The Effect of n-3 PUFA on the Development of Abdominal Aortic Aneurysm

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Abdominal aortic aneurysm (AAA) is characterized by a gradual dilation of abdominal aorta, which is typically asymptomatic until rupture. There is currently no drug for preventing AAA development. Several studies have recently reported the effect of n-3 polyunsaturated fatty acid (PUFA), particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), on AAA development, which is formed in AAA animal models. EPA treatment reportedly attenuates CaCl2-induced AAA formation, elastic lamina destruction, and aortic calcification. Yoshihara et al. reported that EPA and DHA suppress AAA development induced by angiotensin II infusion in apolipoprotein E-deficient mice. Using the same experimental mouse model, Russell et al. reported that dietary supplementations of n-3 PUFA attenuate matrix metalloproteinase 9 immunoreactivity. They also reported a trend of a delay in AAA-related death in mice that were fed n-3 PUFA diet. Using a newly developed AAA animal model, Kugo et al. reported that EPA-rich fish oil prevented AAA development induced by hypoperfusion of the vascular wall. These studies suggested that n-3 PUFA has preventive effects on AAA development in different AAA animal models. The mechanism of action of n-3 PUFA is generally considered to be associated with antiinflammatory and antioxidant activities. Recent studies show that abnormal appearance of adipocyte in vascular wall may induce AAA rupture. The risk for AAA rupture decreased following fish oil administration, with the decreased number and size of ectopic adipocytes in the vascular wall. The hypolipidemic effect of n-3 PUFA might be involved in the preventive effect on AAA development or rupture.

In contrast to the increasing evidences from animal studies, the effect of n-3 PUFA on human AAA remains unknown. In the current issue of Journal of Atherosclerosis and Thrombosis, Aikawa et al. analyzed 67 patients who were admitted for elective surgical repair of AAA. They estimated the correlation of serum EPA, DHA, and EPA/arachidonic acid (AA) ratio with the size and growth rate of AAA. Their study indicated that low serum EPA levels (low EPA/AA ratio) were significantly associated with the size and growth rate of AAA diameter. Interestingly, serum DHA levels did not correlate with AAA formation in their study group. It is of interest to clarify the difference between the effects of each n-3 PUFA on AAA development.

Their cross-sectional study did not show the causal association between n-3 PUFA and AAA development. However, this first study in a clinical setting provided an important finding to estimate the effect of n-3 PUFA on human AAA development. Further investigation should be performed to clarify the association between n-3 PUFA and human AAA development.

Conflicts of Interest

None.

References

2) Yoshihara T, Shimada K, Fukao K, Sai E, Sato-Ookayashi Y, Matsumori R, Shiozawa T, Alshahi H, Miyazaki T, Tada N, Daido H. Omega 3 Polyunsaturated Fatty Acids Suppress the Development of Aortic Aneurysms Through...
the Inhibition of Macrophage-Mediated Inflammation. Circulation Journal. 2015; 79: 1470-U1292

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