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Is there a seasonal feature of new-onset atrial fibrillation after coronary artery bypass graft surgery?

Koroner arter bypass greft cerrahisi sonrası yeni gelişen atrial fibrilasyonun mevsimsel özelliği var mıdır?

Fatih Ada, Vural Polat

Sivas Cumhuriyet University School of Medicine, Department of Cardiovascular Surgery, Sivas, Turkey
Corresponding author: Fatih Ada, MD, Sivas Cumhuriyet University School of Medicine, Department of Cardiovascular Surgery, Sivas, Turkey
E-mail: drfatihada@gmail.com
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Fatih Ada
Vural Polat

ORCID IDs of the authors:
F.A. 0000-0002-6953-5906
V.P. 0000-0001-9553-3990

SUMMARY

Objective: Atrial fibrillation (AF) is seen as very common after cardiac surgery. Postoperative AF occurrence increases mortality and morbidity. Deterioration of clinical condition of the patients results prolongation of hospital stay and increases economic burden. Many risk factors that have an impact on the development of postoperative AF are known. Low vitamin D level has been added to these factors in recent years. Blood serum levels of vitamin D is varied seasonally. Therefore, these factors can be expected to have a seasonal effect on development of postoperative AF. The aim of this study is to investigate the presence of annual features of postoperative AF.
Method: This study is a retrospective analysis of patients who developed atrial fibrillation after coronary artery bypass graft surgery in the Cardiovascular Surgery Department of Sivas Cumhuriyet University between 2017 and 2019 years. The study started after decision of Sivas Cumhuriyet University Local Ethics Committee No. 2019-04/04. Preoperative, intraoperative and postoperative parameters of the patients were evaluated. 39 patients who developed atrial fibrillation after coronary artery bypass graft surgery included the study. Statistical analyses were performed according to the seasons of atrial fibrillation which developed after coronary artery bypass grafting.
Results: Postoperative AF development is observed seasonally most often in winter and less in summer. However, the seasonal incidence is similar in autumn and spring. On the other hand, postoperative AF was observed more frequently in males (69,2%) than females (30,8%).
Conclusions: Postoperative atrial fibrillation showed a seasonal difference. This difference supports the relationship between vitamin D deficiency/insufficiency and postoperative AF development.
Keywords: Atrial fibrillation, coronary artery bypass graft, season, surgery, vitamin D

ÖZET

Amaç: Kardiyak cerrahi sonrasında atriyal fibrilasyon (AF) çok sık görülmektedir. Postoperatif AF, mortalite ve morbiditeyi artırmaktadır. Hastanın kliniğinin bozulması hastane kalış süresinin uzamasına dolayısıyla ekonomik bir yüke de sebep olmaktadır. Postoperatif AF'nin gelişiminde birçok risk faktörü bilinmektedir. Son yıllarda bu faktörlere D vitamini eksikliği de eklenmiştir. D vitamininin, kan serum düzeyi mevsimsel olarak değişmektedir. Dolayısıyla sayılan

faktörlerin postoperatif AF gelişiminde mevsimsel etkiye yol açması beklenebilir. Bu çalışmada, postoperatif AF gelişiminin mevsimsel özelliğinin olup olmadığının araştırılması amaçlanmıştır.
Yöntem: Bu çalışma, 2017 - 2019 yılları arasında Sivas Cumhuriyet Üniversitesi Kalp Damar Cerrahisi Kliniğinde koroner arter baypas greft cerrahisi sonrası atriyal fibrilasyon gelişen hastaların retrospektif bir analizidir. Çalışmaya, Sivas Cumhuriyet Üniversitesi Yerel Etik Kurulunun 2019-04 / 04 sayılı kararı sonrası başlandı. Hastaların preoperatif, intraoperatif ve postoperatif parametreleri değerlendirildi. Çalışmaya koroner arter baypas greft ameliyatı sonrası atriyal fibrilasyon gelişen 39 hasta dâhil edildi. Koroner arter bypass greft sonrası atrial fibrilasyon gelişen hastaların mevsimlere göre istatistiksel analizleri yapıldı.
Bulgular: Postoperatif AF gelişimi mevsimsel olarak en sık kış mevsiminde en az yaz mevsiminde görülmektedir. Sonbahar ve ilkbahar mevsiminde görülme sıklıkları ise bir birine benzerdir. Öte yandan postoperatif AF'nin erkeklerde (%69,2), kadınlardan (%30,8) daha sık görüldüğü izlenmiştir.
Sonuç: Postoperatif AF'nin mevsimsel bir değişim gösterdiği izlenmiştir. Bu değişim D vitamini eksikliği ve postoperatif AF gelişimi arasındaki ilişkiyi destekler niteliktedir.
Anahtar sözcükler: Atriyal fibrilasyon, koroner arter bypass greft, mevsim, cerrahi, vitamin D

INTRODUCTION

The incidence of arrhythmia is between 10-53% after cardiac surgery. The most common arrhythmia after cardiac surgery is atrial fibrillation, which increases mortality and morbidity and also causes prolonged hospital stay and deterioration of the patient's clinic. There are many reasons for AF after cardiac surgery. Hypertension, heart failure, chronic lung disease, right coronary artery lesion, coronary artery disease accompanied by valve diseases, metabolic changes are just a few of these factors. There were no reports in the literature regarding the seasonal characteristics of AF, which develops after coronary artery bypass graft surgery. Kupari et al. reported a study on the relationship between acute AF and low temperature. In this study, it was concluded that AF peaked in December and January and was minimal level in May and June [1]. Watanabe et al.'s study of the seasonal relationship between paroxysmal AF showed similar results [2]. However, both studies remaining an epidemiological study that did not mention the relationship between vitamin D in conclusion.

There are many publications in the literature on low vitamin D levels and postoperative AF [3,4]. In recent years, there are many publications in the literature regarding the relationship between vitamin D deficiency and postoperative AF development. In addition to the known risk factors, the relationship between vitamin D deficiency and the seasonal characteristics of AF, which developed after coronary artery bypass graft surgery is an important issue to examine. In this study, we investigated whether there was a difference in AF seen after coronary artery bypass graft operation during the summer season when vitamin D levels were peak, and during the winter season when it was lowest.

MATERIAL AND METHODS

This study is a retrospective analysis of AF after coronary artery bypass graft surgery at Sivas Cumhuriyet University Cardiovascular Surgery Department between 2017- 2019 with the decision of the number 2019-04/04 of the Sivas Cumhuriyet University local ethics committee. The study included 39 patients who developed AF after coronary artery bypass graft surgery. The written consent form was obtained from all patients. Patient information was obtained from patient cards and the hospital registry system. The anamnesis of the patients was carefully taken, and the physical examinations were made to identify vascular and other pathological diseases.

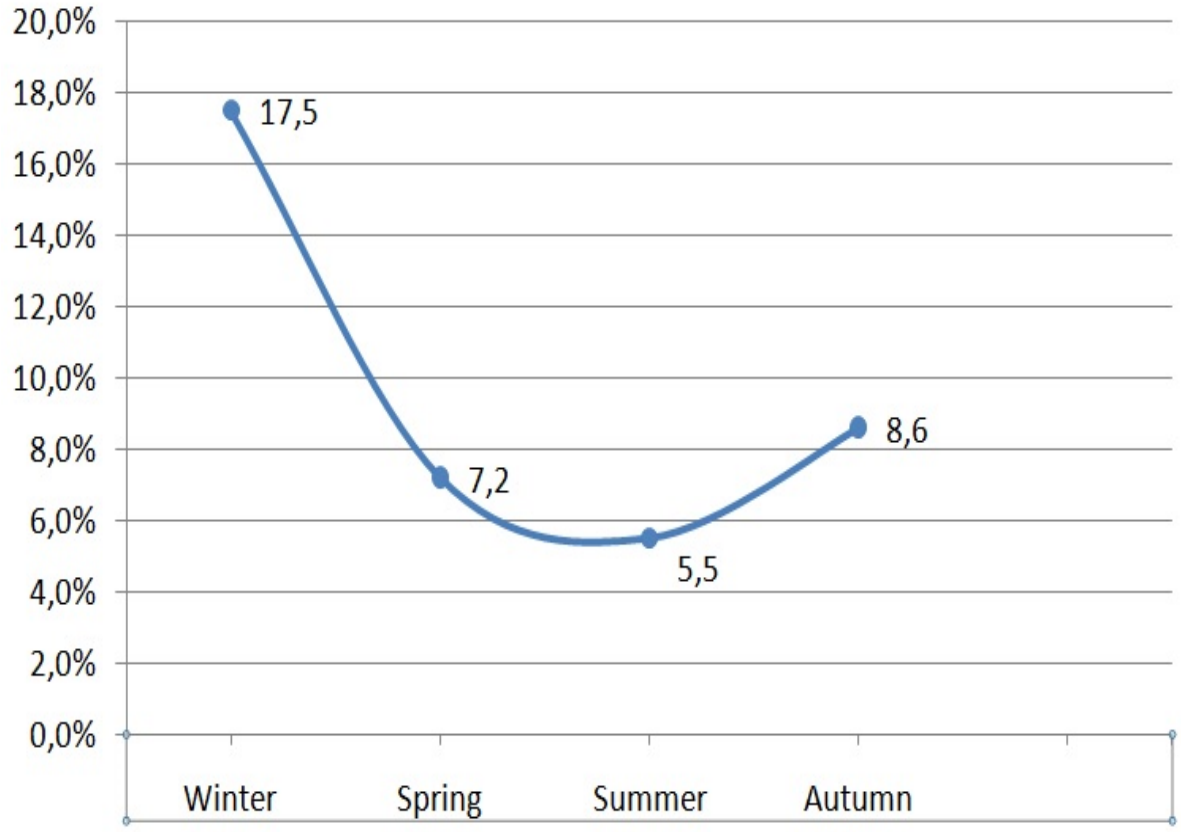
Patients who had preoperative AF, late AF, combined cardiac surgery, and who used vitamin D for any reason before surgery were excluded from the study. Demographic data such as age, sex, habits (tobacco use), drugs, the season of operation, operational data (cross-clamp time, cardiopulmonary bypass time), echocardiography data (ejection fraction (EF), left atrial diameter) and laboratory data of the patients were evaluated. All these data were assessed according to seasonal characteristics of postoperative AF.

Statistical Analysis: In the study, continuous variables were expressed as mean ± SD and categorical variables as frequency and percentage. SPSS 24 package statistical program (StataCorp LP, College Station, TX, USA) was used for descriptive statistics and CI calculations.

RESULTS

Between January 2017 and January 2019, a total of 412 aortocoronary bypass graft surgery was performed at our clinic. Of these surgeries; 33,4% were performed in the spring season, 22,5% in the autumn season, 22,1% in the winter season, and

22% in the summer season (Graph 1). Postoperative AF occurrence was found as follows; 17,5% (91/16) in winter, 8,6% (93/8) in autumn, 7,2% (138/10) in spring and 5,5% (90/5) in summer. Of the patients who developed postoperative atrial fibrillation, 69,2% were male, 30,8% were female, and the mean age was 70,2 ± 7,9 (Table1). In the preoperative tests; mean potassium values were 4,26 mEq/L, mean ejection fraction was 49,9% and mean left atrium diameters were 45,1 cm/m2 (Table 2). The mean cross-clamp time was 51,5 minutes and the mean total bypass time was 89,2 minutes (Table3).



Graph 1: Note the seasonal change in AF development after aortocoronary bypass graft surgery. (AF: Atrial Fibrillation)

Table 1: Demographic Data of the patients. (ACE: Angiotensin-Converting Enzyme)

Demographic Data	**Percentage (%) or Mean (x̄+sd)**	**(n) or min-max**
Male	69,2	27
Female	30,8	12
Age	70,2±7,9	53-85
Body-mass index (kg/m^2)	27,7±3,4	20,4-35,4
Tobacco use	28,2	11
Diabetes Mellitus	41	16
Hypertension	69,2	27
Cerebrovascular disease	12,8	5
Chronic renal disease	28,2	11
Chronic obstructive pulmonary disease	20,5	8
Obstructive sleep apnea	15,4	6
Peripheral artery disease	**23,1**	**9**
Hyperthyroidism	**10,3**	**4**
Hypothyroidism	**10,3**	**4**
Mitral valve failure	**5,1**	**2**
Mitral valve stenosis	**5,1**	**2**
ACE inhibitor use	**30,8**	**12**
Beta-blocker use	**51,3**	**20**
Statin use	**10,3**	**4**
Acetylsalicylic acid use	**46,2**	**18**

Table 2: Laboratory and echocardiographic data of the patients.

Laboratory and echocardiographic data	**Mean (x̄+sd)**	**Min-Max**
Estimated glomerular filtration rate (eGFR) (ml/min/m^2)	71,8	20,4-130,4
Calcium (mg/dL)	9,03	7,7-10
Potassium (mEq/L)	**4,26**	**3,4-5,36**
Ejection fraction (%)	**49,9**	**30-60**
Left atrial diameter (cm/m^2)	**45,1**	**39-58**

Table 3: Intraoperative and postoperative data of the patients.

Intraoperative and postoperative data	**Mean (x̄+sd)**	**Min-Max**
Aorta coronary graft count	3,2	2-4
Cross clamp time (minutes)	51,5	24-112
Total bypass time (minutes)	**89,2**	**45-156**
Erythrocyte suspension need (units)	**2,2**	**0-5**
Fresh frozen plasma needs (units)	**5,5**	**2-11**
The day of postoperative atrial fibrillation	**2,9**	**1-12**

DISCUSSION

There are many publications in the literature about AF after coronary artery bypass graft operations. In recent years, these publications have explicitly focused on the possibility that vitamin D deficiency may play a role in the development of postoperative AF. The synthesis of vitamin D is dependent on sunlight. 90% of vitamin D synthesis occurs on human skin by ultraviolet (UV) B sunlight. In addition, fish, liver, fish oils, egg yolk, mushrooms, and other products with vitamin D additives are available [5]. The fact that UV-B is the main factor in the synthesis of vitamin D suggests that this synthesis may differ by seasonal. Dogan and colleagues noted that low vitamin D levels were seen most often in the winter and autumn seasons and least in the summer and spring seasons [6]. The seasonal characteristics of vitamin D levels are associated with geographic hemispheres. Indeed, Bolland and colleagues in New Zeland found the opposite result in the northern hemisphere. According to the results in the southern hemisphere, the most frequent months of vitamin D insufficiency were in June, July, and August, while January, February, and March were at least [7]. In regions such as the Antarctic, the level of vitamin D in the winter season was found to be completely poor, and vitamin D support needed [8]. In the study of Lagunova et al.noted that vitamin D level was lowest in winter, increased in spring, peaked in summer and again decreased in autumn [9]. In the study of Bouillon et al. in the northern hemisphere also showed that vitamin D levels were lowest during the winter and autumn seasons [10].

Serum vitamin D levels are defined as deficiency if <20 ng / mL and insufficiency if <30 ng / mL. Vitamin D deficiency has a prevalence of between 25-57% in the USA (11). There are some risk factors for vitamin D deficiency. These risk factors are; advanced age, darkly pigmented skin, institution or home dependancy, to be far from equator, winter season, cover-up clothing and / or sunscreen, air pollution, smoking, obesity, malabsorption, renal disease, liver disease, medications: such as, anticonvulsants, glucocorticoids, antirejection, and human immunodeficiency virus medications [11]. Vitamin D increases bone density and reduces the risk of bone and tooth fractures, cancer, multiple sclerosis, diabetes mellitus, allergies and asthma, infection, mental illness, kidney disease [12]. It has also been shown to reduce musculoskeletal pain and cardiovascular mortality (12). Vitamin D deficiency is a risk factor for cardiovascular diseases. This risk is explained by endovascular-protective effect mechanism of vitamin D [13, 14].

AF often develops on the second day after coronary artery bypass surgery. In our study, postoperative AF occurred on the 2,9. day, similar to that in the literature. Advanced age, history of atrial fibrillation, hypertension, heart failure, chronic lung disease, right coronary artery lesion, coronary artery disease accompanying valve diseases, metabolic changes, low plasma magnesium level (<0.95 mmol/l), pre-surgical discontinuation of beta-blocker therapy, inadequate protection of the atrium during surgery, transfusion of blood products are known causes that increase the risk of developing AF during the postoperative period [15-18]. Polat and his colleagues noted that low EF and left primary coronary lesion were severe risk factors for postoperative AF [19]. Şener and colleagues reported that low EF is a predictor of postoperative AF [20]. In the study of Cerit and colleagues, found low vitamin D levels in patients who developed postoperative AF. However, it was found that low vitamin D level was not valid as a predictor for postoperative AF [3].

Beta-blockers, amiodarone, and cardioversion are using in the treatment of postoperative AF. However, amiodarone is most commonly used in postoperative AF. In the study of Çiçekçioğlu and colleagues, they noted that amiodarone was not effective enough in the treatment of postoperative AF [21]. Cerit et al. Investigated the effects of preoperative vitamin D supplementation on postoperative AF development. According to this study, vitamin D has no impact on preventing postoperative AF in patients with insufficiency, but it helps to reduce postoperative AF in patients with a deficiency [22].

CONCLUSION

The seasonal change of postoperative AF supports its relationship with vitamin D. However, the development of postoperative AF is multifactorial. Therefore, prospective randomized controlled trials with large populations are needed to fully establish the relationship between postoperative AF and vitamin D.

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