypoperfusion mainly in temporal, temporoparietal, parietal cortices (Fig.5). The brain regions involved were similar to those seen with SPECT (Fig.6). As shown in table 1, the CBF values of bilateral frontal, temporal, temporoparietal, parietal cortices and hippocampal areas were significantly decreased relative to control subjects($P<0.05$) .

Conclusion

ASL MR imaging can show regional hypoperfusion with AD, in brain regions involved similar to that seen with SPECT. The results of this study suggest ASL MR perfusion imaging is a useful tool for cerebral blood flow characterization of AD.



The CBF values of bilateral cerebral structures (unit: ml/ (100g•min))

	control	AD	*F*	*P*
right frontal cortex	112.06±14.96	84.57±8.13	4.57	0.041
left frontal cortex	113.73±13.90	85.74±7.99	4.44	0.043
right parietal cortex	107.32±21.43	93.54±16.80	4.22	0.048
left parietal cortex	110.59±20.64	94.00±16.17	5.53	0.025
right temporal cortex	105.93±16.66	83.09±13.07	4.28	0.047
left temporal cortex	105.59±16.20	82.86±12.87	4.29	0.041
right temporoparietal cortex	105.66±9.17	77.90±12.98	4.99	0.033
left temporoparietal cortex	104.93±8.84	78.45±12.56	4.51	0.042
right hippocampal area	131.07±14.68	73.73±22.76	4.59	0.040
left hippocampal area			4.48	0.042

Figs. 1-3 an AD patient, female, 72 years old. Figs. 4-6 a control subject, female, 73 years old. Fig 4.Coronal T1WI shows that marked atrophy of hippocampi, hipocamppal gyri, and widening temporal horns of the lateral ventricle (white thick arrow). Compared with the normal control subject, the CASL perfusion image in AD (Fig.5, black thin arrow) reveals marked hypoperfusion in bilateral temporoparietal cortices, similar to that seen with SPECT (Fig.6, white thin arrow).

References

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