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The effect of head and facial massage on sleep condition after coronary artery bypass graft surgery

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Abstract

Background: Sleep disorders after heart surgery lead to increased heart rate, myocardial oxygen demand, and cause dysrhythmia that worsens heart ischemia. The purpose of this study was to determine the effect of head and facial massage on sleep conditions following coronary artery bypass graft surgery. **Materials and methods:** A randomized controlled trial was performed on 72 patients. They were randomly divided into interventional (n = 36) and control groups (n = 36). On the third to fifth day after the operation, head and the facial massage were done for 15 min in the intervention group. The patients in the control group received only routine care. Richard Campbell's Sleep Questionnaire was completed for four consecutive days for each group. Data were analyzed in SPSS V26. **Results:** Mean scores for sleep conditions before the intervention no statistically significant difference seen between the two groups ($P > 0.05$). After the intervention, there was a statistically significant difference between mean scores for sleep conditions of the interventional and control groups ($P < 0.001$). Also with general estimated equation test compared mean scores for sleep conditions between two groups. That revealed sleep condition total score in the intervention group was more than the control group and the trend of changes over time was statistically significant ($P < 0.001$). **Conclusion:** Head and facial massage is an effective nursing intervention in improving the sleep condition of patients after coronary artery bypass graft. Due to the fact that head and face massage is an easy method and brings patient satisfaction, it is recommended to use this method as a suitable supplement for drug therapy and postoperative interventions in these patients.

Keywords: coronary artery bypass grafting; surgery; sleep quality; massage

Author contributins

Masoumeh Bagheri-Nesami supervised the project; Masoumeh Rajabi Ozudi was the executors of this study and wrote the manuscript; Mahmood Moosazadeh conducted the statistical analysis. All authors designed the study, revised the manuscript and approved the final version. All authors read and agreed to the final text.

Competing interests

The authors declare no conflicts of interest.

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Abbreviations

CABG, coronary artery bypass graft; MMSE, Mini-Mental State Examination; GEE, general estimated equation; BMI, body mass index.

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Highlights

Coronary artery bypass graft surgery is one of the most common heart surgeries. Sleep disorders occur in patients in the first days after heart surgery. The use of traditional medicine, including massage therapy, may be helpful in improving the sleep condition of these patients. In this study, we investigated the effect of head and face massage on sleep condition of patients after coronary artery bypass graft surgery.

Medical history of objective

In the past, massage was used as an alternative to medication to relieve pain. Massage as an ancient healing method originated in China and India. Basic information about the use of massage in the treatment of various diseases can be found in the books of Hippocrates. Historians believe that massage was one of the first therapies in Chinese civilization, which is as old as the ancient Egyptian civilization. In the ancient world, including Mesopotamia, China, Egypt, Greece and India, there are manuscripts of the use of massage. Despite the long history of using massage to maintain and promote health, it was from the 1930s that its effects were evaluated and proven by animal and human studies. From 2002 to 2007, the use of massage therapy greatly increased and many articles reported its benefits. Nowadays, massage therapy has been used as a main part of the health care system and has been considered as a nursing intervention in many clinical cases as a complementary treatment to reduce stress.

Background

Cardiovascular diseases are one of the most common causes of death in developing and developed countries worldwide [1]. Coronary artery disease entails the most common cardiovascular disease which is also called coronary artery stenosis [2]. Coronary artery disease accounts for approximately 50% of all deaths per year in Iran [3]. Coronary artery bypass graft (CABG) surgery includes one of the major treatment methods for coronary artery disease [4]. CABG surgery is one of the most common heart surgeries to which more than half of the 300,000 heart surgeries performed annually in the United States of America are devoted [5]. Although CABG surgery enjoys low mortality rates and relieves angina symptoms, it is accompanied by signs and symptoms such as pain, anxiety and fear, depression, psychological distress, and sleep-related problems [6–10]. Almost 79% of the patients suffer from sleep disorders during the first three months after CABG surgery [11]. Post-surgery sleep disorders can be caused by several reasons including environmental factors (noise, light, nursing methods, and prescription), post-surgery pain and anxiety, chest tubes, long-term hospitalization, inactivity, and painkillers used after surgery [10, 12].

Sleep is a human physiological need that is essential for recovery and health [13]. Sleep deprivation might be accompanied by a wide range of deleterious health consequences such as obesity, type 2 diabetes, high blood pressure, and cardiovascular disease [14, 15]. Lack of sufficient sleep can lead to memory and concentration disorder, cognitive function disorder, immune system disorder, depression, impaired wound healing, a decrease in quality of life, and self-care disorder [16–21]. Poor sleep quality as a stressful situation results in the secretion of epinephrine and norepinephrine and consequently causes increased heart rate, respiration rate, blood pressure, myocardial oxygen demand, cardiac dysrhythmia, and decreased renal perfusion which together aggravates cardiac ischemia [22].

Various pharmacological and non-pharmacological methods are employed in treating sleep disorders, with sleeping drugs being the most common ones [23]. A review of studies showed that non-pharmacological interventions such as relaxation, eye masks and earplugs, music therapy, acupressure, and massage therapy can improve the sleeping quality of patients with heart disease [10, 13, 23–26]. Nowadays, massage therapy is among the most common and safe supplementary treatments globally, and the most prevalent alternative medicine in nursing practices [27]. Through exerting mechanical force, massage stimulates muscle and skin tissues which leads to the improvement of lymph circulation and venous return and consequently relieves muscle tension, reduces pain and stress, and improves sleep quality [28]. One type of massage therapy is head and face massage which is characterized by a combination of effleurage and pressure massage. This method is so soothing and simple that makes it suitable for all patients [29]. Besides, head and face massage is among the most effective massage techniques for achieving tranquility and quick reduction of mental and physical fatigue, and can relieve face and eye muscles. Furthermore, it reduces headache and exhaustion, increases concentration, eliminates neural tension and stress, and improves mood [30]. Several studies have investigated the efficiency of various massage techniques on the sleep condition of patients after colorectal and CABG surgery, as well as the cardiac care unit patients [22, 28, 31, 32]. The type of massage, however, varied including back massage, neck and shoulder massage, Swedish massage, and foot reflexology massage [22, 28, 31, 32]. Head and face massage is a simple method that produces high levels of patient satisfaction since it does not require exposing body areas other than the head and face which are normally observable and it can be done in public places such as hospital while the patient is lying on the bed.

Since searching the available databases and reviewing similar research have shown that no studies have been yet published on this subject, the current study aimed at examining the effect of head and facial massage on the sleep condition of patients after CABG surgery.

Materials and methods

The current study is a randomized controlled clinical trial with the code of IRCT20110906007494N35 which aimed to investigate the effect of head and facial massage on the sleep condition of patients after CABG surgery. The study was conducted in the cardiac surgery ward in Fatemeh Zahra Hospital in Sari county. The eligible patients were randomly assigned into groups.

The sample size was determined based on the findings of Shafiee and colleagues' study entitled "The effect of massage therapy on sleep quality of patients after coronary artery bypass graft operation" where the stroke technique of Swedish massage was performed on hand, foot, and back [32]. In the afore-mentioned study, the mean and standard deviation of sleep scores in the intervention group were 10.7 and 3.6, respectively, and in the control group were 6.4 and 3.7, respectively. Given these quantities, the confidence level of 95%, and power of 90% for the two-tailed test, the sample size, using the sample size estimation formula for comparing the groups with four-time repeated measures and STATA software, was estimated 42 (21 patients in each group). Given the executive facilities, the sample size was increased to 30 patients in each group. Considering the 20% dropout rate, 36 patients were finally selected for each group.

The inclusion criteria entailed the following: adults over 18 years of age, patients who underwent CABG surgery, stabilized vital signs (blood pressure, temperature, pulse rate, respiration rate), lack of communication problems (hearing, vision, or speech disorder), not using drugs, lack of cognitive and delirium problems, not using antihistamine and anti-depression drugs, lack of sleep disorders with drug therapy in the preceding month, lack of severe neuropathy, lack of need for intra-aortic balloon pump and intubation of over 24 hours, and lack of any infection or wound on head and face.

The criteria for stopping the study included the following: the presence of pulmonary drainage and secretions of more than 200 cc per hour, patients' lack of desire to continue cooperation with the study, critical condition of the patient, and returning to the operating room. In addition, if the patient declined to continue to cooperate or used anti-histamine and anti-depression drugs, the study would halt.

After obtaining the license from the research ethics committee of the university (IR.MAZUMS.REC.1399.803) and the responsible

authorities, the researcher entered the cardiac surgery ward in Sari's Fatemeh Zahra Hospital, got approval for the eligible sample, got written informed consent from the participants and a companion, explained the goals of the study, provided the unit with the right to participate in the study, and assured them of the confidentiality of the collected information. The researcher, then, started to gather the samples from April to August 2021.

The eligible patients were randomly assigned into massage therapy and control groups of 36 patients using random numbers given by computer software and permuted block randomization by a statistics advisor. There were 18 blocks of 4 where each block entailed two patients from each group. Therefore, 72 pockets were designed which contained letters A (massage therapy group) and B (control group) based on the information obtained through the computer program. Numbers 1 to 72 were written on the pockets. The first patient who was admitted to the ward and had the inclusion criteria were entered into the study following written informed consent, and sampling continued to patient No. 72 (Figure 1).

One of the inclusion criteria in this study was a lack of cognitive and delirium problems. To this end, Nursing Delirium Screening Scale was employed to diagnose delirium, and Mini-Mental State Examination (MMSE) was used to examine the mental and cognitive perceptions of patients prior to the beginning of the study. The Nursing Delirium Screening Scale was developed by Gaudreau. The scale is a five-item observation scale that can be completed quickly and is based on the Confusion Rating Scale [33]. Nursing Delirium Screening Scale has a sensitivity of 85.7% and a specificity of 86.8%. It entails five variables that measure delirium rating from 0 to 2 (0 means the absence of symptoms, one moderate, and 2 sever symptoms) and is completed by the nurse in two minutes. The patient can be examined with this criterion twice a day. The variables include disorientation, inappropriate behaviors, inappropriate communication, illusion or hallucinations, and psychomotor retardation. This scale was measured each day, and patients with a score of 2 or above which indicates the presence of delirium were excluded from the study [34].

The MMSE Questionnaire was developed in 1975 by Marshall Fulstein to screen for dementia and reliability through the pearson correlation coefficient was 0.887 [35]. The Mini-Mental Status Examination is done via interview and examines five dimensions of orientation, registration, attention and calculation, recall, and language. Orientation includes two five-section questions where the patients receive one score for answering each section. Registration has one three-section question and hence three scores are devoted to it. Five scores are devoted to the component of attention and calculation which measure an individual's attention through the practice of counting backward. Recall and language have three and nine scores, respectively. The maximum and minimum MMSE scores are 30 and 0, respectively. If the examinee obtains 25 or more scores (out of 30), he/she is considered normal. Scores 21–24, 10–20, and below nine indicate mild, moderate, and severe cognitive disorders, respectively. The cut-off point of 22 which has a sensitivity of 90% and specificity of 93.5% was used in the current study [36]. The study employed three scales to collect the data.

The massage was performed one hour after the patients ate dinner. The researcher turned off the lamps of the room and those above the patient's head to create a quiet environment with mild light while separating him/her from the nearby patient through a paravan or pulling the curtain. The patient lay on his/her back with the researcher above his/her head. The researcher initially greased his hands using Firooz baby oil. Then, 13 techniques chosen from massage therapy reference which were a combination of effleurage and pressure massage were performed on the patient's head and face for 15 minutes [37]. Effleurage and pressure massage are particularly relaxing, simple, and light, and hence, all patients including patients after CABG can easily tolerate them. The procedure is explained below. In the first technique, the forehead was divided into three hypothetical horizontal lines, the two thumbs were then put on the center of one of these lines, and were gently and quietly pulled in the opposite direction up to the temples. This practice was repeated for the other two lines. In the second technique, the eyebrows were divided into three equal parts. Then, each part was taken and released with the index finger and thumbs (simultaneously on the right and left sides of the face). The third technique involved gentle pressure on a hypothetical point between the two eyebrows (the lower part of the forehead) with the surface of the fingers for 10 seconds (clockwise). In the fourth technique, we put the thumb and the index finger on the gap between the inner corner of the eye and the nose (nasal blades) on both sides of the face simultaneously and gently applied pressure on the area for 10 seconds. In the fifth technique, index fingers were simultaneously put on the external hollow part of the eye bone on both sides of the head (between the temple and eye) and gentle pressure was applied for 10 seconds. In the sixth technique, thumbs were simultaneously put on the temple hollow which was gently squeezed for 10 seconds. The seventh technique involved putting the fingertips on both sides of the face on the eyes of the patient with closed eyes and exerting a very light, slow, and gentle pressure for 5 seconds. In the eighth technique, the two sides of the nose were massaged simultaneously from top to bottom in hypothetical horizontal lines using two thumbs with a uniform gentle pressure from the inside of the face to the outer side. In the ninth technique, each cheek was divided obliquely into three equal parts and gentle pressure was applied on each of the three parts with the thumb (simultaneously on both sides of the face). The tenth technique considered the lower parts of every cheek divided them into three equal parts and applied gentle pressure on each of the three parts with the thumb (simultaneously on both sides of the face). In the elevenths technique, three hypothetical points were considered above and below the lip and gentle pressure was applied on each point using the thumb. The twelfth technique entailed placing palms on the cheeks and massaging up to the chin. In the thirteenth technique, gentle pressure was applied on the head skin using the tip of the fingers, and the muscles were massaged circularly in a center. This practice was stopped every few moments and was done for the other parts. This movement was done gently but firmly from the forehead hairline to the bottom of the skull. Each movement was repeated five times and took 15 minutes [29].

Massage in this study began from the third night after the operation and was performed around 19–21 pm, for almost 2–3 hours before sleep on three consecutive days for the intervention group (on the third to fifth day after operation), while the control group solely received the routine care of the ward. The personnel and patient companions were provided with instructions on tips for sleep hygiene such as reducing environmental noises and light.

A questionnaire was used to investigate patients' demographic and medical information including age, gender, educational level, location, height, weight, body mass index (BMI), marital status, occupation, history of the underlying disease and myocardial infarction, the number of coronary grafts, grafting area, and left ventricular ejection fraction. Afterward, the patients were provided with the Hospital Anxiety and Depression Scale devised by Zigmond and Snaith to screen for psychiatric disorders, particularly anxiety and depression [38]. This scale includes eight questions related to anxiety (questions 1, 3, 5, 7, 9, 11, 13) and seven questions related to depression (questions 2, 4, 6, 8, 10, 12, 14). The questions were rank-ordered with four-option choices where each answer was given a score ranging from 0 to 3. The total score for each component (anxiety and depression) was 21. As far as both components were concerned, scores of 0–7 were considered normal, scores of 8–10 were considered moderate, and scores of above 10 were considered illness [39]. Montazeri and colleagues examined the validity and reliability of this scale for the Iranian population among patients undergoing CABG surgery. Its internal consistency measured through Cronbach's alpha turned out to be 0.78 for anxiety and 0.86 for depression [40]. The mean of this variable was examined prior to the beginning of the study based on the Hospital Anxiety and Depression Scale. Since no significant difference existed between the two groups, it was not regarded as a confounding factor (Table 1).

Richard Campbell Sleep Questionnaire was the third questionnaire.

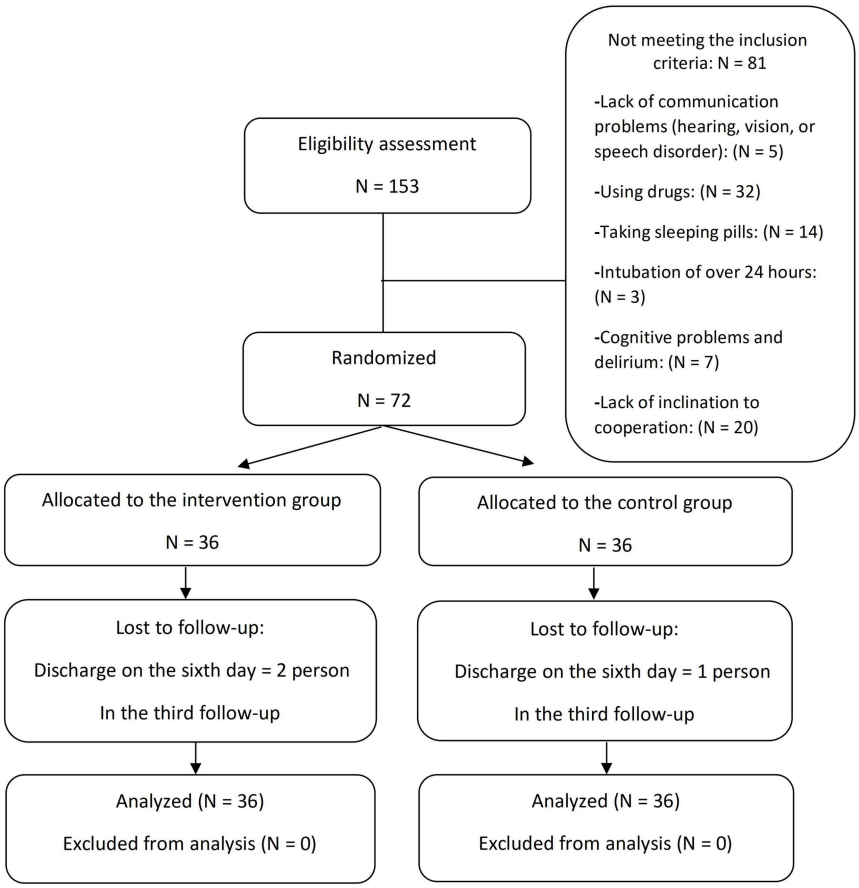

Figure 1 Stages of subject enrollment, allocation, follow up and analyses of data

Table 1 A comparison of demographic and medical information, mean pain, anxiety, and depression of patients in the control and intervention group

Characteristics		Intervention group number (%)	Control group number (%)	*P*-value
Gender	Female	10 (27.80)	18 (50)	$P = 0.053$
	Male	26 (72.20)	18 (50)	
Occupation	Employed	22 (61.10)	16 (44.40)	$P = 0.157$
	Unemployed	14 (38.90)	20 (55.60)	
Educational level	Less than high school diploma	18 (50)	20 (55.60)	$P = 0.637$
	High school diploma and higher degrees	18 (50)	16 (44.40)	
History of underlying disease	Yes	27 (75)	29 (80.60)	$P = 0.571$
	No	9 (25)	7 (19.40)	
History of using sleeping drugs	Yes	2 (5.60)	5 (13.90)	$P = 0.429$
	No	34 (94.40)	31 (86.10)	
Age	Mean (SD)	64.1 (9.60)	63.1 (8.80)	$P = 0.665$
Ejection fraction	Mean (SD)	44.7 (8.10)	42.5 (9.60)	$P = 0.298$
Number of grafts	Mean (SD)	2.05 (0.82)	2.4 (0.65)	$P = 0.016$
BMI	Mean (SD)	24.1 (4.20)	26.3 (3.60)	$P = 0.003$
Pain (VAS)	Mean (SD)	4.8 (0.98)	4.9 (1.01)	$P = 0.562$
Depression	Mean (SD)	3.3 (3.01)	3.5 (3.10)	$P = 0.909$
Anxiety	Mean (SD)	8 (3.20)	9.2 (3.50)	$P = 0.140$

BMI, body mass index; VAS, visual-analogue scale; SD, standard deviation.

This questionnaire was completed three days following the surgery while the patient was in the inpatient department and information about 24 hours before, i.e. the second day of hospitalization was recorded. This questionnaire was developed by Richard Campbell in 2,000 for measuring sleep quality in intensive care patients. Richard Campbell examined the reliability of the questionnaire through internal consistency which revealed a Cronbach's alpha of 0.90. Campbell's Questionnaire, as a short scale, is employed for assessing perceived depth of sleep, sleep latency (time to fall asleep), number of awakenings, sleep efficiency (ease of return to sleep), and quality of sleep. It also entails an item about perceived nighttime noise. Each item is scored on a visual analog scale ranging from 0 mm to 100 mm, with higher scores representing better sleep (0 = the worst possible sleep, 100 = the best possible sleep) [41]. The psychometric properties of this questionnaire have been approved in several studies. The questionnaire was translated into Persian by Rahimi and colleagues (2018) for the first time in Iran and was validated using patients in the cardiac surgery intensive care unit. Inter-rater correlation coefficient and Cronbach's alpha were 0.714 and 0.906, respectively [42].

Richard Campbell Sleep Questionnaire was completed in the evenings of the third to sixth days after the operation before the intervention to examine the prior night's sleep quality.

According to Figure 1, 81 out of 153 patients whose qualifications were examined were excluded from the study. The data were entered into SPSS version 26. The normality of the data was examined through Shapiro-Wilk test. Interpretive statistical methods including Independent t-test, Mann-Whitney, Friedman, Chi-square, and general estimated equation (GEE) were employed for data analysis.

Results

All the participating patients were married. There existed no significant difference between the two groups in terms of qualitative variables and quantitative variables (except for BMI and number of grafts) ($P > 0.05$).

The mean BMI in the intervention group was in the normal range, while that of control groups patients was in the overweight range. The mean number of grafts in the control group was more than the intervention group ($P < 0.05$) (Table 1).

The mean perceived sleep depth on the second night after the operation (i.e. prior to the beginning of intervention) in the intervention and control group was 59.5 and 64.4, respectively. Mann-Whitney test revealed no significant difference between the two groups in this regard ($P = 0.291$). The perceived sleep depth on the fifth night after the operation in the intervention group was more than the control group ($P = 0.001$). A comparison of the trend in the perceived sleep depth among the intervention ($P < 0.001$) and control group ($P = 0.011$) over four days of the study using the Friedman test showed that sleep depth was improved over the four consecutive days in both groups, with the intervention group showing more improvement (Table 2).

Comparing the mean sleep latency on the second and third night of the study between the intervention and control group using Mann-Whitney test demonstrated no significant differences ($P = 0.317$). However, the mean sleep latency on the fourth and fifth night of the study in the intervention group was significantly more than the control group ($P = 0.001$). Friedman test showed that trend in sleep latency over four days of the study were not significant in the control group ($P = 0.068$), but were statistically significant in the intervention group ($P \leq 0.001$) (Table 2).

Comparing the mean number of awakenings on the second and third night of the study between the intervention and control group using the Mann-Whitney test demonstrated no significant differences ($P > 0.05$). However, the mean number of awakenings on the fourth and fifth nights of the study in the intervention group was significantly more than the control group ($P < 0.05$). Friedman test showed that the trend in the number of awakenings over four days of the study was not significant in the control group ($P = 0.202$), but was statistically significant in the intervention group ($P \leq 0.001$) (Table 2).

The findings of the Mann-Whitney test demonstrated no significant difference between the two groups as to the ease of return to sleep on the second, third, and fourth night of the study ($P > 0.05$). With regard to the fifth night, however, the percentage of ease of return to sleep in the intervention group was more than the control group ($P < 0.001$). Friedman test showed that the trend in the percentage of ease of return to sleep over four days of the study was significant in both groups ($P < 0.05$). The intervention group, however, showed more improvement ($P < 0.001$) (Table 2).

The findings of the Mann-Whitney test showed no significant difference between the two groups in sleep quality on the second and third nights ($P > 0.05$). On the fourth and fifth night, however, the sleep quality score of the intervention group patients was more than the control group ($P < 0.001$). Friedman test further revealed that the trend in sleep quality over four days of the study was not significant in the control group ($P > 0.05$), but proved to be statistically significant in the intervention group ($P < 0.001$) (Table 2).

The findings of the Mann-Whitney test showed a significant difference between the two groups in the perceived noise on the second and third night, with the control group showing higher mean perceived noise ($P < 0.01$). However, there existed no significant difference between the two groups in this regard on the fourth and fifth night ($P > 0.05$). Friedman test showed that the trend in the perceived noise over four days of the study was significant in both groups ($P < 0.05$) with the intervention group revealing a more significant differences ($P < 0.001$) (Table 2).

The findings of the Mann-Whitney test showed no significant difference between the two groups in sleep duration in the past 24 hours on the second night ($P > 0.05$). However, since the third night's sleep duration in the past 24 hours was statistically different between the two groups ($P < 0.001$). Friedman test showed that the trend in the sleep duration in the past 24 hours over four days of the study was significant in both groups ($P < 0.05$) with the intervention group revealing a more significant difference ($P < 0.001$) (Table 2).

Also, the finding of the GEE test revealed that all six areas of patients' sleep condition and sleep duration in the past 24 hours in the intervention group was more than in the control group and the trend of changes over time was statistically significant ($P < 0.001$) (Table 2).

Comparison of mean of the total score of sleep condition

The findings of the Mann-Whitney test showed no significant difference between the two groups in sleep condition total scores on the second and third night ($P > 0.05$). On the fourth and fifth night, however, a significant difference was found between the two groups in this respect ($P < 0.01$). Friedman test further revealed that the trend in sleep condition over four days of the study was not significant in the control group ($P > 0.05$), but proved to be statistically significant in the intervention group ($P < 0.001$). Also, the finding of the GEE test revealed that the sleep condition total score in the intervention group was more than the control group which turned out to be statistically significant ($P < 0.001$). Sleep condition total score fell on the third night after operation in both groups which indicate an aggravation of the patient's sleep condition. However, the score increased on the fourth night in both groups, with more increase in the intervention group. Sleep condition total score increased on the fifth night in the intervention group, but decreased in the control group showing an improvement in the sleep condition of the intervention group (Table 3).

Discussion

The current study aimed to investigate the effect of head and facial massage on the sleep condition of patients after CABG surgery in Fatemeh Zahra Hospital in Sari county. Results demonstrated that the mean sleep condition total score on the second night after the operation was 63.05 in the massage group and 65.4 in the control group which seems to be caused by environmental factors such as

noise, light, nursing methods, prescription, post-surgery pain and anxiety [12]. The mean sleep total score on the second night after the operation fell in both groups which were indicative of aggravation of patients' sleep condition. The difference between the two groups, however, was not significant. With regard to the third and fourth night, the sleep score in the intervention group was significantly more than the control group. The mean sleep condition total score in the control group had a descending trend during the four nights of the study which indicated that the sleep condition of these patients aggravated. That of the intervention group, however, showed an

Table 2 Patients' sleep condition and sleep duration during 4 nights of study

Variable		Head and facial massage group	Control group	Test result between group (Mann-Whitney)	Intragroup test result (Friedman)		GEE test result group*time
		Mean (SD)	Mean (SD)		Massage group	Control group	
Sleep depth	Second	59.5 (20.20)	64.4 (23.40)	$P = 0.291$			
	third	57.6 (19.30)	54.5 (18.60)	$P = 0.494$			
	fourth	70.5 (11.00)	56.5 (18.50)	$P = 0.008$	$P < 0.001$	$P = 0.011$	$P < 0.001$
	fifth	75.1 (15.70)	57.5 (25.90)	$P = 0.001$			
Sleep latency	Second	65.2 (14.70)	58.8 (21.20)	$P = 0.317$			
	third	64.4 (12.90)	59.1 (19.10)	$P = 0.631$			
	fourth	73.7 (14.10)	61.2 (16.10)	$P = 0.014$	$P < 0.001$	$P = 0.068$	$P = 0.034$
	fifth	75.4 (17.50)	59.1 (23.60)	$P = 0.001$			
Number of awakenings	Second	61.6 (16.70)	58.4 (23.20)	$P = 0.779$			
	third	62.9 (13.30)	57.8 (16.00)	$P = 0.062$			
	fourth	73.7 (10.20)	60 (19.60)	$P = 0.001$	$P < 0.001$	$P = 0.202$	$P = 0.003$
	fifth	74.02 (16.70)	52.2 (28.50)	$P < 0.001$			
Sleep efficiency (ease of return to sleep)	Second	61.3 (16.50)	63.7 (19.60)	$P = 0.617$			
	third	60.9 (14.40)	57.5 (17.60)	$P = 0.455$			
	fourth	72.7 (9.20)	63.05 (21.10)	$P = 0.301$	$P < 0.001$	$P = 0.015$	$P < 0.001$
	fifth	75.4 (15.50)	51.3 (26.09)	$P < 0.001$			
Sleep quality	Second	59.5 (20.50)	67.05 (22.10)	$P = 0.086$			
	third	60.2 (19.30)	58.6 (14.30)	$P = 0.233$			
	fourth	75.9 (11.10)	59.3 (20.10)	$P < 0.001$	$P < 0.001$	$P = 0.755$	$P < 0.001$
	fifth	76.8 (15.60)	53.7 (28.40)	$P < 0.001$			
Perceived noise	Second	70.8 (15.60)	80 (14.70)	$P = 0.008$			
	third	66.8 (21.10)	78.05 (15.08)	$P = 0.003$			
	fourth	77.9 (8.60)	74.3 (22.20)	$P = 0.406$	$P < 0.001$	$P = 0.046$	$P < 0.001$
	fifth	75.6 (20.10)	64.5 (33.10)	$P = 0.799$			
Sleep duration in the past 24 hours	Second	8.02 (2.60)	7.1 (2.60)	$P = 0.138$			
	third	7.4 (1.50)	5.8 (1.60)	$P < 0.001$			
	fourth	8.01 (1.50)	6.6 (1.80)	$P = 0.007$	$P < 0.001$	$P = 0.046$	$P = 0.017$
	fifth	8.08 (2.40)	5.5 (3.02)	$P < 0.001$			

* stands for interactive effect between group and time. GEE, deneral estimated equation; SD, standard deviation.

Table 3 Comparison of mean of the total score of sleep condition during 4 nights of study

The total score of the Richard Campbell Questionnaire	Group				Test result between group (Mann-Whitney)
	Head and facial massage		Control		
	Mean	SD	Mean	SD	
Second night (before intervention)	63.05	14.10	65.40	16.70	$P = 0.297$
Third night	62.10	13.20	60.90	13.80	$P = 0.495$
Fourth night	74.10	8.90	62.40	15.20	$P = 0.002$
Fifth night	75.40	14.90	56.40	25.70	$P < 0.001$
Intragroup test result (Friedman)	$P < 0.001$		$P = 0.051$		
GEE test result	Group		$P = 0.011$		
	Group*time		$P < 0.001$		

* stands for interactive effect between group and time. GEE, general estimated equation; SD, standard deviation.

improvement. A similar study entitled "The effect of massage therapy on sleep quality of patients after coronary artery bypass graft CABG operation" revealed the positive effects of massage therapy on sleep quality [32]. This study, however, employed the effleurage technique of Swedish massage over four consecutive days from the third to sixth day after the surgery, and sleep quality was measured using a standard hospital sleep quality questionnaire. Another similar study showed that the massage therapy group enjoyed better sleep quality than the control group [28]. In the afore-mentioned study, massage was performed on the back, neck, and shoulders over three consecutive days from the first to third day after discharge from the intensive care unit, and sleep was measured through a daily sleep diary and Visual-Analogue Scale. Another similar study explored the effect of massage therapy on patients' sleep quality after CABG surgery [26]. As with the present study, massage in this study was done on three consecutive days. The massage area, however, was different. That is, it was performed on the back twice per day and the results showed positive effects on patients' sleep quality. The effect of massage therapy on sleep quality was approved in another study which examined the effect of back massage on patients' sleep quality after valve replacement and CABG surgery. The back massage in the above study was performed for three consecutive days for 10 minutes [43]. The findings indicated that although the patients were randomly assigned in the intervention and control groups, the mean BMI in the control group was more than the intervention group. The relationship between increased levels of BMI and sleep has been reported in several studies and BMI above 30 is accompanied by respiratory problems such as sleep apnea. In fact, central obesity, high BMI, and enlargement of soft tissue structures surrounding the upper airway impede the airway and hence stop breathing and the individual wakes up [44]. However, in the present study, the average BMI in the two groups was below 30 and the patients were not in the obesity range. Therefore, the low sleep score of the patients in the control group cannot be attributed to the higher average BMI of the patients in this group. Also, the number of grafts in the control group was more than in the massage group. It seems that more grafts cause patients more pain and hence sleep disorders. However, the average amount of pain in the current study showed no difference between the two groups. Hence, the difference in the sleep condition of the two groups cannot be attributed to the different numbers of grafts.

As far as prior day sleep duration was concerned, no significant difference was found between the massage and control group before the intervention. On the fifth night, however, prior day sleep duration increased in the massage group and decreased in the control group. A similar study investigated the effect of back massage on improving the sleep condition of patients after CABG surgery [45]. Back massage in this study was performed for three consecutive days for 20 minutes, and patients' sleep condition was measured through a sleep measurement scale and daily sleep diary. The results indicated the beneficial effect of massage on sleep quality. In line with the present study, the mean sleep duration showed more increase in the massage group on the third night of the intervention.

The perceived sleep depth was measured on a scale ranging from 1 to 100. The mean prior night sleep depth in the massage and control group was not significantly different on the second night after the operation (prior to the beginning of the intervention). However, the mean prior night sleep depth on the fifth night after the operation increased in the massage group, which showed an increase in sleep depth. Nonetheless, the mean sleep depth on the fifth night was decreased in the control group. A further study that compared the effect of foot reflexology massage and acupressure on patients' sleep condition after CABG surgery demonstrated positive effects of massage on improving patients' sleep condition [46]. Besides, in line with the current study, the intervention group showed deeper sleep than the control group. Foot reflexology massage in this study was performed over four consecutive days for 30 minutes from the third to sixth day after the operation, and a hospital sleep questionnaire was employed for measuring sleep quality. Another similar study investigating the issue demonstrated a contrary finding [47]. That is, it showed no improvements in sleep quality after foot reflexology massage. The sleep quality of both groups was improved on the second night after the operation. As with the current study, the Richard Campbell Questionnaire was employed for measuring sleep quality. Days of intervention, however, varied. Massage in the intervention group was performed on both feet one hour following endotracheal tube extraction for 20 minutes. And, the intervention was conducted once per day for two consecutive days. It seems that a few days of massage account for these contradictory findings. If the massage was continued for more days, it might have demonstrated improvements in patients' sleep quality. Few studies have examined the effect of massage on the sleep of patients undergoing CABG surgery. Nonetheless, similar studies have looked into the effect of massage on the sleep of patients with other heart diseases. The mean sleep latency score in the massage group of the current study was increased on the fifth night after the operation which indicates that the patients fell to sleep sooner than on the prior days. This pattern, however, was not revealed in the control group. A similar study examined how to back massage can affect sleep quality and duration among patients with congestive heart failure [48]. In line with the present study, the time to fall asleep was decreased after the intervention. Back massage in this study was performed three times per day for 20 minutes. Pittsburgh Sleep Quality Index was used for measuring sleep quality and massage therapy proved to be efficient.

Following the intervention, the number of prior night awakenings increased in the control group and decreased in the massage group indicating that the patients in the massage group suffered fewer nighttime awakenings than those in the control group. The mean score of awakening time was increased in the massage group and decreased in the control group, showing more nighttime awakenings in the control group and less in the massage group. Also, the mean score of ease of return to sleep was increased in the massage group and decreased in the control group. This indicates that the control group woke up more at night and could not fall asleep after waking up.

Sleep quality or satisfaction with sleep showed an increasing trend in the intervention group and a decreasing one in the control group. A study investigating the effect of massage on the sleep quality of cardiac care unit patients suffering from ischemic heart disease showed that the intervention, consistence with the present study, significantly improved sleep quality. Foot reflexology massage in this study was performed on two consecutive days for 20 minutes, and a standard hospital sleep quality questionnaire was employed for measuring sleep quality [22]. Another study examined the effect of massage on sleep quality of hospitalized patients with acute myocardial infarction where foot reflexology massage was performed twice a day each taking 30 minutes and sleep quality was measured through the St. Mary's Hospital Sleep Questionnaire [49]. Overall, the findings showed positive effects of massage therapy in this respect. Another study comparing the effects of massage and aromatherapy massage with lavender oil on the sleep quality of cardiac patients revealed positive effects for both methods [50]. Hand and foot massage in this study was performed for seven nights for 20 minutes and Pittsburgh Sleep Quality Index was employed for measuring sleep quality.

The mean perceived noise score was significantly different between the head and facial massage group and the control group on the second night after the operation (prior to the intervention). That is, the perceived noise score in the control group was higher than the massage group which indicates that the patients in the control group perceived less noise due to better quality of their sleep. With regard to the fifth night after the operation, no significant difference existed between the two groups. However, the trend in the mean perceived noise in the control group showed a decreasing trend over four days of the study. This shows a decrease in the sleep depth of these patients and an increase in the perceived noise. Nonetheless, the mean perceived noise in the massage group showed an increasing trend which is indicative of improvements in their sleep quality.

A study compared the effects of foot reflexology massage, foot bath, and a combination of these on the sleep quality of patients suffering

acute coronary syndrome [51]. The reflexology massage was performed on both soles of the feet (between upper one-third and lower two-thirds of the soles of the feet) for two consecutive nights for 10 minutes, and sleep quality was examined via Veran Snyder-Halpern Questionnaire. The results reported positive effects of massage. Contrary to the findings of the present study, a study investigated the effect of foot reflexology massage on sleep quality of patients with acute myocardial infarction where massage was performed on three consecutive days each taking 20 minutes, and sleep quality was measured through a Pittsburgh Questionnaire and Visual-Analogue Scale every morning after the intervention. According to the results, foot massage did not significantly improve the patient's sleep quality which might be due to the severity of sleep disorder and disease as well as fear among these patients [52].

Conclusion

Given the findings of the present study can recommend head and facial massage as a means to improve patients' sleep condition after CABG surgery. This intervention, in comparison with pharmacological methods, did not suffer any side-effects and enjoyed a high level of patient satisfaction. Since the improvements in sleep status in this study were observed on the fourth and fifth nights, it is recommended to continue massage therapy for longer days to explore the effect of continuity of massage on sleep conditions.

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