■Original Article

The Mediterranean Diet Effects on Atrial Premature Complexes.

Akdeniz Diyetinin Atriyal Prematür Kompleks Üzerine Etkileri.

🔘 Yasin Ozen[1]*, 🔘 Aliye Kuyumcu[2]

[1]Sivas Numune Hospital, Department of Cardiology, Sivas, Turkey
[2]Süleyman Demirel University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Isparta, Turkey

Abstract

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

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 APC per day as a result of a 24-hour holter, and 50 patients who presented with palpitations but had less than 10,000 APC 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 lower in patients with APC ≥10.000/day (p<0.001). A significant negative correlation was found between APC and Mediterranean diet score (p<0.001, r = -0.560).

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

Keywords: Atrial premature complexes; Mediterranean diet score; Arrhythmia

Öz

Amaç: Bu çalışmanın amacı, atriyal prematüre kompleksler (APK) ile Akdeniz diyeti skoru arasındaki ilişkiyi değerlendirmektir. Kalpteki ritim bozuklukları hastaların yaşam kalitesini önemli ölçüde etkiler.

Gereç ve Yöntemler: Bu çalışma, çarpıntı şikayeti ile kardiyoloji polikliniğine başvuran ve 24 saatlik holter sonucu günde 10000' den fazla APK' si olan 50 hasta ve çarpıntı şikayeti ile başvuran ancak APK' si 10.000' den az olan 50 hasta üzerinde yapıldı. Diyet kalitesi puanlama yöntemi (5, 6-9 ve ≥10 puan) 'Akdeniz Diyeti Uyum Ölçeği' ile belirlendi ve gruplar arasında karşılaştırıldı.

Bulgular: İki grup arasında klinik ve demografik özellikler açısından fark yoktu. APK ≥10.000/gün olan hastalarda Akdeniz diyeti skorları daha düşük bulundu (p<0.001). APC ile Akdeniz diyeti puanı arasında anlamlı bir negatif korelasyon bulundu (p<0.001, r = -0.560).

Sonuç: Akdeniz diyeti tipi beslenmenin APK sıklığı üzerindeki koruyucu rolü çalışmamızda net bir şekilde gözlendi. Akdeniz diyeti ile APK ilişkisini inceleyen sınırlı sayıdaki çalışmalardan biri olan bu çalışma, APK' nin patofizyolojisinin anlaşılmasında yardımcı olabilir.

Anahtar Kelimeler: Atriyal prematüre kompleks; Akdeniz diyeti puanı; Aritmi

Introduction

Typical dietary habits and style of societies surrounding the Mediterranean; includes high consumption of fruits, vegetables, monounsaturated fats, fish, whole wheat, legumes, and nuts, as well as low consumption of red meat[1]. This type of healthy diet has the potential to have anti-arrhythmic effects with anti-inflammatory, antioxidant, and cytoprotective effects[2]. Previous studies have identified the protective effect of the Mediterranean diet on atrial fibrillation[3]. Antiarrhythmic effects associated with foods frequently used in the Mediterranean diet, such as fruits, walnuts, and olive oil, have been identified. However, The number of studies examining the antiarrhythmic effects of the Mediterranean diet still needs to be increased.

Atrial premature complexes (APC) is a common arrhythmia generally considered benign. It has been reported that the prevalence is up to 73% in young individuals and 100% in healthy elderly individuals[4]. Despite their benign concept, APCs are more common in patients with underlying cardiac conditions such as coronary heart disease, chronic rheumatic heart disease, left ventricular dysfunction, hypertension, and hyperthyroidism. In addition, rapid APCs from arrhythmogenic foci in the pulmonary veins often precede AF attacks in patients with paroxysmal atrial fibrillation (AF)[5].

The increased burden of premature atrial contractions (APCs) and subclinical atrial tachyarrhythmias have been shown to be strong and independent predictors of incident AF and associated complications as the effect of LA structural remodeling[6], indicating the critical role of atrial electric activity in triggering AF and maintenance[7].

This study aims to evaluate the relationship between frequent APCs and Mediterranean diet score.

Material and Methods

In this study, patients who complained of palpitations in the cardiology outpatient clinic at Süleyman Demirel University between December 2018 and September 2019 and who had more than 10.000 APCs daily and also had less than 10.000 APCs. Seventy-two hours prior to the Holter test, caffeine-containing beverages, stimulants, and medications that can alter cardiac rhythm were discontinued. Many publications and guidelines recommend a cut-off value of 10,000/day for catheter ablation or medical therapy[8]. A total of 163 patients were reviewed by the cardiologist, and the study was completed when both groups reached 50 patients. The "Mediterranean diet compliance questionnaire" is a valid questionnaire for Mediterranean populations[9]. Questions were asked by the researcher in the Mediterranean diet compliance questionnaire (Table 1)[10]. The portion amounts consumed by people were assessed using colored representations of foods. The scoring system was used to evaluate the consumption of fish, monounsaturated fats, fermented milk products, whole grains, vegetables, fruits, legumes, nuts, and red meat on average (5, 6–9, or ≥10 points)[10]. Individuals with higher scores were considered to eat more consistently with the

Mediterranean diet. The body weight (kg), height (cm), and waist circumference (cm) of the individuals were taken per the measurement technique, and body mass index (BMI) was calculated according to these measurements. By dividing the body height by the height square, the BMI was determined. The waist-to-length ratio is a measure of body fat distribution calculated by dividing waist size by the height ratio. Patients with hypertension were defined as having a systolic/diastolic blood pressure of 140/90 mmHg or higher and/or taking antihypertensive medication. Diabetes mellitus was defined

as patients with fasting plasma glucose level ≥126 mg/dL or actively using oral antidiabetic and/or insulin. Hyperlipidemia was defined as a total cholesterol level ≥200 mg/dL. Patients with active infection, secondary tachycardia, congestive heart failure, symptomatic congenital heart disease, symptomatic valvular heart disease, diagnosed coronary artery disease, diagnosed psychiatric disorder, and eating disorders such as anorexia, neurosis, and bulimia were excluded from the study. In order to conduct the study, necessary patient consent and ethics committee permission were obtained.

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 home-made), 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). The number of each group was adjusted to 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). The 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 was 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. Pearson correlation analysis was used for correlation analysis to assess the correlation between the number of APC and Mediterranean diet score. Statistical significance was defined as p<0.05.

Results

The basic parameters of both groups are shown in Table 2. There was no difference between the two groups regarding clinical and demographic characteristics. However, Mediterranean diet scores were lower in patients with APC ≥10,000/day (p<0.001). The significant negative correlation between the number of APCs and the Mediterranean diet score is shown in Figure 1 (p<0.001, r= -0.560).

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

| Variables	APC group (n=50)	Control group (n=50)	p value
Age,years	51.0 ± 10.5	55.1 ± 9.4	0.214
BMI, kg/m2	33.1 ± 3.6	27.7 ± 4.2	<0.001
Waist circumference, cm	92.5 ± 11.6	85.1 ± 9.9	<0.001
Smoking, n (%)	22 (44.0)	15 (30.0)	0.147
Hypertension, n (%)	7 (14.0)	4 (8.0)	0.338
Hyperlipidemia, n (%)	13 (26.0)	10 (20.0)	0.476
Diabetes Mellitus, n (%)	7 (14.0)	5 (10.0)	0.538
Female, n (%)	28 (56.0)	33 (66.0)	0.305
Married, n (%)	25 (50.0)	20 (40.0)	0.315
Ejection Fraction, (%)	625 ± 3.2	61.5 ± 6.2	0.502
Education level, n (%)			0.643
Literate	11 (20.0)	12 (24.0)	
Middle School	24 (44.0)	38 (20.0)	
High School and above	15 (36.0)	19 (38.0)	
Physical activity			0.703
Sedentary (<600 METs-min/week)	36 (72.0)	32 (64.0)	
Inactive (600-3000 METs- min/week)	14 (38.0)	17 (34.0)	
Active (>3000 METs- min/week)	0 (0.0)	1 (2.0)	
Mediterranean diet score	3.8 ± 2.3	5.5 ± 2.1	<0.001
Data are given as mean ± standard deviation or number (%) [n (%)], BMI: Body mass index, METs: Metabolic Equivalent Minutes			
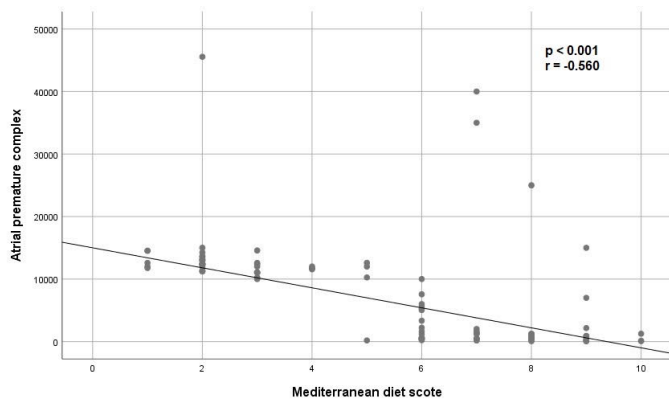
Figure 1. The correlation between Mediterranean diet score and atrial premature complexes

Dıscussion

In our study, Mediterranean diet scores were lower in patients with APC ≥10,000/day than in patients with APC <10,000/day. In addition, our study showed a statistically significant and negative correlation between the Mediterranean diet score and the number of APCs. This study is one of the few studies examining the potential antiarrhythmic effects of the Mediterranean diet.

 Many studies in recent years have shown that there is a close relationship between diet and cardiovascular diseases[11]. The Mediterranean diet is recognized as one of the healthiest diets worldwide in terms of the prevention of cardiovascular diseases and metabolic syndrome. People living in the Mediterranean region show moderate ethanol, low consumption of meat and meat products, and high consumption of vegetables, fruits, fish, nuts, whole wheat, and legumes[12]. The primary source of fat in this diet is olive oil, and the main components of the Mediterranean diet have been shown to have potential cardiovascular protective effects, such as antioxidant and anti-inflammatory effects[13]. The number of studies investigating the Mediterranean diet and its potential antiarrhythmic effects is limited[14]. Due to heavy fish consumption, the Mediterranean diet is rich in n-3 polyunsaturated fatty acids (n-3 PUFA). The ATTICA study showed that long-term fish consumption of healthy individuals in the Mediterranean region was associated with protection from arrhythmias[15, 16]. A large-scale study by Mattioli et al. showed that adopting a Mediterranean diet and antioxidant intake enhanced the spontaneous conversion of atrial fibrillation to sinus rhythm[17]. In addition, 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 the prevention of atrial fibrillation[18].

Etiology of cardiac arrhythmias is associated with alcohol or tobacco use and a marked increase in myocardial oxidative stress in addition to the risk factors such as myocardial infarction, congestive, heart failure, hypertension, diabetes mellitus, chronic obstructive pulmonary disease, Coxsackie virus, higher CHA2DS2-VASC score.

Chong et al. showed that patients with frequent APCs are at greater risk for new AF onset and other adverse cardiovascular events, including ischemic stroke, heart failure, and mortality[19]. Various studies have indicated that supplements such as N-acetylcysteine, polyunsaturated fatty acids (n-3 PUFA), and antioxidant vitamins may be effective in preventing both postoperative AF (POAF) and ventricular extrasystole[20]. Costanzo et al. demonstrated that a Mediterranean diet similar to a long-term intense antioxidant diet reduces the risk of POAF after cardiac surgery [21]. Studies on potential nutritional impacts on heart rhythm are becoming more prevalent in the literature. An essential part of a healthy diet, n-3 PUFA has been shown in numerous studies to have positive effects on the cardiovascular system[22]. Animal studies and in vitro research have both shown that n-3 PUFA has anti-arrhythmic properties[23]. In an electrophysiological study, fish oil consumption decreased the frequency of induced ventricular fibrillation in marmoset monkeys[24]. It has been demonstrated that n-3 PUFA alters the conductivity of ion channels in the cell membrane of cardiomyocyte cultures, reducing the development of arrhythmias [25]. Additionally, n-3 PUFA may have an impact on sodium and calcium currents that traverse cardiac cell membranes and regulate heart rhythm [25]. n-3 PUFAs are thought to prolong the idle time of these channels and reduce their conductivity[25]. Moreover, incorporating n-3 PUFA into myocyte cell membrane phospholipids can reduce vulnerability to arrhythmias by affecting the production of various eicosanoids, thereby preventing ventricular fibrillation during myocardial ischemia and reperfusion.

Conclusion

This investigation into the connection between the Mediterranean diet and APC may aid in our understanding of the pathophysiology of the condition and lead to further research. Although there are few effective medical treatments for APC, the Mediterranean diet may play a protective function and be crucial to understanding its etiology. Turkey is mainly agricultural, and 20% of the nation has a Mediterranean climate. The Mediterranean diet also has a "sustainable" structure, making it an important nutritional reference for current and future generations. The nation's economy and public health may gain from the spread of the Mediterranean diet as a health policy. A multidisciplinary strategy with a specialized team may be more effective in preventing and treating the disease than a single medical therapy method. In light of these findings, maintaining a Mediterranean diet and nutritional lifestyle throughout one's life may help to lower the prevalence of APC and other arrhythmias.

Our study has some limitations, including a cross-sectional design, a small sample size, and no MACE follow-up data. In addition, this study is a retrospective screening study and depends on the memory factor. Therefore, multicenter prospective longitudinal studies with bigger sample sizes should be used to validate our findings.

References

1. Yalin S, Gök H, Toksöz R. [The effects of the short-term regular exercise-diet program on lipid profile in sedentary subjects]. Anadolu Kardiyol Derg 2001; 1(3): 179-8, axv. 2002/07/10.

2. Kurçer MA, Ozbay A. [Effects of patient education and counseling about life style on quality of life in patients with coronary artery disease]. Anadolu Kardiyol Derg 2011; 11(2): 107-13. 2011/02/03. doi: 10.5152/akd.2011.028.

3. Adalet K. [Atrial fibrillation in the elderly]. Turk Kardiyol Dern Ars 2017; 45(Suppl 5): 75-82. 2017/10/05. doi: 10.5543/tkda.2017.37863.

4. Camm AJ, Evans K, Ward D, Martin AJAhj. The rhythm of the heart in active elderly subjects. 1980; 99(5): 598-603.

5. Kisheva A, Yotov Y. Risk factors for recurrence of atrial fibrillation. Anatol J Cardiol 2021; 25(5): 338-45. 2021/05/08. doi: 10.14744/AnatolJCardiol.2020.80914.

6. Wallmann D, Tüller D, Wustmann K, Meier P, Isenegger Jr, Arnold M, et al. Frequent atrial premature beats predict paroxysmal atrial fibrillation in stroke patients: an opportunity for a new diagnostic strategy. 2007; 38(8): 2292-94.

7. Haissaguerre M, Jaïs P, Shah DC, Takahashi A, Hocini M, Quiniou G, et al. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. 1998; 339(10): 659-66.

8. Ephrem G, Levine M, Friedmann P, Schweitzer PJAoNE. The prognostic significance of frequency and morphology of premature ventricular complexes during ambulatory holter monitoring. 2013; 18(2): 118-25.

9. PEHLİVANOĞLU EFÖ, BALCIOĞLU H, ÜNLÜOĞLU İJOTD. Akdeniz diyeti bağlılık ölçeği'nin türkçe'ye uyarlanması geçerlilik ve güvenilirliği. 2020; 42(2): 160-64.

10. Martínez-González MA, García-Arellano A, Toledo E, Salas-Salvado J, Buil-Cosiales P, Corella D, et al. A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. 2012.

11. Uzun Ş, Kara B, Yokuşoğlu M, Arslan F, Yılmaz MB, Karaeren HJAJoCAKD. The assessment of adherence of hypertensive individuals to treatment and lifestyle change recommendations. 2009; 9(2).

12. Kuyumcu MS, Kuyumcu A. High fructose consumption may be associated with slow coronary flow. Turk Kardiyol Dern Ars 2020; 48(7): 690-97. 2020/10/10. doi: 10.5543/tkda.2020.03205.

13. Tokgözoğlu LJTKDA. Ateroskleroz ve enflamasyonun rolü. 2009; 37(4): 1-6.

14. Martínez-González MÁ, Toledo E, Arós F, Fiol M, Corella D, Salas-Salvadó J, et al. Extravirgin olive oil consumption reduces risk of atrial fibrillation: the PREDIMED (Prevención con Dieta Mediterránea) trial. 2014; 130(1): 18-26.

15. Gücük İpek E, Güray Y, Demirkan B, Güray U, Kafes H, Başyiğit F. [The prevalence of alternative herbal medicine and nutritional complementary product intake in patients admitted to out-patient cardiology departments]. Turk Kardiyol Dern Ars 2013; 41(3): 218-24. 2013/05/25. doi: 10.5543/tkda.2013.15146.

16. Altuntaş Y, Batman A. [Microbiota and metabolic syndrome]. Turk Kardiyol Dern Ars 2017; 45(3): 286-96. 2017/04/22. doi: 10.5543/tkda.2016.72461.

17. Mattioli AV, Miloro C, Pennella S, Pedrazzi P, Farinetti A. Adherence to Mediterranean diet and intake of antioxidants influence spontaneous conversion of atrial fibrillation. Nutrition, metabolism, and cardiovascular diseases : NMCD 2013; 23(2): 115-21. 2011/07/30. doi: 10.1016/j.numecd.2011.03.005.

18. İşcan Ş, Eygi B, Beşir Y, Gökalp O. Perioperative predictors of atrial fibrillation. Anatol J Cardiol 2018; 20(3): 194. 2018/08/29. doi: 10.14744/AnatolJCardiol.2018.34946.

19. Chong BH, Pong V, Lam KF, Liu S, Zuo ML, Lau YF, et al. Frequent premature atrial complexes predict new occurrence of atrial fibrillation and adverse cardiovascular events. Europace : European pacing, arrhythmias, and cardiac electrophysiology : journal of the working groups on cardiac pacing, arrhythmias, and cardiac cellular electrophysiology of the European Society of Cardiology 2012; 14(7): 942-7. 2011/12/21. doi: 10.1093/europace/eur389.

20. Rodrigo R, Korantzopoulos P, Cereceda M, Asenjo R, Zamorano J, Villalabeitia E, et al. A randomized controlled trial to prevent post-operative atrial fibrillation by antioxidant reinforcement. Journal of the American College of Cardiology 2013; 62(16): 1457-65. 2013/08/07. doi: 10.1016/j.jacc.2013.07.014.

21. Costanzo S, De Curtis A, di Niro V, Olivieri M, Morena M, De Filippo CM, et al. Postoperative atrial fibrillation and total dietary antioxidant capacity in patients undergoing cardiac surgery: The Polyphemus Observational Study. The Journal of thoracic and cardiovascular surgery 2015; 149(4): 1175-82.e1. 2014/12/24. doi: 10.1016/j.jtcvs.2014.11.035.

22. Altay S. What is the association between obesity and diastolic dysfunction: Obesity or obesity phenotype? Turk Kardiyol Dern Ars 2018; 46(8): 649-50. 2018/12/06. doi: 10.5543/tkda.2018.10.5543/tkda.2018.16626.

23. Billman GE, Kang JX, Leaf A. Prevention of sudden cardiac death by dietary pure omega-3 polyunsaturated fatty acids in dogs. Circulation 1999; 99(18): 2452-7. 1999/05/11. doi: 10.1161/01.cir.99.18.2452.

24. McLennan PL, Bridle TM, Abeywardena MY, Charnock JS. Comparative efficacy of n-3 and n-6 polyunsaturated fatty acids in modulating ventricular fibrillation threshold in marmoset monkeys. The American journal of clinical nutrition 1993; 58(5): 666-9. 1993/11/01. doi: 10.1093/ajcn/58.5.666.

25. Leaf A, Kang JX, Xiao YF, Billman GE. n-3 fatty acids in the prevention of cardiac arrhythmias. Lipids 1999; 34 Suppl: S187-9. 1999/07/27. doi: 10.1007/bf02562284.