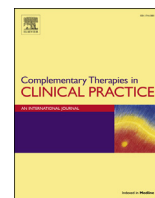




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The effect of relaxing music on heart rate and heart rate variability during ECG GATED-myocardial perfusion scintigraphy

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A B S T R A C T

Keywords:

Relaxing music
Heart rate
Heart rate variability
Myocardial perfusion scintigraphy

Background: The positive changes in human behavior caused by relaxing music demonstrate the psychological effect of music on human body. A meta-analytical study has shown that relaxing music affects blood pressure and heart rate in coronary heart patients and cancer patients. The aim of our study is to research whether there is a significant effect on heart rate and heart rate variability due to listening to relaxing music during ECG GATED MPS imaging under gamma camera.

Method: The music group (n = 50 patients) could choose from 15 different musical types including folk music (no lyric). The other 50 patients were placed in a “no music group” and did not get headphones or any music.

Results: There was a statistically significant reduction in the heart rate of patients in the music group compared to those in the control group.

Conclusions: Relaxing music provides great benefits to both patient and clinician. There is close relationship between relaxing music and health procedure, can use every area of the health noninvasiv, safe, cheap and is a method don't have side effect.

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1. Introduction

In recent years myocardial perfusion scintigraphy (MPS), frequently used in nuclear medical studies, has played an important role in researching coronary artery disease (CAD), in making clinical decisions and in monitoring patients. MPS is a non-invasive imaging method comparing two different scintigraphic studies, one after stress and the other at rest [1].

Imaging procedures where myocardial perfusion scintigraphy is synchronized with electrocardiography (ECG) are called GATED MPS. GATED imaging in the same session as MPS is divided into 8 or 16 sections for each R–R interval on ECG. The images are recorded with the R waves on computer [2]. During GATED-MPS patients lie horizontally in supine position under the gamma camera with arms above their head and remain motionless for 15 min [2]. As patients have to stay in an uncomfortable position, though rare, they may experience pain in their arms. Additionally the anxiety of patients

may increase linked to stress and having to lying still. During GATED SPECT imaging functional data may be affected by reasons related to the cardiac cycle [3].

Heart rate describes the number of heartbeats per unit time. This rate is given as bpm (beats per minute). Heart rate (HR) varies depending on situations such as the body's needs, the amount of oxygen and carbon dioxide in the blood, physical and mental activity, etc. During the normal cardiac cycle there may be changes in the heart rate of patients due to anxiety.

The positive changes in human behavior caused by relaxing music demonstrate the psychological effect of music on humans. Currently studies on relaxing music have determined a close relationship between music and health procedures, that it may be used in every area of healthcare, and is a treatment method that is painless, reliable, cheap and without side effects [4]. A meta-analytical study has shown that relaxing music affects blood pressure and heart rate in coronary heart patients and cancer patients [5,6].

The aim of our study is to research whether there is a significant effect on heart rate and heart rate variability due to listening to relaxing music during ECG GATED MPS imaging under gamma camera.

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2. Material-method

2.1. Study population

One hundred and twenty patients applying to the Nuclear Medicine Department for myocardial perfusion scintigraphy to investigate coronary heart disease for any reason were included in the study. During the study 10 patients with advanced irregular heartbeats, 7 patients who refused to listen to music, and due to technical difficulties 3 patients were excluded from the study. The continuing study was completed with 100 patients. Fifty patients comprised the group who listened to music while 50 patients formed the control group. The work consort flow diagram of the study is presented in Fig. 1. The demographic data, systemic diseases and medication use of all patients participating in the study were questioned. Those patients with known hearing difficulties, those with psychiatric diseases affecting communication, those under the age of 18 and patients above the age of 65 due to radiation safety and those pregnant or with suspected pregnancy were excluded from the study.

The study was completed after permission was granted by the local ethics committee (permission no. 050.99–153).

2.2. Patient choice

Patients included in the study were randomly divided into two groups before the study; the music group and control group.

2.3. Music choice and listening

Before the study lists were prepared by the study team, each with 15 pieces of instrumental-folk music (no lyric). All the 15 pieces of music were stored in CD disk. For each list recordings of 15 min each were compiled on the computer. The headphone was put on when the subject (music group) agreed to participate. The music group ($n = 50$ patients) could chose the music pieces they wished to listen to from the lists on the computer (Hp Compaq 6200). The chosen pieces were broadcast to the participants. Selected music pieces played at a tempo of 60–80 beats per minute and a volume of 50–55 db. The other 50 patients were placed in a “no music group” and did not get headphones or any music.

3. ECG-GATED-myocardial perfusion scintigraphy (GMPS)

The patients underwent a single-day stress-rest protocol. The patients ceased taking cardiac glycosides one week before and other antihypertensive medications 48 h before. Stress images were taken 45 min after 10 mCi 99mTc-MIBI injection while rest images were taken 4 h after the first images and 60 min after 30 mCi 99mTc-MIBI injection.

GMPS images, synchronized with ECG, were taken by a low energy, high definition double-headed gamma camera with parallel slit collimator (GE, Infinia) positioned 45° right anterior oblique to 45° left posterior oblique, with $140 \pm 20\%$ keV energy peak and R–R distance divided in 8 equal intervals in 64×64 matrix. The patient lay in a supine position, each image took 35 s and a total of 32 images were obtained.

4. Evaluations before and after the study

4.1. Blood pressure and heart rate measurements

The patients' SAP and DAP were taken after rest in a sitting position measured on the left arm. For blood pressure measurements an aneroid sphygmomanometer (ERKA, Germany-2011) was used. Heart rate was measured with a Cardiac Trigger monitor 3000 (Ivy Biomedical System, INC) which came with the gamma camera equipment and could synchronize ECG with heart rate measurements.

4.2. Evaluation after ECG GATED-MPS imaging

ECG Gated MPS images were processed with the aid of a computer to obtain short axis, horizontal long axis and vertical long axis slices of the heart which were used to examine local wall movements and wall thickening. The EF values were calculated for the left ventricle.

5. Statistical analysis

Statistical analysis was performed using SPSS 19.0 version for windows program. Data have been presented on the basis of average, standard deviation, median and range for the continuous variables and frequency (percentage) for the categorical variables. After the checking the normality assumptions for the continuous variables with Shapiro–Wilks test, Student's t-test and Mann–Whitney U test have been used for the comparisons. Pearson chi-square test and Fisher's Exact test have been used for the comparison of the distributions of categorical variables between music groups. All statistical analysis were performed according to two-sided hypothesis tests and a p-value of less than 0.05 was regarded as statistically significant difference.

6. Results

A total of 100 patients (65 female and 35 male, age 58.8 ± 8 years) were included in the study. The demographic data of the

Table 1
Demographic differences between music and control groups.

Variables	Music (n = 50)	Control (n = 50)	Total (n = 100)	p-value ^a
Female/Male, (n)	0.85 (23/27)	1.5 (30/20)	1.12 (53/47)	0.161
Age (years), (median)	52 (29–64)	56 (30)	54 (29–64)	0.654
Hypertension, %(n)	44 (22)	52 (26)	48	0.423
Diabetes mellitus, %(n)	20 (10)	26 (13)	23	0.476
Dyslipidemia, (n)	10 (5)	16 (8)	13	0.362
Previous CAD, %(n)	20 (10)	14 (7)	17	0.424
Previous MI, %(n)	6 (3)	6 (3)	12	1
Previous PCI, %(n)	14 (7)	8 (4)	6	0.338
Previous CABG, %(n)	10 (5)	6 (3)	8	0.715
Current smoker, %(n)	12 (6)	14 (7)	13	0.766

Abbreviations: CAD, coronary artery disease; MI, myocardial infarction; PCI, percutaneous coronary intervention, CABG, coronary artery bypass graft.

^a Pearsen Chi-square test.

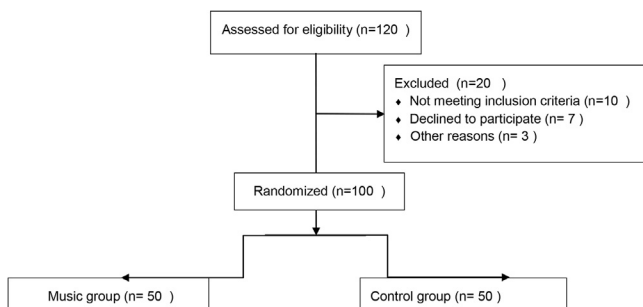


Fig. 1. Consort flow diagram.

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