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Rhythm and orthopedics: The effect of music therapy in cast room procedures, a prospective clinical trial

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ABSTRACT

Introduction: Cast room procedures generally cause anxiety in patients. Anxiety complicates the procedure as well as increases the risk of a complication. Listening to music was found to be the safest and most common non-drug treatment method. The aim of this study is to evaluate the effect of listening to music on adult patients in cast room procedures. This study points out the relation between anxiety and anxiety relevant cardiac arrhythmia.

Materials and methods: The study was performed on 199 patients with stable general condition, aged above 18. The patients were divided into two groups. Randomization method used in the study was coin flip. The first group (Group 1) listened to music during cast room procedures whereby the second group (Group 2) did not listen to music. Length of the procedure, complication, blood pressure and heart rate evaluations before and after the procedure, Visual Analogue Scale (VAS scores for pain), State-Trait Anxiety Inventory (STAI) anxiety score, patient satisfaction, willingness of the patient to repeat the procedure, P wave dispersion (Pd) and corrected QT interval dispersion (QTcd) as electrocardiographic arrhythmia predictors were evaluated. The Clinical Research Ethics Committee approval was obtained for this study.

Results: Significant difference was shown between the two groups for the following criteria: VAS scores ($p = 0.005$), anxiety scores ($p = 0.032$), processing time ($p = 0.027$), and QTcd values ($p = 0.031$). Patient satisfaction ($p < 0.001$) and willingness to repeat the procedure ($p < 0.001$) were higher for the group who listened to music. No significant difference in Pd values, blood pressure and heart rate was reported within the groups.

Conclusion: Music therapy is a non-invasive, safe, nonpharmacologic, anxiolytic, and analgesic treatment. Music therapy should become standard protocol in cast room procedures. One of the most important achievements of this study was the fact that music decreases anxiety and anxiety-related cardiac arrhythmia. Therefore, conducting further prospective studies including high cardiac risk patients especially with arrhythmia is crucial.

Introduction

Cast room procedures, among them cast application, cast removal, suture removal and pin removal generally cause anxiety in patients [1]. Anxiety can make it difficult to implement these procedures effectively and may involve medical risks [2]. Compliance of the patient is vital to keep the patient's anxiety and pain at the minimum [3]. High anxiety level may also affect the rapport between patient and the surgeon [4]. Pain and anxiety that arise during the procedure prolong also the duration; increase the

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frequency of complications that may occur and cause patients to require additional treatment. A long cast removal process may cause cast saw burns as well as epidermal necrosis and deep incision injuries.

Several studies in literature report that music therapy has an analgesic, anxiety reducing and relaxing effect on patients [5]. Music is therapeutic as it may affect the limbic system, evoke feelings of happiness; ameliorate the mental well-being as well as reduce anxiety, depression, anger, and fear [6]. Other studies put forward that using noise protectors and headsets to block unnecessary noises lower heart rate and anxiety of patients in cast room procedures [7,8]. Music therapy has also been shown to reduce pain and discomfort in adult patients with fractures [9]. Listening to music is the safest and most common non-drug treatment method against anxiety [6].

The aim of this study is to evaluate the effectiveness of music therapy on anxiety and anxiety related cardiac arrhythmias in adult patients in cast room procedures. To the knowledge of authors of this study, this is the first study investigating the use of music therapy in cast room procedures involving adult patients. This is the first prospective, randomized study investigating the changes in blood pressure, heart rate, electrocardiographic arrhythmia predictors, pain, anxiety, patient's satisfaction and the willingness of the patient to repeat the process in cast room procedures.

Materials and methods

This prospective study was completed with the permission of the Chair of Yıldırım Beyazıt University Yenimahalle Training and Research Hospital Clinical Research Ethics Committee (2016/33). Informed consent was obtained and patients participated voluntarily.

The study was conducted between November 2016 and February 2017 by two orthopedic physicians and one orthopedic technician in the cast room of the Yıldırım Beyazıt University Yenimahalle Training and Research Hospital. The patients were divided into two groups. The first group (Group 1) listened to music during cast room procedures whereby the second group (Group 2) did not listen to music. Patients listened to music on normal speaking level (40–50 dB) with headsets (Sony MDR-1000X Wireless Noise-Canceling Headphones) covering the ear and minimizing noises from the environment. Headsets were used for both music listening group and no-music group. We have conducted the study by using the same headsets for all groups for the right comparison. Group 1 used headsets with music and Group 2 used headsets without music. To ensure the randomization of the patient, flipping a coin methodology was applied. Patients listened to popular, classical and slow music or Turkish folk according to their preference. No medication was given in both groups.

We used the G Power Version 3.1.9.2 software package to calculate the sample size (effect size = 0.5, $\alpha = 0.05$ and power = 0.8). The calculated number of participants was 51 for Group 1 and 51 for Group 2 with a total of 102. The study comprised 220 patients with stable general condition, aged above 18, not been subject to analgesics and sedation in last 24 h. People with psychiatric disorders, hearing impaired, persons who can't communicate (e.g. mental retardation), pregnant and puerperant women, people with orthopedic anomalies (congenital or acquired), patients in need of acute surgical intervention as well as patients with coronary artery disease diagnosis and atrial fibrillation were not included in the study. Before the cast room procedures all patients were evaluated according to their medical record and clinical history about heart issues. Patients with suspected cardiologic symptoms were consulted to cardiologists and not included in the study. Additionally, 21 patients were excluded whose Holter records were insufficient, blood pressure records were missing, or for whom the procedure could not be completed.

The most frequent 3 procedures in cast rooms, which are intra-articular injection, fracture reduction, and cast removal were included in the study. These three procedures, which we also think cause the most anxiety, were included and patients were assigned to these subgroups. The anxiety potentials of fracture reduction and suture removing are very different from each other in cast room procedures. Therefore, groups have been homogenized.

Patients in the cast room were assessed by orthopedic physicians according to the following criteria: age, gender, orthopedic pathology, procedure to be done, length of the procedure (minute), complication, blood pressure (mmHg) and heart rate (beats per minute-bpm) evaluations before and after the procedure, pain VAS (Visual analogue scale) score, anxiety score (State Trait Anxiety Inventory-STAI), patient satisfaction (0 = poor to 4 = excellent) and lastly willingness of the patient to repeat the procedure (0 = never to 4 = happily).

Anxiety and pain scoring system

STAI form was used for evaluating the anxiety level of the patients [10]. The form entails 20 questions. Scoring is evaluated based upon these questions. High score displays high anxiety level. In this scoring scale, the highest score is 80 and the lowest score is 20. Visual numbers between 0 and 10 are showed in the VAS score that is used to evaluate the pain level [11]. No pain is rated with 0 and unbearable pain is displayed with 10. VAS and Anxiety Inventory was collected immediately after the treatment with the administration of a physician.

Rhythm Holter evaluation and measuring blood pressure

In order to objectively evaluate the study and support with clinical data, physiological changes during cast room procedures in patients have been evaluated by rhythm and blood pressure monitorization.

Blood pressure of patients was measured before the cast room procedures after the patients rested for 5 min on the resting seat and immediately after the procedure was completed with a digital blood pressure device (Braun Exactfit 5 – BP6200).

The rhythm Holter device (Schiller MT-200 Holter-ECG V 3.00.5) was applied to the patients immediately before the procedure and taken as soon as the procedure was completed.

In literature, there are many studies focusing on the P wave dispersion (Pd) which is the noninvasive determinant for the atrial arrhythmia and the QT interval dispersion (QTd) which is the noninvasive determinant of the ventricular arrhythmia that are correlated with anxiety [12–16]. P wave with the longest maximal P wave duration and longest atrial transmission at the ECG was accepted. P dispersion was accepted to be the difference between the longest and shortest P waves duration. QT dispersion was accepted to be the difference between the longest QT sequence and the shortest sequence. In clinical settings, for the evaluation of ventricular repolarization with ECG, frequently measurement of the QT interval and the corrected value of this measurement are used according to the heart rate. Bazett formula was used for the calculation of corrected QT interval dispersion (QTcd) [17]. QTcd was accepted as the difference between the longest corrected QT interval and the shortest corrected QT interval. All patients in this study were equipped with a rhythm Holter device. QTcd and Pd parameters were calculated and single-blind evaluated by a cardiology specialist who had no information on their clinical characteristics.

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