

THE IMPACT OF MUSIC ON POSTOPERATIVE PAIN AND ANXIETY FOLLOWING CESAREAN SECTION

NIKANDISH REZA^{*}, SAHMEDINI MOHAMMAD ALI^{**},
KHADEMI SAEED^{***}, AVAND ABUL-QASIM^{****},
AND TABATABAEE HAMID REZA^{*****}

Abstract

Background: The relief of post-cesarean delivery pain is important. Good pain relief improves mobility and reduces the risk of thromboembolic disease, which may have been increased during pregnancy. Pain may impair the mother's ability to optimally care for her infant in the immediate postpartum period and may adversely affect early interactions between mother and infant. It is necessary, therefore that pain relief be safe and effective and results in no adverse neonatal effects during breast-feeding.

Music may be considered as a potential method of post cesarean pain therapy due to its noninvasiveness and lack of side effects. In this study we evaluated the effect of intraoperative music under general

This study was supported by grants from The Research Committee of Fasa Medical College, Fasa, Fars Province, I.R. Iran.

The investigators offer their thanks to Roksana Behpoor RN and Rahele Dorri and Najme Habibi RNA, for their kind cooperation in this survey.

From Dept. of Anesthesia, Fasa Med. College, Fasa, Fars Province, I.R. Iran.

* MD, Assistant Professor of Anesthesiology.

** MD, Assistant Professor of Anesthesiology.

*** MD, Assistant Professor of Anesthesiology.

**** MA, English Lecturer, Department of Foreign languages.

From Shiraz Univ. of Medical Sciences, Shiraz, I.R. IRAN.

***** MSc, Epidemiologist, Department of Biostatistics and Epidemiology, Health Faculty.

Correspondence: DR. Nikandish, Reza, Dept. of Anesthesia, Fasa Medical College, Avicenna square, Fasa, Fars Province Iran. E-mail: nikandishr@fums.ac.ir. Tel-Fax: 00987313336200.

anesthesia for reducing the postoperative morphine requirements after cesarean section.

Methods: In a double blind placebo-controlled trial, 100 women (ASA I) scheduled for elective cesarean section under general anesthesia, were randomly allocated into two groups of fifty. After standardization of anesthesia, patients in the music group were exposed to a compact disk of Spanish guitar after induction of anesthesia up to the time of wound dressing. In the control group patients were exposed to white music. Post operative pain and anxiety were evaluated by visual analog scale (VAS) up to six hours after discharge from PACU. Morphine was given intravenously for reducing pain to $VAS \leq 3$ postoperatively.

Results: There was not statistically significant difference in VAS for pain between two groups up to six hours postoperatively ($P > 0.05$). In addition, morphine requirements were not different between two groups at different time intervals up to six hours postoperatively ($P > 0.05$). There were not statistically significant difference between two groups regarding postoperative anxiety score and vomiting frequency ($P > 0.05$).

Conclusion: As per conditions of this study, intraoperative Spanish music was not effective in reducing postoperative pain after cesarean section. In addition postoperative morphine requirement, anxiety, and vomiting were not affected by the music during general anesthesia.

Key word: music, pain, cesarean.

Introduction

Cesarean section is one of the most common operations in women at childbearing age. In addition to the benefits derived from relieving postoperative pain in surgical patients, there are additional compelling reasons to provide adequate pain relief for mothers undergoing cesarean delivery. For instance, risk of thromboembolic disease, which is increased during pregnancy, may be further exacerbated by immobility related to pain during the puerperium. Pain

may also impair the mother's ability to optimally care for her infant in the immediate postpartum period and may adversely affect early interactions between mother and infant. Pain and anxiety may also reduce the ability of a mother to breast-feed effectively.

It is necessary that pain relief be safe and effective, that it not interfere with the mother's ability to move around and care for her infant, and that it results in no adverse neonatal effects in breast-feeding women¹. Music is a non-pharmacological technique that is inexpensive, non-invasive and has no side-effects that has been shown to reduce postoperative pain²⁻⁵.

Interventions with music pre-operatively can modulate the patient's response to stress⁶⁻⁸, music intra-operatively can also reduce sedative requirements⁹, and music postoperatively has been shown to reduce fatigue⁴ and can also be used to distract the patient from noise in the postanesthesia care unit (PACU). It has also been suggested that the use of headphones with music may reduce or eliminate awareness during anesthesia¹⁰. However, other studies have failed to confirm the impressive results of music therapy¹¹. In addition there are significant methodological problems in most studies regarding the effectiveness of perioperative music¹².

This present double blind randomized study is designed to evaluate the effect of light Spanish guitar on postoperative morphine requirements and postoperative anxiety levels after cesarean section under general anesthesia in a sample of Iranian population.

Materials and Methods

This randomized prospective double-blind controlled clinical investigation included 100 ASA I patients scheduled for an elective cesarean section under general anesthesia after approval by the Investigation Committee of the University. Patients were randomly allocated into two groups of fifty using computer generated random numbers. The intervention group was exposed to intra-operative music and the control group to white music.

An unblind investigator obtained demographic data and initial consent after random allocation of patients in the preoperative holding area. They were informed that they may or may not be exposed to intraoperative music. Also, patients were trained about self-reporting of postoperative pain using visual analog scale (VAS). Baseline preoperative anxiety was measured using visual analog scale (VAS) by the same investigator.

Patients with emergency operation, preoperative pain, psychiatric disorders, drug abusers and those who received preoperative sedative and analgesics and patients with hearing impairment or mental retardation, were excluded from the study.

Anesthesia was induced using sodium thiopental 3-5 mg/kg and endotracheal intubation was done after succinylcholine 1mg/kg. Anesthesia was maintained using nitrous oxide 50% in oxygen and with 0.8 MAC halothane. All patients received midazolam 1-2 mg and morphine 5-7 mg intraoperatively after delivery of the baby. The patient, anesthetists, surgeon and nurses were blinded to the CD selection.

Patients in the intervention group were exposed to intraoperative music by CD-player with the same audio settings using an occlusive headphone. The type of music played via headphones was soft instrumental and included 15 segments of a Spanish style guitar not selected by the patients. The control group were exposed to a blank CD using the same occlusive headphone. CD-player was started immediately after induction of anesthesia and continued to the time of wound dressing. All patients had headphones that covered the whole ear such that no sounds from the operating room could leak in.

Awake extubation was done for all patients after reversal of neuromuscular blockade with neostigmine 2.5 mg and atropine 1.25 mg and then patients were transported to PACU. All patients were operated by attending obstetricians.

Postoperatively patients were evaluated by a research nurse, blinded to the study groups, who was trained by the investigators. Assessment of postoperative pain at rest was made based on the visual analog score

(VAS), where 0 cm-“no pain” and 10 cm-“worst pain imaginable”. Pain was assessed immediately in PACU and at 0.5, 1, 2, 4 and 6 hrs postoperatively. Postoperative pain was controlled with intravenous morphine to decrease VAS of pain to ≤ 3 and morphine consumption was recorded. No patient received other analgesic medications up to six hrs after discharge from PACU. Breakthrough pain was controlled with additional intravenous injection of morphine at intervals between observations. Postoperative anxiety was measured using VAS. Vomiting frequencies were asked from the patients and metochlopramide was used for control of any episode of vomiting.

Statistics

Descriptive statistics are presented as arithmetic means and standard deviation for the sake of clarity, although the questionnaire is referred to as an ordinal scale. Independent T-Test was used for parametric data and Kruskal-Wallis ANNOVA followed by Mann-Whitney U-test and a Bonferroni correction were used to test differences between groups. A p-value of <0.05 was considered statistically significant. The computer program SPSS for Windows was used for all statistical analysis. Calculation of sample size was based on the following assumptions concerning a one-way analysis (three groups) for pain (VAS): significance level 5%, power 80%, common standard deviation 1.530 and a difference in mean characterised by a variance of means of 0.193. These assumptions suggested a sample size of 40 in each of the three groups. We therefore decided to study a sample size of 50 patients in each group.

Results

Overall, 105 patients were entered in this study. Five of the patients were excluded due to major deviations for standardized anesthesia method. There were no significant differences between the two groups regarding the demographics, pre-operative anxiety, intraoperative morphine, and midazolam used for the patients and surgery time (Table 1).

Table 1
Demographics, VAS for Preoperative anxiety, Intraoperative morphine and midazolam (mg) and duration of surgery (mins) in music group (1) and control group (2)

	Group 1		Group 2		
	Mean	SD	Mean	SD	P-value
Age	26	5.19	25	4.23	0.34
Preoperative anxiety	4.44	1.068	3.82	2.783	0.39
Intraoperative morphine (mg)	7.96	1.068	7.78	0.790	0.91
Intraoperative midazolam (mg)	1.06	0.240	1.08	0.274	0.43
Time of operation	23.74	6.404	21.64	5.150	0.11

There were no significant difference between the two groups regarding the postoperative VAS for pain in PACU and at 0.5, 1, 2 and 4 hours postoperatively ($P>0.05$) (Table 2).

Table 2
Comparison of VAS for pain (VAS-P) at different time intervals postoperatively in music group (1) and control group (2)

	Group 1		Group 2		
	Mean	SD	Mean	SD	P-value
VAS for pain in PACU	7.06	2.551	7.26	2.754	0.47
VAS-P 0.5hr after PACU	8.20	1.030	8.26	0.853	0.95
VAS-P 1 hr after PACU	7.58	1.162	7.50	1.313	0.73
VAS-P 2 hr after PACU	6.68	1.376	6.92	1.192	0.94
VAS-P 4 hr after PACU	6.00	1.414	5.94	1.284	0.81
VAS-P 6 hr after PACU	5.14	1.262	5.08	1.75	0.98

The morphine requirements for decreasing postoperative VAS for pain to ≤ 3 at PACU and at 0.5, 1, 2, 4 and 6 hours postoperatively were not statistically significant ($P>0.5$) (Table 3).

Table 3
Comparison of morphine usage in PACU and at different time intervals
between music group (1) and control group (2)

	Group 1		Group 2		P-value
	Mean	SD	Mean	SD	
Morphine usage in PACU	4.52	2.742	5.3	3.732	0.63
Morphine usage 0.5 hr after PACU	3.34	1.136	3.70	1.418	0.29
Morphine usage 1 hr after PACU	3.12	1.023	3.32	1.301	0.21
Morphine usage 2 hr after PACU	2.64	1.102	2.86	1.050	0.28
Morphine usage 4 hr after PACU	2.34	0.895	2.62	0.987	0.37
Morphine usage 6 hr after PACU	2.14	0.948	2.22	1.48	0.11
Total morphine usage	17.92	4.932	19.18	6.473	0.051

Post-operative anxiety levels in VAS score were not significantly different between two groups ($P>0.05$) (Table 4).

Table 4
Comparison of post operative anxiety levels at different time intervals
between music group (1) and control group (2)

	Group 1		Group 2		P-value
	Mean	SD	Mean	SD	
VAS for anxiety at 0.5 hr after PACU	0.1	0.707	0.38	1.589	0.16
VAS for anxiety at 1 hr after PACU	0.1	0.707	0.1	0.707	0.31
VAS for anxiety at 2 hr after PACU	0	0	0	0	1
VAS for anxiety at 4 hr after PACU	0	0	0	0	1
VAS for anxiety 6 hr after PACU	0	0	0	0	1

There were no difference between two groups regarding vomiting frequency and total dose of metochlopramide used for antiemesis

($P>0.05$) (Table 5).

Table 5
Comparison of vomiting frequency at different time intervals after PACU
between music group (1) and control group (2)

	Group 1		Group 2		
	Mean	SD	Mean	SD	P-value
Vomiting frequency at 0.5 hr after PACU	2.66	3.456	2.62	3.752	0.72
Vomiting frequency at 1hr after PACU	0.6	2.070	0	0	0.16
Vomiting frequency 2 hr after PACU	0	0	0.12	0.849	0.31
Vomiting frequency 4 hr after PACU	0.18	0.896	0	0	0.31
Vomiting frequency 6 hr after PACU	0	0	0	0	0.31
Total dose of metochlopramide usage (mg)	4.10	5.411	4.845	3.00	0.21

Discussion

The primary concern of the present study was to examine the effect of intra-operative music, on postoperative morphine usage. Nilsson et al¹³ found that intra-operative music played to patients during general anesthesia resulted in reduced postoperative morphine requirements in the first two hours after surgery, and another study by the same authors recently confirmed this finding¹⁴.

Intra-operative awareness during general anesthesia has been of concern to anesthetists since the beginnings of modern anesthetic practice¹⁵. The incidence of intraoperative awareness without nociception has been estimated at 2/1000 operations, and the incidence of intraoperative awareness with nociception at 1/10000 operations¹⁶. A higher incidence has been reported for obstetrical cases (0.4%)¹². Several studies have examined the possibility of using this phenomenon to benefit the patient but these have produced conflicting results. Some studies found that positive verbal suggestions¹⁷⁻¹⁹, sounds of the sea²⁰, music²¹, or a combination of these²⁰, improved intraoperative relaxation and postoperative recovery but others could not replicate these findings²²⁻²⁴.

Several physiological and biochemical explanations for the calming and analgesic effects of music and/or sound have been proposed. It has

been suggested that pain and auditory pathways inhibit each other²⁵. Optimum activation of auditory pathways by external sound might therefore inhibit the central transmission of nociceptive stimuli.

The influence of music and acoustic stress on gut hormone levels has been shown²⁶. Music-induced alterations in endorphin levels have also been demonstrated²⁷. In addition, for patients undergoing surgery, it should be recognized that they are sometimes subjected to potentially adverse and threatening operating theatre events and conversation. Noises associated with standard procedures, such as opening a package of surgical instruments and alarms attached to monitors, can be very frightening to the patient²⁸. Listening to music or sounds in the operating theatre masks such unpleasant ambient noise.

There is evidence that processing of auditory information takes place in the brain during general anesthesia²⁹. Part of this processing takes place as implicit memory, which is brief periods of low level information processing. In addition to activation learning, elaboration learning for seemingly new verbal associations was found recently³⁰. Due to light levels of OB anesthesia and higher incidence of awareness, we hypothesized that non-selected light music under general anesthesia may positively affect postoperative course after cesarean section due to possibly more intact implicit memory. Nilsson et al. in their two recent studies showed a brief effect of intraoperative music in the early postoperative period^{13,14}. So we evaluated the pain relieving effect of music only at the first six hours after operation. The present study failed to replicate those findings and, did not show an effect of intra-operative music on postoperative analgesic requirements.

Regarding the results of the present study we can say that either elaboration learning for intraoperative music was not present during the general anesthesia for cesarean section, or if present was not able to change the postoperative course significantly. Nilsson et al. showed that intraoperative music under general anesthesia was effective only for 1 hour postoperatively in reducing analgesic requirements¹⁴.

Not all studies are in favor of memory priming during general anesthesia. Adrea et al. found no difference between memory priming of

familiar and unfamiliar auditory stimuli during propofol-sufentanil anesthesia³¹. So music either familiar or unfamiliar may not be effective in memory priming, or in the case of memory priming, it may not affect postoperative course significantly. Boeke et al in double-blind randomized study regarding the effect of sounds during general anesthesia on postoperative course, administered one of four different sounds during general anesthesia: positive suggestions, nonsense suggestions, seaside sounds or sounds from the operating theatre. The effect of these sounds on the postoperative course was examined to assess intraoperative auditory registration. No differences were found between the four groups in postoperative variables³². Blankfield et al. in single-blinded placebo controlled study of sixty-six patients undergoing coronary bypass surgery, found that there were no significant differences in length of ICU or postoperative hospital stay, narcotic usage, nurse ratings of anxiety and progress, depression, activities of daily living, or cardiac symptoms between the patients who were helped by the music and the patients who were not helped³³.

One of the problems in most studies documenting the positive effect of intraoperative music is that research methodology in the majority is poor¹². Korunka et al³⁴ found that suggestions or music prolonged the period before patients asked for their first postoperative analgesic, compared with a control tape of operating room sounds, but only the music tape reduced total analgesic consumption. Caseley-Rondi et al³⁵ also reported reduction in analgesic requirements in patients who were played therapeutic suggestions during anesthesia. However, differences between the experimental and control groups were only marginally significant in analyses controlling for the greater age of the patients and longer duration of anesthesia (and presumably larger doses of intraoperative opioids) in the experimental group. Furthermore, the significance level in the analysis of morphine use after operation was not adjusted for the number of measures of postoperative recovery that were assessed, increasing the probability of a type 1 error¹².

Another issue regarding the studies related to intraoperative music, is sample size. A simulation study suggested that detecting a 25%

decrease of analgesic use between control and intervention groups (the effect size that has been reported in studies of intraoperative music with positive results) requires a sample size of 116 patients¹². This suggests that most of the studies of intraoperative music has not large enough sample sizes. In the double blind randomized study of Nilsson et al. on 90 patients undergoing hysterectomies, they found a positive effect of intraoperative music on postoperative analgesic requirements but only 30 patients was allocated in each study group³⁶.

In another study by Migneault et al. regarding neurohormonal changes after intraoperative music they found that intraoperative music reduced morphine requirements in the first 24 hours after operation but the sample size was only 30 and was not adequate for any statistical inference regarding the effect of intraoperative music³⁷.

Nilsson et al. in another randomized study of 150 patients scheduled for elective inguinal hernia repair or varicose vein surgery under general anesthesia regarding the intraoperative and postoperative effect of music, found that there is a reduction in morphine requirements only in the first 2 hours postoperatively but this study was not double blinded¹³.

One of the possible reasons for ineffectiveness of the music intervention in our study may be related to the type of music that patients were exposed during general anesthesia. None of the patients had a chance to select the type of music preoperatively and a culturally unfamiliar type of light music was used in our study. This may possibly inhibit memory priming during general anesthesia and inhibit any positive effect of intraoperative music on postoperative course. But as mentioned above, difference in memory priming of familiar and unfamiliar sounds, has not been proved during general anesthesia³¹.

Various types of music such as classical, piano, relaxing, instrumental, new age and selected music styles have been used, but investigation of the effectiveness of the specific types of music used in studies, to determine if one type of music was better than other types, has not been possible because of issues such as too few studies, different circumstances of study populations and the different outcomes utilized

across studies³⁸.

In the present study, anxiety was not influenced by intraoperative exposure to music like the findings of Nilsson et al. Low levels of preoperative anxiety in our study may be a possible explanation for ineffectiveness of intraoperative music on postoperative anxiety as Nilsson et al. mentioned in their study.

In conclusion, we can say that at the setting of this study, intraoperative exposure to light Spanish guitar was not effective in reducing postoperative pain, morphine requirements and postoperative anxiety and vomiting frequency at the first six hours after cesarean section under general anesthesia. Whether exposing patients to selected and familiar music with more cultural acceptability will affect the results of study, needs more evaluations.

References

1. JEFF GADSDEN, STUART HART AND ALAN C SANTOS: Post-Cesarean Delivery Analgesia. *Anesth Analg*; 101:S62-S69, 2005.
2. GOOD M, STANTON-HICKS M, GRASS JA, ET AL: Relaxation and music to reduce postsurgical pain. *Journal of Advanced Nursing*; 33:208-15, 2001.
3. GOOD M, ANDERSON GC, STANTON-HICKS M, GRASS JA, MAKII M: Relaxation and music reduce pain after gynecologic surgery. *Pain Management Nursing*; 3:61-70, 2002.
4. GOOD M, STANTON-HICKS M, GRASS JA, ET AL: Relief of postoperative pain with jaw relaxation, music and their combination. *Pain*; 81:163-72, 1999.
5. NILSSON U, RAWAL N, UNESTAHL LE, ZETTERBERG C, UNOSSON M: Improved recovery after music and therapeutic suggestions during general anaesthesia: a double-blind randomised controlled trial. *Acta Anaesthesiologica Scandinavica*; 45:812-7, 2001.
6. NILSSON U, RAWAL N, ENQVIST B, UNOSSON M: Analgesia following music and therapeutic suggestions in the PACU in ambulatory surgery: a randomised controlled trial. *Acta Anaesthesiologica Scandinavica*; 47:278-83, 2003.
7. KAIN ZN, WANG SM, MAYES LC, KRIVUTZA DM, TEAGUE BA: Sensory stimuli and anxiety in children undergoing surgery: a randomized, controlled trial. *Anesthesia and Analgesia*; 92:897-903, 2001.
8. WANG SM, KULKARNI L, DOLEV J, KAIN ZN: Music and preoperative anxiety: a randomized, controlled study. *Anesthesia and Analgesia*; 94:1489-94, 2002.
9. YUNG PM, CHUI-KAM S, FRENCH P, CHAN TM: A controlled trial of music and pre-operative anxiety in Chinese men undergoing transurethral resection of the prostate. *Journal of Advanced Nursing*; 39:352-9, 2002.
10. BUERKLE H, WUESTEN R: Awareness during anaesthesia. *Lancet*; 355:1721-2, 2000.
11. EVANS D: The effectiveness of music as an intervention for hospital patients: a systematic review. *Journal of Advanced Nursing*; 37:8-18, 2002.
12. GHONEIM, MM, BLOCK ROBERT: Learning and Memory during General Anesthesia: An Update. *Anesthesiology*; 87:387-410, 1997.
13. NILSSON U, RAWAL N, UNESTAHL LE, ZETTERBERG C, UNOSSON M: Improved recovery after music and therapeutic suggestions during general anaesthesia: a double-blind randomized controlled trial. *Acta Anaesthesiol Scand*; 45:812-817, 2001.
14. NILSSON U, RAWAL N, UNOSSON M: A comparison of intra-operative or postoperative exposure to music-a controlled trial of the effects on postoperative pain. *Anaesthesia*; 58:684-711, 2003.
15. KLIEMPT P, RUTA D, OGSTON S, LANDECK A, MARTAY K: Hemispheric-synchronisation during anaesthesia: a double-blind randomised trial using audiotapes for intra-operative nociception control. *Anaesthesia*; 54:769-773, 1999.
16. GHONEIM MM, BLOCK RI: Depth of anesthesia. Learning during anesthesia. *International Anesthesiology Clinics*; 31:53-65, 1993.
17. BONKE B, SCHMITZ PIM, VERHAGE F, ZWAVELING A: Clinical study of so-called unconscious perception during general anaesthesia. *British Journal of Anaesthesia*; 58:957-64, 1986.
18. EVANS C, RICHARDSON PH: Improved recovery and reduced postoperative stay after therapeutic suggestions during general anaesthesia. *Lancet*; 2:491-3, 1988.
19. MIGA'LY P: 'Intra-operative hearing' under general anaesthesia. *Anaesthesia*; 45:58-9, 1990.
20. KUMAR A, BAJAJ A, SARKAR P, GROVER VK: The effect of music on ketamine induced emergence phenomena. *Anaesthesia*; 47:438-9, 1992.

21. BOEKE S, BONKE B, BOUWHUIS-HOOGWERF ML, BOVILL JG, ZWAVELING A: Effects of sounds presented during general anaesthesia on postoperative course. *British Journal of Anaesthesia*; 60:697-702, 1988.
23. BLOCK RI, GHONEIM MM, SUM PING ST, ALI MA: Efficacy of therapeutic suggestions for improved postoperative recovery presented during general anesthesia. *Anesthesiology*; 75:746-55, 1991.
24. VAN DER LAAN WH, VAN LEEUWEN BL, SEBEL PS, WINOGRAD E, BAUMANN P, BONKE B: Therapeutic suggestion has no effect on postoperative morphine requirements. *Anesthesia and Analgesia*; 82:148-52, 1996.
25. GARDNER W, LICKLINDER J, WEISZ A: Suppression on pain by sound. *Science*; 132:32-3, 1960.
26. GUE M, PEETERS T, DEPOORTERE I, VANTRAPPEN G, BUENO L: Stress-induced changes in gastric emptying, postprandial motility, and plasma gut hormone levels in dogs. *Gastroenterology*; 97:1101-7, 1989.
27. MCKINNEY CH, TIMS FC, KUMAR AM, KUMAR M: The effect of selected classical music and spontaneous imagery on plasma beta-endorphin. *J Behav Med*; 20:85-9, 1997.
28. SHAPIRO RA, BERLAND T: Noise in the operating room. *N Engl J Med*; 287:1236-8, 1972.
29. BLOCK RI, GHONEIM MM, SUM PING ST, AH MA: Human learning during general anaesthesia and surgery. *Br J Anaesth*; 66:170, 1991.
30. JELICIC M, DE ROODE A, BOVILL JG, BONKE B: Unconscious learning during anaesthesia. *Anaesthesia*; 47:835-7, 1992.
31. ANDREA G, DONKER AG, HANS PHAF R, PORCELJN T, BONKE B: Processing Familiar and Unfamiliar Auditory Stimuli During General. *Anesthesia Anesth Analg*; 82:452-5, 1996.
32. BOEKE S, BONKE B, BOUWHUIS-HOOGWERF ML, BOVILL JG, ZWAVELING A: Effects of sounds presented during general anaesthesia on postoperative course. *British Journal of Anaesthesia*; 60(6):697-702, 1988.
33. BLANKFIELD RP, ZYZANSKI SJ, FLOCKE SA, ALEMAGNO S, SCHEURMAN K: Taped therapeutic suggestions and taped music as adjuncts in the care of coronary-artery-bypass patients. *American Journal of Clinical Hypnosis*; 37(3):32-42, 1995.
34. KORUNKA C, GUTTMANN G, SCHLEINITZ D, HILPERT M, HAAS R, RITZAL S: The effect of suggestions and music during general anesthesia on postoperative well-being. *Zeitschrift fur Klinische Psychologie*; 21:272-85, 1992.
35. CASELEY-RONDI G, MERIKLE PM, BOWERS KS: Unconscious cognition in the context of general anesthesia. *Conscious Cog*; 3:166-95, 1994.
36. NILLSON U, RAWAL N, UNESTAHAL LE, ZETTEBERGERG C, UNOSSON M: Improved recovery after music and therapeutic suggestions during general anaesthesia: a double-blind randomized controlled trial. *Acta Anaesthesiol Scand*; 45:812-817, 2001.
37. MIGNEAULT B, FRANC D, GIRARD O, ALBERT C, CHOUINARD P, ET AL: The Effect of Music on the Neurohormonal Stress Response to Surgery Under General. *Anesthesia Anesth Analg*; 98:527-32, 2004.
38. EVANS D: The effectiveness of music as an intervention for hospital patients: a systematic review. *Journal of Advanced Nursing*; 37(1):8-18, 2002.