Relationship Between Fluoroscopic Time and Body Weight in Patients with Symptomatic Drug-Resistant Tachycardia Underwent an Invasive Electrophysiological Study and Radiofrequency Ablation

Semptomatik İlaca Dirençli Taşikardisi Olup İnvaziv Elektrofizyolojik Çalışma ve Radyofrekans Ablasyon Yapılan Hastalarda Floroskopi Süresi ile Vücut Ağırlığı Arasındaki İlişki

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ABSTRACT Objective: Catheter ablation therapy with radiofrequency ablation has been used to treat heart rhythm disorders such as supraventricular tachycardia including accessory pathway or atrioventricular nodal reentry, atrial flutter and atrial fibrillation and ventricular tachycardia. The body weight may be an important factor for injury of radiation. Therefore, this article describes the correlation between the fluoroscopic time and body weight during cardiac radiofrequency (RF) catheter ablation procedures. **Material and Methods:** Eighty-six consecutive patients [70 atrioventricular nodal re-entrant tachycardia, 10 atrioventricular re-entrant tachycardia (6 Wolff-Parkinson-White syndrome), two atrial flutter, two atrial fibrillation, and two right ventricular outflow tract tachycardia] with symptomatic drug-resistant tachycardia underwent an invasive electrophysiological study and RF ablation. The fluoroscopy time and radiofrequency ablation time were measured during electrophysiological study. **Results:** Body-mass index was significantly increased in woman patient than man patient. But there were no significance differences the age, height, weight, waist/hip ratio, systolic blood pressure, diastolic blood pressure, heart rate, fluoroscopic time and radiofrequency ablation time between man and woman. There was a correlation between fluoroscopic time and body weight (p=0.02, r=0.29) and body-mass index. **Conclusion:** The study showed that there was a positive correlation between the fluoroscopic time and body weight in patients with radiofrequency ablation for tachycardia. This conclusion could be used to help prevent early and/or late radiation injuries, especially owerweight patients, during RF catheter ablation procedures.

Key Words: Body weight; tachycardia; catheter ablation

ÖZET Amaç: Radyofrekans ablasyon ile yapılan kateter ablasyon tedavileri, aksesuar yolak ya da atriyoventriküler nod reentrisi, atriyal flatter ve atriyal fibrilasyonu içeren supraventriküler taşikardilerin ve ventriküler taşikardilerin tedavisinde kullanılmaktadır. Vücut ağırlığı radyasyon hasarı için önemli bir faktör olabilmektedir. Bu nedenle, bu makale kardiyak radyofrekans kateter ablasyon tedavileri sırasındaki floroskopi süresi ile vücut ağırlığı arasındaki ilişkiyi araştırmaktadır. **Gereç ve Yöntemler:** Semptomatik ilaca dirençli taşikardisi olan ve invaziv elektrofizyolojik çalışma ve radyofrekans ablasyon tedavisi uygulanan 86 ardışık hasta [70 atriyoventriküler nodal reentran taşikardi, 10 atriyoventriküler reentran taşikardi, 6 Wolff-Parkinson-White sendromu, 2 atriyal flatter, 2 atriyal fibrilasyon, 2 sağ ventrikül çıkış yolu taşikardisi] çalışmaya dahil edildi. Elektrofizyolojik çalışma sırasında floroskopi süresi ve radyofrekans ablasyon süresi ölçüldü. **Bulgular:** Kadın hastalarda beden kitle indeksi erkek hastalara göre anlamlı olarak daha yüksek idi. Ancak yaş, boy, kilo, bel/kalça oranı, sistolik kan basıncı, diyastolik kan basıncı, kalp hızı, floroskopi süresi ve radyofrekans ablasyon süresi açısından kadınlar ile erkekler arasında anlamlı bir farklılık yoktu. Floroskopi süresi ile vücut ağırlığı (p=0.02, r=0.29) ve beden kitle indeksi (p=0.01, r=0.30) arasında anlamlı bir ilişki bulunmakta idi. **Sonuç:** Çalışmamız göstermiştirki, taşikardi nedeni ile radyofrekans ablasyon uygulanan hastalarda floroskopi süresi ile vücut ağırlığı arasında anlamlı bir ilişki bulunmaktadır. Bu durum özellikle fazla kilolu hastalarda erken ve/veya geç radyasyon hasarının önlenmesi konusunda yardımcı olabilir.

Anahtar Kelimeler: Vücut ağırlığı; taşikardi; kateter ablasyonu

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Catheter ablation therapy with radiofrequency (RF) ablation has been used to treat heart rhythm disorders such as supraventricular tachycardia including accessory pathway or atrioventricular nodal reentry, atrial flutter and atrial fibrillation and ventricular tachycardia for many years. But, this procedure can potentially result in high patient radiation doses.[1-3] Because high doses of radiation may have the potential harmful effects on the body such as eyes and skin injury including erythema and skin burns.[1,2] The body weight may be an important factor for injury of radiation.[1,4] However, there have been few reports describing the relationship between fluoroscopic time (FT) and body weight during RF ablation procedures.[1,3] Therefore, this article describes the correlation between the FT and body weight during cardiac RF catheter ablation procedures.

MATERIAL AND METHODS

PATIENTS

Eighty-six consecutive patients [70 atrioventricular nodal re-entrant tachycardia, 10 atrioventricular re-entrant tachycardia (6 Wolff-Parkinson-White syndrome), two atrial flutter, two atrial fibrillation, and two right ventricular outflow tract tachycardia] with symptomatic drug-resistant tachycardia underwent an invasive electrophysiological study and RF ablation. All ablation procedures were performed by two cardiologist and all patients provided written, informed consent. The investigation conforms with the principles outlined in the Decleration of Helsinki. A Vivid 3 cardiovascular ultrasound system [3S sector probe (1.5-3.6 MHz), GE] was used for transthoracic echocardiographic evaluation including ejection fraction (%) before ablation procedure.

BODY MASS INDEX AND WAIST TO HIP RATIO MEASUREMENTS

Body mass index (kg/m^2) was calculated by dividing the body weight in kilograms by the square of the body height in metres. Waist to hip ratios were calculated by dividing the circumference of the waist by the circumference of the hips.

BLOOD PRESSURE MEASUREMENTS

The arterial blood pressure was measured by the same observer in each subject in the supine position after at least 20 minutes of rest. Clinic blood pressure was measured, using a mercury sphygmomanometer with a cuff appropriate to the arm circumference (Korotkoff phase I for systolic blood pressure and V for diastolic blood pressure). In each subject two blood pressure measurement were performed, and their mean was considered for analysis.

ELECTROPHYSIOLOGICAL STUDY AND ABLATION PROCEDURE

Electrophysiological study and RF ablation were performed with a single-plane imaging system. All antiarrhythmic agents such as calcium channel blockers, beta blockers, propafenon had been discontinued for more than 3 days. No patient had received amiodarone. A detailed diagnostic study was performed in all patients prior to ablation to confirm the presence of the electrophysiological mechanism of tachycardia. The patient sample included patients with atrioventricular re-entrant tachycardia, atrioventricular nodal re-entrant tachycardia, atrial flutter, right ventricular outflow tract tachycardia and atrial fibrillation that required ablation of the atrioventricular node. The conventional quadripolar (Jos 6F) and multi-polar (Marinr CS-7Fr) (for coronary sinus and His) catheter were introduced into the right atrium across the tricuspid valve to record a right-sided His bundle electrogram, the coronary sinus, and right ventricle. The electrophysiological study was performed the baseline electrophysiological properties, the inducibility of tachyarrhythmias and mapped the locations of the accessory pathway or re-entrant circuits to a general region of the heart. Once the accessory atrioventricular connection was located, mapping the targeted region was performed with the ablation catheter, a 7 F quadripolar electrode catheter with a 4 mm distal electrode (RF Marinr MC-7Fr) were used. Typically this was achieved by positioning the ablation catheter against the mitral or tricuspid annulus in the area identified during preliminary mapping. RF energy was delivered at an

energy of 40-50 W and temperature up to 50-65°C, for 60 s. Following successful ablation, patients were discharged from hospital within 24 hours on aspirin and no antiarrhythmic drugs.

STATISTICAL ANALYSIS

Statistics were obtained using the ready-to-use programme of SPSS version 8.0. All the values were expressed as mean ± standard deviation. Mann-Whitney test was used to examine gender differences in measured antropometric, hemodynamic and procedural (fluoroscopic time, radiofrequency ablation time) variables. Correlations were calculated with the Pearson test. Also, regression analysis was done. $P<0.05$ was considered significant.

RESULTS

Body-mass index was significantly increased in woman patient than man patient. But there were no significance differences the age, height, weight, waist/hip ratio, systolic blood pressure, diastolic blood pressure, heart rate, fluoroscopic time and RF ablation time between man and woman (Table 1). Although there was a correlation between fluoroscopic time and body weight (p=0.02, r=0.29) and body-mass index (p=0.01, r=0.30), there was not any correlation between fluoroscopic time and sex, age, height, waist/hip ratio, systolic blood pressure, diastolic blood pressure, and heart rate (p=0.75, r=0.03; p=0.37, r=0.09; p=0.99, r=0.01; p=0.72, r=0.04; p=0.67, r=0.05; p=0.76, r=0.04; p=0.32, r=0.12; respectively) (Table 2). According to regression analysis, none of them had a correlation with waist circumference. All patients had normal left ventricular function (ejection fraction >50%), without evidence of underlying structural heart disease. There was no radiation-induced skin and other tissue injury in our study. No patient presented with atrioventricular block of any degree.

TABLE 1: Comparing the baseline and procedural characteristics between woman and man.

	Woman (n=63)	Man (n=23)	P
Age (years)	44.9±15.5	41.2±14.7	0.27
Weight (cm)	69.68±9.95	65.38±6.65	0.06
Height (cm)	163.98±8.49	165.00±7.42	0.65
Body mass index (kg/m^2)	25.94±3.67	23.91±1.89	0.03
Waist (cm)	83.47±10.31	85.92±11.62	0.69
Hip (cm)	98.53±8.81	104.08±13.60	0.05
Waist/hip ratio	0.84±0.00	0.82±0.00	0.36
Systolic blood pressure (mmHg)	120.53±13.32	113.85±13.87	0.08
Diastolic blood pressure (mmHg)	74.47±7.68	74.62±7.76	0.96
HR before ablation (beat/min)	76.45±7.41	75.69±7.02	0.84
RF ablation time (sec)	76.58±78.83	70.26±61.53	0.34
Fluoroscopic time (sec)	14.17±5.16	13.76±5.86	0.72

HR: Heart rate, RF: RF ablation.

TABLE 2: Correlation between waist circumference and parameters.

	p	r
Age (years)	0.97	0.02
Gender	0.03	0.14
Weight (kg)	<0.001	0.74
Height (cm)	0.001	0.23
Hip circumference (cm)	<0.001	0.61
Fluoroscopic exposure time (sec)	0.04	0.13
RF time (sec)	0.11	0.11
Systolic blood pressure (mmHg)	<0.001	0.34
Diastolic blood pressure (mmHg)	0.02	0.15
Heart rate (beat/min)	0.31	0.07

DISCUSSION

In this study, we showed that there was a positive correlation between the FT and body weight and body-mass index in patients with RF ablation for tachycardia. FT is an important factor that recommend be monitored during fluoroscopically guided intervention procedures such as percutaneous coronary intervention and RF catheter ablation.[1] Because, some major side effects are associated with a fluoroscopy. One is radiation-induced injuries to the skin or underlying tissue such as thyroid and heart. As the radiation beam passes through the skin and tissue it may cause minor injury. The other major side effect is the small possibility of developing radiation-induced cancer at some time later in life.

The RF ablation under fluoroscopy tend to be long in a single area of anatomy such as triangle of Koch for a prolonged time. In addition, the need

for multiple sequential sessions of therapy may occur. Because of the high doses that can be generated in the course of the RF ablation, some procedures have resulted early or late complications such as skin lesions[2], eye lesions, or cancer. A number of cases involving tissue such as skin injuries in percutaneous cardiac intervention have been reported.[2,5-7] To avoid radiation injuries in patients undergoing percutaneous cardiac intervention procedures, it is necessary to keep the exposure doses as low as can be reasonably achieved and all X-ray machine and laboratory must be calibrated for the reasonably radiation dose.[1,8,9]

In addition to fluoroscopy, the body weight may be an important factor for injury of radiation, as in our study.[1-4] To our knowledge, few studies have examined the correlation between FT and body weight in RF ablation procedures.[1,3] Akber et al. showed a correlation between body weight of different species and their mean lethal dose (LD_{50}).[4] Analysis of LD_{50} with body weight of different species following whole body irradiation yields a good correlation. Results indicate that as the body weight increases, LD_{50} decreases. Also, Chida et al. examined the correlations between the maximum radiation skin dose and body weight, FT, and dose-area product.[1] And, they found good correlations between the maximum radiation skin dose and FT and dose-area product in RF catheter ablation. Also, they recommended that physicians record the patient weight x FT of patients undergoing intervention, because the correlation coefficient for weight x FT was higher than that for FT alone.

In conclusion, the study showed that there was a positive correlation between the FT and body weight in patients with RF ablation for tachycardia. This conclusion could be used to help prevent early and/or late radiation injuries, especially owerweight patients, during RF catheter ablation procedures.

LIMITATIONS

The main limitation of this study includes a small sample size. Secondly, it's a non-randomized, single center study. Also, we used only FT for radiation exposure. The background of patients with tachycardia was very various including atrioventricular nodal re-entrant tachycardia, atrioventricular re-entrant tachycardia, atrial flutter, atrial fibrillation, and right ventricular outflow tract tachycardia.

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