

Music and Its Effect on Intraoperative Haemodynamic Stability and Postoperative Blood Sugar Level in Patients Undergoing Laparoscopic Cholecystectomy under General Anaesthesia

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Abstract: Patient going for a surgery is under stress right from the preoperative period and stress could range from immense and might take serious turn in postoperative phase. Stress is indicated by so many parameters verbal, behavioural and laboratory. Blood sugar level and vital parameters like blood pressure and heart rate are some tools to measure stress of the surgery. Music could be an effective additive for alleviation of stress without its side effects along with other measures such as proper amnesia and analgesia. Our hypothesis is that music therapy reduces perioperative stress and postoperative blood sugar level. This randomized control study was conducted on 90 patients of ASA grade 1 and 2 after taking ethics committee approval. Group A (n=30) patients heard routine operation theatre sound. Group B (n=30) patients heard relaxing music intraoperatively only. Group C (n=30) patients heard relaxing music both intraoperatively and postoperatively till two hours. Diastolic and systolic blood pressure, heart rate were measured throughout the procedure till two hours after the procedure. Blood sugar levels were recorded immediately after extubation and then two hours after the surgery. Exposure of music during perioperative period helps in stabilizing blood sugar level and thus the stress occurred due to surgery. Blood sugar level in group A, group B and group C immediately after extubation are 186.26 ± 29.06 , 116.43 ± 21.43 and 106.43 ± 12.72 and that two hours after extubation are 145.10 ± 23.35 , 100.36 ± 13.64 and 93.56 ± 11.28 . Exposure of music during perioperative period helps in reducing surgery related stress assessed by measuring blood sugar level in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

Keywords: Abdominal surgeries, Blood sugar, General anaesthesia, Haemodynamics, Music, Stress.

INTRODUCTION

A patient going for surgery is in stress due to many factors like pain, anxiety, unstable vitals etc. Unrelieved post-operative pain may cause other changes like inability to cough and less effective movements those further increases morbidities like deep vein thrombosis, atelectasis, myocardial infarction, pneumonia, poor and delayed wound healing, insomnia, longer stay in hospitals thus worsens quality of life [1, 2]. Likely unrelieved postoperative anxiety may led to nausea, vomiting or post traumatic stress disorder in extreme case.

Music has been in use for a long time to make people happy since ancient times and have characteristic psychological and physiological effects on human being [3].

Various studies have demonstrated that music therapy reduces both preoperative and postoperative anxiety and decreases postoperative pain [2, 4-6].

Music is supposed to have effect on antistress system of the body and it acts by enhancing the release of endogenous opioids and other neuropeptides such as oxytocin [4] and increase in the number of mioreceptors have also been reported¹. The auditory evoked potentials are found to be intact even in deeper plane of general anesthesia [5, 7].

Music is an added inexpensive, non-pharmacological, non-invasive and non-chemical method with no side effects. Reduction of anxiety reduces perception of pain and stress and thus decreases the dose of sedatives and opioids and hence their side effects.

MATERIALS AND METHODS

After obtaining approval from the ethics committee and well written informed consent from the patients, study was carried out on 90 patients of ASA grade I and II, aged 20-50 years, undergoing laparoscopic cholecystectomy lasting 1-3 hours

requiring general anaesthesia with endotracheal intubation at J.A Group of Hospitals of G.R. Medical College, Gwalior (M.P), India. Patients were allocated randomly using envelope technique in three groups of 30 each: group A- Patients heard routine operation theatre sounds, group B- Patients heard relaxing music intraoperatively only and in group C- Patients heard relaxing music both intraoperatively and till two hours in the post operative period. Exclusion criteria were ASA grade III and above, language barrier, hearing defect, psychiatric illness or memory disorders, known addiction like alcohol consumption and drug abuse and

patients on antihypertensives, antiarrhythmic, adenoceptor agonist or antagonist.

Consent

Details of procedure were explained to all the patients during preanaesthetic assessment and an informed and written consent was obtained.

PATIENTS' GROUPING

90 patients of ASA grade I & II of either sex scheduled for abdominal surgeries under general anaesthesia were divided into 3 groups (n=30 each) randomly using envelope technique as below:

1.Group 'A' (n=30)	Patients heard routine operation theatre sounds.
2.Group 'B' (n=30)	Patients heard relaxing music intraoperatively only.
3.Group 'C'(n=30)	Patients heard relaxing music both intraoperatively and postoperatively till two hours.

PREMEDICATION

All the patients were uniformly premedicated with Inj. Glycopyrrolate 0.01 mg/kg IM 30 minute before induction of anaesthesia.

PREPARATION OF THE PATIENT

Upon arrival of the patient in the operation room, intravenous access with 18 G cannula was established and 500 mL of crystalloid infusion was started. All the baseline vital parameters (HR, SBP, DBP, MAP), electrocardiography using three lead ECG were monitored. Oxygen saturation (SPO₂) was monitored by using pulse oximeter.

ANAESTHESIA PROCEDURE AND RECORDING

All the drugs were administered by a person who was not involved in the study to avoid bias. Patients were preoxygenated with 100% oxygen at appropriate flow for 3 minutes by facemask. After premedication with i.v. Inj Pentazocine 0.5mg/kg, general anaesthesia was induced with i.v. Inj Thiopentone Sodium 5 mg/kg body weight. Endotracheal intubation was facilitated with i.v. Inj. Succinylcholine 1.5 mg/kg body weight and IPPV was done for 60 seconds with 100% oxygen.

Laryngoscopy was done with laryngoscope having Macintosh blade and tracheal intubation done with appropriate size of cuffed endotracheal tube. Cuff was inflated and bilateral equal air entry was checked and then tube was fixed.

General anaesthesia was maintained with nitrous oxide & oxygen (67:33) and Isoflurane (0.5-1%) with Bain's anaesthetic circuit. Loading and intermittent dosage of non-depolarizing muscle relaxant, IV Atracurium Besylate 0.5mg/kg body weight initially followed by increment doses at 0.1mg/kg was used to maintain general anaesthesia under controlled ventilation throughout the surgical procedure.

Patients in Group B and Group C were applied with headphones such that no sound from the operation theatre was allowed to leak in the ears while patients in Group A were applied with headphones and blank tape was played and kept exposed to the routine operation theatre sound after being comfortable on the operation table before induction.

Patients, anaesthesiologists, surgeons and nurses were blinded to tape selection. Each tape was set on autoreverse mode and was played continuously starting after recording baseline values of pulse oximeter, pulse rate, noninvasive blood pressure recording, capnography to see the effect of allaying preoperative anxiety till the closure of skin incision in Group B and for further two hours in the postoperative period in patients under Group C. Patients listened the music composed of chirping of birds, blowing of wind and soothing music of guitar and violin. Patients in Group A were not exposed to any soothing music but to the routine sounds of operation theatre.

Depth of anesthesia was assessed by the clinical signs of light plane of anaesthesia like increase in blood pressure, heart rate, sweating and changes in capnograph. Patients were maintained in deep plane of anaesthesia throughout the procedure.

Effect of music on intraoperative haemodynamic stability and changes in random blood sugar level post operatively were the primary objectives.

During the intra operative period, vitals like heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate were recorded before induction, after endotracheal intubation, fixation of the tube and then 5,10,20,30,60,90,120 minutes after the intubation denoted as B₀, AETI, A₀, A₅, A₁₀, A₃₀, A₆₀, A₉₀, A₁₂₀ and at 0,30,60 and 120 minutes in post operative period denoted as P₀, P₃₀, P₆₀ and P₁₂₀. At the end of the

surgery, neuromuscular blockade was reversed with inj. Neostigmine 0.04mg/kg i.v. and inj. Glycopyrrolate 0.01mg/kg i.v. Patients were extubated when extubation criteria were met. All the patients were kept in the postoperative recovery ward for minimum of eight hours and all the above vitals were recorded for two hours and patients were monitored for blood sugar and side effects in the post operative period.

Postoperative Pain was assessed using a visual analogue score scale which consisted of a 10 cm horizontal scale with graduations marked as '0' means no pain at all and '10' means unbearable pain. Inj. Diclofenac sodium 75 mg in 100ml. Postoperative nausea and vomiting was assessed by four grade scale (no nausea, mild nausea, moderate nausea and severe nausea). Inj. Ondansetron 0.1 mg/kg body weight intravenous was used as rescue antiemetic on demand of the patients.

The observations were recorded and subjected to statistical analysis using student's "t" test and for qualitative variables chi square test was used. The observations recorded in all the three groups were tabulated and statistical analysis was carried out by using SPSS version 17 statistical software. For intergroup comparison, $p > 0.05$ and $p < 0.05$ were considered as insignificant & significant respectively. $p < 0.01$ was considered as highly significant.

RESULTS

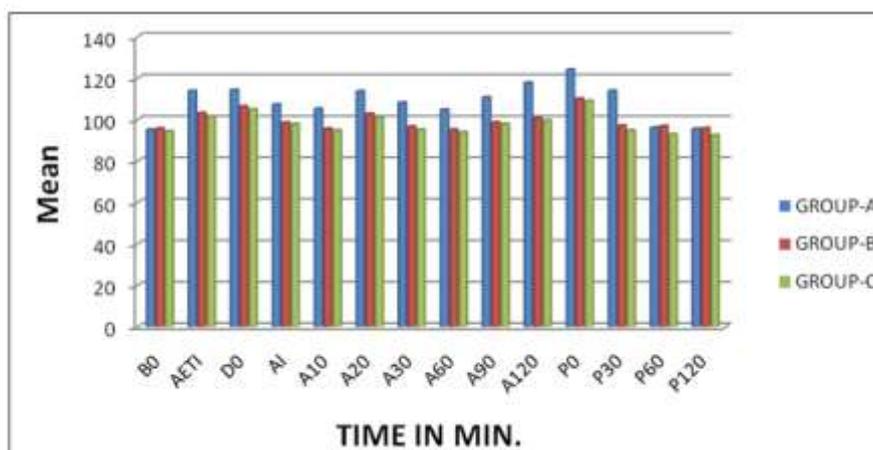
Data obtained from the patients involved in the study were analyzed. The mean age, weight, sex, type of surgery and duration of anaesthesia were comparable in all the three study groups as shown in table 1. Preoperative heart rate, systolic, diastolic and mean blood pressure and blood sugar level were comparable in all the three groups.

Table-1: Showing Demographic Variables of All Three Groups

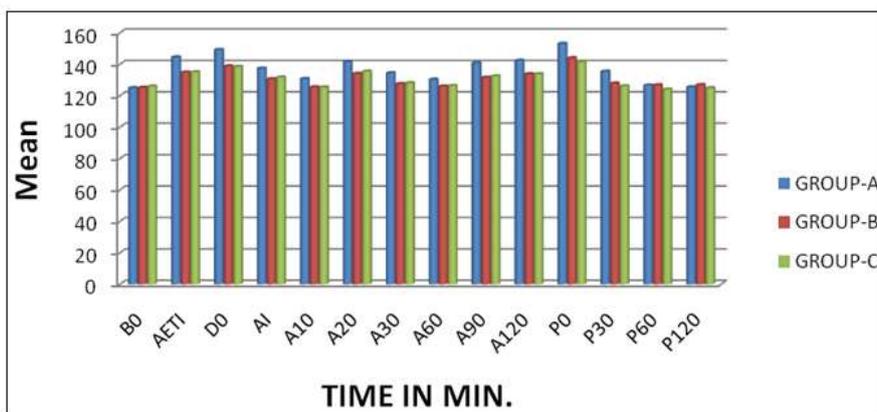
DEMOGRAPHIC DATA	Group A	Group B	Group C
AGE	37.06±10.63	37.90±10.20	36.20±9.57
WEIGHT	58.36±12.15	57.60±9.56	56.53±9.25
SEX (female)	76.7%	86.7%	86.7%
DURATION OF ANAESTHESIA	97.16±17.05	98.00±20.82	99.50±19.13

Intraoperatively, vitals like heart rate, SBP, DBP and MAP were measured at various time intervals with their mean shown in the Graph-1, 2, 3 and 4

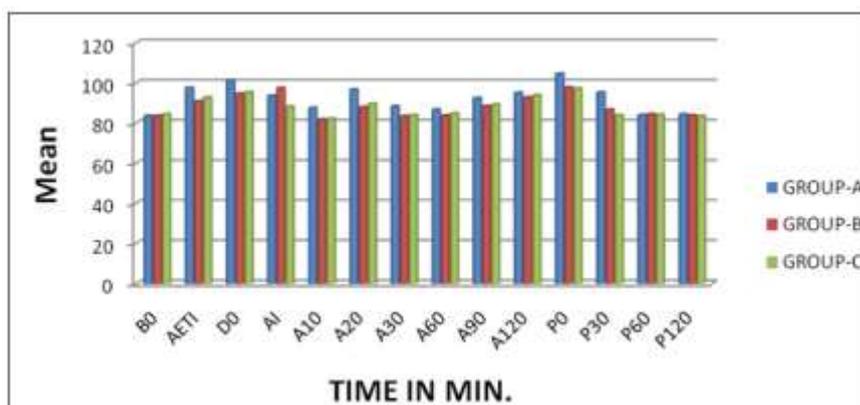
respectively. As all the cases were of laparoscopic cholecystectomy, effect of pneumoperitoneum and its reversal is also taken into the consideration.



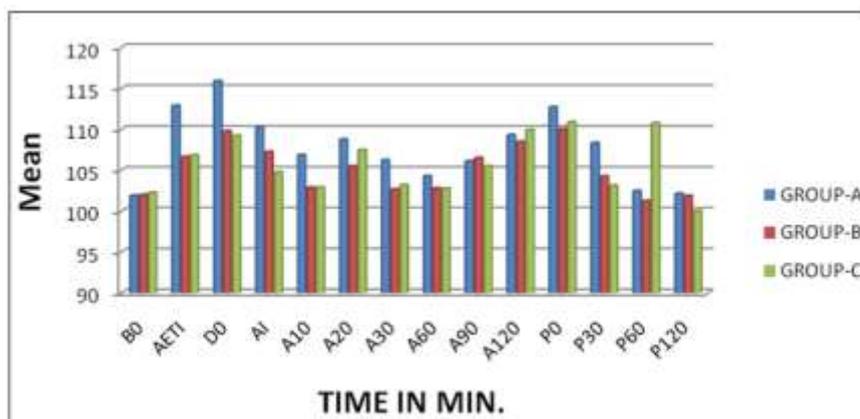
Graph-1: Statistical Analysis Mean of Pulse Rate (bpm) in Three Study Groups



Graph-2: Statistical Analysis Mean of Systolic blood Pressure (mmHg) in Three Study Groups



Graph-3: Statistical Analysis Mean of Diastolic blood Pressure (mmHg) in Three Study Groups



Graph-4: Statistical Analysis Mean of Mean Arterial Pressure (mmHg) in Three Study Groups

Table-3: showing blood sugar level at different time interval of all the three groups

BLOOD SUGAR LEVELS (mg/dl)	Group A	Group B	Group C
Mean±SD Preoperative blood sugar (mg/dl)	83.23±12.33	83.26±11.28	88.03±12.23
Mean±SD blood sugar (mg/dl) after extubation	186.26±29.06	116.43±21.43	106.43±12.72
Mean±SD blood sugar (mg/dl) 2 hours postoperatively.	145.10±23.35	100.36±13.64	93.56±11.28

Table-3 shows that post operative blood sugar levels measured just after extubation and two hours thereafter as an indicator of stress response to the surgery were significantly less in group C as compared to group A and group B.

Postoperative complications like nausea, vomiting, sedation, bradycardia, tachycardia, hypotension, shivering and urinary retention were not significant in all the three groups.

Table-4: Shows Intraoperative Awareness of the Music In All The Three Groups

MUSIC AWARENESS IN PACU	GROUP A	GROUP B	GROUP C
	No. (%)	No. (%)	No. (%)
YES	0 (0%)	0 (0%)	0 (0%)
NO	30 (100%)	30 (100%)	30 (100%)

Above table shows that none of the patient was aware of the music played during surgery.

DISCUSSION

General anaesthesia renders patient immobile with alleviation of all the reflexes with proper muscle relaxation then how music played during surgeries under general anaesthesia helps in stabilization of vital parameters remains a question. Though the exact mechanism is not clearly defined but according to previously done studies, auditory evoked potentials (AEPs) remain intact even in general anaesthesia⁷. Secondly music decreases preoperative anxiety that in turn decreases the perception of pain and also it induces release of endorphins in body acting as analgesics [2].

Selected groups were comparable for the demographic variables like age and weight parameters, type of surgery, sex and duration of anaesthesia with $P > 0.05$. Effect of intubation and laryngoscopy induced stress response, creation of pneumoperitoneum, reversal of pneumoperitoneum and extubation was seen over heart rate, SBP, DBP and MAP in all the groups but was significantly less in the music groups compared to the non-music group showing better stability of the hemodynamic vitals in the patients exposed to the music intraoperatively.

Rise in postoperative blood sugar level was significantly less in group B and C when compared to group A and also sugar level two hours later in the postoperative ward was significantly lower in group C.

Bansal P *et al.*, [8] found that music therapy decreases the mean heart rate spinal anaesthesia.

Kwo-Chen Lee *et al.*, [19] observed that music reduces anxiety and heart rate which is in accordance with our study.

Rohit S. Loomba *et al.*, [10] found that music decreases heart rate, systolic blood pressure, diastolic blood pressure which is similar to our results.

Manish Jha *et al.*, [7], found that music in combination with therapeutic suggestion during surgery under general anaesthesia have a beneficial effect on postoperative rescue analgesic doses.

Valaria Calcaterra *et al.*, [11] conducted a study to evaluate effect of music on post operative distress and pain in pediatric day care surgery. They

concluded that music reduces systolic blood pressure and diastolic blood pressure significantly.

Eliseth Ribeiro Leao *et al.*, [12] found that listening to music and mental images evoked through it have significant effect on the reduction of pain intensity.

Carlton Evans *et al.*, [13] found that therapeutic suggestions during anaesthesia may significantly reduce the duration of recovery and improvises the quality of recovery from hysterectomy surgery.

Elaheh Mottahedian *et al.*, [14] found that music is effective in reducing anxiety and improving the hemodynamic status of patients under spinal anaesthesia.

Masoumeh Forooghy *et al.*, [15] concluded that music alleviates patient's anxiety during coronary angioplasty.

Pamela G. Binns Turner *et al.*, [16] concluded with their study that application of music perioperatively, reduce mean arterial pressure (MAP), anxiety and pain in patients undergoing mastectomy.

T T C McLintock *et al.*, [17] concluded from the results that positive intra-operative suggestions played during surgery can have a beneficial effect on patients undergoing hysterectomy by reducing postoperative pain and thus the analgesic consumption.

U. Nilsson *et al.*, [18] suggests that patients listened to music during intraoperative period may experience decreased postoperative pain, and that postoperative music therapy may reduce anxiety, pain and morphine consumption.

According to previously done studies, music influences neurohumoral stress response system of the body positively as seen by reduction of the level of cortisol, blood sugar level in various previously done studies. It is suggested that music has central projections to the bilateral temporal lobes that might be involved in the decrement of stress response and thus the stress related factors.

There was no any awareness of intraoperative music in the postoperative period to any patient suggesting adequate depth of anaesthesia. Postoperative complications were insignificant.

CONCLUSION

This study was carried out to compare the effect of music on intraoperative haemodynamic stability and postoperative stress relief in patients undergoing laparoscopic cholecystectomy under general anaesthesia. We found that exposure of music during perioperative period helps in stabilizing all haemodynamic parameters (HR, SBP, DBP and MAP) during laparoscopic cholecystectomy under general anaesthesia.

Music also helps in reducing postoperative stress of the surgery as seen from the better stabilization of blood sugar level in the music groups. No untoward effects and or complications were observed during the study.

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