The effect of Turkish bath on QT dispersion

Türk hamamının QT dispersiyonu üzerine etkisi

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Abstract

Objective: It is known that QT intervals might differ from each other on electrocardiogram (ECG). It is also known that diversity of QT interval between derivations is an indicator of heterogeneity of repolarization and it is a leading electrophysiological cause of ventricular arrhythmias and sudden heart death. In this study, we evaluated the effects of the Turkish bath on QT dispersion.

Methods: A total of 47 healthy volunteers were enrolled in the prospective study. The 12-lead ECG recordings were taken in all subjects before and after bath and QT dispersions were calculated. Blood pressure and the heart rate of each patient were recorded. QT dispersion was defined as the difference between the maximum and minimum QT intervals occurring in any of the 12 leads. Statistical analysis were performed using Wilcoxon rank test and paired t test.

Results: The mean age was 49.47±11.64 years; range was between 23-70 years. The mean temperature of the bath was 39.72±1.75 °C, mean humidity percent was 84.42±4.74%. QTc dispersion were respectively determined as 0.047±0.025 sec and 0.047±0.019 sec (p=0.981) before and after bath. We determined no correlation between duration time at bath and QTc dispersion (r=-0.069 p=0.646).

Conclusion: In our study we found no meaningful difference in QTc dispersion in individuals who take bath. Our study is the first study in which we evaluated QTc dispersion in high temperature and humidity environment of the bath and we did not determine any effect on QTc dispersion. *(Anadolu Kardiyol Derg 2010; 10: 216-9)*

Key words: Electrocardiogram, QT dispersion, bath, temperature, humidity

Özet

Amaç: Yüzey elektrokardiyogramın (EKG) derivasyonlar arasında, QT aralıklarının birbirinden farklı olabildiği bilinmektedir. Derivasyonlar arası QT aralığı farklılığının; repolarizasyon heterojenitesinin bir göstergesi olduğu, bunun da ventriküler aritmiler ve ani kalp ölümü için zemin hazırlayıcı elektrofizyolojik bir etken olduğu bilinmektedir. Türk hamamlarına giren kişilerde, Türk hamamının QT dispersiyonu üzerine etkisi araştırıldı.

Yöntemler: Bu prospektif çalışmaya, hamama giren 47 sağlıklı, gönüllü birey alındı. Bireylerin hamama girmeden önceki ve girdikten sonraki 12 derivasyonlu EKG'leri çekildi. QT dispersiyonları hesaplandı. Kan basınçları ve kardiyak atım sayıları kaydedildi. Düzeltilmiş QT dispersiyonu (dQT), herhangi bir derivasyondaki en uzun QT aralığından, en kısa QT aralığı çıkarılarak hesaplandı. İstatistiksel analizlerde Wilcoxon rank test, Mann-Whitney U ve eşleştirilmiş t testleri kullanıldı.

Bulgular: Çalışmaya alınan bireyler 23-70 yaşları arasındaydı. Ortalama yaş 49.47±11.64 yıl idi. Hamamın ortalama sıcaklığı 39.72±1.75 °C, ortalama nem oranı %84.42±4.74 idi. Hamama girmeden önceki dQT dispersiyonu ortalaması 0.047±0.025 sn, hamama girdikten sonra 0.047±0.019 sn olarak öçüldü (p=0.981). Hamamda kalış süresi ile dQT dispersiyonu arasında anlamlı bir bağıntının olmadığı saptandı (r=-0.069 p=0.646).

Sonuç: Çalışmamızda hamama giren kişilerde dQT dispersiyonunda anlamlı bir farklılık oluşmadığı görüldü. Hamama giren kişilerde aritmi risk göstergeleri konusunda yapılan ilk çalışma olarak, hamamda sıcak ve nemin etkisiyle gelişebilecek dQT dispersiyonu değişikliğinin olmadığı görüldü. *(Anadolu Kardiyol Derg 2010; 10: 216-9)*

Anahtar kelimeler: Elektrokardiyogram, QT dispersiyonu, hamam, sıcaklık, nem

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This work was presented at the 8th National Congress of Internal Medicine, 13-17 September 2006 Belek, Antalya, Turkey

Accepted/Kabul Tarihi: 25.01.2010

doi:10.5152/akd.2010.060

Introduction

QT dispersion is defined as the difference between the longest QT interval and shortest QT interval on standard surface electrocardiogram (ECG) and is a parameter of the heterogeneity of the ventricular repolarization (1, 2). QT dispersion is a known electrophysiological factor, which creates tendency towards ventricular arrhythmia and sudden heart death (3).

Turkish bath is an important part of Anatolian culture. Turkish baths are places for everybody for personal cleaning with hot water, steam and soap by scrubbing the body with special cloth. Baths have been used as a form of balneotherapy and for individual sanitary. In some studies, hydrotherapy and balneotherapy effects on cardiopulmonary functions have been demonstrated (4, 5). There are only a few studies, which evaluated the acute effects of bath on cardiovascular functions. Hyperthermal baths are not recommended for older patients and patients who have cardiac risk because of intensive responses on cardiovascular functions (6).

In this study, we aimed to investigate the effects of Turkish bath, which is a hyper-thermal bath on QT dispersion in healthy individuals.

Methods

By determining a Turkish bath in the city, we studied people who came to the bath and were chosen by random sampling. This study was performed in Aydın city between October 2005 and December 2005. In our city the Turkish bath is arranged for females one day in a week, because of this reason, study was performed on women only one day for each week and for male on each Thursday.

During the study period, consecutively 53 patients were examined and finally a total of 47 patients were enrolled into this prospective study after exclusion criteria were applied. Patients with acute or chronic renal dysfunction, diabetes mellitus, hypertension, heart failure, valvular heart disease, cardiomyopathies, atrial fibrillation, history of coronary artery disease, asthma or chronic obstructive lung disease, pregnancy, neurological problems, psychiatric diseases, endocrine diseases, those who has history of drug abuse and use of class I and III anti-arrhythmic agents were excluded from the study. Patients with pathologic echocardiographic findings and electrocardiographic abnormalities including ischemia, previous infarction, bundle branch block, atrial fibrillation, sick sinus syndrome and ventricular pre-excitation were also not included in our study.

Electrocardiography and QT dispersion measurements

Individuals whose QT intervals could not be calculated on their ECG's effectively were also excluded from the study. Only ECG recordings with ≥8 different analyzable leads were accepted. Electrocardiograms of the included individuals were taken before entering the bath following 5 minutes rest at lying down position, ECG devoid of interference was taken from 12 derivations with at least 3 QRS complexes at a rate of 50 mm/sec. Blood pressures and body weights were measured. Immediately after bath 12-lead ECG were recorded again in supine position before resting. Blood pressures and body weights measurements were repeated. Duration time at bath was measured. QT interval and heart rates were measured.

Two investigators, blinded to subjects, manually measured the QT intervals with a ruler from the beginning of the QRS complex to the junction of the T wave with the basal line with the aid of a magnifying glass. Derivations in which last parts of the T wave were not perceived well were not estimated. In the presence of U wave, QT interval end was accepted as the most inferior part of the curve between T and U waves. In each patient, QT interval (QTc minimum and QTc maximum values) was corrected (QTc) to heart rate with Bazett's formula (QTc: QT / $\sqrt{}$R-R sec) (7). QTc dispersion (QTc max-QTc min) was also calculated.

Statistical analysis

All of the statistical analyses were performed using SPSS version 13.0 for Windows software (Chicago, IL, USA). With the use of data, relevant descriptive statistics were performed. Continuous variables before and after bath were compared using the Wilcoxon rank test or paired t test. Pearson correlation analysis was performed to establish relationship between QTd and total duration of bath. A p value of <0.05 was accepted as statistically significant.

Results

Twenty-six male and 21 female healthy voluntary, totally 47, were enrolled into the study after exclusion criteria. Six subjects were excluded from the study because patients with bundle branch block (n=2) and atrial fibrillation (n=2) were excluded from the assessment of ventricular repolarization using the QT interval. Two patients with diabetes mellitus and hypertension were also not included in the current study. Ages of the individuals included in the study were between 23-70 years. Mean age was 49.47±11.64 years (Table 1).

Effect of Turkish bath on QT dispersion and hemodynamic variables (Table 2).

As an index of the heart rate, R-R interval in ECG shortened significantly after bath (p<0.001) and mean heart rate increased significantly after bath (p<0.001). Mean systolic blood pressure

Table 1. Baseline descriptive characteristics of the study population and related Turkish bath

Characteristics	Findings
Gender, n (%)	
Female	21 (44.7)
Male	26 (55.3)
Age, years	49.47±11.64
The mean duration time at bath, minute	62.30±20.58
The mean temperature of the bath, °C	39.72±1.75
The mean humidity of the bath, %	84.42±4.74

Values are expressed as the mean±SD and proportions/percentages

Table 2. Effects of Turkish bath on anthropometric, hemodynamic and electrocardiographic parameters

Variables	Before entering the bath*		After bath*		p**
	Mean±SD	Median (min-max)	Mean±SD	Median (min-max)	
Body weight, kg	76.45±10.68	76 (57-100)	76.55±11.2	76 (57-100)	0.712
Systolic blood pressure, mmHg	126.6±17.35	120 (90-170)	122.55±17	120(80-180)	0.055
Diastolic blood pressure, mmHg	77.87±11.41	80 (60-110)	78.09±11.3	80 (60-110)	0.899
Heart rate, beat/min	76.9	79 (51-111)	86.9	88 (58-115)	<0.001
cQT dispersion, sec	0.047±0.025	0.043 (0.01-0.09)	0.047±0.019	0.039 (0.02-0.1)	0.981
R-R interval, sec	0.78±0.14	0.76 (0.54-1.16)	0.69±0.11	0.68 (0.52-1.03)	<0.001

*Values are expressed as the mean±SD and median (minimum-maximum) values
** t test for paired samples, Wilxocon rank test

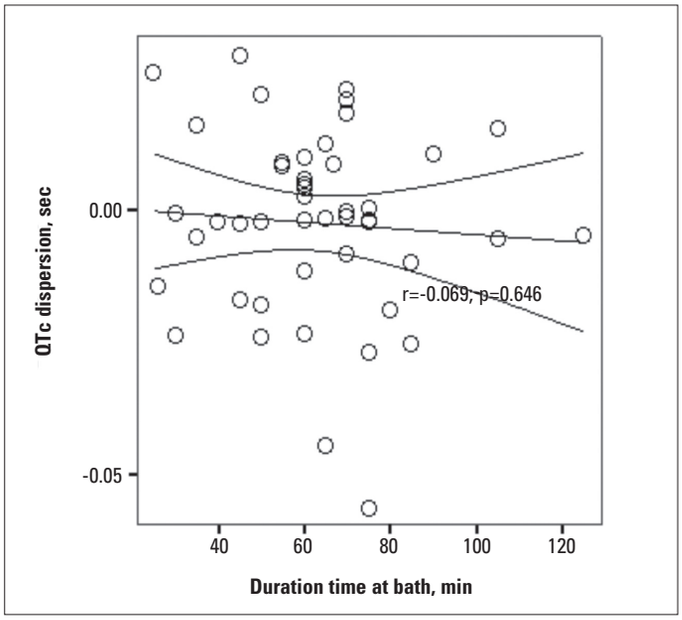

Figure 1. The correlation between duration time at bath and difference of corrected QT

tended to decrease (126.6±17.35 mmHg to 122.55±17 mmHg, p=0.055) and mean diastolic blood pressure was unchanged (p=0.899) after bath. Mean body weight remained unchanged after bath (p=0.712). QTc dispersion was unchanged after bath (0.047±0.025 sec to 0.047±0.019 sec, p=0.981).

The mean temperature of the bath was 39.72±1.75 centigrade (°C) degree and mean humidity percent was 84.42±4.74. The mean duration time at bath was determined as 62.30±20.58 minutes. We found no correlation between duration time at bath and QTc dispersion (r=-0.069 p=0.646) (Fig. 1). Among individuals entering the bath, 36 (76.6%) were rubbed with a coarse bath-glove and 24 of them (51.1%) received massage.

Discussion

In our study, we did not detect any meaningful difference in QTc dispersion before and after bath in individuals taking Turkish bath. Moreover, we did not find any correlation between duration time at bath and QTc dispersion.

Turkish bath is an important part of Anatolian culture. Baths have been used as a form of balneotherapy and for individual sanitary. Balneology, vocabulary mean is science of bath, can be defined as the science of natural therapeutic factors, which sourced from underground, soil, water and climate (8). In some studies, acute effects of hydrotherapy and balneotherapy on cardiovascular functions were evaluated. Hyper-thermal baths are not recommended for older patients and patients who have cardiac risk because of intensive responses on cardiovascular functions (6). Hydrotherapy is the use of the water for the purpose of preservation of the health and the treatment of diseases in the forms of liquid, ice, or steam, or warm or cold. Previous studies demonstrated that long-term use of hydrotherapy like bath, thermal spring therapy and balneotherapy might provide some cardiac benefits.

QTc dispersion is a non-invasive method in determining the patients with high risk related with ventricular arrhythmia and sudden death (9). Persiianova-Dubrova et al. (10, 11) demonstrated that after thermal spring therapy improvements of cardiac rhythm and left ventricular function might be seen in patients with MI. Ekmekçioğlu et al. (12, 13) demonstrated that balneotherapy decreases depression and fatigue, supports antioxidative defensive system, decreases cholesterol level and leads to improvement in chronic pain especially together with other physiotherapy approaches. Korchinskii et al. (14) demonstrated that hydrotherapy and balneotherapy decrease blood pressure and provide positive effects on cardiac functions (14). Thermal spring cures improve cardiopulmonary functions as reported in the literature. However, there are only a few studies about the acute effects of thermal spring baths. Regarding the acute effects, it is known that hot bath water has a vasodilator effect on vessel system (15). Decrease in the peripheral resistance leads to a meaningful decrease in diastolic pressure. However, in our study there was no meaningful decrease in the diastolic blood pressure after the bath (p=0.899). Together with this, we observed a decrease in systolic blood pressure but it was not significant (p=0.055). Increase in heart rate and respiration

number is the normal physiological responses of the hot water and intra-water movements (14). In our study, we observed a remarkable increase in heart rate after bath ($p<0.001$). As a conclusion, acute cardiopulmonary responses before and after balneotherapy in previous studies were within physiological limits.

It is known that increase in heart rate and decrease in diastolic blood pressure are considered as acute cardiac effects. Nevertheless, there is no study on cardiac rhythm after bath. Hyper-thermal baths (40°C or hotter baths) lead to intensive responses especially in cardiovascular functions; because of this isothermal (33-35°C) or slight hypothermal baths (30-33°C) are recommended instead of hyper-thermal baths (3). High altitude climate, extreme hot weather in summer months and sea climate because of humidity are not recommended for older patients. The risk of development of cardiovascular and neurological pathologies including especially infarction and stroke are remarked (6). In bath cures, recommended medium temperature is 37-38 degree and duration time is usually 5-20 minutes (16). Also in our study, mean temperature of the bath was 39.72±1.75 centigrade degree. Mean duration time at bath was 62.30±20.58 minutes. The risk of bath causing sudden death due to hot water, high medium temperature and humidity was studied by QTc dispersion, which is the non-invasive electrophysiological indicator of the ventricular arrhythmias. However, in our study we did not determine any effect of bath on QTc.

Study limitations

The major limitations of our study include the following; study was not based on the general population, the small number of the subjects included in the study and due to this reason absence of subgroup analysis.

Conclusion

In our study, we determined no meaningful difference in QTc dispersion in individuals who take bath. Our study is the first study in which we evaluated QTc dispersion in high temperature and humidity environment of the bath and we did not determine any effect on QTc dispersion. Further larger studies are needed to confirm these findings.

Conflict of interest: None declared

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