

The Correlation of Omega-3 Fatty Acids and White Matter Hyperintensity

Investigate Cognitive Impairment in Vascular Depression Patients

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ABSTRACT

Background: Vascular depression is related to cognitive impairment and cerebrovascular structural changes. Omega-3 fatty acids have been used to prevent and protect neurodegeneration in brain aging, and also to treat depression. However, the effect for treating vascular depression is still under research. White matter hyperintensity (WMH) is the biomarker of cognitive impairment in neuroimaging study. We aimed to investigate the relationship between omega-3 fatty acids and vascular depression, and cognitive impairment through quantifying the changes in WMH.

Method: We performed a 24-week open-labeled study of omega-3 fatty acids (3 g of 1.5 g eicosapentaenoic acid (EPA) + 1.5 g docosahexaenoic acid (DHA) per day) treatment in 14 participants with vascular depression aged 50 and above. Magnetic resonance imaging (MRI) was used for quantification of the brain volume changes. Montreal Cognitive Assessment (MoCA), Hamilton Depression Rating Scale (HAMD), Beck Depression Inventory (BDI), and EuroQol-5D (EQ-5D) were used for evaluation depressive symptoms and cognitive impairment.

Results: After 24-week intervention, there were enrolled 14 participants, among them 5 drop-out (included 1 death), and 9 were completed. HAMD ($p < 0.001$), BDI ($p < 0.01$), and EQ-5D ($p < 0.05$) scores were decreased in all 9 patients, while WMH volume was decreased in 3 patients.

Conclusion: Current study showed omega-3 fatty acids could improve depressed symptom in patients with vascular depression. We speculate omega-3 fatty acids may be efficacious in protecting cognitive dysfunction by delaying brain volume changes, however, the evidence is still limited. Thus, further research is warranted to confirm the effect of omega-3 fatty acids for vascular depression in double-blind study.

Key words: aging, cognitive, depression, omega-3 fatty acids, WMH

Introduction

- White matter hyperintensity (WMH) lesions in the brain that show up as areas of increased brightness in T2-weighted magnetic resonance imaging (MRI).
- WMH frequent in elderly with cerebrovascular change.
- Higher volumes of WMH was associated with cognitive dysfunction and depressive symptoms.
- Current evidence show omega-3 fatty acids could decrease WMH in healthy control.
- Several independent clinical trials showed that omega-3 fatty acids were more effective than placebo, or as effective as conventional antidepressant medication in treating patients with depression.

Methods

- 3g EPA+DHA /day omega-3 fatty acids intervention for 24-week and using questionnaires to follow-up once a month.
- Voxel-based brain imaging microinfarct analyzed at the baseline and endpoint.

Results

- We enrolled 14 subjects, among them 5 drop-out (included 1 death).
- HAMD, BDI, EQ-5D scores were decrement (Table 1) after omega-3 fatty acids treatment for 24-week compared to the baseline.
- Gray matter volume has decrement, but WMH volume was nonsignificant after omega-3 fatty acids treatment for 24-week compared to the baseline.

Table 1. Demographic data, psychological ratings and voxel-based morphometry of patients

	Baseline	Omega-3 fatty acids treatment for 24-week	p value
	(n=9) (Mean ± SD)	(n=9) (Mean ± SD)	
Demographic			
Age		67.88 ± 7.88	
Male (%)		33.33%	
Female (%)		66.66%	
Education		10.88 ± 2.84	
Psychological Assessments			
HAMD score	18.11 ± 5.79	7.56 ± 7.45	0.001
BDI score	25.33 ± 10.79	13.22 ± 14.84	0.029
EQ-5D score	7.44 ± 1.81	6.78 ± 1.85	0.05
MoCA score	22.89 ± 5.01	23.33 ± 3.39	0.669
Brain volumes (cm³)			
Total intracranial volume	1412.33 ± 142.979	1419 ± 136.646	0.538372715
Gray matter volume	541 ± 73.286	532.677 ± 72.029	0.252519725
White matter volume	553.222 ± 61.262	548.778 ± 55.012	0.541199089
CSF volume	318.222 ± 60.414	337.889 ± 44.340	0.230471171
WMH volume	23.66 ± 12.986	21.44 ± 9.779	0.464755507

Conclusion

- omega-3 fatty acids may alleviate vascular dysfunctions linking to pathological aging brains.
- The WMH was attenuate after intervention and keep brain volumes stable.

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