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The effect of omega-3 polyunsaturated fatty acid supplementation on vascular structure, function, and inflammation in type 1 diabetes: a double-blind, randomised, placebo-controlled trial

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Raised inflammation and impaired endothelial function are common in patients with type 1 diabetes (T1D)[1–2]. Although increased omega-3 polyunsaturated fatty acid (n-3 PUFA) intake can improve risk factors for macrovascular complications in adults with type 2 diabetes[3], such evidence is limited in T1D. Here, we report findings from a trial examining the effect of 6-month n-3 PUFA supplementation on vascular structure, function, and inflammation in adults with T1D.

For this double-blind, randomised, placebo-controlled trial, individuals with T1D (n = 20; males:16; 34 ± 14 years; BMI:26.6 ± 5.2 kg/m^2; glycated haemoglobin (HbA_{1c}):58 ± 13 mmol/mol^{-1} [7.5 ± 3.3%]), were randomly allocated in a 1:1 ratio to receive either 3.3 g/day of encapsulated n-3 PUFA or placebo (PLA) consisting of an encapsulated dose of 3.0 g/day corn oil for 6-months. Fatty acids were measured in erythrocyte membranes by gas chromatography with n-3 PUFA index (O3I) calculated as eicosapentaenoic acid plus docosahexaenoic acid. Carotid artery intima-media thickness (CIMT), flow mediated dilation of the brachial artery (FMD), and biomarkers of vascular inflammation were assessed at baseline and following 6-months supplementation. A paired-samples t test was used to compare intragroup mean differences and an independent samples t test was used for comparisons between n-3 PUFA and PLA at baseline; statistical significance was set at $p \leq 0.05$. Data are presented as mean ± SD.

O3I levels were comparable at baseline, increasing significantly under n-3 PUFA, but not PLA, (mean difference: 3.37 ± 1.52% vs. 0.36 ± 0.69%; $p < 0.001$). All outcome variables were similar between conditions at baseline ($p > 0.05$). After 6-months n-3 PUFA supplementation, CIMT remained unchanged (0.61 ± 0.12 mm vs. 0.60 ± 0.10 mm; $p = 0.200$), as did FMD (7.11 ± 1.31% vs. 6.90 ± 1.43%; $p = 0.541$). Similar findings were observed in the PLA group; CIMT (0.64 ± 0.09 mm vs. 0.64 ± 0.09 mm; $p = 0.726$) and FMD (7.66 ± 1.95% vs. 7.78 ± 2.58%; $p = 0.656$). Vascular cell adhesion molecule-1 ($p = 0.825$), intercellular adhesion molecule-1 ($p = 0.926$), vascular endothelial growth factor ($p = 0.332$), E-selectin ($p = 0.420$), P-selectin ($p = 0.390$), pentraxin-3 ($p = 0.902$), and tumor necrosis factor alpha ($p = 0.993$) remained unchanged in the n-3 PUFA group. Comparable findings were observed in the PLA group ($p > 0.05$). Overall, no safety issues arose during administration of n-3 PUFA or PLA.

Despite significant increases in erythrocyte n-3 PUFA concentration, a daily high-dose-bolus of n-3 PUFA for 6-months had no effect on vascular structure, function, or inflammation in adults with T1D. These findings do not support the use of n-3 PUFA supplementation in the management of T1D and its associated macrovascular complications.

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