Complementary Therapies in Clinical Practice 35 (2019) 278–283

Contents lists available at ScienceDirect

Complementary Therapies in Clinical Practice

journal homepage: www.elsevier.com/locate/ctcp

The effects of listening to music on the postoperative nausea and vomiting

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ARTICLE INFO

Keywords:
Music
Laparoscopic cholecystectomy
Nausea
Vomiting

ABSTRACT

Aim: To determine the effect of music on the severity of postoperative nausea and vomiting after the laparoscopic cholecystectomy.

Methods: This study was a randomized, controlled clinical study. The subjects were randomly divided into two groups (intervention group and control group). The numerical scale of nausea was used in rating the nausea complaints of the patients and the vomiting incidence assessment form in determining the incidence of vomiting.

Results: There were statistically significant difference between the groups in terms of the severity of nausea complaint ($W = 110.826$ $p < 0.001$). When compared to the control group, the vomiting incidence of the patients was statistically significantly lower in intervention group.

Conclusions: This study demonstrated that listening to music decreased the severity nausea and the incidence of vomiting in the postoperative period.

1. Introduction

All the surgical interventions incorporate the postoperative complication risk. Two of the complications most common in the postoperative period are the vomiting and nausea [1,2]. The postoperative nausea and vomiting (PONV) refers to the development of nausea (solely or together with vomiting) within 24 h after the application of general anesthesia. PONV is an important condition influencing 20–30% of the patients [3]. The risk factors playing role in the development of PONV are the type of anesthesia, the type of surgical intervention, the age and sex of patient, the duration of operation, and the history of previous postoperative nausea-vomiting [4,5]. The postoperative use of analgesic significantly increases the rate of PONV [6–8]. The abdominal and otorhinolaryngology surgeries are the surgical operations carrying higher risk of PONV [4]. It the rate of PONV might was reported to rise up to 70% after the laparoscopic surgery [9,10]. The laparoscopic cholecystectomy is a surgical intervention that is commonly used in general surgery clinics because of the low postoperative infection and pain levels, shorter hospitalization time, sooner healing, and better esthetical outcomes [11,12]. However, the development of PONV is a common condition in this method [6]. In addition to the patient's discomfort, the PONV also prolongs the hospitalization duration, recovery period, and healing [13]. Moreover, in severe cases, it also causes the loss of fluid-electrolyte loss, aspiration to airways, contamination in surgery area, strain in suture line, increase in intraocular and intra-abdominal pressure, formation of hematoma, and prolongation of healing, as well as pain in wound site [10,14,15]. The negative experiences of the patient due to the PONV require the nursing care. It is important to take PONV under control because of the problems that the patient faces. There are pharmacological and non-pharmacological methods which can be used for this purpose. One of the pharmacological methods is to use the anti-emetics after determining the risk factors. However, because of the adverse effects, the antiemetic medications have limited efficiency against PONV. The combination of rare complications and the relatively low efficiency inspired interest in the alternative methods used in PONV treatment [16]. Some of the complementary treatments aiming to prevent the PONV are acupuncture, aromatherapy [17], acupressure [18], physical activity [19] and listening to music [17,19]. The music can be described as a natural intervention aiming physical, psychological, social, sensual, and spiritual recovery. It has been historically used as intervention in the health care [20]. Listening to music is a non-pharmacological intervention, which is easy-to-implement, use and it has no adverse effect or cost [21]. In the literature, it was reported that the music is a non-pharmacological nursing practice used in managing the severity of nausea and vomiting [22,23] and symptoms [24]. Moreover, it was reported that listening to music had positive effects on the hospitalization time, fatigue, and use of analgesic and anti-emetic medications [25]. In their studies carried out on the patients that have undergone surgical operation, Nilsson et al. [26] and Laurion and Fetzer [27] reported that the music had no effect on PONV.

Because of the inconsistencies regarding the effects of music on the severity of nausea and vomiting, further studies on this subject are needed in order to provide sufficient evidence. In the present study, it

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https://doi.org/10.1016/j.ctcp.2019.03.003
Received 22 January 2019; Received in revised form 1 February 2019; Accepted 4 March 2019

was aimed to evaluate the effects of music on the postoperative nausea and vomiting severity after the laparoscopic cholecystectomy.

2. Materials and methods

2.1. Trial design

This study is a randomized controlled experimental study aiming to determine the effects of listening to music on the postoperative nausea and vomiting.

2.2. Study settings

This study was conducted at the General Surgery Clinic of a training and research hospital the city of Aksaray, Turkey, between July and November 2018.

2.3. Sample size

The power analysis of the study was performed using G * Power Version 3.1. Post-hoc power was calculated by ANOVA method in repeated measurements. Effect size f = 0.61 calculated from data and for $\alpha = 0.05$, the power of our study with 67 patients was calculated as 0.99 (1-β err).

2.4. Randomization

After the first evaluations, the participants were randomly divided into two groups. The sealed envelope method was employed for ensuring the randomization. There were even and uneven numbers in the envelopes. The patients with uneven numbers were assigned to the control group (n = 35), whereas those with the even numbers were assigned to the intervention group (n = 35). The flowchart is presented in Fig. 1.

2.5. Participants: eligibility criteria

The inclusion criteria were the history of laparoscopic cholecystectomy surgery, to be aged ≤65 years, to have orientation, to be cooperative, to have open consciousness, and the willingness to participate. The exclusion criteria were the BMI index > 40 kg/m^2, to have insufficient mental functions limiting the communication, to have hearing impairment, and not to know Turkish language.

2.6. Blinding

The patients assigned to the intervention group were informed about the intervention, and the postoperative data of the present study were collected by the nurses having no knowledge about the subjects in the intervention and control groups. The data analyses were performed by a statistician having no information about the study groups. All the patients were similar in terms of the operation duration. Moreover, the treatment protocols implemented for the postoperative nausea and vomiting severity were also similar.

2.7. Interventions

After ensuring the randomization, the patients in the intervention group were taken to the patients' rooms after the procedure and the routine physiological parameters were evaluated. On the 2nd, 4th, 6th, 8th, 12th, and 24th postoperative hours, the nausea severity and vomiting incidence of patients were analyzed. 15 min before these evaluations, the patients listened to music for 20 min by using Mp3–player. Each of the patients was provided with personal earphones and Mp3-player. Listening to the prerecorded music has been defined as music medicine contrary to active music therapy, in which a music therapist is involved [28]. In the previous studies, it was showed that the music medicine was as effective as active music therapy [29,30]. Thanks to its effect on the limbic system, the music recalls the good psychophysiological responses and it aims diverting the concentration from the harmful stimulants [17]. Moreover, it was also emphasized that the personal preferences should be taken into consideration while choosing the music for relaxing [30]. In the present study, an album recorded by an instructor, who is an expert on the Turkish music (Turkish art, Turkish folk and classical music), considering the music preferences of the patients was used. The songs were uploaded to the Mp3 player

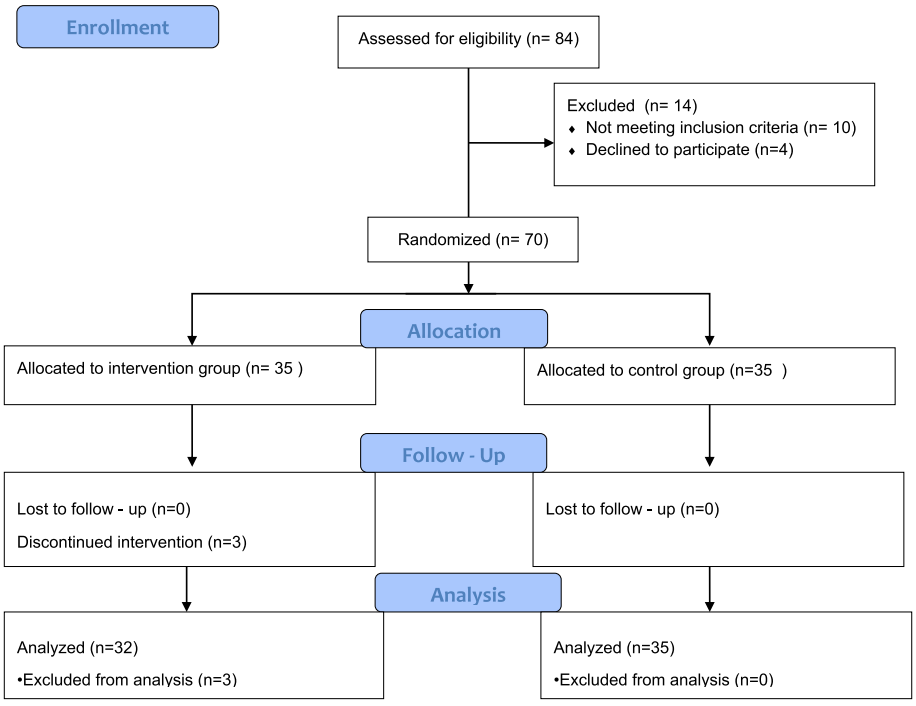

Fig. 1. Flow chart of patient selection.

Table 1
Comparison of descriptive characteristics of the intervention and control group (n = 67).

Variables	Intervention Group (n = 32)	Control Group (n = 35)	Statistics test	p-value
Age (years) [mean (SD)]	46 (11.7)	45.2 (11.3)	t = 0.264	p = 0.793
Operation time [mean (SD)]	57.7 (5.2)	56.6 (5.3)	t = 0.873	p = 0.386
BMI (kg/m2) [mean (SD)]	26.03 (2.6)	27.0 (2.4)	t = 0.348	p = 0.557
Gender (n-%)				
Female	16 (50.0)	22 (62.9)		
Male	16 (50.0)	13 (37.1)	$\chi2 = 1.126$	p = 0.289
Marital status (n - %)				
Married	22 (68.8)	28 (80.0)		
Single	10 (31.2)	7 (20.0)	$\chi2 = 1.117$	p = 0.290
Educational status (n - %)				
Literate	2 (6.2)	4 (11.4)		
Primary school	16 (50.0)	12 (34.3)	$\chi2 = 1.865$	p = 0.394
High School	14 (43.8)	19 (54.3)		
Previous surgery (n - %)				
Yes	19 (59.4)	13 (37.1)		
No	13 (40.6)	22 (62.9)	$\chi2 = 3.312$	p = 0.069
Presence of the chronic illness (n - %)				
Yes	12 (37.5)	17 (48.6)		
No	20 (62.5)	18 (51.4)	$\chi2 = 0.835$	p = 0.361
Favorite music type (n - %)				
Turkish art music	4 (12.5)	9 (25.7)		
Turkish folk music	14 (43.8)	12 (34.3)	$\chi2 = 6.718$	p = 0.081
Religious music	8 (25.0)	13 (37.1)		
Turkish classical music	6 (18.8)	1 (2.9)		

BMI: Body mass index.
t: Independent sample *t*-test statistic; $\chi2$:chi square test statistic $p < 0.05$ level of significance.

given to the patients in intervention group, and the participants listened to whichever song they wanted. 15 min after each music intervention, the nausea and vomiting severity of the patients was evaluated using the numerical scale of nausea and the vomiting incidence assessment form.

The data collection intervals were the same in both of control and intervention groups. However, no music was listened in the control group but the routine treatment protocols and nursing care implementations were performed.

2.8. Instruments

In collecting the data, “Personal Information”, “Vomiting Incidence Assessment Form”, and “Numerical Scale of Nausea” were used.

The preliminary data of the study were collected by the researcher in the patient examination room and the procedure took approximately 10 min.

Personal Information Form: The form developed by the researcher consists of 10 close-ended questions. In this form, there are items related with the demographic characteristics (age, sex, marital status, educational status, height, and weight), medical characteristics (chronic diseases and previous surgery), and the type of music that they like listening to.

Vomiting Incidence Assessment Form: This form was used for assessing the vomiting incidence on 2nd, 4th, 6th, 8th, 12th, and 24th post-operative hours.

Numerical Scale of Nausea: the numerical scale of nausea is a scale, which starts with “0 (no nausea)” and ends with “10 (very severe nausea)” and which has 1 cm interval given a numerical value. In this scale, the patient or his/her relative marks the most severe nausea that the patient felt. The numerical scale has a single dimension and it is mainly used in assessing the severity of pain. It is used for assessing the severity of nausea in Edmonton's symptom identification scale, validity and reliability of which were tested by Kurt [31]. The numerical scales are recommended since they ease the definition of severity, make it easier to score and record, and are useful in evaluating the minimum and maximum effect [32]. This numerical scale was used for assessing the severity of nausea, which was reported by the patients in number, by converting them into an objective form.

2.9. Data analysis

The data of this study were analyzed in IBM SPSS Version 22 program and RStudio software. The descriptive information of the participants was expressed in mean values, standard deviation, and percentage. Kolmogorov–Smirnov and Shapiro–Wilk tests were used to evaluate the suitability of normal distribution of research data. Demographic and clinical characteristics of participants were described using frequency distributions for categorical variables and means/standard deviations for continuous variables. The non-parametric test in factorial design was used for the repeated measures of nausea severity measurements. Since the group-time interaction was found to be significant, the significant difference between the pairs was examined using Dunn test (post-hoc test). For the comparisons, $p < 0.05$ was accepted to be statistically significant.

2.10. Ethical considerations

The present study was carried out in accordance with the principles of Helsinki Declaration. The approval of ethics committee was obtained prior to the study from the Human Studies Ethics Committee of Aksaray University (number: 2018/132), and the written approval (number: 66472688–771) was obtained from the institution's administration. All the participants were informed about the purpose and design of the study. The anonymity and privacy were guaranteed. The willingness was taken as base for the participation. The patients were informed that their decision of not participating in the study would have no effect on the nursing interventions they were receiving and the patients would be able to quit the study whenever they would like to.

3. Results

3.1. Demographic characteristics

A total of 84 potential participants were assessed; 10 patients were excluded for not meeting the study criteria and 4 patients for not accepting the participation. Thus, 70 patients were involved into the study in total. Since 3 patients in the intervention group quitted listening to music, those patients were excluded from the analyses and the study was completed with 67 patients (Fig. 1).

The descriptive characteristics of the participants are presented in Table 1. The mean age of the individuals in the intervention group was 46 ± 11.7 years. Of the participants in this group, 50% were female, 68.8% were married, 50% had primary school graduation, 59.4% had a previous surgery history and 62.5% had no chronic illness. Moreover, 43.8% of the participants in this group stated that they like listening to Turkish folk music. For the control group, the mean age was calculated to be 45.2 ± 11.3 years. Of the participants in this group, 62.9% of the participants were female, 80% were married, and 54.3% had high-school graduation. Moreover, 62.9% of the participants in this group had no previous surgery history, 51.4% had no chronic illness and 37.1% of the participants in this group stated that they like listening to religious music. It can be seen that the participants in both groups have similar descriptive characteristics. The mean operation duration of the participants in intervention group was 57.7 ± 5.2 min, whereas that of

Table 2
Severity of nausea in patients intervention and control group.

Time after surgery	Intervention group n = 32		Control group n = 35		Statistics test
	Mean ± SD [Min-Max]		Mean ± SD [Min-Max]		
2 h	2.88 ± 0.71	3 [1–4]	4.11 ± 0.76	4 [3–5]	Time W = 228.123 p < 0.001
4 h	1.16 ± 0.77	1 [0–3]	3.37 ± 0.84	3 [2–5]	Group: W = 110.826 p < 0.001
6 h	0.53 ± 0.72	0 [0–3]	2.37 ± 1.09	2 [1–4]	Group x Time: W = 45.177 p < 0.001
12 h	0.25 ± 0.44	0 [0–1]	1.49 ± 1.01	1 [0–4]	
24 h	0.16 ± 0.37	0 [0–1]	0.6 ± 0.98	0 [0–4]	

W: Nonparametric testing in factorial design for repeated measurements p < 0.05 level of significance.

the individuals in control group was 56.6 ± 5.3 min. The mean body mass index in intervention group was 26.03 ± 5 2.6 kg/m2 and it was 27.0 ± 2.4 kg/m2 in control group (p > 0.05; Table 1).

3.2. Nausea

In Table 2, the comparison between the groups in terms of the severity of nausea is presented. There is a statistically significant difference between the nausea severity levels of the groups (W = 110.826 p < 0.001). The differences observed in the nausea severity levels in the course of time were also found to be statistically significant (W = 228.123 p < 0.001). The time interaction (on 2nd, 4th, 6th, 8th, 12th, and 24th postoperative hours) in the groups was found to be statistically significant (W = 45.177 p < 0.001). The difference between the groups was also found to be statistically significant (W = 110.826, p < 0.001).

The intragroup comparison of the nausea severity in the course of time is presented in Table 3. The difference between the average values calculated for the intervention (F = 101.547 p < 0.001) and control (F = 120.666 p < 0.001) groups was found to be statistically significant. In the intergroup comparisons, the differences between the measurements were statistically significant (p < 0.05). It was determined that the mean value of the measurements performed in intervention group was statistically significantly lower than in the control group (p < 0.05).

3.3. Vomiting

In the present study, the vomiting incidence on 2nd, 4th, 6th, 8th, 12th, and 24th postoperative hours were examined (Table 4). In all the hours, the vomiting incidence of the patients in intervention group was found to significantly decrease when compared to the control groups.

4. Discussion

The results of the present study showed that listening to music reduced the severity of postoperative nausea and vomiting after the laparoscopic cholecystectomy. The nausea is defined as an unpleasant and subjective sense indicating the vomiting. However, the nausea does not necessarily result in vomiting. Thus, it is difficult to examine the nausea. PONV is one of the most commonly seen complications observed after the general anesthesia in laparoscopic surgery [33]. During the first hours after the operation, the patients are under the effects of prophylactic anti-emetic medications given during the surgical operation depending on the half-life of the medications and the patients complain about the nausea and vomiting as the effects of medications disappear [34]. In the present study, it was showed that listening to music significantly reduced the severity of postoperative nausea when compared to the control group (Table 2). In parallel with the present study, Karagözoğlu et al. [24] reported that the music had positive effect on the severity of nausea for the patients receiving chemotherapy. Similarly, in the studies examining the effects of music on the cancer patients, it was reported that the music played effective role in decreasing the nausea and vomiting incidence of the patients [35,36]. Moreover, in addition to the studies reporting the positive effects of the music on the postoperative nausea, there also are studies reporting that there was no effect. Nilsson et al. [26] carried out a double-blind, randomized controlled study on 90 women, who have undergone hysterectomy under general anesthesia, and the authors reported that the music had no effect on decreasing the PONV in the study group. In their randomized controlled study on the women having gynecologic laparoscopic surgery history, Laurion and Fetzer [27] reported that listening to music had not effect on the postoperative nausea.

In the present study, the change in the nausea severity between the intragroup repeated measurements was statistically significant (Table 3). In the previous studies carried out on the physiological effects of music, it was emphasized that the music played effective role in patients' recovery by causing changes in the neuroendocrine system [37]. In the literature, it was reported that music increases the endogenous opioid release from the pituitary gland and it has also effects on the pain, mood, and memory. Furthermore, the music also decreases the level of catecholamine, increases the level of phenylethylamine that is a neuroamine regulating the mood, and makes individual feel relax by decreasing the adrenocorticotropic hormone, cortisol, and corticotrophin-releasing hormone released in cases of stress [37,38].

Table 3
Comparison of severity nausea in patients intra-group and inter-group.

Time after surgery	Intervention group n = 32				Control group n = 35				Statistics test
	[Mean ± SD]	[Min-Max]	Statistics test	Binary comparisons	[Mean ± SD]	[Min-Max]	Statistics test	Binary comparisons	
2 h	2.88 ± 0.71	3 [1–4]	F = 101.547	2-24: p = 0.001	4.11 ± 0.76	4 [3–5]	F = 120.666	6-24: p < 0.001	p < 0.001
4 h	1.16 ± 0.77	1 [0–3]	p < 0.001	4-24: p < 0.001	3.37 ± 0.84	3 [2–5]	p < 0.001	4-24: p < 0.001	p < 0.001
6 h	0.53 ± 0.72	0 [0–3]		2-12: p < 0.001	2.37 ± 1.09	2 [1–4]		2-24: p < 0.001	p < 0.001
12 h	0.25 ± 0.44	0 [0–1]		4-12: p = 0.001	1.49 ± 1.01	1 [0–4]		4-12: p < 0.001	p < 0.001
24 h	0.16 ± 0.37	0 [0–1]		2-4: p = 0.003	0.6 ± 0.98	0 [0–4]		2-12: p < 0.001	p = 0.022
				2-6: p < 0.001				4-6: p = 0.022	
								2-6: p < 0.001	

F: Friedman test istatistiği p < 0.05 level of significance.

Table 4
Incidence of vomiting in patients intervention and control group.

Time after surgery	İntervention group (n = 32)		Control group (n = 35)		Statistics test	p-value
	Yes n (%)	No n (%)	Yes n (%)	No n (%)		
2 h	13 (40.6)	19 (59.4)	23 (65.7)	12 (34.3)	$\chi2 = 4.233$	p = 0.040
4 h	7 (21.9)	25 (78.1)	18 (51.4)	17 (48.6)	$\chi2 = 6.242$	p = 0.012
6 h	6 (18.8)	26 (81.2)	15 (42.9)	20 (57.19	$\chi2 = 4.514$	p = 0.034
12 h	3 (9.4)	29 (90.6)	13 (37.1)	22 (62.9)	$\chi2 = 7.091$	p = 0.008
24 h	1 (3.1)	31 (96.9)	7 (20.0)	28 (80.0)	$\chi2 = 4.527$	p = 0.033

$\chi2$:chi square test statistic $p < 0.05$ level of significance.

In the present study, the vomiting incidence of the patients was analyzed and it was found to be significantly lower in the intervention group (Table 4). These results show that the music reduced the severity of nausea and caused a decrease in the incidence of postoperative vomiting. In parallel with the present study, Rhodes et al. examined the effects of music and visual imagining on the severity and duration of nausea-vomiting and they reported significant decrease in the severity of nausea-vomiting and reduction in the incidence of vomiting [23]. Moreover, it was also reported in the literature that the music could be used in managing the symptoms such as nausea and vomiting [22,39].

The results of present study indicate that listening to music, which is one of the non-pharmacological nursing practices, is an intervention that can be used for decreasing the nausea and vomiting levels of the patients.

4.1. Study limitations

The present study has several limitations. The results obtained here might have been influenced because the study was carried out in a single center and, instead of listening to a single type of music, the participants listened to the type of music that they preferred.

5. Conclusion

In the present study, the effect of listening to music after the laparoscopic cholecystectomy on the PONV was examined. At the end of the study, it was revealed that the severity of PONV observed in the intervention group was statistically significantly lower than in the control group. The changes observed in the intragroup analyses were statistically significant.

In conclusion, the use of music during the surgical interventions with high PONV risk should be popularized and the healthcare professionals should be informed on the positive effects of music. According to these results, without the personal preferences of the patients, it is recommended to comparatively examine the effects of different music types on a larger sample size and by making use of different applications should be examined.

Conflicts of interest

The content of the paper has not been yet published or under consideration for publication elsewhere. I stated that there are no conflicts of interest regarding the publication of this article.

Support

This research did not receive any financial support.

Funding

None.

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