



Impaired Sleep Quality in Patients with Supraventricular Tachycardia Improves after Radiofrequency Catheter Ablation

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ABSTRACT

Objective: Radiofrequency catheter ablation (RFA) treatment is applied in patients with symptomatic supraventricular tachycardia (SVT). It is known that the frequency of SVT increases in patients with poor sleep quality (PSQ). However, especially in patients with frequent SVT episodes at night, PSQ occurrence and the effect of RFA therapy on PSQ have not been evaluated. The aim of this study was to evaluate PSQ in patients undergoing RFA treatment due to SVT and detect the effect of RFA treatment on PSQ.

Material and Methods: This cross-sectional study included 153 patients who underwent RF ablation with a diagnosis of SVT in our clinic. Self-reported sleep quality was carried out in all patients in addition to routine examinations before ablation and at the first month control. The effect of RFA treatment on self-reported sleep quality in patients with SVT was evaluated.

Results: Patients with SVT had a PSQ of 66%. RFA treatment in patients with SVT was shown to positively and significantly reduce subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, daytime dysfunction, and global Pittsburgh Sleep Quality Index (PSQI) (54%) ($p < 0.001$).

Conclusion: PSQ is common in patients with SVT, and PSQ improves significantly with RF ablation therapy. While evaluating patients with SVT, it should be kept in mind that PSQ may have occurred especially due to SVT and that presence of PSQ increases SVT incidence. Also, as a result of the data obtained, we believe that performing subjective sleep quality test in addition to complaints of palpitation would be beneficial in questioning whether SVT patients are symptomatic or not.

Keywords: Supraventricular tachycardia, radiofrequency catheter ablation, poor sleep quality

ÖZ

Supraventriküler Taşikardi Hastalarında Bozuk Olan Uyku Kalitesi Radyofrekans Kateter Ablasyon Sonrası Düzeliir

Giriş: Semptomatik supraventriküler taşikardi (SVT) olan olgularda radyofrekans kateter ablasyon (RFA) tedavisi uygulanır. Kötü uyku kalitesi (PSQ) olan hastalarda SVT sıklığının arttığı bilinmektedir. Ancak özellikle geceleri sık SVT atağı olan hastalarda PSQ meydana getirebilmesi veya RFA tedavisinin bu hastalardaki PSQ üzerine etkisi değerlendirilmemiştir. Bu çalışmanın amacı SVT nedeni ile RFA yapılacak olan hastalarda PSQ değerlendirmek ve RFA tedavisinin PSQ üzerine olan etkisinin tespit edilmesidir.

Gereç ve Yöntemler: Bu yatay kesit çalışmasına kliniğimizde SVT tanısı ile RF ablasyonu uygulanan 153 hasta alındı. Tüm hastalara ablasyon öncesi ve birinci ay kontrolde rutin incelemelere ek olarak Özel Uyku Kalite Testi yapıldı. SVT olan hastalarının RFA tedavisinin özel uyku kalitesi üzerine etkisi değerlendirildi.

Bulgular: SVT olan hastalarda %66 PSQ vardır. SVT olan hastalarda RFA tedavisinin özel uyku kalitesi, uyku gecikmesi, uyku süresi, uyku verimliliği, uyku bozukluğu, gündüz disfonksiyon ve global Pittsburgh Uyku Kalite İndeksi (PSQI) olumlu yönde ve anlamlı olarak azaldığı (%54) gösterildi ($p < 0.001$).

Sonuç: SVT hastalarında PSQ sıkırt ve RF ablasyon tedavisi ile PSQ önemli şekilde düzeltilmektedir. Çalışmamız sonucunda SVT hastalarını değerlendirirken PSQ varlığının SVT sıklığını artırdığını düşünülerek birlikte, özellikle SVT nedeni ile PSQ olabileceği de göz önünde bulundurulmalıdır. Ayrıca elde edilen veriler sonucunda SVT hastalarının semptomatik olup olmadığının sorgulanmasında çarpıntı şikayetine ek olarak özel uyku kalite testinin de yapılmasının faydalı olacağı düşünülmüştür.

Anahtar Kelimeler: Supraventriküler taşikardi, radyofrekans kateter ablasyon, kötü uyku kalitesi

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INTRODUCTION

According to the 2019 Guidelines on Adult Supraventricular Tachycardia of the European Society of Cardiology (ESC), supraventricular tachycardia (SVT) comprises tachycardias where atrial and/or ventricular rate is ≥ 100 beats/min during rest resulting from the bundle of His and over it (1). Paroxysmal SVT is the most commonly encountered reason of tachycardia in the community after atrial fibrillation (1). The most frequently seen SVT type is atrioventricular nodal re-entrant tachycardia (AVNRT) and the most common AVNRT type is typical AVNRT (1).

Among the triggering factors of supraventricular tachycardia incidence and attack are stress, dehydration, caffeine, alcohol use, medical treatment received, hormonal cycle in women, and poor sleep quality (PSQ) (2). PSQ or disturbed sleep is known to cause the development of many cardiovascular diseases and increase SVT incidence along with many arrhythmias (2,3). It was shown three decades ago that paroxysmal SVT incidence is increased especially in the REM stage of sleep (4). The relation of obstructive sleep apnea (OSA) with atrial fibrillation, SVT and ventricular arrhythmia is clear. In a recent study, it has been demonstrated that a significant reduction is obtained in the incidence of SVT through OSA treatment (5). PSQ reason and SVT development are correlated in daily practice, and PSQ due to SVT is generally overlooked. In routine evaluation of SVT patients, change in sleep habit can be found in the recommendations of lifestyle change given to patients with PSQ at treatment stage.

Our observations in daily practice suggest that there is improvement in sleep quality as of day one in addition to the palpitation symptom in patients receiving radiofrequency catheter ablation (RFA) treatment due to symptomatic SVT. In patients with SVT, sleep quality may have been affected due to palpitations and increased shortness of breath, decrease in functional capacity, anxiety and frequent hospital presentations. We were of the opinion that sleep quality could have been disturbed in patients with SVT and that this disturbed sleep quality may have increased SVT symptoms. To the best of our knowledge, there is no study evaluating the relation between SVT and PSQ.

Therefore, the aim of this study was to evaluate PSQ in patients undergoing RFA for SVT and determine the effect of RFA treatment on PSQ.

MATERIALS and METHODS

The study was approved from Adana City Training and Research Hospital Clinical Research Ethics Committee.

Study Group

In this cross-sectional study conducted in the arrhythmia clinic, symptomatic SVT patients resistant to medical treat-

ment between February 2019 and August 2019 were scanned. The study included patients planned to be taken to the electrophysiology laboratory to undergo RFA due to symptomatic SVT. A total of 196 patient records were found, but only 153 patients were included into the study because of exclusion criteria. Exclusion criteria were as follows: unclear SVT with 12-lead EKG, inappropriate SVT documentation, unsuccessful RFA procedure, not inducing SVT during the procedure, SVT recurrence in control examination, not showing up for third month follow-up visit, presence of atrial fibrillation, being hospitalized in the last one month due to coronary artery disease or heart failure, valvular heart disease, presence of known psychiatric problems, bone deformity affecting the chest wall, sleep apnea syndrome, presence of chronic obstructive pulmonary disease, active thyroid and malignancy, pregnancy or pregnancy suspicion, presence of chronic kidney disease, receiving medical treatment affecting sleep quality, presence of active infection, and denying consent to the study. Necessary approvals for the study were obtained from the local ethics board of our hospital, and all patients included into the study according to the Helsinki Declaration were informed on the study, and informed consent form was received from all.

A detailed medical history was obtained, and physical examination was performed. Active medical treatments of the patients received for SVT were recorded. White blood count, hemoglobin, serum blood urea nitrogen, creatinine, potassium, uric acid, total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides were measured by automated laboratory methods (Abbott Aeroset, MN, USA) and available commercial kits (Abbott).

Two-dimensional echocardiography was performed by EPIQ 7 (Philips Healthcare Andover MA, USA). Left ventricle diastolic size and left ventricle systolic size were seen in M-mod examination on parasternal long axis. LVEF measurement was done by the modified Simpson's method in both apical four-chamber and two-chamber views (6).

12-Lead Electrocardiography

All patients were evaluated through 12-lead EKG before the start of EPS procedure and during tachycardia. In order to standardize EKG evaluation in all patients, EKG with standard paper speed (25 mm/sec) and amplitude (10 mm/mV) also recommended in daily practice was used. In order not to particularly affect the chest derivation (V1), special attention was paid to get EKG readings of all patients during sinus and tachycardia with the same device. EKG evaluations were carried out by two electrophysiologists with five-year electrophysiology experience and ≥ 200 SVT ablations a year, and they were blinded to the patient clinic, tachycardia mechanism, and unaware of the EPS and ablation procedure per-

formed (AOD and TE). As a result of this evaluation, in case of an interobserver incompatibility, definitive decision was made by a third electrophysiology specialist in our clinic (YKI).

Evaluation of Subjective Sleep Quality

The present study used Pittsburgh Sleep Quality Index (PSQI) comprising of seven components and 19 self-rated questions evaluating subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping pill, and daytime dysfunction (7). All components were given a score between 0 and 3, with a higher score indicating low sleep quality. These seven component scores are added obtain a global score of subjective sleep quality, with a range of 0-21 points. Low values in PSQ indicate a better subjective sleep quality. Clinical cutoff value recommended for good subjective sleep quality is 5.

Electrophysiological Study and Radiofrequency Ablation Protocol

EPS was performed on all patients following at least one week after palpitation complaint or SVT attack and at least five half-lives for anti-arrhythmic drugs. EPS procedures of all patients were carried out using WorkMate Claris™ device (St. Jude Medical, St. Paul, Minnesota). Right and left inguinal areas were prepared for EPS. Quadripolar and decapolar catheters were respectively placed, one within HRA and the other within CS, via left femoral vein. RVA quadripolar diagnostic catheter was used via the right femoral vein and multicurve RF ablation catheter was used with long sheath via the femoral area. If the patient had concealed left-sided accessory pathway, a pathway was opened from right femoral area, and the patient was heparinized. SVT was induced through standard EPS protocols, and tachycardia mechanism was detected with differential diagnoses (atrioventricular nodal re-entrant tachycardia (AVNRT), atrioventricular reciprocating tachycardia (AVRT), atrial tachycardia (AT) and other SVT). SVT mechanism of all patients included into the study was eliminated properly. Thus, reasons of AVNRT, AVRT, AT and other SVT were clarified.

Clinical Follow-Up and Determining Recurrences

Patients undergoing RFA had their first follow-up examination one month after the procedure, and then followed with three-month intervals. Patients with constant or intermittent SVT on 24-hour Holter monitorization records were accepted as recurrence. Subjective sleep quality test evaluation was re-done to patients with no SVT recurrence in the third month follow-up.

Statistical Analysis

All analyses were performed on SPSS 23.0 (SPSS for Windows 20.0, Chicago, IL, USA). Data were expressed as mean±

SD for continuous variables and as percentage for categorical variables. Normality of the distribution of continuous variables was assessed using “Kolmogorov-Smirnov” test. Kappa coefficient was used to investigate interobserver changeability of subjective sleep quality parameters. Repeated measures analysis of variance was performed to compare the change in basal and sixth month sleep quality parameters reported by the patient before and after radiofrequency catheter ablation. Statistical significance was set as p value <0.05 for all comparisons.

RESULTS

The study included 153 patients having successfully undergone RFA due to SVT and in whom no recurrence was detected on the third month follow-up according to symptoms, 12-lead EKG and 24-hour holter EKG records.

Subjective Sleep Quality test was successfully conducted in all patients included into the study. This has the Cohen Kappa values evaluating interobserver variability and is over 90% for all Self-Reported Sleep Quality parameters (p < 0.001 for all comparisons). Table 1 shows the demographic, clinical

Table 1. Demographic, clinic, laboratory, medical treatment and echocardiographic findings in patients with supraventricular tachycardia

	Patients with SVT n= 153
Age (year)	32.8 ± 9.5
Sex (male/female)	68/85
Hypertension, n (%)	11 (7%)
Diabetes mellitus, n (%)	18 (12%)
Current smoker, n (%)	38 (25%)
Coronary artery disease, n (%)	9 (6%)
Systolic blood pressure (mmHg)	118 ± 9.9
Diastolic blood pressure (mmHg)	71 ± 9.4
White blood cell (ul)	8.8 ± 2.4
Hemoglobin (gr/dl)	13.5 ± 1.37
Blood urea nitrogen (mg/dl)	30.1 ± 9.2
Creatinine (mg/dl)	0.76 ± 0.18
Potassium (mg/dl)	4.25 ± 0.49
Total cholesterol (mg/dl)	186 ± 37
Low-density lipoprotein cholesterol (mg/dl)	118 ± 31
High-density lipoprotein cholesterol (mg/dl)	42 ± 10
Triglycerides (mg/dl)	161 ± 96
Uric aside (mg/dl)	4.82 ± 0.95
Beta blocker, n (%)	74 (48%)
Calcium channel blocker, n (%)	35 (25%)
Left ventricular ejection fraction (%)	58.6 ± 7.9

Table 2. In patients with supraventricular tachycardia; the change in parameters of self-reported sleep quality before and after radiofrequency catheter ablation

	Patients with before RFA n= 153	Patients with after RFA n= 153	p
Subjective sleep quality	2.13 ± 0.33	0.38 ± 0.49	<0.001
Sleep latency	1.01 ± 0.14	0.99 ± 0.08	<0.001
Sleep duration	0.99 ± 0.35	0.94 ± 0.24	<0.001
Sleep efficiency	1.17 ± 0.38	0.66 ± 0.48	<0.001
Sleep disturbances	0.67 ± 0.49	0.22 ± 0.11	<0.001
Daytime dysfunction	1.32 ± 0.47	0.29 ± 0.45	<0.001
Global PSQI	7.30 ± 1.43	4.27 ± 0.80	<0.001
PSQI >5, n (%)	101 (66%)	19 (12.4%)	<0.001

PSQI: Pittsburgh sleep quality index.

cal, laboratory, medical treatment, and electrocardiographic findings of the population. SVT reasons of the patients included into the study and in whom RFA was successfully performed were found as AVNRT in 96 patients (63%), AVRT in 50 patients (33%), and AT in 7 patients (4%).

Table 2 shows the change in subjective sleep quality parameters before and after RFA. RFA treatment in patients with SVT was shown to positively and significantly reduce subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, daytime dysfunction, and global Pittsburgh Sleep Quality Index (PSQI) (Table 2). It was seen that patients with symptomatic SVT having a 66% poor sleep quality before RFA reported a significant decrease in poor sleep quality rate to 12.4% in the third month (Table 2).

DISCUSSION

Main result of our study is that the majority of adult patients with SVT suffer from poor sleep quality and sleep quality of patients with symptomatic SVT is successfully improved with RF ablation treatment. To the best of our knowledge, this is the first study evaluating sleep quality in patients with SVT and showing improvement in disturbed sleep quality through RF ablation treatment.

Patients with SVT are first evaluated with anamnesis and physical examination. 12-lead EKG during SVT and sinus rhythm is used to determine the type of SVT. Biochemical investigation in terms of anemia and thyroid functions and Holter EKG records are requested in patients specifically requiring them. LV functions and additional cardiac valve and wall abnormalities are detected on electrocardiography. Exercise test is carried out in cases of suspected ischemic heart disease and in the presence of SVT induced by exercise. As a result of these evaluations, medical or RF ablation treatment is decided on talking to the patients and next-of-kin.

Sleep quality assessment is not routinely performed in patients with SVT. However, it is known that sleep duration and quality are vitally important in all cardiovascular diseases. In studies conducted, it has been shown that short sleep duration (<5-6 h) or long sleep duration (>9 h) has a negative impact on cardiovascular events (8-10). Negatively correlated cardiovascular events in patients with sleep disturbance are hypertension, myocardial infarction, congestive heart failure, cardiovascular mortality, and sudden death (11-14). Sudden cardiac death is seen twice as much between midnight and 06.00 in the morning in patients with sleep disorders compared to those without (13). Sleep disturbance and especially the increase in correlated arrhythmic events may have an association with increased sudden cardiac deaths (15). We have previously shown that sleep quality is disturbed in patients with PVCs and that this could be regressed via RF ablation treatment (16). Although supraventricular arrhythmias are not correlated with nocturnal sudden deaths, this arrhythmia negatively affects quality of life in these patients. In a study by Selim BJ et al. (2), it has been determined that AF, SVT and co-presence of both disease are seen more frequently in patients with sleep disturbance. However, there is no clear information regarding the effect of SVT disease on sleep quality.

In the literature, there is information on the fact that sleep quality is disturbed in patients with atrial fibrillation (AF) and AF treatment positively improves sleep quality in these patients (10,17-19). In a study, poor sleep quality has been established in half of the cases with AF (20). The most important reasons of poor sleep quality in these patients are sympathetic activity increase, irregular ventricular response and constant sympathetic stimulation. To the best of our knowledge, although there are many studies investigating the relation between AF and poor sleep quality, there is no

study evaluating the relation between poor sleep quality and other SVT types including AVNRT, AVRT and AT.

It has been shown in patients with SVT that RF ablation treatment improves life quality and is a cost-effective treatment (1). However, the effect of successful SVT treatment on sleep quality is not fully known. In our study, it was shown that sleep quality was disturbed in patients with SVT and disturbed sleep was improved following RF ablation treatment. Along with not having clear evidence at hand, it is considered that the reason of sleep disturbance in patients with SVT is the same as that found in patients with AF. In SVT patients, similar to AF patients, sympathetic activity is increased, which may affect sleep quality, like in AF (21). Anxiety triggered by SVT may affect night sleep in these patients (22). Particularly in a recent study, it has been reported that nocturnal hypoglycemia is correlated with SVT presence (23). Another possible mechanism can be that long or short SVT attacks may have disturbed the sleep quality of the patient by waking he/she up with palpitations. In our study, sympathetic activity increase, anxiety evaluation, and nocturnal hypoglycemia were not investigated or poor sleep quality cannot be explained clearly. In our study, sleep disturbance that continue despite successful SVT treatment is close to the sleep disturbance rate (17-20%) that occurs without a cause in the community (24,25).

There are several limitations of this study. We carried out the evaluation of sleep quality with a subjective algorithm. We do not know the sleep quality of the patients before suffering from SVT or the onset of palpitation complaints. We could have obtained more significant results if we had evaluated the sleep habits of the patients in a longer term rather than a specific one. Another important limitation is that even though patients with known psychiatric disorders or depression and those using drugs for these disorder were excluded from the study, psychiatric evaluation was not performed on all remaining patients since sleep disturbance is frequently seen in psychiatric disorders.

CONCLUSION

As it is known in AF patients, poor sleep quality is frequently seen in patients with SVT. Successful treatment of SVT patients with RF ablation results in the improvement of sleep quality in these patients. According to the result of our study, it is recommended to perform a PSQ evaluation in polyclinic visits of patients with SVT and to inform the patient that this condition may improve with RF ablation treatment. However, the data of our study should be evaluated with other patient groups and objective sleep evaluation systems.

Ethics Committee Approval: The study was approved from Adana City Training and Research Hospital Clinical Research Ethics Committee (Date: 11.09.2019, Decision No: 549).

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