ARTICLE: Long Chain Omega-3 Polyunsaturated Fatty Acids Improve Vascular Stiffness in Abdominal Aortic Aneurysm: A Randomized Controlled Trial

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INTRODUCTION:

- Problem:
  - Patients who have Abdominal Aortic Aneurysm with aortic stiffness can take advantage of Long Omega-3 Polyunsaturated Fatty acids to improve cardiovascular diseases.
- Suggestion:
  - Taking Long chain omega-3 polyunsaturated fatty acid may prevent/reduce occurrence of vessel stiffness in patients who suffer from Abdominal Aortic Aneurysm

DEFINITION OF TECHNICAL TERMS:

- AAA = Abdominal aortic Aneurysm: It is a vessel disease that cause permanent vasodilation in the abdominal aortic segment
- LC n-3 PUFAs = Long chain omega-3 polyunsaturated fatty acid: It contains docosahexaenoic acid (C22:6n-3; DHA) and eicosapentaenoic acid (C20:5n-3, EPA) .
- PWV = Pulse Wave Velocity: It is the measurement of circulation rate from heart to abdomen along aorta. If vascular stiffness increase, PWV also increase. => Increase heart burden
- AIx75 = Augmentation Index: Tt determines the thickness of aorta. If augmentation index increases, systolic blood pressure and diastolic blood pressure also increases. => more vasocontraction => can affect cardiovascular disease.
- RDW = Red blood cell volume Distribution Width: It indicate the variation of red blood cells size in the entire red blood cell population.
- HR = Heart Rate
- Omega 3 index: The measurement of omega-3 intake

PURPOSE AND HYPOTHESIS:

Purpose:

- This experiment not only estimates how the LC n-3 PUFAs affect aortic stiffness between control group and variation group with AAA but also illustrate what the association of PWV and RDW is in variation group with AAA. Moreover, it determines the efficiency of LC n-3 PUFAs supplementation in patients with AAA and vascular stiffness.

Hypothesis:

- There were significantly different outcomes between AAA patients and the health population without AAA.
- It assumes that RDW and PWV have a connection with each other which occurs in AAA participants.
- LC n-3 PUFAs may significantly positively affect PWV and AIx75 in AAA patients.

METHODS:

Study design:
15 men with 1AAA intake 1.8g LC n-3 PUFAs /day for 12 weeks, and 15 men also with AAA take placebo for 12 weeks

Age: 60-80 years old

Weight: BMI = 39kgm ± 2

Year: 2021

- Outcome variables:
- PWV
- AIx75
- RDW
- HR
- Omega-3 index

RESULT:

- Using student's test and Fisher's exact test in the observational group and experimental group because the p-value is less than 0.05.

Table 1. Demographic, biometric and medical characteristics of male patients with abdominal aortic aneurysm (AAA) and control participants. Continuous demographic data are presented as mean ± SD, categorical demographic data are presented as number (percentage).

	Observational Study		Omega-3 Clinical Trial	
Variable	**Control Participants (n = 20)**	**AAA Patients (n = 30)**	**AAAn-3 Cohort (n = 15)**	**AAA Placebo Cohort (n = 15)**
Age (years)	73.2 ± 5.6	74.4 ± 5.3	73.6 ± 5.0	75.1 ± 5.7
AAA size (mm)		39.3 ± 5.3	39.3 ± 5.7	39.2 ± 5.0
Smoking:				
Never	8 (40%)	3 (10%) †	1 (7%)	2 (13%)
Past	11 (55%)	24 (80%)	12 (80%)	12 (80%)
Current	1 (5%)	3 (10%)	2 (13%)	1 (7%)
BMI (kg/m^2)	28.4 ± 5.3	29.5 ± 5.2	29.4 ± 4.1	29.0 ± 5.0
SBP (mmHg)	141 ± 17	140 ± 18	136 ± 16	144 ± 20
DBP (mmHg)	81 ± 7	79 ± 10	78 ± 8	80 ± 11
Hypertension	12 (60%)	17 (57%)	6 (40%)	11 (73%)
Diabetes	1 (5%)	4 (13%)	3 (20%)	1 (7%)
Dyslipidemia	15 (75%)	19 (63%)	7 (47%)	12 (80%)
CHD	6 (30%)	9 (30%)	5 (33%)	4 (27%)
Anti-hypertensives				
Beta blockers	3 (15%)	7 (23%)	4 (27%)	3 (20%)
ARBs	3 (15%)	8 (27%)	3 (20%)	5 (33%)
ACE inhibitors	7 (35%)	4 (13%)	3 (20%)	1 (7%)
CCBs	2 (10%)	6 (20%)	1 (7%)	5 (33%)
Diuretics	2 (10%)	3 (10%)	2 (13%)	1 (7%)
Anti-platelet drugs	3 (15%)	18 (60%) †	11 (73%)	7 (47%)
NSAIDs	1 (5%)	3 (10%)	1 (7%)	2 (13%)
Statins	14 (70%)	21 (70%)	8 (53%) ‡	13 (87%)
Baseline omega-3 Index			4.53 ± 0.22	4.37 ± 0.20
12-Week omega-3 Index			8.03 ± 0.20	4.26 ± 0.28

† AAA significantly different to control (Fisher's exact test, $p < 0.05$). ‡ AAA omega-3 cohort significantly different to placebo cohort (Fisher's exact test, $p < 0.05$). ARBs, Angiotensin receptor blockers; BMI, body mass index; CHD, coronary heart disease; CCBs, Calcium channel blockers; NSAIDs, non-steroidal anti-inflammatory drugs; SBP, systolic blood pressure; DBP, diastolic blood pressure.

RESULT:

- P-value between PWV and omega 3 index was 0.017 and P-value between PWV and RDW index was 0.047.

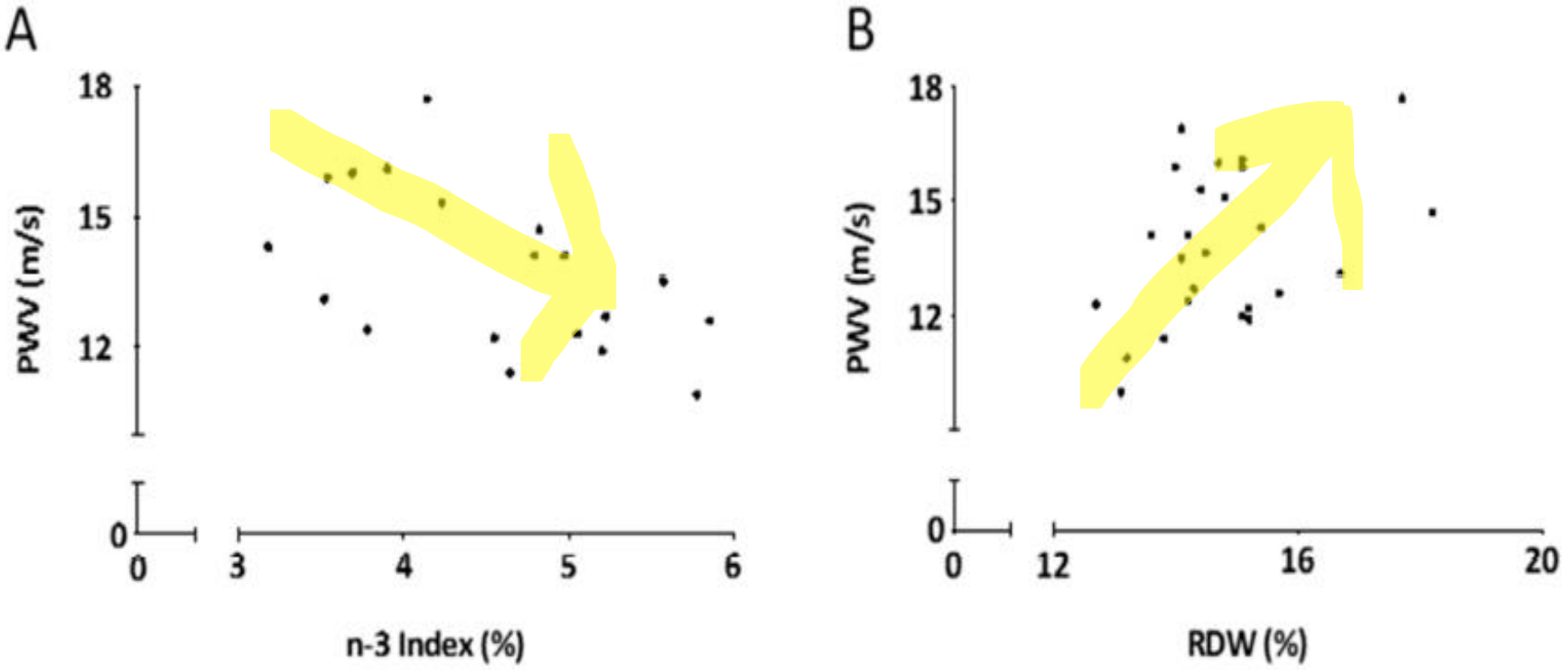

Figure 1. Relationship between pulse wave velocity (PWV) and omega-3 index (A) and PWV and red blood cell distribution width (RDW) (B) at baseline in patients with AAA.

RESULT:

- the p-value of PWV was 0.014 , heart rate was 0.009, and AI-75 was 0.005.

Table 2. Vascular stiffness, heart rate and central blood pressure indices at baseline and weeks 3 and 12 post treatment (mean ± SEM).

Variable	Fish Oil Cohort			Placebo Cohort		
	Baseline	Week 3	Week 12	Baseline	Week 3	Week 12
PWV (ms^{-1})	14.2 ± 0.6	13.8 ± 1.2	12.8 ± 0.7 *	14.6 ± 0.6	14.7 ± 0.6	14.0 ± 0.5
AIx75 (%)	26.4 ± 3.0	24.0 ± 4.2	23.7 ± 2.5	28.3 ± 2.2	28.6 ± 2.6	28.9 ± 2.5
RM (%)	64.1 ± 2.2	61.5 ± 3.0	66.0 ± 3.3	64.7 ± 2.3	67.9 ± 3.3	67.8 ± 1.6
HR (bpm)	63 ± 3	59 ± 3	58 ± 3 **	66 ± 2	65 ± 2	66 ± 3
cSBP (mmHg)	126 ± 4	127 ± 5	124 ± 3	129 ± 4	129 ± 4	126 ± 3
cDBP (mmHg)	80 ± 3	79 ± 4	79 ± 3	81 ± 3	83 ± 3	79 ± 3
cPP (mmHg)	46 ± 3	52 ± 5	45 ± 2	49 ± 3	46 ± 3	47 ± 2

Fish oil cohort week 12 significantly different to fish oil cohort baseline (* $p < 0.05$, ** $p < 0.01$). PWV, pulse wave velocity; AIx75, heart rate corrected augmentation index; RM, reflection magnitude; HR, aortic heart rate; cSBP, central systolic blood pressure; cDBP, central diastolic blood pressure; cPP, central pulse pressure.

DISCUSSION:

LU n-3 PUFAs has a high significant outcomes in AAA patients with vascular stiffness that decrease heart rate, PWV, and AIx75 after 12 weeks.

LU n-3 PUFAs intake also positively affects the RDW value. When RDW percentage increases, the PWV also increases. Conversely, PWV also decreases when RDW decreases

HR and PWV are no significant differences in the AAA placebo group.

DISCUSSION: LIMITATION AND FOLLOW-UP

Limitation:

All the participants in this experiment were 60-80 years old male

All the data in this research did not demonstrate how the LC n-3 PUFA impact in the younger generation and AAA female.

- Follow-Up:
- Age
- Gender
- Nationality.

QUESTIONS??