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ORIGINAL ARTICLE

The Effect Of Music Therapy On Sedative Requirements And Haemodynamic Parameters In Patients Under Spinal Anaesthesia; A Prospective Study

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ABSTRACT

Background: Music therapy is the application of music in the treatment of physiological and psychological aspects of an illness or disability. Music has been shown to modulate the stress response in minor operations, intensive care and other various hospital settings. We designed this study to determine the effects of music therapy on intraoperative sedative requirements in achieving similar degrees of sedation and on Haemodynamic parameters in patients undergoing surgery under spinal anaesthesia. **Methods**: We prospectively studied 100 cases of ASA Grade I and II between 15-65 years of age from both sexes, undergoing abdominal, urological and lower extremity surgery under spinal anaesthesia. The patients were randomized into Group M (those who listened to music) and Group C (those who didn't listen to music). After the induction of spinal anaesthesia, and after achieving the desired effects and levels, headphones were applied to all the patients and music was started in group M. The intraoperative vital parameters and total sedative requirements were recorded and compared in both the groups. **Observations:** The total midazolam requirements were significantly lower in patients who listened to music intraoperatively (2.17 ± 0.53 mg versus 3.25 ± 0.77 mg; $P = 0.02$), for achieving similar degree of sedation (Ramsay grade 3). The mean pulse rate was significantly lower in group M as compared to group C (from 68-76 versus 86-98; $P<0.05$) at 30-90 minutes intervals intraoperatively. Systolic and diastolic blood pressure were comparable in both the groups, with insignificant difference at all times ($P > 0.05$), though the patients in group M reported a higher sense of satisfaction and well- being postoperatively. **Conclusions:** Our findings suggest an important role of music in perianesthetic patient care. We conclude that music is a non-pharmacological alternative which is suitable for decreasing intraoperative sedative requirements under spinal anaesthesia.

Keywords. : Music Therapy, Spinal Anaesthesia, Sedative, Midazolam, Operation Theater (OT)

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Introduction

The perioperative period is not only physically traumatic, but is also a source of significant fear and anxiety to patients [1]. Surgical procedures performed using regional anaesthetic techniques present a special challenge to anaesthesiologists, because patients are awake and are exposed to multiple anxiety provoking visual and auditory stimuli [2]. Therefore, sedative and anxiolytic drugs are regularly administered before and during surgery, for the purpose of calming patients, but at the cost of dose dependent central nervous system and cardio-respiratory system depression [3],[4]. Different drugs have been tried in the past to achieve sedation, the most prominent among them being diazepam, propofol, midazolam and ketamine. Non-pharmacological alternatives like acupressure, hypnosis, therapeutic suggestions and music have also been tried in the past, with varying results, to avoid the complications from the overdose of the sedative drugs [3],[4],[5]. Music has found its application during various out-patient or minor procedures, ICU stay, in cancer wards, labour rooms, or other hospital settings and has been seen to reduce stress and anxiety levels in patients. A few previous studies have compared the efficacy of intra- or post-operative music therapy in decreasing sedative or analgesic requirements by using various drug combinations [4],[5]. We aimed to observe the role of music therapy in the modulation of Haemodynamic variables such as heart rate and mean blood pressure and on the intraoperative requirement of sedatives for achieving similar degrees of sedation.

Methods

This prospective controlled study was carried out at our institute from April 2004- March 2007 (3 years), after approval from the ethical review board of the institute. 100 cases of ASA Grade I and II, between 18-65 years of age from both sexes, undergoing abdominal, urological or lower extremity surgery under spinal anaesthesia were enrolled for the study. The exclusion criteria were patients with any contraindication to spinal anaesthesia, those with refusal for procedures or music therapy and those with hearing disorders. After the pre-anaesthetic check up and routine investigations, the patients were explained about the procedure of spinal anaesthesia and their written/informed consent was taken.

On the day of the surgery, the patients who would listen to music were randomly allocated by using the lottery method to Group M, and those in whom headphones would be applied but who would not listen to music were allocated to Group C. . In the operation theatre, standard ASA monitors were attached and the baseline parameters were recorded. Spinal anaesthesia was administered by using bupivacaine (0.5% heavy) in the doses of 3.2-3.5 cc and the T10 level was achieved. Thereafter, occlusive headphones rooted to a compact disc player (Discman, Sony Corp. Ltd, China) were applied to all the patients. In group M, the patients were asked about the choice of music that they would prefer to listen intraoperatively, which comprised of the classical, folk or religious category. Music was started in accordance with the patient's choice and the volume was adjusted according to the patient's comfort. All the music albums contained soothing music with slow beats. Music with fast beats or rhythms is known to cause more excitement and anxiety and hence, it was avoided. In Group C, occlusive headphones were applied to eliminate ambient noise, but no music was started. It is important to note that with this type of intervention, the subjects and investigators are difficult to be blinded to group assignment. Moreover, the requests of the patients to change the music album, track or volume adjustments, draws the attention of all the operating room staff and so, the study was single-blinded.

Table/Fig 1: Ramsay sedation score to assess intraoperative sedation

Clinical Status	Score
Pt. anxious, agitated or restless	1
Pt. cooperative, oriented and tranquil	2
Pt. asleep, responds to verbal commands	3
Pt. asleep, responds to gentle shaking, light Glabellar tap or loud auditory stimulus	4
Pt. asleep, responds to noxious stimuli as firm Nailbed pressure	5
Pt. asleep has no response to any noxious stimuli	6

Interpretation of sedation score: Score 1: Inadequate sedation; Score 2-4: Acceptable sedation; Score 5-6: Excess sedation

The intraoperative vital parameters, sedative requirements and the sedation scores were recorded. Intravenous midazolam was given in a bolus dose of 1.5-2 mg, followed by incremental doses of 1 mg after every half hourly assessment of the sedation score, to achieve the Ramsay Sedation Score of 3 in both the groups [Table/Fig 1].

Appropriate intravenous fluids were given as per the individual's requirements. Haemodynamic variables were recorded every 15 minutes and the total midazolam requirements were calculated at the end of the surgery.

Statistical Analysis

The power of our study was determined by using the decrease in the sedative requirements by 40% as shown in previous studies [6],[11]. Based on the α-error of 5% and the β-error of 25%, a sample size of 96 patients was required so we enrolled 100 patients and allocated them in two groups. The data was analyzed by using statistical software SPSS, version 12.0 (SPSS Inc., Chicago, IL). The categorical data was analyzed by using the Chi-square test. The continuous variables were analyzed by using the Student's t-test. The data was expressed as median (range) and mean ± standard deviation for continuous variables. A P value < 0.05 was considered as statistically significant and P values < .001 were considered to be highly significant.

Results

The demographical data was comparable in both the groups, with no significant difference in age, weight, gender and the duration of surgery [Table/Fig 2].

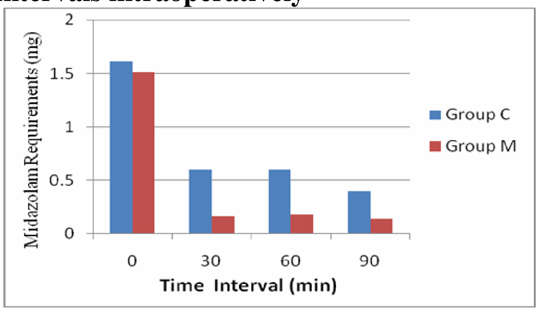
Table/Fig 2: Patient characteristics in both groups

Variable	Group M (n=50)	Group C (n=50)	*P*- value
Age (yrs)	34±16.6	32±17.8	0.46
Weight (kg)	56±17.42	59±16.34	0.32
Male/Female (n)	38/12	34/16	0.76
Duration of surgery (min)	65±38.8	60±33.6	0.63
Total Midazolam requirement (mg)	2.17±0.53	3.25±0.77	0.02*
Midazolam per hour (mg/hr)	1.31(1-2.5)	2.18 (1.5-4.5)	0.02*

*P-value: <0.05 (significant)

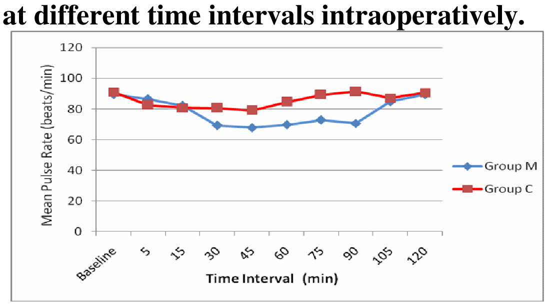
Due to the study design, the mean sedation scores were comparable with the non-significant differences in both the groups at all time intervals (P > 0.05 at baseline, 30, 60 and 90 min intervals). The average requirements of midazolam were similar in both the groups at the start of surgery (1.5mg vs.1.67 mg in group M and group C respectively; P=0.82) (Fig. 3). Thereafter, at half hourly intervals, the requirements of midazolam were observed to be low in group M for achieving similar degrees of sedation.

Table/Fig 3: Mean requirements of midazolam in both groups at different time intervals intraoperatively

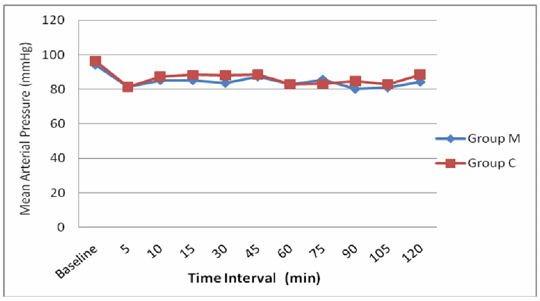


The values of the mean pulse rate in group M showed statistically significant differences (P= 0.04, 0.036, 0.015, 0.02, 0.012) at 30, 45, 60 75 and 90 minutes time interval respectively [Table/Fig 4]. The mean arterial pressures were comparable in both the groups at various time intervals and showed no significant differences throughout the procedure [Table/Fig 5].

Table/Fig 4: Mean Pulse rate in both groups at different time intervals intraoperatively.



Table/Fig 5: Mean arterial pressures in both groups at regular time intervals intraoperatively



The total intraoperative requirements of midazolam were significantly lower in Group M (2.17 ± 0.53 mg) as compared to Group C (3.25 ± 0.77mg) (P=0.02) to achieve the Ramsay sedation grade 3 levels of sedation.

Our study group (group M) demonstrated a strong preference for religious music (48%), followed by the folk (32%) and the classical (20%) variety. Moreover, in Group M, 86% of the patients reported that music helped them relax intraoperatively and that they would opt for intraoperative music if operated again in future.

Discussion

Listening to music has been shown to modulate the mood, behavior and the psychology of the patient into a 'more positive frame of mind'. It has been shown to reduce the state of anxiety while having a favorable impact on Haemodynamic variables [7],[8],[9]. We evaluated these effects of music therapy by recording the vital parameters such as pulse rate and mean arterial pressure, the increase of which is an indirect indicator of anxiety.

The neurophysiological mechanism of music therapy explains its effect on anxiety and stress. Listening to music leads to the release of endorphins, also commonly called the body's own morphine, in the brain. This facilitates an atmosphere of peace and tranquility [1]. Endogenous endorphin release has also been implicated as a mechanism in decreasing pain and analgesic requirements in some studies [4],[10]. The neural interconnections of the auditory pathway and the limbic system modulate emotional responses which are associated with the listening of music. Auditory interconnections with the hypothalamus, hippocampus and the reticular activating system are presumed to attenuate the release of excitatory neurotransmitters, thus providing relaxation and the sedative effects of music [1].

Another hypothesis suggests that our brain and heart beats synchronize with the rhythm and beats of music, thus leading to the entrainment phenomenon [11]. Fast and loud music activates sympathetic responses, while slow and soft beats relax and calm the body. This calming and the sedative effect of music is best observed when the composition is instrumental and has slow rhythm and is of the patient's choice, as reported by many music therapists [11],[12]. Earlier studies have described the beneficial effects of musical elements such as tempo and pitch on physiological and emotional responses, though the reaction to any piece of music can vary widely among listeners [13]. It is also important to understand that age, culture, socioeconomic status and religion affects the way people respond to pain and music [14]. Keeping these facts in consideration, we allowed our patients to select their own choice of music from our collection which contained soft and slow rhythmic music.

Our study group showed a strong preference for religious (48%) or folk music (22%), which reflects that the patient's choice of music is strongly associated with their cultural background. Similar findings have been reported by Ovayolu et al, where Turkish classical music decreased sedative requirements during colonoscopy [15]. A study done by Chan et al using Chinese and Western classical music with slow beats on patients undergoing a C-clamp procedure, found significant reduction in heart rate, respiratory rate, and pain scores in the intervention group [16]. These few studies demonstrate the role of cultural and patient-selected music in coping with the stress and anxiety of the unfamiliar hospital environment [17],[18].

As patients are exposed to multiple anxiety-provoking visual and auditory stimuli under regional anaesthesia, concerns are also rising over the use of loud music which is played in the OT. Music which is rooted through wall speakers contribute to the overall level of background noise, it impairs effective communication among staff members and makes the patients' choice secondary [8],[19]. The application of headphones is therefore a preferable solution to all these problems in operating room settings [20].

It is well-known that intraoperatively used sedatives delay the recovery of patients and are liable to cause adverse effects like oversedation and respiratory depression in the postoperative phase. Our results showed that intraoperative music provided a consistent decrease in the sedative requirements in patients who were allotted to the music therapy group as compared to patients in the control group. The average midazolam requirement to achieve an equal sedation score was significantly less in the music group [1.31 (1 – 2.5) mg/ hr] as compared to the control group [2.18 (1.5 – 4.5) mg/hr]. In studies conducted by Carolina Lepage et al [11] and Marc E. Koch et al [6], a significant decrease in sedative requirements in the music group was observed, as compared to non-music group for achieving similar levels of sedation. Lai HL reported that music resulted in a significantly better sleep quality; longer sleep duration, shorter sleep latency and less sleep disturbance in older patients with sleep disorders [12]. By decreasing sedative requirements, music can aid in faster recovery whilst preventing the adverse effects of sedative drugs. On the contrary, Tej Kaul et al reported that patients with occlusive head phones had similar requirements of propofol as compared to those who listened to music intraoperatively and that the head phone setting eliminated the ambient noise in operation theatre and decreased the sedative requirements in patients under regional anaesthesia [21].

We observed a significant drop in the mean heart rate intraoperatively in the music therapy group as compared to the control group, which correlates with the observations made by Good M and many other researchers [4-6],[22]. A study in Taiwan, in 64 parturients, reported that music therapy decreased heart rate by 7 beats/min and improved satisfaction scores by 3.4 points on a 35-point scale, though the clinical benefit of this observation was subtle and questionable [23]. Contrary to our study, Shu-Ming Wang et al [24] and Ebneshahidi [17] noted no significant changes in heart rate during music therapy and explained that it was due to variations in individual autonomic responsiveness to a stressful situation. In intensive care settings, a single session of music with 25–90 minutes of listening time has been shown to reduce heart rate, blood pressure, respiratory rates and anxiety levels in intubated patients during the weaning phase [25]. Compared to the operating room, the patients stay for a longer duration in the confined environment of the ICU, which suggests that music is a definite source of distraction and relaxation in these settings.

We did not observe any significant reduction in the blood pressure in the intervention group as compared to the control group, which is in agreement with the results of most recent studies [5],[26]. Sendelbach et al reported that music did not cause significant decreases in systolic and diastolic blood pressures in patients recovering from cardiac bypass surgery, though significant decreases in anxiety levels attributed to music are beneficial to patients with coronary heart disease [27]. On the contrary, a meta-analysis of 23 trials performed by Bradt J, showed that listening to music has a beneficial effect on blood pressure, heart rate, respiratory rate, anxiety and pain in patients with coronary heart disease, with consistent results in all the studies. However, the clinical significance of these decreased parameters was found to be subtle and more of academic interest [28].

Other than the objective parameters like decrease in the dose of midazolam or decrease in pulse rate which can be taken as signs of sympathetic activity, the subjective observations made during our study were noteworthy. Patients who had listened to music during their first surgery actually demanded for music in subsequent orthopedic or plastic surgery corrections. Those patients who had been operated previously under regional anaesthesia, found the intraoperative period with music this time much better, less stressful and more relaxing. The average reduction of midazolam in the music therapy group amounted to less than 0.20 USD savings per case and did not seem to have a significant economical impact, but the levels of patient satisfaction achieved with this intervention was invaluable. Moreover, the strong preference of people towards religious and folk music indicated that music can prove to be a reliable companion in the unfamiliar and stressful environment of hospitals.

Due to the non-availability of some advanced facilities, there were a few limitations in our study. The monitoring of the plasma levels of stress hormones (adrenaline, nor-adrenaline and cortisol) and objective or complex questionnaires could have helped the evaluation of anxiety levels and added precision to our results. Incorporating a patient controlled sedation device in the study could also have helped in maintaining the same level of sedation throughout the study period and in accurately calculating intraoperative sedative requirements [29]. Moreover, extending music therapy to the preoperative and postoperative period could have helped us in evaluating the analgesic sparing efficacy of music therapy. In future studies, the effects of music on the operating room staff and the environment can also be carried out [22],[30].

In conclusion, this study shows that music is an attractive adjuvant to sedative drugs for alleviating anxiety and distress which is suffered by patients undergoing surgeries under regional anaesthesia. We recommend the incorporation of this low-cost intervention in routine anaesthesia practice because of its beneficial effect on Haemodynamic parameters and also because of its enhancing effect on the sedatives used in regional anaesthesia.

Conflict of Interest: Nil

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References

[1] Myskja A, Lindbaek M. How does music affect the human body? Tidsskr Nor Laegeforen. Apr 2000; 120(10): 1182-5.
[2] Kari Christiansen: The history of music therapy. Available from: http://www.creative exchange music.com
[3] Byers JF, Smyth KA. Effect of a music intervention on noise annoyance, heart rate and blood pressure in cardiac surgery patients. Am J Crit Care. May 1997; 6(3):183-91.
[4] Good M, Stanton-Hicks M, Grass JA, Cranston Anderson G, Choi C, Schoolmeesters LJ, et al. Relief of postoperative pain with jaw relaxation, music and their combination. Pain. May 1999; 81(1-2): 163-72.
[5] Nilsson U, Rawal N, Unestahl LE, Zetterberg C, Unosson M. Improved recovery after music and therapeutic suggestions during general anesthesia: a double-blind randomized controlled trial. Acta Anaesthesiol Scand. 2001; 45(7): 812-7.
[6] Marc E. Koch, Zeev N. Kain, Chakib Ayoub, Stanley H. Rosenbaum, The sedative and analgesic sparing effect of music. Anesthesiology 1998; 89(2): 300-6.
[7] Lee D, Henderson A, Shum D. The effect of music on preprocedure anxiety in Hong Kong Chinese day patients. J Clin Nurs. Mar 2004; 13(3): 297-303.
[8] Kliempt P, Ruta D, Ogston S, Landeck A, Martay K. Hemispheric-synchronisation during anesthesia: a double-blind randomised trial using audiotapes for intra-operative nociception control. Anesthesia Aug 1999; 54(8): 769-73.
[9] Menegazzi JJ, Paris PM, Kersteen CH, Flynn B, Trautman DE. A randomized, controlled trial of the use of music during laceration repair. Emerg Med 1991; 20(4): 348-50.
[10] Good M, Anderson GC, Stanton-Hicks M, Grass JA, Makii M. Relaxation and music reduce pain after gynecologic surgery. Pain Manag Nurs. Jun 2002; 3(2): 61-70.
[11] Carolina L, Pierre D, Michel G, Yvan G. Music decreases sedative requirements during spinal anesthesia Anesth Analg 2001; 93: 912–6.
[12] Lai HL, Good M. Music improves sleep quality in older adults. Journal of Advanced Nursing 2005; 49(3): 234–44.
[13] Suda M, Morimoto K, Obata A, Koizumi H, Maki A. Emotional responses to music: towards scientific perspectives on music therapy. Neuroreport 2008; 19(1): 75-8.
[14] Camara JG, Ruszkowski JM, Worak SR. The Effect of Live Classical Piano Music on the Vital Signs of Patients Undergoing Ophthalmic Surgery. Medscape J Med. 2008;10(6):149.
[15] Ovayolu N, Ucan O, Pehlivan Y, et al. Listening to Turkish classical music decreases patients' anxiety, pain, dissatisfaction and the dose-sedative and analgesic drugs during colonoscopy: A prospective randomized controlled trial. World J Gastroenterol. 2006;12:7532-7536.
[16] Chan HL, Fong MC, Lai SY, Lo CW, et al.Effects of music on patients undergoing a C-clamp procedure after percutaneous coronary interventions. Journal of Advanced Nursing 2006; 53 (6): 669-79.
[17] Ebneshahidi A, Mohseni M. The effect of patient-selected music on early postoperative pain, anxiety, and Haemodynamic profile in cesarean section surgery. J Altern Complement Med 2008 Sep;14(7):827-31.
[18] Ann-Charlotte F, Leif H, Ulrica N. Patients' perception of music versus ordinary sound in a postanaesthesia care unit: A randomized crossover trial. Intensive and critical care nursing. 25(4): 208-13.
[19] Chakib MA, Laudi BR, Chadi IY, Dorothy G, Zeev NK. Music and Ambient Operating Room Noise in Patients Undergoing Spinal Anesthesia. Anesth Analg 2005; 100: 1316–9.
[20] Lewis AK, Osborn IP, Roth R. The effect of hemispheric synchronization on intraoperative analgesia. Anesth Analg. 2004 Feb; 98(2): 533-6.
[21] Kaul TK, Ahuja N, Avtar S. Does music reduce sedative requirement under regional anesthesia? J Anaes Clin Pharmac 2003; 19(2): 203-6.
[22] 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. Anesthesia. 2003 Jul; 58(7): 699-703.
[23] Laopaiboon M, Lumbiganon P, Martis R, Vatanasapt P, Somjaivong B. Music during caesarean section under regional anaesthesia for improving maternal and infant outcomes. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD006914. DOI: 10.1002/14651858. CD006914.pub2
[24] Shu MW, Kulkarni L, Jackqulin D, Kain ZN. Music and Preoperative Anxiety. Anesth Analg 2002; 94:1489–94.
[25] Jaber S, Bahloul H, Guétin S, Chanques G et al. Effects of music therapy in intensive care unit without sedation in weaning patients versus non-ventilated patients. Ann Fr Anesth Reanim 2007;26(1):30-8.

[26] Mandel SE, Hanser SB, Secic M, Davis BA. Effects of music therapy on health-related outcomes in cardiac rehabilitation: A randomized controlled trial. Journal of Music Therapy 2007; 34(3): 176-97.
[27] Sendelbach SE, Halm MA, Doran KA, Miller EH et al. Effects of Music Therapy on Physiological and Psychological Outcomes for Patients Undergoing Cardiac Surgery. Journal of Cardiovascular Nursing 2006 May-Jun;21(3):194-200.
[28] Bradt J, Dileo C. Music for stress and anxiety reduction in coronary heart disease patients. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD006577. DOI: 10.1002/14651858.CD006577.pub2.
[29] Voss JA, Good M, Yates B, Baun MM, Thompson A, Hertzog M. Sedative music reduces anxiety and pain during chair rest after open-heart surgery. Pain. 2004 Nov; 112(1-2):197-203.
[30] Nilsson U, Rawal N, Enqvist B, Unosson M: Analgesia following music and therapeutic suggestions in the PACU in ambulatory surgery; a randomized controlled trial. Acta Anaesthesiol Scand 2003; 47(3): 278-83.