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Original Article

Mediterranean diet effects on ventricular premature complexes

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Abstract

Aim: The aim of this study was to evaluate the relationship between ventricular premature complexes (VPC) and Mediterranean diet score. Rhythm disturbances in the heart significantly affect the quality of life of the patients.

Material and Methods: This study was conducted on 50 patients with palpitations who were referred to the cardiology outpatient clinic and had more than 10000 VPC per day as a result of a 24-hour holter, and 50 patients who presented with palpitations but had less than 10,000 VPC in the holter. Diet quality was determined by scoring method (5, 6-9 and ≥10 points) 'Mediterranean Diet Adaptation Scale' and compared between groups.

Results: There was no difference between the two groups in terms of clinical and demographic characteristics. Mediterranean diet scores were found lower in patients with VPC's ≥10.000/day ($p<0.001$). There was a significant negative correlation found between number of VPC and Mediterranean diet score ($p<0.001$, $r = -0.652$).

Conclusion: The protective role of Mediterranean diet type nutrition on the frequency of VPC was clearly observed in our study. This study, which is one of the limited numbers of studies examining the relationship between Mediterranean diet and VPC, may be helpful in understanding the pathophysiology of VPC.

Keywords: Ventricular premature complexes; Mediterranean diet score; arrhythmia

INTRODUCTION

A style of diet that represents the typical nutritional habits of populations surrounding the Mediterranean Sea includes consumption of high rates of fruits, vegetables, monounsaturated fats, fish, whole-wheat grains, legumes and nuts, as well as low amounts of red meat (1). Such styles of healthy nutrition have an antiarrhythmic effect potential with their anti-inflammatory, antioxidant and cytoprotective effects (2). Previous studies have determined the protective effect of the Mediterranean diet from atrial fibrillation (3). While the antiarrhythmic effects associated with some components of the Mediterranean diet (fruits, walnuts and olive oil) have been determined (4), the number of studies that have examined the antiarrhythmic effects of the Mediterranean diet as a whole are still limited.

Although ventricular premature beats are the most common form of arrhythmias in both patients with and without structural heart disease, ventricular premature beats may cause long-term left ventricular failure in patients with normal heart structure (5). Increased frequency of ventricular premature complexes (VPC) may be associated with mental and physical stress or lifestyle habits (6) as well as with cardiovascular risk factors such as hypertension, dyslipidemia, diabetes mellitus, and coronary artery disease (7). Frequent VPC may cause tachycardiomyopathy, and therefore may lead to increased mortality and morbidity (8,9).

This study aims to evaluate the relationship between frequent Ventricular Extrasystoles (VPC) disease and Mediterranean diet score (10).

MATERIAL and METHODS

Patients with palpitations who were admitted to the cardiology outpatient clinic of Süleyman Demirel University between December 2018 and September 2019, with more than 10,000 VPC per day as a result of a 24-hour Holter, and patients without 10000 VPC per day, were included in the study. Caffeine-containing beverages, stimulants,

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drugs that can affect heart rhythm were discontinued 72 hours before the holter test. Many publications and guidelines suggest the cut off value of VPC as 10,000/day for catheter ablation or medical therapy (7). A total of 397 patients were evaluated by the cardiologist and the study was completed when both groups reached 50 patients. "Questionnaire of Mediterranean diet adherence" is a questionnaire validated in Turkish (11). In the questionnaire of Mediterranean diet adherence, 14 questions were asked by the researcher (Table 1) (12). Colored visual images belonging to foods were used to assess the portion sizes consumed by individuals (13). We assessed the individual consumption of vegetables, fruits, legumes, nut, whole grains, fermented dairy product, fish and monounsaturated fats, average alcohol and red meat according to the scoring method of (≤5, 6-9 or ≥10 points) (12). Individuals with higher points were considered to be fed more consistently with the Mediterranean diet (14,15). Body weight (kg), height (cm), and waist circumference measurements (cm) of the individuals were taken in accordance with the measurement technique (16) and body mass index (BMI) was calculated according to these measurements. BMI was calculated by dividing body height by the square of height (m2). The waist to height ratio is a measure of the distribution of body fat. It is calculated as waist measurement divided by height measurement (17). Hypertension was defined as patients with a systolic/diastolic blood pressure of 140/90 mmHg or higher and/or taking any antihypertensive drugs. Diabetes mellitus was evaluated as patients with fasting plasma glucose level≥126 mg/dL or actively taking oral anti-diabetics and/or insulin. Hyperlipidemia was defined as a total cholesterol level≥200 mg/dL. Patients with an active infection, tachycardia due to secondary causes, congestive heart failure (also VPC induced tachycardiomyopathy), symptomatic congenital heart disease, symptomatic valvular heart disease, diagnosed coronary artery disease, diagnosed psychiatric disorder, and eating disorders such as anorexia neurosis and bulimia neurosis were not included in the study. Necessary permissions were obtained for carrying out the study.

Table 1. Validated 14-item Questionnaire of Mediterranean diet adherence.

Questions	Criteria for 1 point
1. Do you use olive oil as main culinary fat?	Yes
2. How much olive oil do you consume in a given day (including oil used for frying, salads, out-of-house meals, etc.)?	≥4 tbsp
3. How many vegetable servings do you consume per day? (1 serving : 200 g [consider side dishes as half a serving])	≥2 (≥1 portion raw or as a salad)
4. How many fruit units (including natural fruit juices) do you consume per day?	≥3
5. How many servings of red meat, hamburger, or meat products (ham, sausage, etc.) do you consume per day? (1 serving: 100–150 g)	<1
6. How many servings of butter, margarine, or cream do you consume per day? (1 serving: 12 g)	<1
7. How many sweet or carbonated beverages do you drink per day?	<1
8. How much wine do you drink per week?	≥7 glasses
9. How many servings of legumes do you consume per week? (1 serving : 150 g)	≥3
10. How many servings of fish or shellfish do you consume per week? (1 serving 100–150 g of fish or 4–5 units or 200 g of shellfish)	≥3
11. How many times per week do you consume commercial sweets or pastries (not homemade), such as cakes, cookies, biscuits, orcustard?	<3
12. How many servings of nuts (including peanuts) do you consume per week? (1 serving 30 g)	≥3
13. Do you preferentially consume chicken, turkey, or rabbit meat instead of veal, pork, hamburger, or sausage?	Yes
14. How many times per week do you consume vegetables, pasta, rice, or other dishes seasoned with sofrito (sauce made with tomatoand onion, leek, or garlic and simmered with olive oil)?	≥2

Statistics analysis

All statistical analyses were performed using SPSS for Windows version 19.0 (SPSS, Chicago, IL). Number of each group was adjusted as 50 patients. We calculated the minimum number of individuals that should be sampled with 90% power and 0.05 Type-I error as at least 44 (R 3.0.1. open source program). Primary effect variable was calculated as ± 0.18. For the descriptive statistics of the data, mean, standard deviation, rate, and frequency values were used. The Kolmogorov–Smirnov test was used to evaluate whether the distribution of continuous variables were normal. For the analysis of parametric data, Student's t-test was used. For the analysis of nonparametric data, the Mann–Whitney U test was used. The v2 test was used to compare the categorical variables between groups. For correlation analysis to assess correlation found between number of VPC and Mediterranean diet score, Pearson correlation analysis was used. Statistical significance was defined as $p<0.05$.

RESULTS

Table 2 shows the baseline parameters of the study groups. There was no difference between the two groups in terms of clinical and demographic characteristics. However, Mediterranean diet scores were found lower in patients with VPC's ≥10.000/day ($p<0.001$). Figure 1 shows the significant negative correlation found between number of VPC and Mediterranean diet score ($p<0.001$, $r=-0.652$).

Table 2. Baseline general and clinical characteristics of the study population

Variables	VPC group (n=50)	Control group (n=50)	p value
Age, years	57.0 ± 10.6	55.1 ± 9.4	0.354
BMI, kg/m2	29.4 ± 3.1	27.7 ± 4.2	0.122
Waist circumference, cm	86.9 ± 7.3	85.1 ± 9.9	0.259
Waist to height ratio	0.54 ± 0.06	0.53 ± 0.09	0.722
Smoking, n (%)	22 (44.0)	15 (30.0)	0.147
Hypertension, n (%)	6 (12.0)	4 (8.0)	0.505
Hyperlipidemia, n (%)	12 (24.0)	10 (20.0)	0.629
Diabetes Mellitus, n (%)	6 (12.0)	5 (10.0)	0.749
Female, n (%)	30 (60.0)	33 (66.0)	0.534
Married, n (%)	16 (32.0)	20 (40.0)	0.403
Ejection Fraction, (%)	62.3 ± 4.1	61.5 ± 6.2	0.433
Education level, n (%)			
Literate	10 (20.0)	12 (24.0)	
Middle School	22 (44.0)	38 (20.0)	0.807
High School and above	18 (36.0)	19 (38.0)	
Physical activity			
Sedentary (<600 METs-min/week)	30 (60.0)	32 (64.0)	
Inactive (600-3000 METs- min/week)	19 (38.0)	17 (34.0)	0.812
Active (>3000 METs- min/week)	1 (2.0)	1 (2.0)	
Mediterranean diet score	5.5 ± 1.9	7.2 ± 1.7	<0.001

Data are given as mean ± standard deviation or number (%) [n (%)], BMI: Body mass index, METs: Metabolic Equivalent Minutes

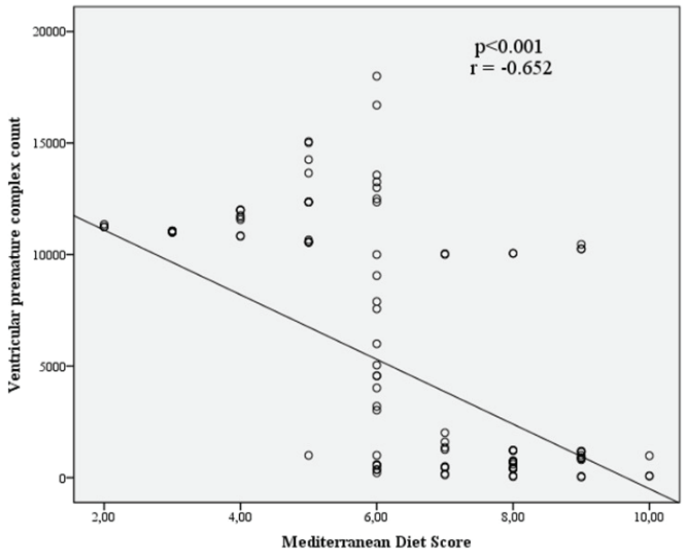

Figure 1. The correlation between Mediterranean diet score and ventricular premature complexes

DISCUSSION

In our study, Mediterranean diet scores were lower in patients with VPC's ≥10.000/day than patients with VPC's <10.000/day. Also our study has showed a statistically significant and negative correlation between Mediterranean diet score and VPC count. This study is one of the rare studies that have examined the potential antiarrhythmic effects of the Mediterranean diet.

Several studies in recent years have shown that there is a close relationship between diet and cardiovascular diseases (1,18). Today, the Mediterranean diet is accepted as one of the healthiest diets worldwide in terms of prevention of cardiovascular diseases and metabolic syndrome (10). People living in the Mediterranean region show moderate ethanol consumption, low consumption of meat and meat products and high consumption of vegetables, fruits, fish, nuts, whole-wheats and legumes (19). The main source of fat in this diet is olive oil, and it was shown that the main components of the Mediterranean diet have potential cardiovascular protective effects such as antioxidant and anti-inflammation effects (20,21).

The number of studies which have investigated the Mediterranean diet and its potential antiarrhythmic effects are limited (4,22). The Mediterranean diet includes intensive fish consumption, and therefore, increased n-3 polyunsaturated fatty acids (n-3 PUFA). An ATTICA study showed that long-term fish consumption by healthy individuals in the Mediterranean region is related with protection against arrhythmia (23). Another large-scale study demonstrated that the Mediterranean diet and adoption of antioxidant intake increase the spontaneous transformation of atrial fibrillation into sinus rhythm (24). Additionally, in the same study, low adoption of the Mediterranean diet was associated with the development of persistent atrial fibrillation, and high adoption of the Mediterranean diet was associated with prevention of atrial fibrillation.

Early-onset postoperative atrial fibrillation (POAF) is one of the most frequently encountered complications after heart surgery, and it leads to significant mortality and morbidity (25). In similarity to the pathophysiology of VPC, POAF is associated with noticeable increase in the oxidative stress of the myocardium (26,27). Several studies have obtained that suggesting supplements such as N-acetylcysteine, polyunsaturated fatty acids and antioxidant vitamins may be effective in preventing both POAF and VPC (28,29). Costanzo et al. showed that the Mediterranean diet similar to the long-term intensive antioxidant diet was found to reduce POAF after heart surgery (30).

Studies on the possible antiarrhythmic effects of nutrition are increasing in the literature. N-3 PUFA are an important element of balanced nutrition and its cardiovascular benefits have been repeatedly demonstrated in studies (31,32). Anti-arrhythmic effects of n-3 PUFA have been demonstrated in animals and in-vitro studies (33). In a study, infusion of intravenous fish oil fatty acids in dogs with attached coronary arteries prevented ventricular arrhythmias caused by stress applied to the heart (34). Fish oil intake also reduced the rate of ventricular fibrillation induced in marmoset monkeys after stimulation in the electrophysiological study (35). It has been shown that n-3 PUFA modulates the conductivity of ion channels in the cell membrane of cardiomyocyte culture and thus prevents the formation of arrhythmias (36). The n-3 PUFA also have the potential to affect sodium and calcium currents along the heart cell membranes that control heart rhythm (36). The n-3 PUFA are thought to prolong the period in which these channels are inactive and reduce their conductivity (36). Furthermore, the inclusion of n-3 PUFA in cardiac membrane phospholipids may affect the production of various eicosanoids, which may reduce fragility to arrhythmias and thereby prevent ventricular fibrillation during myocardial ischemia and reperfusion (37).

CONCLUSION

Our study has some limitations. This study is a cross-sectional study with a relatively small sample size. We do not have follow-up MACE data. So, our results should be verified by future multi-center prospective longitudinal studies with larger sample sizes.

This study which investigates the relationship between the Mediterranean diet and VPC will provide advantages in understanding the pathophysiology of VPC and may shed light on new studies. While the existing medical treatments today have limited effects in treatment of VPC, the Mediterranean diet may have a protective role and significant effects in its pathophysiology. Turkey is a semi-agricultural country, and the Mediterranean climate is dominant on approximately 20 percent of the country. Additionally, the Mediterranean diet has a "sustainable" nature, and with this characteristic, it is a highly significant nutritional model for the present and future generations. Making the Mediterranean diet

prevalent as a health policy may be beneficial in terms of the country's economy and public health. In the prevention and treatment of the disease, rather than single medical treatment options, a multidisciplinary approach with an expert team may be more effective. In the light of these data, life-long continuation of a nutritional lifestyle with a Mediterranean-type diet has a potential of reducing the incidence of VPC and other types of arrhythmia.

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