ORIGINAL ARTICLE

STUDY OF CHANGE IN MACULAR VOLUME WITH UNCONTROLLED HBA1C LEVELS IN A DIABETIC PATIENT IN ABSENCE OF DIABETIC MACULAR OEDEMA

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ABSTRACT

Aim: Our aim of this study was to analyze the beneficial effects (if any) of music therapy in decreasing anxiety, providing stable haemodynamics and decreasing anaesthetic agent requirement in patients coming for modified radical mastectomy.

Methods: Forty patients in the age group of 40 -50 years scheduled for modified radical mastectomy were selected for this prospective observational study. They were randomly assigned to Group M (receiving music therapy) and Group N (not receiving music therapy). Musical intervention was started one hour prior to surgery. The level of anxiety (score of 1 to 4, based on simplified version of state-trait anxiety inventory), pulse rate, MAP were recorded at 15 minutes interval up to one hour post surgery and compared with their baseline values.

Results: With musical intervention, anxiety score declined to 2 in 80 % of cases at the time of induction and in Group N no such improvement was observed. Postoperatively, level of anxiety decreased in Group M was 100 % displaying a score of 1. Group M patients also displayed stable haemodynamics throughout the perioperative period. However, in Group N, there was a significant increase in both pulse rate and MAP intraoperatively ($p < 0.0001$). The need for anaesthetic agent (isoflurane) was also more in the control group compared to Group M ($p = 0.05$ and 0.0250 at 15 minutes and 1 hour after incision respectively).

Conclusion: Music therapy has the potential to be an alternative cheap and promising option to pharmacological premedication agents which needs to be looked in to.

Keywords: Breast cancer, music therapy, peri-operative, hemodynamics

INTRODUCTION

The very thought of the operation theater (OT) brings a lot of uneasiness to common people. Just the initial idea of having surgical procedures can bring about very high levels of anxiety in patients.[1]This is more so for cancer patients who are scheduled for surgery. The typical OT ambience with the sound of the monitors, the instruments, and the discussion of the medical staff by the side of the patient leads to a lot of stress and anxiety to the patient awaiting surgery which can lead to unstable haemodynamics (tachycardia, high blood pressure), increased intraoperative blood loss, impaired wound healing, increased risk of infection, and may complicate the induction of anaesthesia and impede postoperative recovery.[1, 2] Anxiety has also been proven to cause higher analgesic and anaesthetic requirement, postoperative pain, and prolonged hospital stay,and thus, an overall unfavourable surgical outcome.[3]

Though numbers of drug are being used as part of premedication to reduce this anxiety, they have their own drawbacks in terms of side effects. There is increasing interest in evaluating the use of nonpharmacological interventions such as music to minimize potential adverse effects of anxiety-reducing medications.[4] The attenuation of perioperative stress through music listening is probably due to the activation of emotional and cognitive processes that evoke feeling of pleasure and can distract patient's attention from fear and unpleasant thoughts related to the surgical procedure. Few investigators have got beneficial results with music intervention in the perioperative period in both adults and children. [4, 5, 6, 7, 8] Further

research into music therapy is warranted in light of the low cost of implementation and the potential ability of music to reduce perioperative patient distress. [7] This has prompted us to study the effect of pre recorded music on the level of anxiety, anaesthesia requirement, perioperative haemodynamics and the need for hypotensive agents in patients undergoing modified radical mastectomy (MRM).

METHODOLOGY

This study was conducted in the department of Anaesthesiology, Dr. B.Borooah Cancer Institute and Research centre, Guwahati in the period between Jan'15 and Dec'15 after getting approval from the institutional review board. This was a prospective observational study. 40 Normotensive patients of carcinoma (CA) breast in the age group of 40-50 years with no associated morbidity who are scheduled for modified radical mastectomy (MRM) were selected for this study. After properly explaining the nature of the study and obtaining informed written consent of the patients, the patients were randomly included in either Group M (receiving musical intervention) or Group N (no musical intervention) i.e. the control group. While giving clearance for anaesthesia, the patient's were asked about their choice of music and was recorded in the pre-anaesthesia check up form. On the day of surgery, the patients were brought to the operation theater (OT) waiting room 1 hour prior to surgery. Their vitals [pulse, blood pressure (BP), mean arterial pressure (MAP)] and the level of anxiety were recorded. Anxiety was recorded on a 4 point scale which is based on a simple version of the state-trait anxiety inventory. [9]The 4-point A-State intensity response scale is as follows: 1 = not anxious at all; 2 = somewhat; 3 = moderately so; 4 = Very much so.They were then premedicated with inj. Midazolam 1mg IV. Following this, Group M patients were made to listen to the music of their choice using a headphone. This was continued throughout the surgery till the time of extubation. Headphones were used so as to avoid the patients from hearing ambient sounds and also to avoid other patients getting disturbed. Group N patients were not provided with any music and were kept in the same waiting room as Group M. The vitals and the anxiety levels were recorded every 15 minutes till the patients were shifted to the OT table and additional premedications (no anxiolytics) were given (on the OT table). Pulse, BP, MAP [diastolic pressure plus one third (systolic-diastolic)] were continued to be recorded during induction of anaesthesia, laryngoscopy and endotracheal intubation and throughout the surgery at 15 minutes interval till extubation. Anaesthesia was maintained with O_2, N_2O and isoflurane (with BIS monitoring) and muscle relaxation was maintained with inj. Vecuronium bromide. The percentage (volume %) of isoflurane needed to maintain acceptable BIS and MAP within 20 mmHg of the baseline value was recorded and Injection nitroglycerine (NTG) infusion was used as the rescue hypotensive agent to keep the MAP within 20 mmHg of the baseline value (if it was not maintained with isoflurane up to 1.2 volume % alone). Intraoperative hypotension or hypertension is defined as increases or decreases of ≥ 20 mmHg in the MAP from the patient's preoperative MAP.[2] Our target was to maintain the MAP within this range as fluctuations beyond this is associated with increased incidences of postoperative complications.[10] This target of MAP was based on the physiology of autoregulation of regional circulations and the impact of anaesthesia and surgery on autoregulation.[10, 11, 12] Once the patients were adequately reversed and extubated, the Group M patients were again made to listen to the music which was stopped just prior to extubation. Vitals and anxiety levels were continued to be recorded at 15 minutes and 1 hour interval respectively for 6 hours post operation.

Statistical Analysis

Data were expressed as Mean ± Standard Error of Mean (SEM). The significance of the level of anxiety, pulse rate, MAP etc. were compared to the baseline values of the said parameters and was determined by applying ONE WAY ANOVA followed by Dunnet's multiple comparison tests. Student "t" test was used to see the differences among music and non music group at different point of time. P values of < 0.05 were considered to be statistically significant.

RESULTS

All the patients under study had significant anxiety while coming for PAC. No patient had an anxiety score of less than 3. 47.5% patients had an anxiety score of 4 and the rest had a score of 3. After starting musical intervention in Group M, this anxiety level started to decline to a score of 2 in 60% of patients within 15 minutes and then in another 30 minutes time, i.e. at 45 minutes, the number of patients with a score of 2 increased to 90% and at induction also significant number of patients had a score of 2 (80%). However, in Group N, no such decline in the anxiety level was observed. On the contrary, fraction of patients with a score of 4 increased to 70% in 15 minutes which remained so till induction. Musical intervention did result in significant reduction of anxiety preoperatively which was not observed in the control group. Postoperatively, we observed substantial decrease in the anxiety level in Group M patients. At 15 minutes after extubation, 60% had a score of 2 and the rest 40% had a score of 1, i.e. no anxiety and after 1 hour of extubation, all the patients in the group displayed no anxiety (score

1). In the control group also, we observed a decrease in the anxiety level postoperatively compared to the baseline state with 65% displaying a score of 2 and the rest 35% a score of 3 at 15 minutes after extubation which further decreased to a score of 2 after 1 hour of extubation. So, postoperatively there was a decline in the anxiety level in both the groups, however, this was more so in the musical intervention group.

Table 1: Pulse, MAP and Level of anxiety up to induction

	Pulse	MAP	Level of Anxiety (n = 20)			
			1	2	3	4
Baseline						
Group M	85.10±1.938	90.30±0.9655	0	0	50%	50%
Group N	85.00±1.606	85.50±0.7931	0	0	55%	45%
15 Min after music intervention						
Group M	76.70±1.079^{xxx}	87.10±0.9567	0	25%	75%	0
Group N	87.70±1.154	99.50±1.846^{XXX}	0	0	30%	70%
30 Min after music intervention						
Group M	71.90±0.8395^{XXX}	99.50±1.846^{XXX}	0	60%	40%	0
Group N	86.30±0.9208	99.50±1.846^{XXX}	0	0	30%	70%
45 Min after music intervention						
Group M	72.10±0.8269^{XXX}	85.70±1.300^{XX}	0	90%	10%	0
Group N	85.30±0.9545	102.1±1.244^{XXX}	0	0	30%	70%
During Induction						
Group M	73.40±1.206^{XXX}	83.30±0.8114^{XXX}	---			
Group N	87.20±0.8000	96.00±1.105^{XXX}				
P value						
Group M	F = 19.6P < 0.0001	F = 6.450P < 0.0001	---			
Group N	F=1.082P = 0.3710	F = 25.13P < 0.0001				

^{x} = p < 0.05; ^{xx} = p < 0.001; ^{xxx} = P < 0.0001, level of anxiety: 1=not anxious at all; 2=somewhat; 3=moderately so; 4=Very much so

Table 2: Intra-operative Pulse, MAP, average volume% (vol %) of isoflurane, NTG requirement

	Pulse	MAP	Vol % of Isoflurane		NTG requirement
Baseline					
Group M	85.10±1.938	90.30±0.9655	---		---
Group N	85.00±1.606	85.50±0.7931			---
During intubation					
Group M	80.50±1.305	86.40±0.8026^{X}	0.6 %		---
Group N	88.90±0.9116	100.9±1.288^{XXX}	0.6 %		---
15 min after incision					
Group M	72.50±1.247^{XXX}	83.90±1.061^{XXX}	0.64±0.04724	P = 0.05	---
Group N	88.90±0.9116^{XXX}	99.90±1.844^{XXX}	0.78±0.0521		---
1 hour after incision					
Group M	73.80±1.015^{XXX}	83.50±1.123^{XXX}	0.61±0.3692	P = 0.0250	---
Group N	92.6±1.274^{XXX}	96.70±1.008^{XXX}	0.80±0.07255		35 %
P value					
Group M	F =17.33P < 0.0001	F = 9.861P < 0.0001	---		---
Group N	F = 6.351P < 0.0001	F = 29.67P < 0.0001			

(^{x} = p < 0.05; ^{xx} = p < 0.001; ^{xxx} = P < 0.0001, NTG = Nitroglycerine)

As regarding haemodynamics, all the patients under study in Group M displayed stable pulse and MAP throughout the perioperative period. Compared to the baseline, Group M patients had greater reduction (p < 0.05) in the pulse rate and MAP till induction (Table 1) [mean ± SEM: 85.10±1.938 (pulse); 90.30±0.9655 (MAP) at baseline against 72.10±0.8269^{XXX} (pulse); 85.70±1.300^{XX} (MAP) at 45 minutes and 73.40±1.206^{XXX} (pulse); 83.30±0.8114^{XXX} (MAP) at induction]. Intraoperative MAP was maintained within the target range with isoflurane alone without the need for NTG in any of the cases. Intraoperatively as well as postoperatively also, Group M patients had greater reduction (p < 0.05) in pulse and MAP compared to the baseline (Table2, 3).

In the control group, i.e. Group N, however, though heart rate was maintained below 100 per minute in the preoperative period (heart rate changes were not statistically significant preoperatively) there was an increase in the heart rate to more than 100 per minute in the intraoperative period (including extuba-

tion) in 45% of the cases ($p < 0.0001$). 66.6% of these cases, however, were on NTG infusion to maintain MAP within the target level and the increased heart rate in these cases might be because of the effect of NTG. As is seen with the heart rate, we observed a similar increase in the MAP to more than 20 mmHg of the baseline values in 60% of the cases preoperatively (including induction). This trend was maintained during laryngoscopy and endotracheal intubation where 35% patients displayed increase of MAP to more than 20 mmHg of the baseline values. In the intraoperative period also, in this fraction of patients MAP remained above the target level even with 1.2% isoflurane and NTG infusion had to be started to maintain the MAP. Post extubation, however, the MAP was maintained within the acceptable limit in all the cases under study in the control group. Statistically significant rise of MAP ($p < 0.0001$) was seen throughout the preoperative, intraoperative period and up to 15 minutes post extubation in the control group (Table 1, 2, 3). Though increase in the pulse rate was not statistically significant in the preoperative period but intraoperatively up to the time of extubation rise in pulse rate observed was highly significant ($p < 0.0001$) (Table 2,3). In intergroup comparison also, control group had significantly higher ($p < 0.001$) pulse rate and MAP throughout the perioperative period (Table 4). Musical intervention thus resulted in stable haemodynamics in the perioperative period which was not observed in the control group.

As haemodynamics was well maintained throughout the perioperative period in Group M, we didn't need to use NTG in any of the cases and the anaesthetic requirement was also less in this group of patients where we didn't had to increase the isoflurane concentration to more than 1% in any of the cases. But in the control group, we had to use NTG infusion in 35% of cases in the intraoperative period where the upper limit of 1.2% isoflurane couldn't maintain the MAP in the desired range. So the anaesthetic and hypotensive agent requirement was more in the control group compared to the musical intervention group.

Table 3: Pulse, MAP, NTG requirement postoperatively and Level of anxiety post extubation

	Pulse	MAP	NTG requirement	Level of anxiety (n =20)			
				1	2	3	4
Baseline							
Group M	85.10±1.938	90.30±0.9655	---	0	0	50%	50%
Group N	85.00±1.606	85.50±0.7931	---	0	0	55%	45%
During extubation							
Group M	83.40±0.9958	87.50±0.8811	---			---	
Group N	96.60±1.106^{xxx}	94.20±0.8066^{xxx}	30 %			---	
15 min after extubation							
Group M	72.10±0.5889^{xxx}	83.20±0.6867^{xxx}	---	0	60%	40%	0
Group N	83.70±1.059	92.50±0.8062^{xxx}	---	0	65%	35%	0
1 hour after extubation							
Group M	71.30±0.5482^{xxx}	83.20±0.8385^{xxx}	---	85%	15%	0	0
Group N	87.30±0.9870	87.60±0.8156	---	0	100%	0	0
P value							
Group M	F = 39.35P < 0.001	F = 16.84P < 0.0001	---			---	
Group N	F = 23.03P < 0.0001	F = 25.64P < 0.0001					

(^{x} = $p < 0.05$; ^{xx} = $p < 0.001$; ^{xxx} = $P < 0.0001$, NTG = Nitroglycerine, level of anxiety : 1 = not anxious at all; 2 = somewhat; 3 = moderately so; 4 = Very much so)

DISCUSSION

We selected patients in a narrow age group of 40 to 50 years to prevent the effect of physiological changes of age on the cardiovascular system which could have brought biasness on the haemodynamic parameters. We included patients undergoing modified radical mastectomy only so as to keep uniformity in the nature of the disease, extent of surgery and the anxiety and the surgical pain associated with it as far as possible. As the stress of operation could have altered the level of anxiety and the haemodynamics on the day of surgery, we recorded the baseline anxiety level and the haemodynamics during preanaesthesia check up one week prior to surgery.

All patients anticipating surgery experiences stress and anxiety which is particularly affected by gender (higher anxiety in women), type of surgery (acute more than planned), type of anaesthesia (spinal more than general), and time before surgery (anxiety level increases with a shorter time before surgery)and this preoperational anxiety has been linked to unfavourable overall postoperative outcome of the patient.[3,13] Our finding of musical intervention resulting in decreasing the preoperative anxiety level is supported by the findings of Palmer et al.[5] In their study on 207

patients of potential or known breast cancer they have demonstrated that preoperative music therapy which is either patient selected live music or therapist selected pre recorded music, results in decrease in the preoperative anxiety scores and concluded that including music therapy as a complementary modality with cancer surgery may help manage preoperative anxiety in a way that is safe, effective, time-efficient, and enjoyable. Binns-Turner et al provided continuous music throughout the preoperative, intraoperative and postoperative period to their patients undergoing mastectomy and their findings indicated that women in the intervention group had a greater decrease in MAP and anxiety with less pain from the preoperative period to the time of discharge from the recovery room compared with women in the control group.[6] Similar observation was reported by Li et al in their randomized clinical trial on the effect of music therapy on anxiety of patients with breast cancer after radical mastectomy.[4] They studied the effect of musical intervention in reducing anxiety in the late postoperative period (on the day before patients were discharged from hospital, the second and third time of admission to hospital for chemotherapy respectively). The repeated-measure ancova model analysis indicated that the mean state anxiety score was significantly lower in the experimental group than those in the control group at each of the three post-test measurements. We observed a decrease in the anxiety level in both the groups in the postoperative period compared to the preoperative baseline scores. But this reduction in the anxiety level was more in the musical intervention group. Similar finding was published by Brenda Johnson et al whocompared the effect of music with noise blocking headphones on the level of anxiety in women undergoing gynecologic same-day surgery.[14] Both the groups experienced a drop in anxiety from pre to postoperative status, but the music group experienced the lowest postoperative anxiety scores. Bradt et al did a meticulous study of reports and publications on music interventions for preoperative anxiety.[2] They searched the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2012, Issue 7), MEDLINE (1950 to August 2012), CINAHL (1980 to August 2012), AMED (1985 to April 2011; we no longer had access to AMED after this date), EMBASE (1980 to August 2012), PsycINFO (1967 to August 2012), LILACS (1982 to August 2012), Science Citation Index (1980 to August 2012), the specialist music therapy research database (March 1 2008; database is no longer functional), CAIRSS for Music (to August 2012), Proquest Digital Dissertations (1980 to August 2012), ClinicalTrials.gov (2000 to August 2012), Current Controlled Trials (1998 to August 2012), and the National Research Register (2000 to September 2007). They hand searched music therapy journals and reference lists, and contacted relevant experts to identify unpublished manuscripts. They included all randomized and quasi-randomized trials that compared music interventions and standard care with standard care alone for reducing preoperative anxiety in surgical patients. They concluded that music interventions may provide a viable alternative to sedatives and anti-anxiety drugs for reducing preoperative anxiety. In our study also, musical intervention group displayed stable haemodynamics throughout the perioperative period, and we didn't had to use NTG for control of blood pressure in any of the cases whereas in the control group we had to use NTG in 35% of the cases to maintain the MAP, a finding which is supported by the study of Binns-Turner et al.[6] In their study, a total of 30 women undergoing mastectomy were assigned randomly to a control group or to the music intervention group. Findings indicated that women in the intervention group had a greater decrease in MAP from the preoperative period to the time of discharge from the recovery room compared with women in the control group. They concluded that perioperative music can reduce MAP among women undergoing mastectomy for breast cancer. However, Jiménez et al [15] did a controlled randomized clinical trial on safety and efficacy of music therapy on intraoperative stress and anxiety reduction and they didn't find statistical differences between the control and experimental groups in heart rate gradient or systolic and diastolic blood pressures measured after the intervention. There are not many studies on the effect of music therapy on intraoperative haemodynamics. Further studies in this aspect will be required in the near future. There is a notion that general anesthesia does not completely abolish auditory perception and that some processing of intraoperative events can occur in unconscious patients, even in the absence of postoperative recall. [16] This has been the basis for us to assume the hypothesis that intraoperative music listening can decrease anesthetic requirements and reduce isoflurane consumption. Music has been shown to reduce patient's anxiety and decrease sedative requirements.[17, 18, 19] X. W. Zhang et al evaluated the sedative effect of music using the bispectral index (BIS) during target-controlled infusion (TCI) propofol in their study on 110 women undergoing hysterectomy.[20] They were randomly allocated to receive either music or no music. The music group had a significant reduction in mean (SD) induction time of sedation: 12 (12) min vs. 18 (12) min, $p < 0.01$. Ganidagli et al assessed the effect of music on the level of sedation and the electroencephalograph bispectral index (BIS) during the preoperative period on Fifty-four ASA physical status I-II patients, scheduled for elective septo-rhinoplastic surgery and concluded that listening to music during midazolam premedication is associated with an increase in sedation level in the preoperative period as reflected by a lower BIS value.[21]In our study though we kept an upper limit of

using isoflurane to 1.2% (provided BIS was acceptable), we didn't had to increase the isoflurane concentration to more than 1 volume % in any of the cases in the music intervention group. The mean for isoflurane was 0.64 ± 0.04724 at 15 minutes after incision and 0.61 ± 0.03692 at 1 hour after incision. But in the control group the need for isoflurane was significantly higher with a mean of 0.78 ± 0.05211 at 15 minutes after incision and 0.80 ± 0.07255 at 1 hour after incision which was a statistically significant difference (p = 0.05 and 0.0250 at 15 minutes and 1 hour after incision respectively) amongst the two groups.

CONCLUSION

Music is a cheap, non pharmacological, easily available modality of therapy which can be used efficiently in the perioperative period to decrease stress and anxiety associated with surgery with additional benefit of providing stable perioperative haemodynamics and decreasing anaesthetic agent requirement in the intraoperative period.

REFERENCES

1. Pritchard MJ. Identifying and assessing anxiety in preoperative patients. Nursing Standard 2009;23:35-40.
2. Bradt J, Dileo C, Shim M. Music interventions for preoperative anxiety. Cochrane Database Syst Rev 2013 ;6:CD006908.
3. Agarwal A, Ranjan R, Dhiraaj S, Lakra A, Kumar M, Singh U. Acupressure for prevention of pre-operative anxiety: a prospective, randomised, placebo controlled study. Anaesthesia 2005;60: 978-81.
4. Li XM, Zhou KN, Yan H, Wang DL, Zhang YP. Effects of music therapy on anxiety of paients with breast cancer after radical mastectomy: a randomized clinical trial. J Adv Nurs 2012 ; 68(5):1145-55.
5. Palmer JB, Lane D, Mayo D, Schluchter M, Leeming R. Effects of Music Therapy on Anesthesia Requirements and Anxiety in Women Undergoing Ambulatory Breast Surgery for Cancer Diagnosis and Treatment: A Randomized Controlled Trial. J Clin Oncol 2015 Oct 1;33 (28):3162-8.
6. Binns-Turner PG, Wilson LL, Pryor ER, Boyd GL, Prickett CA. Perioperative music and its effects on anxiety, hemodynamics, and pain in women undergoing mastectomy. AANA J 2011 Aug; 79(4 Suppl):S21-7.
7. Nilsson U. The anxiety- and pain-reducing effects of music interventions: a systematic review. AORN J 2008;87(4):780-807.
8. Van der Heijden MJE, Araghi SO, Dijk M, Jeekel J, Hunink MGM. The Effects of Perioperative Music Interventions in Pediatric Surgery: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. PLoS One 2015;10(8): e0133608.
9. Grös D F, Antony, M M, Simms L J, McCabe R E. Psychometric properties of the state-trait inventory for cognitive and somatic anxiety (STICSA): Comparison to the state-trait anxiety inventory (STAI). Psychol Assess 2007;19:369-81.
10. Charlson ME, Mackenjie CR, Gold JP, Ales KL, Topkins M, Shires GT. Intraoperative blood pressure. What patterns identify patients at risk for postoperative complications? Ann Surg 1990 Nov; 212 (5):567-80
11. Shipley RE, Study RS. Changes in renal blood flow, extraction of insulin, glomerular filtration rate, tissue pressure and urine flow with acute alteration of renal artery blood pressure. Am J Physiol. 1951; 167; 676-88.
12. Larson CP, Mazze RI, Cooperman LH, H Wollman. Effects of anesthetics on cerebral, renal and splanchnic circulations. Anaesthesiology 1974; 41:169-81.
13. Solgajová A, Sollár T, Zrubcová D , Vörösová G. Predictors of preoperational anxiety in surgical patients. Kontakt 2015; 17:e201-05
14. Johnson B, Raymond S, Goss J. Perioperative music or headsets to decrease anxiety. J Perianesth Nurs 2012 ;27(3) :146-54.
15. Jiménez-Jiménez M, García-Escalona A, Martín-López A, De Vera-Vera R, De Haro J. Intraoperative stress and anxiety reduction with music therapy: a controlled randomized clinical trial of efficacy and safety. J Vasc Nurs 2013; 31(3):101-6.
16. Theodoraki K. The effect of intraoperative music listening on sevoflurane consumption and recovery parameters. Available at https://clinicaltrials.gov/ct2/show/NCT02220452 Last updated, December 28, 2015
17. Lepage C, Drolet P, Girard M, Girard M, Grenier Y, DeGagne R. Music decreases sedative requirements during spinal anesthesia. . Anesth Analg 2001; 93: 912–6.
18. Wang SM, Kulkarni L, Dolev J, Watcha MF. Music and preoperative anxiety: a randomized, controlled study. Anesth Analg 2002; 94: 1489–94.
19. Koch ME, Kain ZN, Ayoub C, Rosenbaum SH. The sedative and analgesic sparing effect of music. Anesthesiology 1998; 89: 300–6.
20. Zhang XW, Fan F, Manyande A, Tian YK, Yin P. Effects of music on target-controlled infusion of propofol requirements during combined spinal-epidural anaesthesia Anaesthesia 2005;60:990-94.
21. Ganidagli S, Cengiz M, Yanik M, Becerik C, Unal B. The effect of music on preoperative sedation and the bispectral index. Anesth Analg 2005;101(1):103-6