The efficiency and duration of the analgesic effects of musical therapy on postoperative pain

Müzik ile tedavinin postoperatif ağrıdaki etkisi ve etkinlik süresi

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Summary

Objectives: *The aim of this study was first to find out the effect of music therapy on postoperative analgesia and second to determine the duration of its effect.*

Methods: *Seventy patients who were undergoing elective cesarean delivery were enrolled. The patients were randomly allocated into two groups as follows: In Group 1, patients listened to music through a headphone for one hour after surgery, while in Group 2, patients did not listen to any music during the same period. In the postanesthesia care unit, patients were connected to a Patient Controlled Analgesia (PCA) device. The PCA device (tramadol 3 mg/ml) was set to deliver a bolus of 20 mg, with a lockout interval of 15 min and 4-hour maximal dose of 150 mg. Postoperative pain was assessed with a visual analog scale (VAS) and consumption of tramadol was recorded at 4, 8, 12, 16, 20 and 24 hours.*

Results: *There was a significant decrease in Group 1 with respect to PCA delivery frequency at the 4th hour postoperatively ($p<0.05$). Concerning the postoperative tramadol consumption, values measured at the 4th hour were significantly lower in Group 1 ($p<0.05$). The total amount of tramadol consumption and additional analgesic use in the postoperative 24 hours were again lower in Group 1 when compared with Group 2 ($p<0.05$). All VAS values were lower in Group 1 when compared with Group 2 ($p<0.05$).*

Conclusion: *We suggest that music therapy given after surgery decreases postoperative pain in the first 24 hours and the analgesic consumption during the first four hours.*

Key words: Music therapy; postoperative pain; tramadol.

Özet

Amaç: Bu çalışmanın amacı, birincil olarak müzik ile tedavinin postoperatif ağrıdaki etkisi ve ikincil olarak postoperatif ağrıdaki etkinlik süresini incelemektir.

Gereç ve Yöntem: Çalışmaya, 20-40 yaş arası, genel anestezi planlanmış 70 elektif sezaryen ameliyatı olan hasta alındı. Her grupta 35 hasta olmak üzere hastalar bilgisayar yardımıyla iki gruba ayrıldı. Grup 1'de hastalar kulaklık ile ameliyattan sonra bir saat boyunca hoşlandıkları müziği dinlediler. Grup 2'de ise hastalara aynı dönemde herhangi bir müzik dinletilmedi. Postoperatif bakım ünitesinde hastalara intravenöz hasta kontrollü analjezi (HKA) cihazı bağlandı. HKA cihazı, tramadol 3 mg ml^{-1} ile hazırlandı ve bolus 20 mg, kilitli kalma süresi 15 dk ve 4 saatlik maksimum doz 150 mg olarak ayarlandı ve 24 saat devam ettirildi. Visual Analog Skala (VAS) skorları ile tramadol tüketimleri 4., 8., 12., 16., 20. ve 24. saatlerde kayıt edildi.

Bulgular: Grup 1'de HKA cihazındaki alım sayıları ve tramadol tüketim miktarları postoperatif 4. saatte anlamlı olarak düşüktü ($p<0.05$). 24 saatlik total tramadol tüketim miktarları ve ek analjezik tüketim miktarları Grup 1'de, Grup 2 ile kıyaslandığında anlamlı olarak düşüktü ($p<0.05$). Tüm VAS değerleri Grup 1'de, Grup 2 ile kıyaslandığında anlamlı olarak düşüktü.

Sonuç: Sonuç olarak, postoperatif müzik ile tedavi ilk dört saat analjezik tüketimini ve 24 saat süresincede postoperatif ağrı şiddetini azaltmaktadır.

Anahtar sözcükler: Müzik terapisi; postoperatif ağrı; tramadol.

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Introduction

Management of postoperative pain encompasses the attempts in reducing painful symptoms, improving the quality of recovery and resuming normal activities of daily living.[1] In spite of the common use of opioids, the overall incidence of moderate-severe pain has been reported as 30% in the postoperative period.[2] Other than local anesthetics and systemic or epidural opioids,[3] adjunct medications have been tried i.e. nonsteroidal antiinflammatory drugs, tramadol and N-methyl-D-aspartic acid receptor antagonists.[4-6] Further, it has been recommended that peri-operative stress can also be controlled with non-pharmacological methods.[7-9] In this regard, postoperative music therapy has been used in a few studies.[10-13]

Likewise, the purpose of this current study was first to find out the effect of music therapy on postoperative analgesia and second to determine how long the duration of its effect is.

Materials and Methods

The study was approved by the local Ethics Committee and all subjects gave informed consent before they participated in this prospective single-blind study.

Seventy patients (ASA-I), between the ages of 20-40 years, with uncomplicated singleton pregnancies of at least 36 weeks of gestation, who were planned to undergo elective caesarean delivery via a Pfannenstiel incision under general anaesthesia were enrolled. Women who had any of the followings were excluded; patients with known allergy to any of the study medications, coagulopathy, bronchial asthma, peptic ulcer, liver or kidney disease, hearing impairment, alcohol or drug abuse, any known psychiatric or memory disorder, inability to operate a patient controlled analgesia (PCA) device, pregnancy-induced hypertension, placenta praevia, abruptio placentae, evidence of intrauterine growth restriction or other fetal abnormalities and professional musical background were excluded from the study.

On the preoperative evaluation the day before surgery, patients were assessed with regard to habitual music listening and musical background (training, interest and frequency of listening). The PCA technique and visual analog score (VAS) were also explained. All patients were fasted for at least eight hours and received aspiration prophylaxis consisting of metoclopramide 10 mg and ranitidine 50 mg, one hour before surgery.

The patients were randomly allocated into two groups (with 35 patients in each) according to computer-generated randomization. In Group 1, patients listened to music through a headphone (whatever she liked) for one hour, after surgery as the Aldrete scores ≥ 9. In Group 2, patients did not listen to any music during the same period.

In the operating room, a 20-gauge i.v. cannula was inserted into the forearm and an infusion of 1000 mL lactated Ringer's solution was given (10 mg kg^{-1} h^{-1}) during anaesthetic induction. The anaesthetic technique was standardized. Subjects were monitored with mean arterial blood pressure (MAP), heart rate (HR), peripheral oxygen saturation (SpO_2) and end-tidal carbon dioxide concentration ($EtCO_2$). Patients were positioned supine with left lateral tilt using a pillow under the right hip. After pre-oxygenation for 5 min, rapid-sequence induction was performed with thiopental 4-6 mg kg^{-1} followed by succinylcholine 1 mg kg^{-1} after loss of verbal response. Cricoid pressure was applied after loss of consciousness and was released after correct placement of the tracheal tube had been confirmed. Atracurium 0.3 mg kg^{-1} was given to maintain neuromuscular block after recovery from succinylcholine. Ventilation was controlled to produce normocapnia. Anaesthesia was maintained with a mixture of sevoflurane and 50% nitrous oxide in oxygen. After the umbilical cord was clamped, intravenous fentanyl 1.0 μg kg^{-1} was given and a 10-unit infusion of oxytocin was started.

Sevoflurane and nitrous oxide were discontinued at the start of skin closure and 0.5 mg kg^{-1} i.v. tramadol was administered. At the end of surgery, residual neuromuscular block was antagonised with neostigmine 30 μg kg^{-1} and atropine 15 μg kg^{-1}. Duration of anesthesia was noted as the time period between induction and extubation.

In the postanesthesia care unit, patients were con-

Table 1. Patient characteristics

	Group 1 (n=35)	Group 2 (n=35)	p*
Age (years)	30.23 ± 3.94	29.00 ± 5.40	NS
Weight (kg)	72.74 ± 8.93	76.40 ± 8.91	NS
Height (cm)	162.23 ± 7.12	164.69 ± 5.43	NS
Duration of anesthesia (min)	38.46 ± 5.41	37.69 ± 7.39	NS

*Independent samples t test; (mean±SD).

nected to i.v.-PCA device (Pain Management Provider; Abbott, North Chicago, IL) when Aldrete scores ≥9 (Aldrete score is post-anesthetic recovery score which evaluates activity level, respiration, circulation, consciousness, and color of the patient during postoperative period). The PCA device (tramadol 3 mg/ml) was set to deliver a bolus of 20 mg, with a lockout interval of 15 min and 4-h maximal dose of 150 mg. PCA was continued for a minimum of 24 hours. 75 mg i.m. diclofenac was given when VAS ≥ 4 and the time for initial analgesic requirement was noted.

The patient's level of satisfaction with peri-operative care was assessed by a 10 cm visual analogue scale (no satisfaction: 0, maximum satisfaction 10) on the postoperative 6th hour. The severity of postoperative pain during sitting and lying position were assessed with VAS (with 0 = no pain and 10 = worst pain imaginable).

Postoperative MAP, HR, SpO_2, RR (respiratory rate), VRS (verbal rating scores), VAS (sitting and lying position); consumption, demand and delivery of tramadol were recorded on the 4 th, 8 th, 12 th, 16 th, 20 th and 24th hour.

The presence and intensity of any side effects were assessed on the 4th, 8th, 12th, 16th, 20th and 24th hour after surgery; e.g. sedation (4-point VRS 1: awake, 2: drowsy, 3: arousable, 4: deep sleep), nausea and vomiting. On patient request or if nausea and vomiting occurred, ondansetron 4 mg i.v. was given.

All measurements were recorded by an anesthesiologist that was blinded to the study groups. Statistical analysis was performed with SPSS for Windows version 11.5 (Chi., Il., USA). Descriptive statistics were given as mean±standard deviation and proportion. The comparisons were done by independent samples t test and Mann-Whitney U test for continuous and chi-square test for categorical variables. A p value of <0.05 was accepted as statistically significant.

Results

Patient characteristics are given in Table 1. The two groups were statistically similar with regard to age, height, weight and duration of surgery (p>0.05). Table 2 summarizes the musical background of the two groups which were indifferent (p>0.05).

There was no significant difference between the groups regarding PCA demand frequency at any time postoperatively (p>0.05). There was a significant decrease in Group 1 with respect to PCA delivery frequency at the 4th hour postoperatively (p<0.05) (Table 3). Concerning the postoperative tramadol consumption, values measured on the 8th, 12th, 16th, 20th and 24th hours were similar between the groups; however, values measured on the 4th hour were significantly lower in Group 1 (52.57±30.32 vs 72.00±30.75) (p<0.05). Total amount of tramadol consumption and additional analgesic use in the postoperative 24 hours were again lower in Group 1 when compared with Group 2 (p<0.05) (Table 3). There was no statistical significant differance in additional analgesic usage between groups in all other mesurement times (p>0.05).

Mean patient satisfaction scores were greater in Group 1 (p<0.05) (Table 3). The two groups were similar concerning the postoperative MAP, SpO_2, HR, RR and VRS values (p>0.05).

All VAS values were lower in Group 1 when compared with Group 2 (p < 0.05) (Figures 1 and 2).

Table 2. Patient's characteristics regarding music (number)

	Group 1 (n=35)	Group 2 (n=35)	p*
Music perception			
Like	35	35	NS
Ambivalent	0	0	
Dislike	0	0	
Music exposure frequency			
Few times a day	16	14	NS
Once a day	19	21	
Once a week	0	0	
Less than once a week	0	0	
Level of music education			
None	35	35	NS
Self-taught	0	0	
Primary	0	0	
Moderate	0	0	
Advanced	0	0	

*Chi-square test

The most common side effects during the postoperative period were nausea and vomiting (Group 1: 4/35, Group 2: 6/35), and the two groups were similar in this regard (p>0.05). There were no other serious side effects during the study.

Discussion

In this study, the effect of postoperative music therapy on postoperative pain was investigated and we have found that it significantly decreased postoperative pain in the first 24 hours and the analgesic consumption during the first four hours.

Postcesarean section pain is an important issue in obstetrics. Several studies have shown the importance of adequate postoperative analgesia on well-being, mobilization, rehabilitation, and decreasing the length of hospital stay. Further, it enhances bonding between the mother and the newborn.[14] Opioids provide a high level of patient satisfaction, but are usually omitted at the induction of general anaesthesia for caesarean delivery because of concerns about placental transfer resulting in neonatal respiratory depression.[15] The use of nonsteroidal antiinflammatory drugs significantly reduces the need for opioids after caesarean delivery minimizing opioid-induced side-effects. However, there is still debate on their compatibility with respect to breastfeeding.[16] Opposingly, music therapy has no adverse effects in this regard.

Analgesic effects of music therapy have been previously reported.[10-13] Auditory stimuli may affect

Table 3. Patient characteristics regarding analgesic use

	Group 1 (n=35)	Group 2 (n=35)	p
Tramadol consumption at 4th hour (mg)	52.57±30.32	72.00±30.75	0.007**
Total amount of tramadol consumption (mg)	307.43±62.51	352.57±109.02	0.037*
Tramadol delivery at 4th hour	2.63±1.51	3.60±1.53	0.007**
Total amount of diclofenac consumption (mg)	51.43±43.70	72.86±42.60	0.041**
Patient satisfaction scores	8.97±0.78	8.34±1.05	0.006*

*Independent sam ples t test; (mean±SD), ** Mann-Whitney U test.

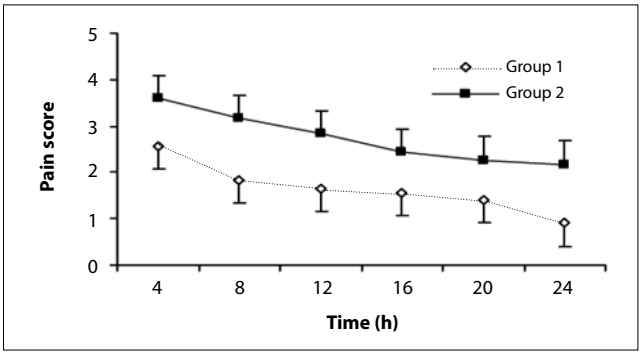

Fig. 1. VAS scores of the patients in lying position.

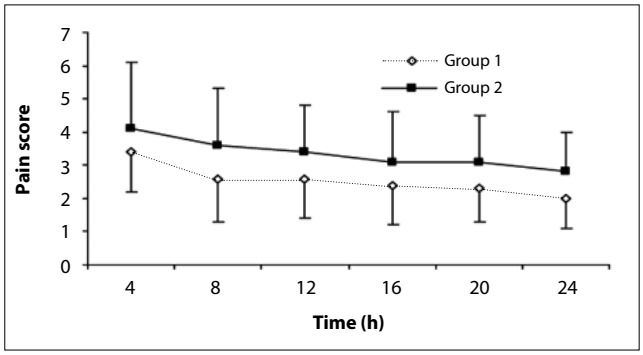

Fig. 2. VAS scores of the patients in sitting position.

human response to stress and uncomfortable or unfamiliar environment, loss of control, and fear of disfigurement, may be attenuated by the calming effects of music. It has been suggested that pain and auditory pathways inhibit each other; thus the activation of the auditory pathway may play role in inhibiting the central transmission of painful stimuli.[10,11,17]

In one study, a 30-minute music therapy during the postoperative period of cesarean section surgery has been shown to alleviate pain and reduce the need for analgesics during the first one hour.[10] Similarly, Nilsson et al.[11] found that in patients who listened to music for 1 h in the immediate postoperative period after general anaesthesia; intraoperative music might decrease postoperative pain, and that music therapy in the postoperative period may reduce pain, morphine consumption. There are also studies where music therapy was applied more than once either pre-, intra- or postoperatively.[18,19] In those studies, the total amount of analgesics was found to be decreased. Further, in some studies musical therapy has been applied on the first and second days postoperatively, and their results were again favorable.[9,12] On the contrary, there is also a study that have shown that music therapy did not significantly decrease postoperative pain.[20]

Our result, similar to previous reports, shown that postoperative music therapy had a pain reducing effect as seen by increased pain relief and reduced tramadol consumption (early period).

The efficacy of music therapy has been reported; on postoperative anxiety, hemodynamic changes during anaesthesia after listening to natural sounds (sounds of a ripple, a small stream) intraoperatively under general anaesthesia and reduction in HR after postoperative listening to music.[11,17] Our results did not show any differences between the groups that might been level of stres at type of surgery.

To summarize, in the light of our findings, we conclude that music therapy -a simple and convenient method- applied after surgery decreases postoperative pain and analgesic requirement. Further studies for better understanding the mechanisms of the effects of music therapy on postoperative analgesia are awaited.

References

1. White PF, Kehlet H. Postoperative pain management and patient outcome: time to return to work! Anesth Analg 2007;104(3):487-9.
2. Erdine S. Ameliyat sonrasi agrı tedavisi. Ağrı sendromları ve tedavisi. 2. basım. İstanbul: Gizben Matbaacılık; 2003. s. 43.
3. Yukawa Y, Kato F, Ito K, Terashima T, Horie Y. A prospective randomized study of preemptive analgesia for postoperative pain in the patients undergoing posterior lumbar interbody fusion: continuous subcutaneous morphine, continuous epidural morphine, and diclofenac sodium. Spine (Phila Pa 1976) 2005;30(21):2357-61.
4. Takmaz SA, Kaymak C, Pehlivan BS, Dikmen B. Effect of preoperative 900 and 1200 mg single oral dose of gabapentin on postoperative pain relief and tramadol consumption in open cholecystectomy surgery. Agri 2007;19(3):32-8.
5. Arslan M, Tuncer B, Babacan A, Taneri F, Karadenizli Y, Onuk E, et al. Postoperative analgesic effects of lornoxicam after thyroidectomy: a placebo controlled randomized study. Agri 2006;18(2):27-33.
6. Akın A, Esmaoğlu A, Boyacı A. Total kalça protezi uygulanan hastalarda piroksikamın preemptif analjezik etkinliği. Türk Anest Rean Cem Mecmuası 2002; 30: 161-5.
7. 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.
8. Allen K, Golden LH, Izzo JL Jr, Ching MI, Forrest A, Niles CR, et al. Normalization of hypertensive responses during ambula-

tory surgical stress by perioperative music. Psychosom Med 2001;63(3):487-92.
9. Good M, Stanton-Hicks M, Grass JA, Anderson GC, Lai HL, Roykulcharoen V, et al. Relaxation and music to reduce postsurgical pain. J Adv Nurs 2001;33(2):208-15.
10. Ebneshahidi A, Mohseni M. The effect of patient-selected music on early postoperative pain, anxiety, and hemodynamic profile in cesarean section surgery. J Altern Complement Med 2008;14(7):827-31.
11. Nilsson U, Unosson M, Rawal N. Stress reduction and analgesia in patients exposed to calming music postoperatively: a randomized controlled trial. Eur J Anaesthesiol 2005;22(2):96-102.
12. 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. Anaesthesia 2003;58(7):699-703.
13. Good M, Anderson GC, Stanton-Hicks M, Grass JA, Makii M. Relaxation and music reduce pain after gynecologic surgery. Pain Manag Nurs 2002;3(2):61-70.
14. El-Tahan MR, Warda OM, Yasseen AM, Attallah MM, Matter MK. A randomized study of the effects of preoperative ketorolac on general anaesthesia for caesarean section. Int J Obstet Anesth 2007;16(3):214-20.
15. Gin T, Ngan-Kee WD, Siu YK, Stuart JC, Tan PE, Lam KK. Alfentanil given immediately before the induction of anesthesia for elective cesarean delivery. Anesth Analg 2000;90(5):1167-72.
16. Lowder JL, Shackelford DP, Holbert D, Beste TM. A randomized, controlled trial to compare ketorolac tromethamine versus placebo after cesarean section to reduce pain and narcotic usage. Am J Obstet Gynecol 2003;189(6):1559-62.
17. Tsuchiya M, Asada A, Ryo K, Noda K, Hashino T, Sato Y, et al. Relaxing intraoperative natural sound blunts haemodynamic change at the emergence from propofol general anaesthesia and increases the acceptability of anaesthesia to the patient. Acta Anaesthesiol Scand 2003;47(8):939-43.
18. Good M, Ahn S. Korean and American music reduces pain in Korean women after gynecologic surgery. Pain Manag Nurs 2008;9(3):96-103.
19. Ikonomidou E, Rehnström A, Naesh O. Effect of music on vital signs and postoperative pain. AORN J 2004;80(2):269-74, 277-8.
20. Leardi S, Pietroletti R, Angeloni G, Necozione S, Ranalletta G, Del Gusto B. Randomized clinical trial examining the effect of music therapy in stress response to day surgery. Br J Surg 2007;94(8):943-7.