Original Article

The effects of listening to preferred music on pain intensity after open heart surgery

Hedayat Jafari[1], Amir Emami Zeydi[2], Soghra Khani[3], Ravanbakhsh Esmaeili[1], Aria Soleimani[4]

Abstract

Background: Pain is a common phenomenon after surgery. Cardiac surgeries are no exception and patients generally experience acute pain after these surgeries. Inadequate pain management after cardiac surgery predisposes patients to many complications. Therefore, the aim of this study was to determine the effects of listening to preferred music on pain intensity after open heart surgery.

Materials and Methods: This study was a randomized clinical trial (RCT) conducted in open heart intensive care unit (ICU) of a university hospital in Sari, Iran. A total of 60 patients who were scheduled to undergo open heart surgery were randomly allocated in two groups. Patients in the intervention group (n = 30) listened to their preferred music by headphones for 30 minutes, whereas those in the control group (n = 30) did not listen to music. Using a Numerical Rating Scale (NRS), pain intensity was measured among the patients before the intervention, and immediately, 30 minutes and one hour after the intervention. Data was analyzed by Chi-square test, student's t-test and repeated measures analysis of variance (ANOVA).

Findings: Mean pain intensity in the intervention group before, immediately after, 30 minutes and one hour after the intervention were 5.8, 3.1, 2.5 and 2.4, respectively. Corresponding numbers in the control group were 4.7, 4.7, 4.8 and 4.9, respectively. Repeated measures ANOVA showed music to significantly reduce pain intensity (p = 0.0001)

Conclusions: Music can be effective as a non-pharmacological, inexpensive, non-invasive and side effect free method for pain management after open heart surgery.

Key words: Music, postoperative pain, cardiac surgery, intensive care unit, music therapy

[1] PhD Student, Department of Medical-Surgical Nursing, School of Nursing and Midwifery (Nasibeh), Mazandaran University of Medical Sciences, Sari, Iran.
[2] MSc of Critical Care Nursing, School of Nursing and Midwifery (Nasibeh), Mazandaran University of Medical Sciences, Sari, Iran.
[3] PhD Student, Department of Midwifery, School of Nursing and Midwifery (Nasibeh), Mazandaran University of Medical Sciences, Sari, Iran.
[4] Assistant Professor, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Address for correspondence: Amir Emami Zeydi, MSc of Critical Care Nursing, School of Nursing and Midwifery (Nasibeh), Mazandaran University of Medical Sciences, Sari, Iran.
E-mail: emamizeydi@yahoo.com

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Introduction

Today, cardiac diseases are the most common causes of mortality worldwide. They would be the main cause of death worldwide in 2020, according to a prediction made by the World Health Organization (WHO).[1]

In the Middle East countries including Iran, cardiac diseases are turning into major health and social problems.[2] Despite technological developments in the treatment of cardiovascular diseases, such as thrombolytic therapy, angioplasty and atherectomy, the only alternative in many patients is still cardiac surgery.[3] While approximately 686000 open heart surgeries are performed in the USA annually,[4] the number decreases to more than 40000 in Iran.[5] Despite the frequency of cardiac surgeries and increased knowledge regarding pain and pain management, patients experience considerable pain during the postoperative period[6] and pain management remains inadequate after the cardiac surgery.[7] Gelinas showed that more than 75% of cardiac surgery ICU patients mentioned an experience of moderate to severe pain in the ICU.[8] Therefore, pain is a common complaint of patients expressed to nurses,[9] and

as a result, it is considered as a nursing priority.[10] Inadequate postoperative pain management leads to inability in coughing and effective movement which in turn predisposes patients to complications such as pneumonia, atelectasis, and deep veins thrombosis (DVT).[11] Schwann et al. showed that a considerable number (13%) of cardiac surgery patients develop DVT despite maximal thromboprophylaxis.[12] In addition, postoperative pain can keep patients from participating in expected activities such as deep breathing and getting out of bed which improve and reinforce the patient's better feeling and wellness.[13] Moreover, postoperative pain has a negative psychological impact on patients and delays the postoperative recovery.[11] There are several options for postoperative pain control including systemic medications (narcotics and non-narcotics), regional anesthesia (epidural) and non-pharmacological interventions. Systemic medications can lead to complications such as insufficient treatment, respiratory depression and excessive sedation. Epidural anesthesia may also result in hypotension, itching, nausea, vomiting and urinary retention.[14] Furthermore, medications cannot be used in all patients and impose expenses to the health care system.[15] Therefore, the recent tendency towards non-pharmacological strategies for relieving pain is growing fast.[16] In addition, a balanced combination of pharmacological and non-pharmacological methods provide up to 23% better pain management.[17] One of these methods, named as music therapy, involves listening to pleasant stimulating sounds.[16] Music is a source of pleasure for many people which has been used since ancient years to influence human health and alleviate sickness and suffering.[6] The application of music therapy to reduce discomfort has a long history. Egyptians used music therapy to cure infertility in women and Iranians used the sound of "ood" (a traditional Iranian musical instrument) to treat many diseases.[18] In nursing practice, music is considered as an effective and noninvasive intervention in relieving pain, stress and anxiety. It is also believed to increase comfort and immunity and to improve vital signs.[19] There are limited numbers of published studies on the effect of music on pain after open heart surgery.[7] In addition, music has a cultural implication[17] and insufficient studies have been conducted in many countries such as Iran. Meanwhile, the success of music therapy may be greatly enhanced by determining patient's preference, familiarity and cultural context.[20] While some studies have demonstrated pain to decrease after music,[4,21-26] others found music to be ineffective on pain.[27-33] Many previous investigations have been limited in a way. For instance, some employed a small sample size,[24,34] some evaluated different types of surgeries and anesthesia in one study,[35] and some used a type of music not selected by patients.[19,22,24,30,32,36,37] Moreover, while a systematic review recommended a minimum duration of 30 minutes for music therapy to be effective in clinical practice,[38] a number of studies played music for less than 30 minutes.[7,34,37] On the other hand, the constant presence of the researcher during the intervention[36] might have affected patient's response. However, no similar study has been conducted in Iran. Therefore, considering the above mentioned facts and according to the cultural, social and economic differences in Iran, we tried to perform a study without the aforesaid limitations to investigate the effects of preferred music on pain intensity among patients after open heart surgery in Mazandaran Heart Center, Sari, Iran.

Materials And Methods

This study was a randomized clinical trial (RCT) performed on patients undergoing open heart surgery (coronary artery bypass graft (CABG) and valvular surgery) admitted in open heart ICU of Mazandaran Heart Center (a university affiliated teaching hospital in Sari, Iran) during May-August 2010. A sample size of 30 subjects per group was selected. Sample size calculations were based on mean and standard deviation (SD) of a similar study[26] and considering a 95% level of significance and a power of 80%.

The inclusion criteria included willingness to participate in the study, non-emergency open heart surgery, first time open heart surgery, hemodynamic stability (systolic blood pressure higher than 90 mmHg, lack of life threatening dysrhythmia and a heart rate of 60-100 bpm).[39,40] Patients were excluded if they were connected to a ventilator at the time of intervention, had a history of mental disorders, chronic pain, and hearing disorders, used narcotic drugs 4 hours before intervention at the ICU, had a history of playing music, needed intra-aortic balloon pump (IABP), or used other alternative methods for pain reduction such as massage therapy during the intervention. In addition, with any complications during the operation or anesthesia or willingness to quit the study, the patient was omitted from the study. After obtaining approval from the Ethics Committee of Mazandaran University of Medical Sciences, the researcher went to the heart surgery ward of the hospital. Then, patients who were supposed to undergo surgery on the same day and met the inclusion criteria were randomly selected. Afterwards, the study procedure was explained for the subjects and written informed consents were taken. The participants were assigned into two groups of intervention and control. Each group consisted of 30 patients. The subjects were instructed about

determining their pain intensity using a 0–10 point Numerical Rating Scale (NRS). In the intervention group, the patients were provided with a list of music pieces. After listening to approximately one minute of the pieces patients were interested in, using a portable computer, they were asked to choose their favorite piece.

Demographic characteristics of the patients including age, gender, education, marital status, diabetes, pervious surgery, place of residence and profession were obtained by referring to medical records of the patients and also by asking the patients. As mentioned before, pain intensity was scored using a self-reporting 0-10 NRS in which 0 indicated lack of any pain and 10 represented most severe pain. This scale has extensively been used in the studies related to pain[7,9,24,36] and its validity and reliability have been approved.[41,42]

In the intervention group, while the patients were staying at the ICU for the first 24 hours after the surgery, their pain intensity was assessed and recorded. Then, the music pieces the patients selected previously were played by an MP3 player with special headphones for 30 minutes. All relaxation music pieces were selected by a music expert considering the cultural conditions of the society and the type of recommended music in the literature, i.e. with a tempo of 60-80 beats (or even less) per minute.[20,28] The musical tempo was evaluated by a Metro-Tuner (Musedo MT-30, China). Pain intensity was again evaluated immediately, 30 minutes and 1 hour after the music was completely played. However, in the control group, headphones were used without playing any music.

This study was conducted between 3 to 6 P.M. of the day after surgery because the traffic of hospital staff was lower and patients' routine care was completed and other people were less likely to be present and to interfere with the process. Evaluation of pain intensity was done by nurses with sufficient knowledge in this context who were blinded to the study groupings. The anesthesia was administered according to a single protocol recommended by the institution for all subjects. If, for some reason, the protocol could not be used for a subject, the patient was excluded from the study. In addition, other factors affecting pain intensity, such as incision method, type and extent of incision, having chest tube, and type of analgesic drugs used, were the same for all patients.

Data was analyzed using the Statistical Package for Social Sciences (SPSS) and descriptive-inferential statistics. Descriptive statics, i.e. mean, SD, and proportions, were used to determine the demographic data of all study subjects. Chi-square test and student's t-test were used to respectively compare qualitative and quantitative data between the two groups.

Repeated measurements were conducted to determine the impact of preferred music on pain intensity at different times of intervention. An $\alpha = 0.05$ was the level of significance used for all analyses.

Findings

All randomized patients were included in the analysis and there were no drop outs. A total of 60 persons participated in the study, 56.6% of whom were female. While mean age of all patients was 57.83 (10.62) years, it was 57 (11.6) in the intervention group and 58.6 (9.6) in the control group. The majority of patients (98.3%) were married and the two groups did not significantly differ in this regard ($p = 0.9$). While 40% ($n = 24$) of the subjects were housewives, 1.7% ($n = 1$) were unemployed and there was no significant difference between two the groups ($p = 0.3$). Most subjects (91.7%) underwent a CABG (83.4% ($n = 25$) in the intervention group and 86.7% ($n = 26$) in the control group ($p = 0.7$)). A combination of an internal mammary artery (IMA) graft and a saphenous vein graft (SVG) was used for all patients undergoing CABG. Others demographic and clinical characteristics of the patients are shown in Table 1. As it is seen, there were no significant differences in baseline demographic and clinical characteristics of the participants among the two study groups. The mean and standard deviation of pain intensity in the intervention and control groups, before intervention, immediately, 30 minutes and 1 hour after completion of the intervention are shown in the Table 2. There was no significant difference regarding baseline pain intensity among the two groups ($t = 1.746$; $p = 0.08$; and $df = 58$). Repeated measures analysis of variance (ANOVA) indicated music to significantly reduce pain intensity ($p < 0.0001$; $F = 16.31$).

Discussion

The present study examined the effects of listening to preferred music on pain intensity after open heart surgery As it is observed, the two groups (intervention and control) were similar at the baseline of the study in terms of variables studied, confirming the random nature of the groups.

Table 1. Frequency distribution of the subjects in the intervention and control groups base on some demographic and clinical characteristics

Variables		Groups		P value (Chi-square test)
		Control N (%)	Intervention N (%)	
Gender	Male	12 (20%)	14 (23.3%)	P = 0.38
	Female	18 (30%)	16 (26.7%)	χ^2 = 0.27
Education	Illiterate	13 (21.7%)	13 (21.7%)	P = 0.93
	High school	12 (20%)	11 (18.3%)	χ^2 = 0.13
	Higher education	5 (8.3%)	6 (10%)	
Place of residence	Urban	13 (21.7%)	17 (28.3%)	P = 0.3
	Rural	17 (28.3%)	13 (21.7%)	χ^2 = 1.06
History of diabetes	Yes	14 (23.3%)	13 (21.7%)	P = 0.72
	No	16 (26.7%)	17 (28.3%)	χ^2 = 0.06
Diabetes duration (month)	0	16 (26.7%)	17 (28.3%)	P = 0.64
	1 - 35	9 (15%)	7 (11.7%)	χ^2 = 0.37
	≥ 36	5 (8.3%)	6 (10%)	
History of pervious surgery	Yes	14 (23.3%)	18 (30%)	P = 0.24
	No	16 (26.7%)	12 (20%)	χ^2 = 1.07

Table 2. Mean and standard deviation of pain intensity among patients in the intervention and control groups before, and immediately, 30 minutes and one hour after the intervention

Variable	Group	Mean	SD
Pain intensity before the intervention	Control	4.7	2.8
	Intervention	5.8	1.7
Pain intensity immediately after the intervention	Control	4.7	2.8
	Intervention	3.1	2.1
Pain intensity 30 minutes after the intervention	Control	4.8	2.8
	Intervention	2.5	2.1
Pain intensity one hour after the intervention	Control	4.9	2.9
	Intervention	2.4	2.2

Based on the results of this study, music significantly decreased postoperative pain in patients after open heart surgery. Two studies that focused on patients' pain experience in the ICU after cardiac surgery reported more than 70% of patients to recall pain after surgery and therefore emphasized on pain as a major problem in patients after cardiac surgery.[8,43] Like our study, both Sendelbach et al.[7] and Hatem et al.[22] showed that music reduced patients' pain after cardiac surgery. Voss et al. studied patients during chair rest after open heart surgery and reported lower pain levels in the music intervention groups compared with the control groups.[4] Similarly, Tse et al. showed lower pain ratings and decreased pain over time in patients who listened to music immediately after nasal surgery.[44] Nilsson et al. stated patients exposed to soft relaxing music intraoperatively to have significantly lower pain scores compared with the control group patients on the first day after the surgery.[45,46] In contrast, Allred et al. evaluated patients undergoing knee arthroplasty and did not find any significant pain reduction ($p = 0.337$) in the case group (music) as compared with the control group (resting on bed).[28] Likewise, the effect of music on pain reduction after caesarian section was not statistically significant in a study conducted in Iran.[32] Music ineffectiveness on pain reduction in these studies could be attributed to the type of the music listened by the patients, i.e. one type of Spanish guitar music was played for all participants without considering the local and national culture of the patients. However, it has been suggested that preferred music, as opposed to prescribed music, is a critical factor in the effectiveness of music therapy.[47] The results of Stratton and Zalanowski showed a significant correlation between the degree of relaxation and liking the music.[48] Since the emotional responses differ from culture to culture, a type of music related to the cultural features of the subjects should be selected.[49] Therefore, the success of music interventions may be greatly enhanced by determining preferences, familiarity and cultural contexts of the patients. Additionally, preferred music can reestablish a sense of control in an environment that may be unfamiliar to patients.[20] However, Cepeda et al. reported music not to reduce alfentanil requirement and pain intensity in patients undergoing extracorporeal shock wave lithotripsy (ESWL).[50] Similarly, another study conducted by Nilsson et al. on patients after cardiac surgery did not reveal any significant differences in pain between the group that listened to music and the control group.[36] The reason might again be using only one type of music for all the patients. In other words, greater effects could have been observed if patients had selected their favorite type of music.

Conclusion

The results of this study support the beneficial effects of preferred music on pain control after open heart surgery while the patients are in the ICU. Since listening to music is a simple, inexpensive, and side effect free intervention which could be simply provided by an MP3 player and headphones, we recommend extensive use of music therapy in patients undergoing open heart surgery for postoperative pain reduction.

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