

Assessment of cerebral metabolic change in patients undergoing carotid endarterectomy using magnetic resonance spectroscopy

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Introduction

Carotid endarterectomy (CEA) is well established as a method for the prevention of stroke recurrence. However, whether CEA can improve the cerebral metabolism remains unclear. On the contrary, neuropsychological testing detects cognitive impairment in 20% to 30% of patients after CEA. Magnetic resonance (MR) spectroscopy was used to evaluate cerebral metabolism in patients before and after CEA.

Subjects and Methods

Twenty patients underwent MR spectroscopy before and after CEA. Single voxel MR spectroscopy with the PRESS method used a GE SIGNA 3.0 T Excite HD. The 3 x 3 x 2 cm regions of interest (ROIs) were placed on the deep white matter, excluding the region of infarction. The parameters were as follows: repetition time 2000 msec, echo time 144 msec, and number of excitation 128. The area under the peaks of choline (Cho), creatine (Cr) and N-acetyl aspartate (NAA) were calculated with console software. The higher brain function was evaluated before and after CEA in each patient using the Wechsler Adult Intelligence Scale-Revised (WAIS-R).

Results

Mean NAA/Cr ratio of the pathological side was significantly lower than that of the non-pathological side before surgery ($p=0.0072$), but there was no significant difference after CEA. Neuropsychological testing demonstrated improved score in some patients, and poorer score in others. NAA/Cr ratio increased after CEA in patients with improved WAIS-R score after CEA, and decreased in patients with poorer WAIS-R score (Fig. 1).

Discussion

The case whose NAA/Cr ratio decreased after CEA revealed ischemia with transcranial oxygen saturation monitoring in the cerebral hemisphere during CEA. Although the patient recovered without the appearance of new neurologic deficits, the intraoperative hypoperfusion may concern with the decline of NAA/Cr.

Conclusion

CEA may improve cerebral metabolism in some patients. MR spectroscopy has the potential to evaluate cerebral metabolism in patients undergoing CEA. The NAA/Cr ratio may indicate the cognitive function after CEA.

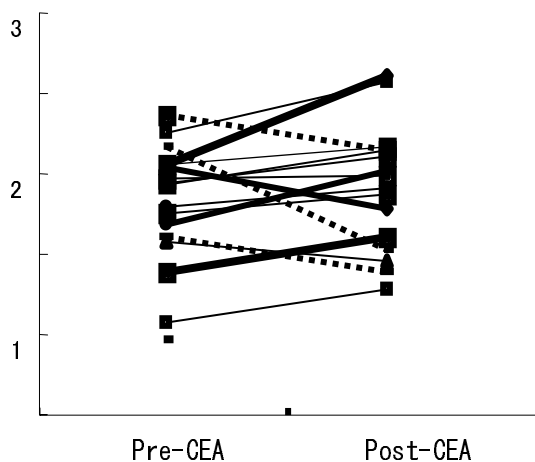


Fig. 1
The response of NAA/Cr ratio to CEA in the pathological side.
The bold lines indicate 3 patients with increased NAA/Cr ratios who also showed improved scores in neuropsychological testing.
The dashed lines indicate 3 patients with decreased NAA/Cr ratios and poorer neuropsychological test scores.