Sports Nutrition and Therapy
ISSN: 2473-6449f 189

Ã 1 ½ È ³ Å¾ ½ À Â Á ¡ Ã Â À
— ¢ œ

Research Article Open Access

&GGFDU PG / 1PMJVOTBUVSBUFE 'BUUZ "DJET "OUJIZQFSUFOTJWF 5SFBUNFOU JO 4QBOJTI 1

Diego Muñoz [1]*, Ignacio Maynar [2], María Ángeles Maynar [2], Ignacio Bartolomé [1], Ignacio Sierra Maynar [2], María Concepción Robles Gil [1], Francisco Javier Grijota Pérez [3] and Marcos Maynar Mariño [1]

[1]*Sport Science Faculty, University of Extremadura.Cáceres, Spain*
[2]*Health Center "El progreso".Badajoz, Spain*
[3]*(GXFDWLRQ)DFXOW\ 8QLYHUVLW\ 3RQWL¿FLD RI 6DODPDQFD 6DODPDQFD 6SDLQ*

Abstract

Objective: The purpose of this study is to evaluate the effects of taking low doses of omega-3 (1,5 g/day) in hypertensive women.

Method: Longitudinal clinical trial Health Center of San Fernando de Badajoz. Primary care. 55 postmenopausal hypertensive women. For the study, participants were divided into two groups, group supplementation (GS) (n=28) and one control group (CG) (n=27). Supplementation with n-3 PUFA to the experimental group for 6 months (1.5 g/day). The control group was given nothing. The variables of the study have been blood pressure, n-3 fatty acid supplementation and it was tried to control nutritional intake.

Results: ,Q 6* V\VWROLF EORRG SUHVVXUH GHFUHDVHG VLJQL¿FDQWO\ DW WKH V DIWHU VWDUWLQJ WKH VWXG\ DQG WKUHH PRQWKV S VLQFH WKH HQG RI V SUHVVXUH OHYHOV LQ WKH VDPH JURXS €•€P€xF K K K À ° ° L K Kr[`€'bK H€ €0•VLJ VWDWLVWLFDOO\ VLJQL¿FDWLRQ :H KDYH VKRZQ LQFUHDVHV LQ WKH SODVPD S DIWHU WKUHH PRQWKV RI LQLWLDWLQJ VXSSOHPHQWDWLRQ S DIWHU P OHDYLQJ VXSSOHPHQWDWLRQ S $UDFKLGRQLF DFLG GHFUHDVHV WKURXJ UHDFKHG D VWDWLVWLFDOO\ VLJQL¿FDQW GLIIHUHQFH DIWHU PRQWKV ZLWKLQ

Conclusions: 7KH LQWDNH RI J GD\ RI ¿VK RLO DV FRDGMXYDQW LQ WKH WUHDW improves blood presure and other cardiovascular diseases.

Keywords: Postmenopausic women; Hypertension; Lipids; n-3-fatty acid

Introduction

Cardiovascular disseases (CD) are the main cause of death in Spain [1]. A wide number of surveys have shown an inverse relationship among CD and the n-3 poliunsaturated fatty acids (n-3 PUFAs) intake [2-5]. In this sense, it has been research in surveys of nutritional intervention, among humans and animals, the kinetics of n-3 PUFAs, their incorporation to cellular structures and their link to eicosanoids metabolism, in comparison with n-6PUFAs [6-8]. Furthermore, the e cacy of several fatty acids derived from sh oil, like the eicosapentaenoic acid (20:5n-3 or EPA) and the docosahexaenoic acid (22:6n-3 or DHA) as well as other minor important PUFAs, in the treatment of cardiovascular disseases with minimum daily intakes of 0.5 g/day in healthy individuals and 1 g/day in patients diagnosed with CD [9]. Several surveys have demonstrated anticarcinogenic, antitrombotic and anti [ritionahmnd 7cac5ect balance with other nutritional compouds, like n-6 PUFAs [11]. Arterial hypertension (AHT) is a serious, infradiagnosed dissease, with growing prevalence and, frequently, poorly controlled [12]. AHT is determined as an arterial pressure 140 mmHg and/or 90 mmHg. It is generally treated with antihypertensive farmacological treatment. AHT a ects more of the 15% of occidental countries inhabitants, with an unknown etiology, but frequently a ected by nutritional factors, like the fat intake [13,14]. Among Spanish inhabitants, some surveys have pointed out that AHT ranges between the 30 and the 50% of total population [15]. AHT surveys trends to attribute hypotensive properties to n-3 PUFAs [16,17] althought the results are contradictory [5]. Some meta-analysis andreviews have attributed this discrepancy to the variability of several critical factors, like dosage, sample size, timing and duration of the treatment and the patient's selection criteria [18-20]. Althought some data have demonstrated the diminution of arterial tension (AT) with n-3 PUFAs in the essential hipertension [18,21,22], it was suggested that the supplementation with diet could be more appropriate in the prevention strategies than in the AHT treatment [18]. Nutritional supplements rich in n-3 PUFAs can decrease the AT. However, their use has been reduced due to the high dosage needed as well as to t side concominant e ects. Several meta-analysis and intervention surveys [20,23] have suggested that high dosage supplementation with n-3 PUFAs (tipically 3 g/day) can reduce signi cantly the AT in arterial hypertesive patients [22,24], but with side e ects. So, the aim of the present survey was to evaluate the e ect of low-medium dosage n-3

*Corresponding author: Diego Muñoz, Sport Science Faculty, Avenida de la Universidad s/n, 10003 Cáceres, Extremadura, Spain, Tel: 927257460 (57833); E-mail: diegomun@unex.es

Received August 23, 2017; Accepted September 04, 2017; Published September 11, 2017

Citation: Muñoz D, Maynar I, Maynar MA, Bartolomé I, Maynar IS, et al. (2017) Effect of N3-Poliunsaturated Fatty Acids as Coadjuvant in the Antihypertensive Treatment in Spanish Postmenopausal Women. Sports Nutr Ther 2: 127. doi: 10.4172/2473-6449.1000127

PUFAs (1,5 g/day) as coadjuvant treatment, in combination with other antihypertensives, in the AT of Spanish postmenopausal women.

Material and Methods

Participants

55 hypertensive postmenopausal women participated in this survey. All of them were recruited from the San Fernando Clinic of Badajoz (Spain). e participants were ramdomly divided in two groups: the supplementation group (SG; n=28) who were supplemented with n-3 PUFAs, and the control group (CG; n=27) who were not supplemented. As inclusion criteria, it was stablished by the physician that all participants should present at least 12 moths of amenorrhea, and to should be diagnosed as hypertensive at least 3 months before the beginning of the survey. General characteristics of both groups are presented in Table 1. All hypertensive participants were diagnosed in accordance with the criteria of the h Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure of 1993 (JNC-V) (SBP> 140; DBP> 90 mmHg). Antihypertensive farmacological treatment were followed homogeneously between groups, and consisted in: diet (n=8), diuretics (n=16), calcium antagonists (n=10), Inhibitors of the angiotensin-converting enzyme (n=6), calcium antagonists plus diuretics (n=10). Inhibitors of the angiotensin-converting enzyme plus calcium antagonists plus diuretics (n=5). e change of pharmacological treatment during the experimental period was xed as exclusion criteria.

e supplementation of the SG consisted in sh oil capsules composed of sh from salmon, trout, mackerel, herring and sardine with a nutritional composition equivalente to 21% of EPA and 11% of DHA. Both groups were controlled in the third and sixth months of the survey and three months a er the supplementation period (6 months). All participants were previously informed about the survey, participated voluntary and all of them gave their signed informed consent. is research was carried out under the Helsinki Declaration ethic guidelines, updated at the World Medical Assembly in Seoul in 2008, for research with human subjects.

Dietetic control

All participants followed a similar 1500 Kcal, low in sodium, diet. Before the start of the survey a nutritional questionarie was applied to each participant in order to ensure no di erences between groups in the intake of macronutrients and n-3 and n-6 PUFAs. e nutritional control was carried out by the same physician during the whole experimental period. e questionarie consisted of 3 consecutive days (2 weekdays and 1 weekend day) registry. e same registry was applied to all partincipans at the beginning, at the third and sixth monts of the supplementation period and three monts a er this period. In order to determine macro and micronutrients of their diets, di erent tables of nutricional composition were used [25]. It was previously objecti ed and protocolized the di erent quantities of food ingested by participants, stablishing a standardization in order to diminished the error in the nutritional records introduced in the databases.

Anthropometric meassurements

Antrhopometric characteristics of all participants were evaluated always at the same time. To determine the body wheight, a Seca weighing machine (Hamburg, Germany) with a precision of ± 100 g was used; to determine the height, a Seca tallimeter (Hamburg, Germany) with a precision of ± 1 mm was used; body fat percentajes were measured with a Holtain plicometer (Crymych, United Kingdom) with a precision of ± 0.2 mm. e equations used to calculate the body fat mass were determined by Porta et al., (1993) [26] of the Spanish Group of Cineanthropometry. Body mass index (BMI) was calculated dividing body wheigh (kg) by squared heigh (m^2).

Blood arterial pressure meassurement

Bloord arterial pressure was meassured in sitting position in the le forearm, leaning it in a so surface, at the heart high. Each measurement was repeated three times in similar conditions, waiting three minutes between meassurements. All measurements were performed by the same skilled physician with an es gmonamoter of mercury (Riester, 660-2-306). e measurements were made at the beginning of the survey and each 15 days of the experimental period. All evaluations were performed in the same clinic, in similar conditions.

Blood samples determination

One blood extraction was taken of the antecubital vein to each participant. e extrations were performed in the morning a er, at least, 8 hours of fasting. Blood samples were ploted in glass tubes with lithium herparine. Once obtained, the samples were centrifuged at 2500 rpm during 10 minutes. A er this process, erythrocytes were isolated, extracted from plasma and washed three times with a sodium chloride at 0.9%. Finally, they were frosted at -80ºC until biochemical analysis. Total plasma cholesterol and tryglycerides were determined by spectrophotometry, using a Hitachi 717 autoanalyzer and commercial kits for biochemical determination. To determine total fatty acids in plasma and erythrocyte, 0.5 mL were extrcted of each sample, then, 2 mL of methanol/benzene (4:1) with an internal pattern (17:0) were added. Once mixed, the samples were so ly shaked in a magnetic stirrer while 200 µL of Acetil chloridre were progressively added. A er that, the samples were stoppled and sealed with Te on in order to avoid evaporation losses. Once sealed, the samples were heated at 100°C f one hour and cooled in coold water. en, 5 mL of CO_3 at 6% were slowly added to each sample to stop the reaction and neutralize the mixtures. A er that the samples were centrifugued at 6000 rpm during 5 minutes. en, the benzene extracts containing mutilated fatty acids were taken for the tubes to be injected in the chromatographer.

For each sample, 3 µL of benzene extrac were injected. A gas chromatographer HP-5890 Series II was used to determine the biochemical analysis. is chromatographer was equipped with a HP-5972 mass spectrometer detector. e column used to determinate the samples was a capilar column SGE-BPX70 of 50 m. 0.33 × 0.25. e fatty acids determined with this technique were: saturated fatty acids (SFAs): 14:0, 16:0, 18:0; Monounsaturated fatty acids (MUFAs) 16:1, 18:1 y 20:1; n-6 poliunsaturated fatty acids (n6-PUFAs): 18:2, 18:3.6, 20:3 y 20:4; and n-3 poliunsaturated fatty acids (n3-PUFAs): 18:3.3, 20:5, 22:5 y 22:6.

Statistical analysis

All data were analyzed with the so wa IBM SPSS Statistics in the version 22.o for windows

signi cance was xed in 5% ($p<0.05$). Wilcoxon test was used to compare di erences between each group alog the di erent moments of evaluation.

Results

Participants characteristics

All the 55 women completed the survey. Table 1 recopilates the characteristics of both groups at the beginning of the survey. is data manifest an accurate adaptation of the participants to the inclusion criteria.

Dietary intake of cholesteroland fatty acids during the survey

Table 2 refects the weekly nutritional intake of SFAs, MUFAs, n3-PUFAs and n6-PUFAs of all participants of both groups.

Anthropometric evaluation

Table 3 shows the anthropometric characteristics of both groups during the survey.

As it can be observed in Table 3, no anthropometric changes are produced in the CG. However, the SG experienced a highly signi cant ($p<0.001$) diminution in the tripecs and subscapular folds a er 6 months of supplementation. Additionally, 3 months a er the supplementation period, the diminution in body wheigh ($p<0.01$) and in triceps ($p<0.001$), subscapular ($p<0.001$) and abdominal ($p<0.001$) folds maintain signi cantly lower in comparison to the initial values.

Biochemistry	Quantity
Cholesterol	1285.40 ± 272.10
Saturated Fatty Acids (SFA)	106.45 ± 44.71
Monounsaturated Fatty Acids (MUFAs)	174.35 ± 82.08
Total Polyunsaturated Fatty Acids (PUFAs)	52.71 ± 28.55
C14:0	9.44 ± 5.85
C16:0	63.06 ± 25.74
C18:0	21.21 ± 9.52
C16:1	7.44 ± 3.19
C18:1	154 ± 74.93
C18:2-6	48.6 ± 29.25
C18:3-3	0.36 ± 0.27
C20:4-6	3.35 ± 1.41
C20:5-3 (EPA)	0.89 ± 0.90
C22:6-3 (DHA)	2.38 ± 2.13

Table 2: Weekly intake of Cholesterol (mg/week) and fatty acids (g/week).

Blood pressure and lipidic pro le

Table 4 shows data about blood pressure and total plasma cholesterol and tryglicerids concentrations during the research period.

Table 4 shows that no changes have been occurred in any paramete of the CG. In the SP, the SBP decreased signi cantly ($p<0.01$) during the supplementation period, and it was maintained decreased ($p<0.05$) three monts a er this period, in comparison to the initial values. However, the DBP only decreased signi cantly ($p<0.05$) a her 6 months of supplementation. Total cholesterol decreased ($p<0.05$) a er 3 months a er supplementation and it was maintained ($p<0.05$) 3 months a er the supplementation period. Tryglycerides only reaches statistical signi cance a her 6 months of supplementations, being higher ($p<0.05$) in comparison to the initial values.

Total plasma fatty acids concentrations

Table 5 presents the e ects of MUFAs supplementations in the total plasma fatty acids pro le.

As previously occurred, no changes were produced in the CG in any parameter. e n3-PUFAs supplementation a ected the levels of DHA and EPA, wich increased ($p<0.05$) a er 3 months of supplementation, a er 6 months of supplementation ($p<0.001$), and continued augmented ($p<0.001$) a er three months a er the supplementation period. N3-PUFAs also showed a similar trend during the survey. N6/n3-PUFAs index decreased ($p<0.05$) a her 6 months of supplementation, and maintained these values three months a er the end of the supplementation ($p<0.05$). It is remarkable that a er the survey the FA C24:1, C18:2-6, C20:3-6, C20:4-6, C20:5-3, C22:6-3 ($p<0.001$); C18:3-6 ($p<0.01$); C14:0 and C18:1E ($p<0.05$) increased in comparison to the initial values.

Erythrocite fatty acids pro le

 e results of the di erent percentajes of fatty acids in the erythrocyte membrane are presented in Table 6.

It can be observed in the Table 4 that no changes occurred in

Some previous surveys have demonstrated a diminution in the blood pressure as consequence of n3-PUFAs [22,28], but with dosages higher than 3 g/day. In this sense, surveys with animas and humans have demonstrated that EPA and DHA are incorporated in a di erent way in plasma [29], platelets, cellular membranes [6] and fatty tissue [30]. According to these reports, the diminution in the SBP experienced by the SG could be due to a progressive doby accumulation of n3-PUFAs during the supplementation period. It is highly remarkable here that these participants had previously had a low nutritional intake of these nutrients. So, the administration of this sh oils in this survey could e ectively reduce their BP. In fact, this diminution is higher when the supplementation period is lengthened. eoretically, this n3-PUFAs accumulation could maintain the BP diminution three months a her the supplementation. However, the DBP diminutions were produced more slowly, reaching the statistical signi cance ($p<0.05$) 6 months a her the beginning of the supplementation period. A er the treatment, the BP trends to return to the previous values, without statistical signi cance (Table 4). Additionally to these cardiovascular e ects, anthropometric changes were produced in this survey. e SG experienced a diminution of subcutaneous body fat. is is a remarkable fact, because the subcutaneous fat induces a great tension on the cardiovascular system, increasing the cardiac output and nally reaching the BP. is periferical subcutaneous fat reduction could reduce the BP by itself. It should be considered that in the previous surveys the skinfolds were not considered among hypertensive patients and this could taint the obtained results. Cholesterol concentrations were high (200 mg/dL) during all the survey and only decreased singni cantly at the third month os the supplementation. is fact reinforces the results previously obtained in similar populations with sh oils and vitamin E [31], as well as with an increment in the intake of PUFAs from extra virgin olive oil [32]. In relationship to total plasma FA (Table 5), the increment of FA 16:0 and C18:0 experienced in the SG at 3 and 6 months of supplementation can be due to a greater mobilization of periferical fat mass as consequence of a higher n3-PUFAs intake. In the

Citation: Muñoz D, Maynar I, Maynar MA, Bartolomé I, Maynar IS, et al. (2017) Effect of N3-Poliunsaturated Fatty Acids as Coadjuvant in the Antihypertensive Treatment in Spanish Postmenopausal Women. Sports Nutr Ther 2: 127. doi: 10.4172/2473-6449.1000127