Effect of increasing doses of long chain n-3 polyunsaturated fatty acids on heart rate, interbeat interval and heart rate variability in the MARINA study: a randomised controlled trial

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Background

• Heart rate variability (HRV) describes measures of cardiac electrophysiology that can be recorded over 24 h (or shorter periods) to ascertain mean indices of cardiac responses to autonomic regulation.
• Lower HRV is associated with an increased risk of sudden cardiac death (1).
• Observational data suggest that fish consumption might be associated with vagally-mediated HRV parameters measured in a cohort of older adults (2).
• Furthermore, meta-analysis of fish oil trials concluded that ≥12 weeks consumption reduced heart rate (HR) by 2.5 beats per min (bpm), with little evidence of a dose-response effect (3).

Aims

• The aim of the MARINA trial (ISRCTN666664610) was to investigate whether low doses of long chain n-3 polyunsaturated fatty acids (n-3 LCP), equivalent to consuming 1, 2 or 4 portions of oily fish per week, would improve markers of cardiovascular health in healthy men and women (45-70 y).
• This poster reports the effects of increasing low doses of n-3 LCP on heart rate and heart rate variability.
• The primary outcome of this study is reported in an adjacent poster (OC 122).

Methods

• A parallel-design randomised controlled trial compared 3 levels (0.45 g/d, 0.9 g/d or 1.8 g/day) of n-3 LCP (eicosapentaenoic acid (EPA) to docosahexaenoic acid (DHA) ratio 1.5) versus placebo (refined olive oil) taken for 12 months.
• Participants wore an Actiheart monitor (Cambridge Neurotechnology Ltd, Cambridge, UK, see fig. 1.) which measured 24 h HR, interbeat (R-R) intervals (IBI), standard deviation of all normal R-R intervals (SDNN) and triangular index (Ti), a time domain geometric parameter of overall HRV, at baseline, 6 and 12 months.
• Ti is calculated as the base of the triangular area under the main peak of the R-R interval frequency distribution, and is an estimate of overall HRV (fig. 2).
• 367 participants randomised to treatment (142 M, 225 W; mean age 55 y (SD 7); mean BMI 26 (SD 4)). 312 completed the study and 24 h HR, IBI and HRV data were complete for 301 participants.
• Data were analysed using ANCOVA adjusting for baseline, age, gender, BMI and ethnicity using Stata 11 software (StataCorp LP, Texas, USA). The mean value on treatment (6 & 12 mo) was used in the analysis. Data are geometric means (GM) with 95% CI.

Results

• A slight decrease in heart rate (fig. 3) was evident at the highest dose (equivalent to 4 portions of oily fish per week).
• No significant differences in IBI (Rx 850 (826≥875), 866 (845-888), 859 (835-883) and 879 (855-904) on placebo, 0.45, 0.9 and 1.8 g/d respectively), SDNN (Rx 188 (172-205), 186 (174-200), 178 (166-191) and 195 (182-210) on placebo, 0.45, 0.9 and 1.8 g/d respectively) or Ti (fig. 4) between treatment groups.

Discussion

• 12-month daily consumption of marine n-3 LCP, at doses up to 1.8 g/d, has no observable effects on HRV.
• There is a suggestion that the highest dose (1.8 g/day, equivalent to 4 portions/wk) may slightly reduce HR but this is not conclusive
• Previous studies have found increased HRV following higher doses (4-5 g/d) for 12 wk in myocardial infarction survivors and patients with chronic renal failure (4,5).
• However, the current findings agree with other studies, including those in healthy people (6,7), and using similar doses to ours in CVD patients on haemodialysis (8).
• EPA+DHA supplementation, in the range that would be supplied by following UK recommendations for oily fish intake, does not seem to improve markers of cardiac autonomic balance in healthy middle-aged/older people.

References

1. Task Force of the Eur Soc of Cardiol/The N Amer Soc of Pacing & Electrophysiolo... 12 12 12 12, 354-381.