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The Effect of Patient-Selected Music on Early Postoperative Pain, Anxiety, and Hemodynamic Profile in Cesarean Section Surgery

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Abstract

Background: After cesarean section surgery, routine pharmacologic methods of analgesia—opioids and benzodiazepines—may impair the immediate close contact of mother and neonate for their sedative and emetic effects.
Objectives: The aim of this study was to explore the effect of patient-selected music on postoperative pain, anxiety, opioid requirement, and hemodynamic profile.
Methods: A total of 80 patients, American Society of Anesthesiologists (ASA) physical status I-II, scheduled to undergo general anesthesia and elective cesarean section surgery were enrolled. Patients were randomly allocated to receive 30 minutes of music or silence via headphones postoperatively. Pain and anxiety were measured with a visual analogue scale. Total postoperative morphine requirement as well as blood pressure and heart rate were recorded after the intervention period.
Results: Pain score and postoperative cumulative opioid consumption were significantly lower among patients in the music group ($p < 0.05$), while there were no group differences in terms of anxiety score, blood pressure, or heart rate ($p > 0.05$).
Conclusions: Postoperative use of patient-selected music in cesarean section surgery would alleviate the pain and reduce the need for other analgesics, thus improving the recovery and early contact of mothers with their children.

Introduction

Pain and anxiety are the most common distressing adverse effects in the early postoperative period. Routine pharmacologic methods—opioids and benzodiazepines—may impair the recovery of patients for their sedative and emetic effects. The use of more holistic methods of analgesia, especially in cesarean section where the immediate close contact of mother and neonate is desired, would improve the recovery of patients.

Some studies have suggested that exposure to calming music can alleviate perioperative pain and anxiety,[1,2] and may improve the hemodynamic status of patients.[3,4] However, other studies have not found such beneficial effects.[5–8] The conflicting results of previous investigations might be attributable to multiple methodologic problems, such as small sample size, selection bias, nonblinded investigators, lack of a control group, no randomization in design, and nonobjective outcome measures. However, most previous studies have been focused on the treatment of preoperative anxiety[9–11] or late postoperative pain,[12,13] and studies on early postoperative anxiety and pain are sparse. We conducted this controlled clinical trial to evaluate the effects of patient-selected music on self-reported pain and anxiety as well as analgesic requirement and hemodynamic parameters in the early postoperative phase in patients who underwent cesarean section.

Methods

This randomized, controlled study was conducted with 80 pregnant women aged 18–36 year, American Society of Anesthesiologists (ASA) physical status I–II, scheduled to undergo general anesthesia and elective cesarean section surgery. None of the patients had any hearing impairment, chronic pain problems, alcohol or drug abuse, any known psychiatric or memory disorder, known allergy to any of the planned perioperative medications, past complications dur-

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ing anesthesia or surgery, an established diagnosis of anxiety disorder, hypertension, or a first language other than Persian. Subjects were randomly assigned to either music or silence groups. The hospital's ethics committee approved the study protocol, and written informed consent was obtained from all participants.

Subjects were contacted the night before surgery and were questioned about their attitude toward being exposed to calming music in the postoperative period. In case of positive attitude, they were asked to bring their favorite music tape. They were also told that they might or might not have an opportunity to actually listen to music at the recovery. On admission, all patients were instructed to mark the pain and anxiety scales representing their status. Moreover, they received preoperative information about the routine duration of surgery, anesthesia, and recovery as well as common physical and psychologic experiences of women in the early postoperative period.

Anesthesia was induced with thiopental 4–5 mg/kg and succinylcholine (1–1.5 mg/kg). After tracheal intubation, anesthesia was maintained with halothane 0.5% delivered in a N_2O (50%)/O_2 (50%) gas mixture. Controlled mechanical ventilation with an initial tidal volume of 10 mL/kg and respiratory frequency of 10 breaths/min was adjusted to maintain normocapnia. After delivery, we continued the volatile agent (halothane 0.8%) and administered morphine 0.2 mg/kg, midazolam 2 mg, and atracurium 0.5 mg/kg as well as increasing N_2O concentration to 70%. Anesthesia was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg. The same anesthetist who was blinded to the assignments performed all anesthetic procedures.

Intervention

Music was administered 15 minutes after arrival at the recovery room for 30 minutes to the intervention group via soft open-air headphones and a tape player (WM-EX 190 Cassette Walkman; WM-EX 190 Cassette Walkman, Sony, San Diego, CA). The Control group wore headphones with no music administered. The patients were asked to adjust the sound volume to a comfortable level. The type of headphones used in this study allowed outside sounds to be heard by the participant.

Measures

Pain intensity was measured with a visual analogue scale (VAS), a 100-mm horizontal line with anchors of no pain and worst possible pain. The VAS was scored by measuring in millimeters the distance from the side marked no pain to the edge of the mark made by the participant. Possible scores ranged from a minimum of 0 to a maximum of 100 mm. The anxiety scale was marked and scored in a manner similar to the pain VAS scale with the same range, from 0 to 100 mm. Validity and reliability of this instrument for the assessment of anxiety have been approved earlier.[10,14] After 30 minutes of intervention, each VAS scale was presented to the participants individually by an instructed nurse who was unaware of assignments. Each scale took 30 seconds to complete on average.

The total amount of morphine administered in the recovery room and via the patient-controlled analgesia (PCA) for the first postoperative hour was recorded. After 30 minutes of intervention, an attending nurse who was unaware of assignments measured heart rate and noninvasive blood pressure two times with a 5-minute interval. The average of two measurements was considered for analyses.

Statistical analyses

Calculation of required sample size was performed with respect to pain score. From the literature, a standard deviation of 20 mm was expected, and the analysis was carried out with respect to detecting a difference of at least 15 mm for this parameter. With a power of 80% and α level of 0.05, a sample size for each group of at least 36 patients was calculated as being appropriate. Another four patients (10% of calculated sample size) were also added to each group. This was the percentage that was added to our calculated sample size to replace possible missing data for all potential causes, including technical problems or inappropriate sedation levels in the recovery that could affect the ability of patients to accurately perceive their pain and anxiety. What was noteworthy is that, after the practice was performed 2 patients were excluded because of technical problems with cassette players and another patient was dropped from the analyses because of extreme anxiety.

Data are presented as mean ± standard deviation. Baseline characteristics and outcome measures of the two groups were analyzed with Student's *t*-test for continuous data and χ^2 tests for categorical analyses. All the comparisons were two tailed. *P* values <0.05 were considered statistically significant. Statistical analysis was performed with SPSS version 11.0 software (SPSS Inc., Chicago, IL).

Results

There were no significant differences between the two groups regarding demographic data or anesthetic and surgical parameters (Table 1). Two patients from the music group were excluded because of technical problems with cassette players at the recovery. Another patient from the control group was identified as an outlier for extreme anxiety and was dropped from the analyses. Anesthesia and surgery were considered uncomplicated in both groups.Pain score and postoperative cumulative opioid consumption were significantly lower among patients in the music group, while anxiety score was not statistically different between two groups. There were no group differences in terms of blood pressure or heart rate (Table 2).

Discussion

Our results suggest a role for patient-selected music in perianesthetic patient care. The results of the present study re-

Table 1. Comparison of Baseline Characteristics in Two Groups

Variable	*Music group* (n = 38)	*Control group* (n = 39)
Age (yr)	25.6 ± 4.3	24.8 ± 4.4
Weight (kg)	66.7 ± 8.7	67.1 ± 9.4
Height (cm)	161.4 ± 9.3	162.6 ± 10.5
Anesthesia[a] (min)	41.2 ± 3.2	41.9 ± 3.6
Surgery (min)	32.1 ± 2.7	32.7 ± 2.9

[a]Minutes from induction to opening the eyes.

Table 2. Postoperative Pain, Anxiety, Morphine Requirement, and Hemodynamic Parameters

Variable	*Music group* (n = 38)	*Control group* (n = 39)
Pain score	27 ± 21	46 ± 23*
Anxiety score	11 ± 14	13 ± 12
Morphine (mg)	1.6 ± 1.7	2.5 ± 1.9*
SBP (mm Hg)	116 ± 17	119 ± 16
DBP (mm Hg)	69 ± 12	71 ± 13
HR	87 ± 14	83 ± 15

Systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR).
*$p < 0.05$.

vealed that patient-selected music after cesarean section surgery improves pain relief and minimizes analgesic requirements, with no significant effects on anxiety score or hemodynamic profile. The influence of music on pain relief and its analgesic-sparing effect have been evaluated in different subgroups of patients.[2,6,15–17] It is important to note that because of the type of intervention studied, subjects could not be blinded to group assignment. However, both the anesthesiologist and nurses who were involved in data collection were blinded to the allocations. Thus, the observer bias would be eliminated in this study.

Faster recovery is a topic of research in recent years.[18] It is well-known that current analgesics—opioids and benzodiazepines—may delay the flow of patients through recovery for their sedative effects. Improved pain relief along with decreased requirement for analgesics achieved with the use of calming music would facilitate the recovery of patients, and consequently advances the turnover of operating rooms, reduces the costs of postoperative care, and improves the satisfaction of patients.

There are several positive[1,2] and negative[15,19] reports regarding the effects of music on perioperative anxiety levels. Anxiety was not influenced in this study, possibly because the levels of estimated anxiety were low and it was unlikely that a significant effect would be found. We did not measure the preoperative levels of anxiety, and one might assume that this may hinder our results. It is noteworthy that it has been shown that the levels of anxiety may not change significantly before and after surgery.[8,20] However, future studies should continue to test the effects of music on postoperative anxiety in patients with different types of surgery and levels of anxiety.

Although several mechanisms may be considered for the effects of music on physiologic responses,[10,21] a few studies showed the efficacy of music postoperatively on reducing blood pressure and heart rate.[3,4] Of note, these studies did not adjust hemodynamic parameters for the intensity of pain and anxiety; thus, a desirable direct effect on blood pressure and heart rate could not be determined by their results. Moreover, the effect size of music in the abovementioned papers is quite subtle and may be more of academic interest. However, we did not find any significant improvement in the hemodynamic profile in our series, which is in agreement with the results of most recent studies.[5,15,22] These findings may weaken the possibility of a psychophysiologic theory for the pain-relieving effects of music and warrant further studies that consider other theoretical frameworks in their design, including the psychologic relationship between music and pain; spinal mechanisms involved in pain modulation; and the role of endorphins.[23]

Earlier research studies have described the effects of musical elements such as tempo and pitch on physiologic responses.[12,13,24] With respect to these data, most previous investigators used a single type of music for all patients or at a maximum offered limited choices to them. All claimed to be sedative but did not consider patients' musical preferences in reality. It is important to note that age, culture, socioeconomic status, and religion affect the way people respond to pain and music.[25,26] In this study, we allowed participants to listen to their favorite music. We expected that prior familiarity with the music might help our patients feel at home in the strange environment of recovery and facilitate distraction from undesired experiences such as pain and anxiety. In agreement with our results, some previous studies demonstrated the efficacy of patient-selected music in the perioperative period,[6,22,27–29] even with comparable effects with standard sedative music.[30] Interestingly, it has been suggested that no particular style of music is more effective than another at increasing relaxation; rather, the most important factor is how much the patient likes the music.[31] The effects of patient-selected versus standard researcher-provided calming music should be addressed in further large-scale randomized clinical trials.

Experts suggest that music therapy might be more effective when patients are capable of focusing on music intervention.[12,32] Most of the previous interventions were performed on postoperative days 1 and 2,[12,13] while the present study demonstrated that playing music immediately after surgery would be beneficial for patients. It is possible that prior familiarity of our patients with the played music improved the concentration on intervention, and subsequently facilitated distraction from the recovery environment. Interestingly, some earlier studies have shown that sedative music even during general anesthesia would minimize the patients' pain and anxiety.[2] In support of these findings, some have suggested that even under general anesthesia with adequate depth, some processing of intraoperative events can occur.[33,34] Taken together, it seems that the use of music at any time around the surgery would be beneficial. However, the most appropriate timing of intervention should be investigated in future studies.

The optimal duration of exposure to music is not known; however, a study on intensive care patients suggested a listening time of 25–90 minutes for each therapeutic session.[35] In the present study, the duration of listening to music was fixed at 30 minutes. In addition to clarifying the optimal duration of intervention, the role of patients in controlling the duration of intervention should be addressed in future.

It has been demonstrated that the single best measure of pain is the patient's self-report;[36] however, patients in the early postoperative period may be disoriented and are less likely to understand the scoring systems. In the present study, the participants were trained preoperatively to minimize this confusion. Although results were not objectively measured, we believe that our patients marked their scores without confusion and the results were sufficiently valid.

Study limitations

A limitation of this study is that pain and anxiety scores were only evaluated in the immediate postoperative period. It can be expected that the effect size would be larger if outcome variables had been observed for a longer period after the sedative and analgesic effects of anesthetic medications had worn off. Moreover, we did not evaluate the effect of repeated exposure to music in our series. It has been suggested that repeated interventions may empower and prolong the desirable effects of music therapy,[13] which should be validated in further studies in different subgroups of patients. Finally, we did not record the type of preferred music in our participants, so we are not able to evaluate the effects of each type of music.

The theory and clinical practice of music therapy is changing increasingly from a social science model to a neuroscience-guided model based on brain function and music perception. This may move music therapy from an adjunct modality to a central treatment modality in preventive as well as in clinical and rehabilitative areas.[37] In this study, we simply used a single session of recorded music, which was demonstrated to have pain-relieving and anxiolytic effects in our setting. However, some parameters such as the strength of live versus recorded music,[38,39] the presence of a music therapist who could monitor the moment-to-moment responses of clients to music, and the effects of group music therapy[40] are key elements of music therapy that should be evaluated in appropriate settings in future. Certainly, the source of pain/anxiety, the course and prognosis of illness, and demographic characteristics of patients should be considered in using these modalities.

Another limitation is that objective measures such as pain and anxiety scores and hemodynamic assessments do not reflect what the patients are reporting, and their real emotional experience of exposure to music would not be clarified. Undoubtedly, the patients' satisfaction and overall attitude toward the use of music by the bedside is a key element in facilitating their recovery, which should be addressed in future studies.

Conclusions

We suggest that the postoperative use of patient-selected music in cesarean section surgery would alleviate pain and reduce the need for other analgesics, thus improving the recovery and facilitating early contact of mothers with their children. Further studies are needed to evaluate the optimal duration for a music session and the effect of repeated sessions on postoperative anxiety and pain. The clinical importance of considering patients' music preferences as well as the influence of sociodemographic characteristics of patients on analgesic and anxiolytic effects of music should be addressed in future investigations. Finally, it would be interesting to evaluate the effects of music therapy elements such as live versus recorded music or the presence of a music therapist in similar settings.

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