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Eicosapentaenoic acid (EPA) from highly concentrated n-3 fatty acid ethyl esters is incorporated into advanced atherosclerotic plaques and higher plaque EPA is associated with decreased plaque inflammation and increased stability.

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Abstract

OBJECTIVE:
To examine n-3 polyunsaturated fatty acid (PUFA) incorporation into atherosclerotic plaques and the association with plaque inflammation and stability.

METHODS AND RESULTS:
Patients awaiting carotid endarterectomy (n=121) were randomised to consume control capsules or n-3 PUFA ethyl ester capsules until surgery (median 21 days). The fatty acid compositions of plasma and carotid plaque phospholipids, plaque features, and expression of inflammatory genes were determined. The proportion of eicosapentaenoic acid (EPA) was higher (P<0.0001) in carotid plaque phospholipids in patients in the n-3 PUFA group. Plaques from patients in the n-3 PUFA group had fewer foam cells (P=0.0390). There were no other differences between plaques in the two groups with regard to histological characteristics or morphology. Plaque stability was not different between the two groups. However, the EPA content of plaque phospholipids was inversely associated with plaque instability (P=0.0209), plaque inflammation (P=0.0108), the number of T cells in the plaque (P=0.0097) and a summary score considering a range of plaque features (P=0.0425). Plaques from patients who received n-3 PUFAs had significantly lower levels of mRNA for matrix metalloproteinases (MMP)-7 (P=0.0055), -9 (P=0.0048) and -12 (P=0.0044) and for interleukin-6 (P=0.0395) and intercellular adhesion molecule 1 (P=0.0142).

CONCLUSIONS:
Atherosclerotic plaques readily incorporate EPA. A higher plaque EPA content is associated with a reduced number of foam cells and T cells, less inflammation and increased stability.