International Journal of Research in Medical Sciences
Kaur H et al. Int J Res Med Sci. 2019 Aug;7(8):3219-3223
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20193424

Review Article

Extra note of music in anaesthesia

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Received: 11 June 2019
Revised: 27 June 2019
Accepted: 10 July 2019

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ABSTRACT

Role of music has been identified since ancient times for alleviating anxiety. Music has been known for its potential to produce a sense of wellbeing and peace. Anaesthesia and surgery are major stress factors for any person. Preoperative anxiety is a usual phenomenon in patients posted for various surgical interventions as well as those admitted to intensive care units (ICU). Literature shows ample evidence regarding neurohormonal disturbances related to stressful situations like preoperative, intraoperative and post-operative periods. Music has been shown to attenuate release of various biochemical molecules leading to relaxing and sedative effects on the brain. Not only patients under regional anaesthesia who are awake have a positive impact, even patients under general anaesthesia have also been shown to benefit from listening to music intraoperatively. Music is a hazard free intervention which can be added to various drug combinations used by anaesthesiologists.

Keywords: Anxiety, Calming effect, Endorphins, Hypnotics and sedatives, Music, Patient satisfaction

INTRODUCTION

Anaesthesia and surgery are related to various unpleasant psychological experiences for the patients, stress being a major contributory factor. Anxiety in preoperative time has a definite implication on the perioperative period. Authors have observed that endogenous release of hormones like catecholamine and cortisol leads to change in hemodynamics like heart rate, blood pressure, and respiration.[1] Further, these disturbances in parameters may lead to increased requirement of anaesthetic and anxiolytic drugs.[2]

Researchers have shown that neural mechanisms that come into play while listening to music include modulation of auditory interconnections with limbic system, hypothalamus, hippocampus and reticular activating system. This attenuates release of various neurotransmitters leading to relaxing and sedative effects on brain.[3] Studies have even shown the antianxiety effect of music equivalent to low dose of anxiolytic drugs.[4,5] A systemic review conducted by Nilsson et al, who reviewed 42 studies showed that in half of the studies music significantly reduced anxiety levels of patients.[6]

Music has been shown to have positive effects on not only patients under regional anaesthesia but also those under general anaesthesia. Awareness under anaesthesia has been shown to be reduced by use of music intraoperatively.[7]

Music and anxiety

Since ancient era, music has been shown to play role in daily life situations. It has been observed that music produces a feeling of wellbeing and alleviates anxiety and stress by its calming effect. Various authors have studied and proved this fact in literature.

Bailey JR et al, stated in their study that heart rate variability or fluctuation in R-R interval in electrocardiogram (ECG) is a reflection of central nervous system control over the heart rate. They further added that low frequency power in enhanced by rise in sympathetic activity and ratio of low to high frequency power could be taken as quantitative indication of vagal sympathetic balance.[8]

A study conducted in 2014 also compared heart rate variability using holter monitor due to anxiety in forty elderly patients undergoing elective surgery. They observed that patients who were subjected to listening music pre-operatively for thirty minutes had significant lowering of low frequency to high frequency power ratio ($p < 0.05$) as compared to control group with no music listening. This study concluded that intervention via use of music in perioperative period significantly reduced sympathetic and enhanced parasympathetic activity by reducing anxiety.[9]

Another research evaluated effect of music on 100 patients undergoing caesarean sections. Authors found a highly significant lowering of anxiety and a high patient satisfaction score in music group as compared to control group.[10]

A recent study assessed the effect of music on the anxiety scores on 100 patients. They found a significant difference in anxiety scores of music group (who listen to music for 20 minutes pre-operatively) and control group (with no music intervention). Mean anxiety score in music group was found to be 1.76±0.59 and was 2.92±0.52 in control group ($p < 0.001$). They also stated that anxiety-lowering impact of music could be due to reduction in catecholamine levels.[1]

Another study also quoted similar results with respect to anxiety score.[11]

A very recent study conducted on previous caesarean sections under regional anaesthesia by Bansal GL et al, observed effects of music on visual analogue score for anxiety (VASA). They found a significant reduction in VASA in music group as compared to no music group. (2.2±1.8 v/s 3.4±1.3) ($p=0.004$). Further they found that level of anxiety was much less in patients who were subjected to music during this surgery as compared to the same patients during their previous caesarean sections.[12]

However, few authors have also quoted that music does not alter the anxiety of patients.[13,14]

Music and haemodynamics

Numerous authors have studied changes in heart rate, blood pressure, respiratory rate and oxygen saturation (SpO2) in relation to music intervention. Authors have correlated this change in haemodynamics with reduction in anxiety levels of patients undergoing surgeries.

Decrease in heart rate has been shown in a recent study by Bansal GL et al, and many other authors Some other authors have found a significant drop in blood pressure (systolic or mean) by listening to music of choice as well as when music is started preoperatively.[1,12,16,17]

In a systemic review of 23 clinical trials it was found that music had positive effects music on blood pressure, heart rate, respiratory rate, anxiety, and pain in coronary artery disease patients.[18]

Another meta-analysis conducted on pediatric patients showed lowering of distress and anxiety in children by making them listen to music during surgery. (SMD -0.34 95% CI-0.66; -0.01 and SMD -0.50; 95% CI -0.84;-0.16).[19]

Improvement in SpO2 in patients undergoing caesarean sections has been found with music intervention. This could be due to lower anxiety and heart rate of patients.[20]

However, studies showing no effect of music on haemodynamic profile are also present in literature.[21]

Biochemical markers-effects of music

Hormones and biochemical marker levels have been used as physiological indicators of stress by authors. Levels of hormones like cortisol, epinephrine, nor epinephrine, adrenocorticotropin hormone (ACTH), immunoglobulin A (Ig A) have been studied by authors in blood as well as saliva.[1,22,23]

This stress lowering and hormonal modulator effect of music has been presumed to be due to capacity to modify emotional and cognitive processes, mental distraction, diminished unpleasant noises of operation room and evoking feeling of relaxation and pleasure. Serum cortisol levels have been shown to be reduced significantly in music group as compared to control group during intra operative period.[22]

Another recent study evaluated serum levels of adrenaline and nor adrenaline and found that music significantly lowered epinephrine levels (30.30±2.3 in music group and 32.90±2.8 in non-music group, $p=0.039$) which correlated with lowering of anxiety in their study.[1]

Blood glucose levels have also been estimated as indicators of stress response. Reduction in blood glucose has been seen in operative patients by some authors with use of music.[21,24]

Sedative and analgesic requirements

Studies have evaluated effects of music listening on requirements of sedatives and analgesics in various operative settings. Bansal P et al found that mean midazolam requirements during intra operative period in patients under spinal anaesthesia were significantly lower

in those who listened to music as compared to those patients who were not subjected to music listening (2.17±0.53 mg v/s 3.25±0.77 mg, p=0.02).

The mechanism suggested by authors included release of endogenous endorphins by music, which help to lower the sedative and analgesic requirements.[15]

Requirement of propofol used for sedation was found to be 15% lesser in music group, this was assessed by using Bi spectral index (BIS) in patients under regional anaesthesia.[22]

Many other authors have echoed similar results with respects to lesser sedation requirements if patients were made to listen music.[7,25] However, few authors have found no change in sedative requirements following music intervention.[21,26]

Studies by authors regarding analgesic requirements have also concluded that music therapy reduced the requirement of analgesics in intra-operative and postoperative periods.[27-29]

Mechanism of action involved break in the afferent conduction of pain impulses and stimulation of production of endorphins.[30]

Postoperative period

Few authors have assessed recovery time, type of recovery from anaesthesia, postoperative nausea and vomiting (PONV) and awareness under anaesthesia with respect to music. It has been shown in a study that music shortened the time of recovery in patients who were subjected to hear live music than those who heard recorded music. Authors calculated time difference of 12.4 minutes in recovery time (95% CI, 2.2 to 22.5; p=0.018).[26] Calm recovery was observed in music group than in no music group patients in another study (77.1% v/s 44%, p <0.001).[7]

Some studies have evaluated PONV in postoperative period and found significant difference in reduction of PONV with use of music. Mechanism suggested by authors includes modulation of psychology of patients thus allaying anxiety, reducing nausea and vomiting.[29,31,32] Awareness under anaesthesia has been assessed in various studies using questionnaires. They concluded music intervention decreases awareness under general anaesthesia.[7,29,31]

Patient satisfaction score

Numerous researches have enquired postoperatively about whether patients were satisfied with the experience of anaesthesia and surgery they noted difference between subject satisfaction after listening to music and subjects without music during surgery. They found a high degree of patient satisfaction with use of music therapy intraoperatively.[7,10,12,15]

Bansal GL et al, quoted a very high satisfaction rate in music group patients compared to no music group patients (46.7% v/s 13.3%). This difference was found to be highly significant (p= 0.018).[12]

This could be due to reduction in anxiety, mental relaxation and distraction, occlusion of obvious operation room sounds and sense of psychological wellbeing.

Type of music

It has been highlighted by researches that type of music affects the patient anxiety, satisfaction and haemodynamic responses. Music of patients' choice of patients has been preferred by authors to ensure autonomy and familiarity in unfamiliar operating room environment.[26]

One study promoted use of only instrumental music without lyrics. This was done in order to remove the confounding effect of lyrics on the patient's psychology to obtain results of only music intervention on the patient and not the lyrics.[22] Another study stated that soothing meditational music has positive impact on neurohormonal activities in brain.[33]

Binaural beats frequencies between 15 and 7 Hertz have reported to be producing significant entertainment effects.[34] Effects of type of binaural beats on continuous electroencephalogram (EEG) have also been reported.[35]

Binaural beats have been found to alleviates anxiety, lower heart rate and blood pressure and modulate chronic pain.[32] Researchers have pointed that age, culture, religion, and socioeconomic status affects the response to music. Music of choice helps the patients to find a familiar environment and feel at home even in strange hospital settings.[10]

Silence and music group patients with help of headphones were compared in a recent study. Authors concluded that music of choice was more effective in lowering anxiety, stable haemodynamics and enhancing patient's satisfaction as compared to silent group patients.[12]

CONCLUSION

Music is a non-invasive, non -pharmacological and non -hazardous intervention, which can be used in operative or intensive care environment. It is a useful adjuvant with multifold benefits during pre, intra and postoperative period. In addition to drugs, potential of music therapy can be harnessed to allay patient anxiety, stabilize haemodynamic profile, reduce analgesic and sedative requirements and improve patient satisfaction.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Kaur H, Shukla V, Bansal GL, Harsh HK, Joseph A, Bharadwaj MS. Extra note of music in anaesthesia. Int J Res Med Sci 2019;7:3219-23.