



Evaluating the efficacy of Valsalva's maneuver and music therapy on peripheral venous cannulation: A prospective study

Hakan Tapar, MD¹, Tugba Karaman, MD², Serkan Dogru, MD¹, Aynur Sahin, MD¹, Serkan Karaman, MD², Mustafa Suren, MD², Fatih Altıparmak, MD³

ABSTRACT

¹Assistant Professor; ²Associate Professor; ³Specialist
Department of Anesthesiology and Reanimation, Medical Faculty, Gaziosmanpasa University, Tokat, Turkey

Correspondence: Dr Hakan Tapar, Department of Anesthesiology and Reanimation, Medical Faculty, Gaziosmanpasa University, Tokat 60100, Turkey; Phone: 05056844496; E-mail: hakantapar@hotmail.com

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Aim: Peripheral venous cannulation (PVC) is a painful but necessary procedure for patients undergoing surgery. Various distraction techniques have been used to reduce the pain. This study was designed to compare the effect of music therapy and the Valsalva maneuver (VM) on patients' perioperative pain, anxiety, and satisfaction associated with the PVC.

Methodology: This study was performed in patients that underwent surgery from April 2017 to July 2017, at the Gaziosmanpasa University School of Medicine Hospital. One hundred and fifty patients were randomized into three groups. One listened to music (Group M), one underwent the VM (Group V), and one had no intervention (the control group, Group C) during PVC. A visual analog scale (VAS) was used to assess the pain and anxiety of the patients two minutes after venipuncture. A 5-point Likert scale was used to evaluate each patient's satisfaction.

Results: The study found significant differences in pain score, anxiety level, and patient satisfaction between Group C and Group M (for pain, $p = 0.001$; for anxiety, $p = 0.003$; for patient satisfaction, $p = 0.004$). The only difference measured between groups C and V was in pain score ($p = 0.034$).

Conclusions: Music and the Valsalva maneuver can be useful to reduce perception of pain. Additionally, music has a positive effect on reduces patient anxiety in a way that the VM does not.

Key words: Venous cannulation; Pain; Valsalva maneuver; Music therapy

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INTRODUCTION

Pain is a subjective experience that is influenced by environmental, socio-cultural, and personal factors and has behavioral and emotional aspects.¹ Pain is also important, so much so that it was identified as the fifth vital sign by the Pain Association of America (PAA).²

Peripheral venous cannulation (PVC) should be

applied for anesthesia during surgery. The PVC is mostly a painful procedure that may lead to anxiety and discomfort.³ Many pharmacological and non-pharmacological methods have been used to reduce pain and anxiety during PVC. Methods such as parental presence, verbalization, topical local anesthetics, hypnosis, and ice have been shown to reduce PVC pain.⁴

Some studies show that listening to music - a non-

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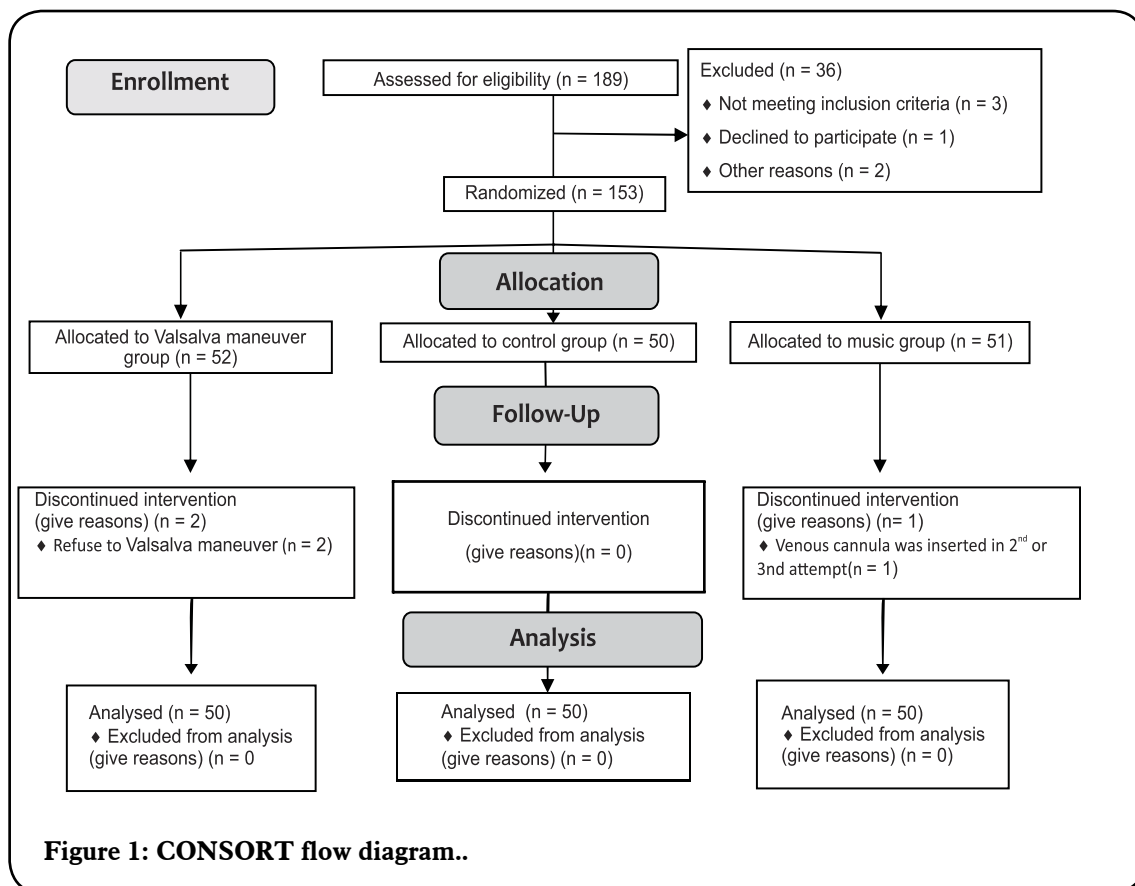
pharmacological method, reduces PVC pain and anxiety.⁵ The most common explanation for this involves music's distractive and mild sedative effects.⁶ Music also causes an increase in the listener's levels of s-oxytocin and reduces s-cortizol.⁷

Applying the Valsalva maneuver (VM) during PVC reduces the frequency and severity of patients' pain.⁸ The VM increases intrathoracic pressure⁹ which causes a vagal response by stimulating the vagus nerve.¹⁰ Vagus nerve stimulation has an antinociceptive effect, reducing pain perception.¹¹

The VM is a simple and non-pharmacological method used in PVC. As previously mentioned that listening music can be an effective technique to decrease the anxiety and pain intensity. However, there has been no study conducted to prove the positive effects of listening music on pain during PVC in which also compares the impacts of music with Valsalva maneuver. Therefore, this study aims to compare the effects of VM with those of listening to music on patients' pain and anxiety during PVC.

METHODOLOGY

This prospective, randomized study was performed during venipuncture on 150 patients undergoing surgery. Study approval was obtained from the Gaziosmanpasa University Clinical Research Ethics Board (17-KAEK-009) after registering at www.clinicaltrials.gov (NCT03125317). This study was performed during PVC in patients that underwent elective surgery (Grade I or II surgical procedure) from April 2017 to July 2017. Patients with an American Society of Anesthesiologists (ASA) physical status score of I or II, aged between 18 and 65, and had given written informed consent were included in the study. Patients with a history of drug addiction, anxiety disorders, hearing problems, chronic consumption of analgesics, or peripheral neuropathy and patients with verbal communication problems were excluded. In addition, patients with failed first-attempt cannulation were excluded from the study. Patients were randomly allocated to one of three groups. None of the patients were given any medication before the procedure. Peripheral venous



cannulation was performed using a 20 G venous cannula, Plusflon® (Mediplus, Haryana, India) by inserting on the right hand dorsal side of the patient by healthcare professionals. A researcher that was blind to the study evaluated and selected the participating patients.

The three randomized groups were a control group (Group C), a group that underwent the VM (Group V), and one that listened to music (Group M) (Figure1).

Group assignments were given in a sealed, opaque envelope and opened in the preoperative care room (PCR). The outcome assessors were unaware of the group allocations. In Group C, no action was performed during PVC. In Group V, patients were instructed to perform VM just before PVC: patients were asked to inhale deeply and then hold their breath after application of the tourniquet. PVC was performed during this time (VM lasted no longer than 20 s). Patients were asked to resume breathing after PVC. In Group M, patients were asked about their music preferences before PVC and listened to their selected music during the procedure (music was played for five minutes using speakers linked to an MP3 player (Sony, MP3, NWZ-B183B 4GB, China).

The primary goal of this study was to assess patients' pain scores during PVC. The patients' pain scores were evaluated two minutes after cannulation using a 10 cm visual analog scale (VAS). Patients' anxiety levels before the application of the VM or music (A1) and their anxiety levels after cannulation (A2) were evaluated using VAS. Patient satisfaction was measured using the 5-point Likert scale (0: worst to 4: best) 15 min after cannulation. Researchers who were unaware of the study recorded each patient's pain, anxiety, and satisfaction levels. The demographic data, age, sex, and ASA physical status of the patients were all noted.

A pilot study revealed that the mean VAS score was 3.00 ± 1.7 . Assuming a 40% decrease in VAS score by music therapy during PVC with a two-side type 1 error of 0.05 ($\alpha = 0.05$), and a power of 0.80 ($\beta = 0.02$), we calculated that a minimum of 45 patients per group would be required. One-

sample Kolmogorov-Smirnov test was used to assess the normality of the distribution. Descriptive data were presented as mean (\pm SD) for the continuous variables, median (range) for the ordinal variables, and as numbers (frequencies) for the categorical variables. The VAS score which is the primary outcome, anxiety levels and five point Likert scale scores of the groups were compared using one-way ANOVA and posthoc analysis was completed by Tukey's HSD test. All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software version 20.0 (SPSS Inc., Chicago, IL, USA). P-values of $p < 0.05$ were considered statistically significant.

RESULTS

Statistical analysis was performed on 150 patients. There were no differences in demographic profiles (age, sex, BMI) among the different groups ($p > 0.05$) Table 1.

The patients' anxiety scores after PVC (A2) were significantly higher in Group C than in Group M ($p = 0.003$). There were no significant differences between the A2 scores of Group C and Group V ($p = 0.166$) or between those of Group M and Group V ($p = 0.320$). The patients' Likert scale scores after PVC were significantly higher in Group M than in Group C ($p = 0.004$). There were no differences between Group C and Group V ($p = 0.330$), and no differences between Group M and Group V ($p = 0.184$) Table 2.

Table 1: Demographic characteristics

Variable	Valsalva group (Mean \pm SD)	Music group (Mean \pm SD)	Control group (Mean \pm SD)	p
Age (years)	45.13 \pm 15.05	44.30 \pm 17.48	47.68 \pm 15.62	0.553
Weight (kg)	74.89 \pm 14.42	76.92 \pm 12.53	76.94 \pm 11.63	0.674
Height (cm)	164.11 \pm 0.16	168.82 \pm 0.07	167.28 \pm 0.09	0.126
ASA I/II	36/14	32/18	34/16	0.965

^aSignificantly difference between music group and control group, ^bSignificantly difference between valsalva group and control group

Table 2: The comparison of the pain, anxiety and satisfaction scores between groups

Parameter	Valsalva group (Mean \pm SD)	Music group (Mean \pm SD)	Control group (Mean \pm SD)	p
Anxiety scores (A1)	4.39 \pm 1.54	4.44 \pm 1.78	4.66 \pm 1.23	> 0.05
Pain scores	3.41 \pm 0.74	3.20 \pm 0.92	3.94 \pm 1.30	< 0.05 ^{a,b}
Anxiety scores (A2)	4.28 \pm 1.22	3.84 \pm 1.50	4.84 \pm 1.70	0.003 ^a
Likert scores	3.04 \pm 0.55	3.24 \pm 0.62	2.80 \pm 0.80	0.004 ^a

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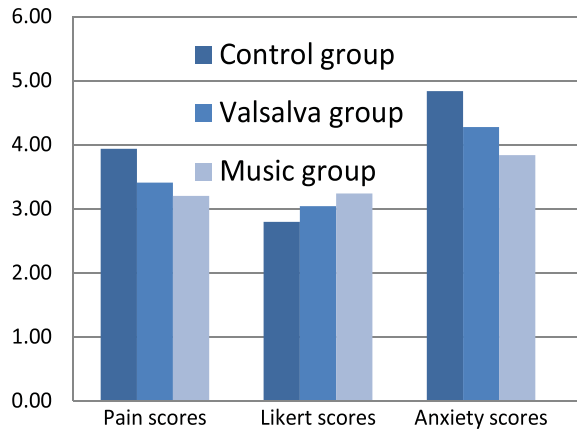


Figure 2. Comparison of the pain scores, Likert scores, anxiety scores between groups

DISCUSSION

This study demonstrated that music therapy and the VM had positive effects on patient pain during PVC. It also showed that the anxiety scores of patients who listened to music were significantly lower than those of patients who underwent the VM and those of the control group.

Distraction of the patient's attention is one of the non-pharmacological techniques used in pain management. Music has been acknowledged as a safe and cheap non-pharmacologic technique. Music activates the cingulo-frontal cortex, mitigating perceived pain.¹² Additionally, music increases hormonal secretions and nociceptive reflexes.¹³

Chang et al. conducted a study involving 76 male patients who underwent TRUS-guided prostate biopsy divided into two groups: a 38-person control group and a second group of 38 patients who listened to music. Chang et al. found that listening to music during surgery significantly reduced patients' feelings of pain and dissatisfaction.¹⁴ A study conducted by Zengin et al. found that listening to music significantly reduces pain levels and anxiety scores compared to groups that do not listen to music during invasive interventions.¹⁵ On the other hand, in their 2014 study, Abraham et al. found no differences between the groups' (music vs. no music) scores.¹⁶ Despite the lack of statistical evidence, most of the participants still reported feeling a positive effect, similar to the results obtained by Martindale et al. in their study of colonoscopy patients. They compared a music-listening group of 17 patients to a control group of 17 patients and found no difference between the groups' pain and anxiety, but the patients reported a preference for listening to music.¹⁷ We found that the pain and anxiety scores (A2) in Group

M were significantly lower than those of Group C. This can be explained by the distractive capabilities of music and its effects on endorphin release.¹⁸

Patient satisfaction is an important issue in health care, and it is positively impacted by music therapy.¹⁹ We used a 5-point Likert scale to evaluate patient satisfaction. Our results show significantly higher levels of patient satisfaction in Group M than in the non-music groups. Music has a slight sedative effect and provides a pleasant distraction.²⁰ Dubois et al. investigated the effect music on satisfaction for patients of bronchoscopy, conducting a study where an intervention group was compared to a control group. Satisfaction was found to be significantly greater in the intervention group.²¹ Likewise, Kılıç et al. also confirmed the beneficial effects of music therapy on patient satisfaction.²²

The VM is a simple and effective method of reducing venous cannulation pain.¹¹ VM stimulates the vagus nerve, producing an antinociceptive effect. Agarwal et al. found that VM decreased the VAS scores compared to those of control group patients undergoing venipuncture.⁸ Basaranoglu et al. showed that VM significantly decreased NRS score according to control group.¹¹ In our study, we determined that VM decreases VAS score but does not affect patient anxiety.

Preoperative anxiety can lead to long recovery times, perioperative complications, and pain.²³ In this study, preoperative music listening had a positive effect on anxiety. People with autonomic dysfunction may faint or become lightheaded when undergoing the VM, making music a preferable anxiety-reducing method.²⁴

LIMITATIONS

One limitation of this study was that it was not blind because of the different techniques used among the groups. Secondly, patient demographics were limited to a single hospital in one region of Turkey, and the sample size was relatively small.

CONCLUSION

We conclude that the music significantly reduces patients' pain and anxiety during peripheral venous cannulation, while Valsalva maneuver only provides a reduction in pain.

Conflict of interest: None declared by the authors

Authors' contribution: All authors took part in the conduct of study, data collection, literature search and manuscript preparation

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