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Effect of family presence on stress response after bypass surgery

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ABSTRACT

Background: Coronary artery bypass grafting (CABG) is a major surgery that may cause severe surgical stress response (SR). Although the presence of family members in intensive care unit (ICU) is known to benefit intensive care patients socially and emotionally, its effects on surgical SR are unknown.
Objectives: To investigate the effect of an informed family member (IFM)'s presence in the awakening process in ICU on patients' SR after CABG.
Methods: A nonrandomized controlled clinical study was completed with a total of 73 patients: 37 patients in the control (CG) and 36 in the intervention group (IG) underwent CABG surgery. In the CG patients, no family members were taken into the ICU during the awakening process and routine care and treatment practices were continued. In the IG patients, besides routine care and treatment practices, an IFM was taken into the ICU during the awakening process in accordance with the research method. Groups were statistically compared in terms of serum cortisol level which is the one of the main indicators of surgical SR, state anxiety, sedative drug requirements, and duration of intubation, sedation, and ICU stay. A p value <0.05 was accepted as statistically significant.
Results: Presence of an IFM in the ICU was found to be effective in decreasing serum cortisol level, state anxiety, sedative drug requirements, and the duration of intubation, sedation, and ICU stay ($p<0.05$).
Conclusions: In CABG, the presence of IFM in ICU is effective in reducing SR.

Introduction

Surgical stress, defined as the effect applied to the human body through a surgical procedure, plays a role in the development of a series of physiological, psychological and immunological responses in the organism which is called as stress response (SR).[1] Although coronary artery bypass grafting (CABG) surgery is still a common and important treatment option in coronary heart diseases,[2,3] it may cause major physical and psychological stress response in patients.[4-8] These stressors are accepted as both the cause and indicator of the SR.[4] SR is the result of hormonal, metabolic, immunological, and psychological changes that occur after tissue damage.[9] Prominent changes include an increase in serum cortisol (also known as stress hormone), insulin resistance, increased serum glucose, and anxiety.[9-10] In addition, the degree of surgical trauma is believed to correlate with the concentration of serum cortisol level (SCL).[11]

In patients undergoing CABG, increased cortisol levels have been reported to be associated with adverse cardiac events and increased mortality.[12] Studies in various patient populations have shown that high cortisol levels increase tendencies toward delayed healing of infected wounds,[13] atrial fibrillation,[14] low blood-flow rate,[15] heart failure,[16] respiratory depression, pulmonary insufficiency,[17] thromboembolism,[18] delirium,[19] and myocardial infarction.[20] In addition, cortisol elevation may delay postoperative recovery and prolong hospital stay in CABG patients.[12] There is also a correlation between high preoperative anxiety levels and higher postoperative pain in patients who have undergone CABG.[21]

The most difficult period for patients in the ICU after CABG is when they wake up from anesthesia and find themselves intubated and on mechanical ventilation. With feelings of panic, accompanied by pain, patients may exhibit behaviors that could make their condition critical, such as pulling at tubes, drains, and catheters.[22] In addition, it was stated that the need for physical restraints and sedation increases in patients experiencing stress and panic.[23] Various studies have aimed to address such problems through the use of different anesthesia methods, mechanical ventilation modes, and drugs. However, the problems

Abbreviations: CABG, Coronary Artery Bypass Greft; IFM, Informed Family Member; ICU, Intensive Care Unit; SR, Stress Response; SCL, Serum Cortisol Level; AACN, American Association of Critical-Care Nurses; FM, Family Member; FMs, Family Members; SIL, Serum Insulin Level; SGL, Serum Glucose Level; IG, Intervention Group; CG, Control Group; ASA, American Society of Anesthesiologists; IC, Intensive Care; SAP, Systolic Arterial Pressure; DAP, Diastolic Arterial Pressure; T0, 9:00 AM, one day before surgery; T1, Surgery day, six hours after extubation; T2, 9:00 one day after surgery; STAI-S, State Anxiety; STAI-T, Continouous Anxiety; VAS, Visual Analogue Scale

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related to the weaning from intubation and arising from anesthesia and sedation which is shortly identified as 'awakening process'[24] have not been resolved yet. .[3,25,26] These problems may necessitate prolongation of intubation, sedation, and ICU stay.[3] It was reported that the increase in plasma cortisol level reached the highest level at 8–12 h post CABG surgery.[27] Increased cortisol levels can be seen in patients who have undergone CABG, with a peak occurring in the immediate postoperative period, around the time of extubation.[28]

Negative emotions and effects arising from anesthesia and sedation can include loss of autonomy, difficulty communicating and protecting privacy, loneliness, helplessness, and fear of death. The effects of these negative emotions on SR and the accompanying neurohormonal changes are not well known. Moreover, no prior study has investigated the effect of the presence of family members in the ICU on hormonal, metabolic, immunological, and psychological changes in SR. Families can provide significant emotional and informal support to their patients in ICU.[29] In 2012, the American Association of Critical-Care Nurses (AACN) published a guide titled Family Presence and Visits in the Adult ICU. In this guideline, it is suggested that the patient should be with a family member or a friend for 24 h for emotional and social support.[30] The presence of a family member can contribute invaluably to the care and recovery of their relatives in the ICU. The role of families in ICU scenarios is not just about providing information; their presence in intensive care provides vital emotional and social support to patients.[31] In a study, it was stated that the presence of the family members at the bedside in weaning trials of patients contributed positively to the weaning process, communication, social interaction and the patient's feeling of safety.[32] In these studies, it was also stated that nurses should inform families about the patient's condition, ICU environment, treatments and expectations from the family in advance. In the light of these studies and in line with AACN's recommendations we considered that in the awakening process after CABG surgery, the presence of a family member who has been informed about the ICU and the awakening process may increase the patient's confidence, decrease anxiety, and reduce the effects of SR. Additionally, the presence of an informed family member in these difficult times during the awakening process can help patients feel safe and reduce some indicators of SR.

The purpose of this study was to determine the effect of an informed family member present in the ICU when a CABG patient awakens on SCL, serum insulin level (SIL), serum glucose level (SGL), pain, and anxiety as important indicators of SR.

Methods

Study design

This was a nonrandomized clinical study that included a control group (CG) and an intervention group (IG) patients who underwent CABG surgery. It was conducted in the cardiovascular surgery ICU of a private hospital in Gaziantep/Turkey between January 1 and June 30, 2018.

In order to avoid ethical problems among the CG and IG groups, randomization was not performed. Therefore CG patients' data were collected in the first three months (January 15th–March 15th, 2018), and IG patients' data were collected in the second three months (March 16th–July 15th, 2018), consecutively. The ICU had a total capacity of 8 beds. To protect the privacy of patients, a curtain system was used that completely covered the patients' beds.

Control Group: According to the hospital's clinical practices, routine care and treatment were continued for the CG patients. Family members of CG patients were not taken into the ICU during the awakening process on the day of surgery. The family members of patients in this group were informed about the patient's condition by telephone in accordance with the clinical procedure. Patients were not in direct contact with family members during the ICU process but were able to directly contact them after the ICU.

Intervention Group: According to the hospital's clinical practices, routine care and treatment were continued for the IG patients too. The intervention whose effect on the SR was investigated within the scope of this study is the presence of an informed family member with the patient during the awakening period in the IG patients as detailed below:

Patients in the IG were asked to determine a family member who would be present in the intensive care process. In the IG, the family member was informed one day before the surgery by the researchers. Information was both oral and written (a booklet was provided). The information covered the aims of the study, the family members' intensive care responsibilities (explained below), an introduction to the intensive care environment and patient-related devices and materials, ICU rules, attitudes toward the patient, and what family members should do and say at the bedside (explained below). Any questions raised by the family members were answered. The process of informing family members took an average of 25 (min: 15, max: 40) minutes.

We administered a verbal posttest to the family member about the information they received (mentioned in the paragraph above). We repeated the information until the families stated that they understood the information provided. These family members who received information and who were successful in the verbal posttest were called '*informed family members*' (IFMs) for this study.

On the day of surgery for the IG patients, IFMs were asked to be rested and not hungry. After the termination of sedative drugs in the ICU, the IFM was taken to the patient's room. At the ICU entrance, IFMs were given disposable aprons, caps, masks, and overshoes. They were asked to wash their hands for three minutes with antiseptic solution. After IFMs were received in the ICU, devices and materials related to the patient were introduced. IFMs were asked not to touch any device, material, or medical dressing on the patient. A chair was available so that the IFM could sit next to the patient's bed.

Guidelines for IFM Behavior and Patient Interaction at the Bedside: To protect patients' privacy, curtains were placed around the beds, and IFMs were not allowed to take photos or videos. The IFM was allowed to hold the patient's hand and communicate with the patient. IFMs frequently addressed the patients by name, reminded them of the date, place, and time, and made statements intended to increase patients' orientation under the supervision of an ICU nurse. IFMs were given a script to tell the patient at the bedside. They were asked to repeat this information frequently by addressing the patient with his or her name. They would say, for example, beginning with the patient's name, "*Today is Monday, it is 5:00, you underwent surgery, your surgery is over, you are in the ICU right now, everything is okay, you cannot speak because there is a tube in your mouth, you can talk when the tube is out. I am here; relax and calm down—your situation is good.*" Families remained in intensive care for at least 8 and no more than 12 h (average 10 h).

IFMs were taken to the ICU approximately two hours after the end of the surgery; when the decision was made for rousing the patients from sedation. Since the cortisol level reached the highest level 8–12 h post CABG surgery[27]; IFMs stayed in the ICU for an average of 10 h after surgery (minimum: 8, maximum: 12). Thus, IFMs were in the ICU during the period when SCL was expected to be at its highest level. IFMs were allowed to take breaks for personal needs; if they felt uncomfortable, they could leave the study.

IFMs' Responsibilities in the ICU: The responsibilities of the family members were determined in accordance with the purpose of the research and in such a way as to not violate the intensive care rules where the study was conducted. In addition, the AACN guidelines were also considered (AACN, 2012). The main responsibilities of the family members were as follows: to cooperate with healthcare professionals, to stay with the patient during the awakening process

(approximately 8–10 h), to follow the warnings and suggestions of the healthcare professionals and researchers, to engage in the requested activities (in accordance with the information given to them by the researchers above), to maintain communication with the patient, and to facilitate communication between the patient and healthcare professionals.

According to routine clinical procedure, patients are followed up on for an average of 24–36 h after cardiac surgery in the ICU where the study was performed. This study did not interfere with the patients' monitoring and intubation process in intensive care after CABG surgery. The patients were followed up on in the ICU for 24–36 h with an average of 8–10 h intubation according to the clinical procedure.

Sampling criteria

Patients and family members were informed about the research after their compliance with the sample criteria was evaluated. After signing the informed consent form, only the patients in the CG and the patients and family members in the IG were included in the sample.

Patients. The sampling criteria for patients were as follows: had no disease that would change cortisol level (e.g., Addison's disease, Cushing syndrome, etc.), had no comorbid diseases (e.g., diabetes mellitus, asthma, chronic kidney and liver diseases, etc.) did not use cortisone-derived drugs, had no complications that would affect the process of surgery and intensive care (IC), were in a low-risk group according to American Society of Anesthesiologists (ASA) status (I or II) and EuroSCORE scores, had undergone open-heart surgery for the first time, and had their surgery performed in the morning between 08:00 and 12:00 (serum cortisol levels may vary according to circadian rhythm.[28] Therefore, patients whose CABG surgery was planned between 08:00 and 12:00 h were included in the study), had no diagnosis of psychiatric disorder, had a family member to support them in the awakening process, were older than 18 years, and had volunteered to participate in the study.

Family members. The sampling criteria for family members were as follows: they were determined by the patients, could understand and follow the rules and behaviors to be observed in the ICU, had no infectious diseases, were older than 18 years, and had volunteered to accompany the patient in the ICU during the specified time and participate in the study. Prior to the study, patients were informed that their relatives such as their spouses, parents, grandparents, adult children, siblings, cousins, aunts and uncles as well as their close friends count as '*family members*' for the purpose of presence after surgery. In this study all patients had a relative present and no patient preferred a close friend.

Exclusion criteria for each group. Excluded patients were those whose surgeries were prolonged because of complications, whose intraoperative period ended in the evening (after 16:00), whose level of consciousness after surgery hindered participation or who had received cortisone-derived drugs, and who wanted to leave at any stage after having volunteered to participate. If the patient died during the study, the data of the deceased patient were excluded from the study.

Determination of sample size

SCL is an important indicator of the activity of SR, and the degree of surgical trauma is believed to correlate with the concentration of cortisol.[11] SCL ranges vary according to circadian rhythm and gender. Normal ranges at AM hours are 6.4–34.9 μgdl, and 1.8–18.1 μgdL at

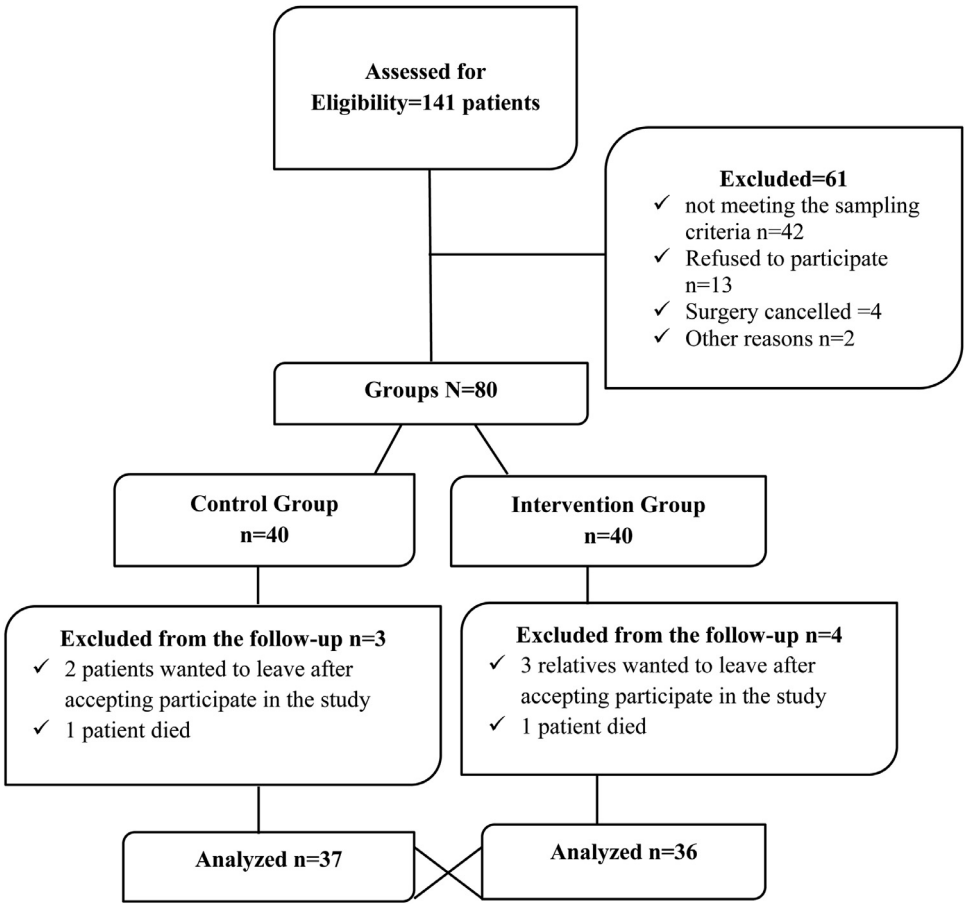


Fig. 1. Consort diagram of the study.

PM hours.[32] SCL increases rapidly with surgical stimulation and parallel to the severity of the stimulus. In patients who underwent CABG, SCL is increased with anesthesia induction, and surgical incision may increase it by 2–10 times during and after surgery. It returns to normal levels within 24 h after surgery, but may remain high for 72 h depending on the degree of surgical trauma.[33]

A decrease in SCL was taken as the main criterion for determining the number of patients to be sampled for each group, adopting the calculation used in a similar study.[34] To compare groups (α= 0.05, β= 0.1, test power: 90%), the minimum number of patients required for each group was calculated as 36 according to the following formula[34]:

$$n = \frac{(Z_1 - \alpha/2 + Z_1 - \beta)[S_1^2 + S_2^2]}{(\mu - \mu)^2} = 36$$

CABG was performed on 141 patients in the hospital during the study period. Of the patients who were excluded, 42 did not meet the sampling criteria, 13 refused to participate, and six had their surgeries canceled. Of the 80 included patients, 40 were in the CG and 40 were in the IG. Two patients who wanted to quit participating in the study and one deceased patient after surgery were excluded from the CG sample. Three IFMs who wanted to quit participating in the study and one deceased patient after surgery were excluded from the IG sample. Thus, the study was completed with a total of 73 patients (CG: 37; IG: 36) (Fig. 1).

Ethical approval

Before conducting the study, ethical approval was obtained from the Local Ethics Committee (clinical trial no.: 2018-12), along with written permission from hospital management (authorization approval no: 2018-53). The patients and the family members were informed about the study at separate times on the day before surgery. First, the patient was informed about the study and was asked if there were any relatives who could stay with them during the awakening process in the ICU. After the patient volunteered to participate in the study, they were asked to determine family members who could stay with them in the ICU during the awakening process. Family members' questions were answered by the researcher. These first interviews with patients and family members took an average of 10–20 min. The family members were also told that participation in the study was voluntary. Written consent was obtained when patients and family members agreed to participate at the same time on the day before surgery.

Data collection

Three nurses working in the cardiovascular surgery unit were informed about the study and the data-collection procedure by the researchers. A 30-minute informative meeting was held with these three nurses. To ensure consistent data collection, the data were collected by these three nurses. In addition these nurses observed the IFMs in the ICU. The data-collection form was created based on a literature review.[3,4,9,10] The literature[10] was used to create questions about stress response.

The first part of the data collection form included information about the patients' birth date, sex, height, weight, educational status, use of medication; duration of anesthesia, intubation, and sedation; amount of medication used for sedation; and duration of stay in the ICU. This information was obtained from the patients' files. The second part of the form concerned IFM characteristics (birth date, sex, educational status, working status, relationship with patient). This information was supplied based on face-to-face interviews with family members; this section was only applied to the IG. The third part included SCL, SIL, SGL, pain and anxiety scores. These were recorded based on measurements and blood test results.

Variables and measures

The measurements and evaluations were performed at T0 (9:00 AM, one day before surgery), T1 (surgery day, six hours after extubation), and T2 (9:00 AM, one day after surgery). Since the patients were tired after extubation, T1 measurements were performed after resting for six hours. In the T0, T1, and T2 evaluations, anxiety and pain were measured; and a blood sample was taken for SCL, SIL, and SGL In addition, in the T1 evaluation, durations of anesthesia, intubation, sedation, and the drug amounts used for sedation were noted. In the T2 evaluation, the duration of ICU stay was noted. Interviews with patients for the T0, T1, and T2 evaluations lasted approximately 15–20 min.

Blood sample collection. Blood samples for the T0, T1, and T2 evaluations were taken a total of three times; 5 mL was taken from the peripheral intravenous catheter in the patient's arm. Blood samples were taken at the same time for each patient to avoid the effects of changes in cortisol depending on circadian rhythm.[10] Since movement and physical activity can change catecholamine release and cortisol levels,[12] patients were allowed to rest for 30 min before taking a blood sample. Blood samples were delivered to the central biochemistry laboratory of the hospital within 15 min, maintaining cold-chain protection. These samples were separated from their sera by centrifugation at 4000 rpm for 10 min. Serum samples were collected from two separate ependores for each control and stored at −80 °C.[27-28]

Serum Cortisol and Serum Insulin Levels were measured with a validated "Electrochemiluminescence" method provided by "Roche Diagnostics" with ROCHE Cobas e601 device. *Serum Glucose Levels* were measured using the validated "Enzymatic Hexokinase" method provided by "Roche Diagnostics" with ROCHE Cobas c501 device. The measurement kits used were calibrated with the calibrator supplied by Roche Diagnostics, and their accuracy was proven by performing a performance evaluation with quality control materials. All measurements were studied in the Hospital's Central Laboratory with a verificated method.

Measurement of anxiety. STAI, developed by Spielberger et al., was used to measure anxiety. STAI is comprised of two 20-item self-report scales measuring state anxiety (STAI-S) and trait anxiety (STAI-T) based on four-point Likert scales. STAI-S is used to assess how an individual feels "in the moment" by evaluating the individual's current anxiety status.[35] In this study, the concept of "state anxiety" was considered as the anxiety state that the patient felt due to CABG surgery. The items included in STAI-S were scored as: None=1, A little=2, Very=3, Completely=4. STAI-T determines how an individual usually feels and measures continuous anxiety. STAI-T items are scored as Never=1, Sometimes=2, Often=3, Always=4. The lowest score for both dimensions of the scale was 20, and the highest score was 80. The higher the score, the higher the level of anxiety.[35,36] In the present study, the Cronbach's alpha coefficient was calculated as 0.69 for the STAI-S and 0.71 for the STAI-T. STAI-S was used for the T0, T1, and T2 measurements and STAI-T was used for the T0 measurement. The STAI-S was applied first and then the STAI-T since the application of the scale might cause anxiety.

According to routine clinical procedure, the patient's anxiety status is evaluated by the primary doctor the day before and the night before surgery. Patients with high anxiety are given sedative drugs according to the doctor's orders. Therefore, no medication was given by the doctor to patients with high anxiety, according to STAI scores.

Pain evaluation. Pain was evaluated using a 100 mm visual analog scale (VAS). To evaluate pain perception, the patient was asked to mark his or her pain level on a 100 mm vertical line; the bottom said "no pain," and top said "highest pain to be felt" .[37] Pain in both groups was evaluated once at T0, T1, and T2.

For pain relief, morphine infusion is applied to patients as required by the clinical procedure. Patients with high pain scores are administered additional pain relievers (diclofenac sodium), and the pain scores are measured again by the nursing staff according to the routine clinical pain protocols. In this study, treatment and care of the patients (including medications for pain) continued according to the routine protocols and procedures of the clinic. Pain measurements were not shared with the clinical staff and none of the patients included in the research sample were given drugs due to high level of pain measured in this study.

Statistical analysis

Data were analyzed using SPSS 21.0 (IBM SPSS Inc., USA). In the descriptive statistics, the number (n) and percentage (%) were used in the representation of the discrete values; the mean±standard deviation value was used in the representation of the continuous values. Using Shapiro–Wilk tests, data were screened for normal distribution. In the comparison of age and BMI showing normal distribution ($p>0.05$), independent sample *t*-tests were used. The Mann–Whitney U test was used to compare other means that did not have a normal distribution ($p<0.05$). A chi-squared test was used to compare discrete variables. A *p*-value of <0.05 was considered statistically significant.

Results

The IG and CG patients were similar in terms of characteristics such as age, BMI, gender, educational status, working status, and time of skin incision ($p>0.05$). The mean duration of intubation in the CG was higher than that in the IG (644.32 ± 104.36 min and 551.38 ± 117.42 min, respectively; $p<0.05$). The mean duration of sedation in the IG was 197.77 ± 55.81 min and 252.97 ± 76.66 min in the CG ($p<0.05$). The mean duration of ICU stay was 20.11 ± 3.83 h in the IG and 23.05 ± 5.04 h in the CG ($p<0.05$) (Table 1).

T0 measurements

In both groups, the differences measured at 9:00 a.m. before surgery (T0) in mean SCL, SIL, SGL, STAI-S, and STAI-T scores were not statistically significant ($p>0.05$) (Table 2).

T1 and T2 measurements

In the T1 measurements, the SCL mean was lower in the IG than in the CG (33.28±9.91 and 41.99±14.94, respectively, $p<0.05$). The mean STAI-S score was 37.33±8.82 in the IG and 52.45±7.33 in the CG ($p<0.05$). There were no statistically significant differences between the means of SIL, SGL, and pain scores ($p>0.05$) (Table 3).

In the T2 measurements, SCL was lower in the IG than in the CG (19.84±4.09 and 25.92±9.91, respectively; $p<0.05$) (Graph 1; Table 3). The STAI-S score was 31.66±6.99 in the IG and 41.16±12.01 in the CG ($p<0.05$) (Graph 2; Table 3). The groups were similar in terms of SIL, SGL, and pain scores ($p>0.05$) (Table 3).

Discussion

The main result of this study is that the SCL levels of patients at T1 and T2 were lower in the IG than in the CG ($p<0.05$). Similarly, STAI-S scores, which measure stress and anxiety, were also lower in the IG than in the CG ($p<0.05$). Taken together, the measurement results indicate that in the awakening process after CABG, the presence of IFMs in the ICU helped decrease the SCL of the IG patients. We can say, then, that the presence of IFMs in the ICU during the awakening process effectively decreased patients' surgical and ICU-related stress.

SCL averages were normal at T0 in both groups. In this period (T0), even though patients' anxiety was high, SCL did not increase at the same level. This result could be attributable to physical stress, depending on the surgery. In this study, the SCL of patients in both groups increased at T1 compared to T0. However, this increase was less in the IG than in the CG. In Gallagher and McKinley's study (2007), the highest level of anxiety was found to be in the preoperative period in patients who underwent CABG.[38] In the present study, the anxiety of patients in both groups was similar and high in the preoperative period (T0 measurement). In the ICU process, during which T1 measurement was performed, the anxiety level of the CG was close to the T0 measurement level and high. In the T1 measurement, the anxiety of patients in the IG was lower than that at T0. This suggests that the presence of IFMs helped to reduce anxiety in the IG.

In the preoperative period, anxiety levels in the IG and CG at T0 were high, and the SCL level was in the normal range. This suggested that the high level of anxiety in the preoperative period was not immediately effective in increasing SCL but was delayed. This delayed increase can be explained by the fact that the homeostasis mechanism is activated, which tries to balance the organism. In the ICU process, the mean anxiety (STAI-S) score in the CG at the T1 measurement was close to that of the T0 measurement. Meanwhile, the mean anxiety (STAI-S) score of the IG at the T1 measurement decreased compared to T0. STAI-S scores were similar in the preoperative period (T0 measurement) in both groups, but the SCL level was high. This suggests that physical stress is more dominant in the early ICU process, but the effects of psychological stress may be reflected in the SCL in the period until T1 measurement. SCL might have increased in both groups after surgery because the T1 and T2 measurements both included the period in which physical stress was predominant. This evaluation aligns with previous literature.[33] In the measurements at T1 and T2, anxiety scores decreased in the IG because of the presence of IFMs in the ICU; a similar decrease in SCL was observed as well. In one study examining the relationship between social support and anxiety in patients awaiting CABG, low emotional support was found to be associated with anxiety, and patients' fears and concerns were related to social-support resources.[39]

Although there are few studies stating that some of the effects and behaviors of family members who are allowed to enter intensive care can increase the stress of the patient and health personnel, studies in the last two decades show that the presence of family in intensive care does not increase the stress of patients, family members, and healthcare professionals[31,40] In addition, it has been reported that preoperative psychological interventions targeting the expectations of patients buffer the psychobiological stress responses.[41] In this study, we thought that routine medical treatment and care in the ICU and the presence of IFMs may have buffered psychological stress responses, thus reducing SCL. In addition, we considered that the presence of an IFM has an impact on the lower anxiety and SCL levels of IG patients. This may be due to the fact that IG patients feel socially and emotionally supported. In fact, previous literature also states that the presence of family in intensive care makes the patient feel socially and emotionally supported.[42] Thus, the presence of IFMs in the ICU could help reduce the long-term consequences of SR. Gonzales et al. (2004) reported that meeting with family members in the ICU helped patients feel safe.[43] It has been shown, moreover, that care is increased by providing uninterrupted social support to patients via family members in the ICU.[44,45] It has been shown that the presence of the family in intensive care contributes to the care and recovery of patients, and makes patients feel safe.[29,31,32] In the present study, in parallel with existing literature, patients in the IG might have felt safe as a result of the presence of IFMs at T1 and T2. With the presence of an IFM in the ICU, it may be easier for patients to cope with psychological stress, physiological difficulties, and negative emotions.

Table 1
Comparison of intervention and control group in terms of descriptive characteristics and durations of surgery and anesthesia and skin incision times (N = 73) and informed family members sociodemographic characteristics (N = 36).

Characteristics	Intervention group (n = 36) Mean. ± S.D* (Min-Max)	Control group (n = 37) Mean ± S.D* (Min-Max)	Test p
Age (year)	61.13±8.47 (44–74)	61.21±11.23 (19–78)	t=−0.033 p = 0.974
BMI**	26.56±3.27 (21.15–33.06)	27.60±4.79 (17.72–37.65)	t=−1.078 p = 0.285
Duration of Anesthesia /min	196.66±36.17 (180–300)	201.08±41.75 (150–360)	z=−0.497 p = 0.619
Intubation / min	551.38±117.42 (360–840)	644.32±104.36 (500–900)	z=−3.614/ ***p* = 0.000**
Sedation / min	197.77±55.81 (130–420)	252.97±76.66 (180–480)	z=−4.419/ ***p* = 0.000**
Intensive Care / hour	20.11±3.83 (14–28)	23.05±5.04 (14–34)	z=−2.837/ ***p* = 0.005**
	n(%)	**n(%)**	
Age Groups ≥65 years ≤66 years	23(63.9)	22(59.5)	x^2=0.151
	13(36.1)	15(40.5)	p = 0.697
BMI Groups***			
≥18.5	0(0)	2(5.4)	x^2=3.288
18.5–24.9	9(25.0)	5(13.5)	p = 0.193
<25	27(75.0)	30(81.1)	
Gender			
Female	9 (25.0)	8 (21.6)	x^2=0.117
Male	27 (75.0)	29 (78.4)	p = 0.733
Educational Status			
illiterate	12 (33.3)	4 (10.8)	x^2=5.743
literate	3 (8.3)	3 (8.1)	p = 0.125
Primary/Secondary School	19 (52.8)	26 (70.3)	
Bachelor and above	2 (5.6)	4 (10.8)	
Working Status			
Active	12(33.3)	15(40.5)	x^2=0.409
Retired	14(38.9)	13(35.1)	p = 0.815
Housewife/Not working	10(27.8)	9(24.3)	
Starting Time of Skin Incision			
8^{o0}- 10^{o0} (After Morning)	24(66.7)	27(73.0)	x^2=0.345
10^{o1}–12^{o0}(After Morning)	12(33.3)	10(27.0)	p = 0.557
	Informed Family Members *N* = 36		
	Mean. ± S.D*(Min-Max)		
IFM Age (year)	39.97±11.35(21–60)		
	n(%)		
IFM Age Groups			
21–40	21(58.3)		
41–60	15(41.7)		
IFM Gender			
Female	20(55.6)		
Male	16(44.4)		
IFM Educational Status			
literate	5(13.8)		
Primary/Secondary School	20(55.6)		
Bachelor and above	11(30.6)		
IFM Working Status			
Active	19(52.8)		
Housewife/Not working /Retired	17(47.2)		
IFM Relative relationship			
Patient's child	22(61.1)		
Patient's wife or husband	9(25)		
Distant relative (Cousin)	3(8.3)		
Patient's sibling	2(5.6)		

t: independent samplest test, z=Mann-Whitney U test, $x^{2=}$ Chi-square test, *Mean±SD: Mean ± Standard Deviation, **BMI: Body Mass Index, ***BMI Groups: categorization BMI was made according to WHO (http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi) IFM: Informed Family Members.

In the ICU, patients tend to see themselves as passive participants in complex medical processes. A study by Gallagher and McKinley (2007) was reported that patients perceived informed consent forms as a legal procedure as an obligation to continue treatment rather than as information.[38] Davidson et al. found that healthcare professionals making joint decisions with family members were found to reduce the stress of patients and families and help them cope with the situation.[46] In addition, AACN (2012) suggested that it could be useful to have the continuous presence of a person (family member or friend) determined by the patient who helps make

Table 2
Comparison of T0 measurements of intervention and control group (N = 73).

Measurements	Intervention group (n = 36) Mean±SD*	Control group (n = 37) Mean±SD*	Test / p
Serum Cortisol Level μg / dl	13.04±4.47	12.22±5.93	t = 0.666 /p = 0.507
Serum Insulin Level UI / ml	36.85±20.01	38.54±32.96	z=−0.739/p = 0.460
Serum Glucose Level mg / dl	97.92±5.43	100.70±11.06	z=−1.135 p = 0.256
State Anxiety (STAI-S)	51.61±5.46	49.54±8.31	z=−1.827/p = 0.068
Trait Anxiety (STAI-T)	42.75±6.89	41.43±6.81	z=−1440 /p = 0,150

t = independent samples t-test, z = Mann-Whitney U test, * Mean ± SD: Mean ± Standard Deviation.

Table 3
Comparison of T1 and T2 measurements of intervention and control groups ($N = 73$).

Measurements	Intervention group ($n = 36$) Mean±SD*	Control group ($n = 37$) Mean±SD*	Test/p
Serum Cortisol Level μg/dl			
T1	33.28±9.91	41.99±14.94	t= −2.764/**p = 0.006**
T2	19.84±4.09	25.92±9.91	t =−3.012/**p = 0.003**
Serum Insulin Level UI/ml			
T1	15.60±12.65	10.79±6.11	z=−1.407/p = 0.159
T2	20.90±12.21	21.80±14.98	z=−0.607/p = 0.544
Serum Glucose Level mg/dl			
T1	230.63±61.51	245.78±80.61	z=−0.607/p = 0.544
T2	124.11±29.18	130.21±32.53	z=−1.612/p = 0.107
Pain (Visual Analog Scale)			
T1	4.19±1.30	4.48±1.23	z=−0.945/p = 0.344
T2	2.38±0.72	2.62±0.72	z=−1.149/p = 0.251
State Anxiety (STAI-S)			
T1	37.33±8.82	52.45±7.33	z=−7.971/**p = 0.000**
T2	31.66±6.99	41.16±12.01	z=−4.111/**p = 0.000**

z: Mann−Whitney U test, t: independent samples t-test, * Mean ± SD: Mean ± Standard Deviation.

decisions about the patient, takes over the patient's autonomy, and also acts as a legal representative, if necessary.[30] In the present study, in alignment with the literature, the presence of IFMs during the awakening process may have enabled patients to feel physically safe and to maintain autonomy. This feeling of relief may have been effective in reducing patients' stress.

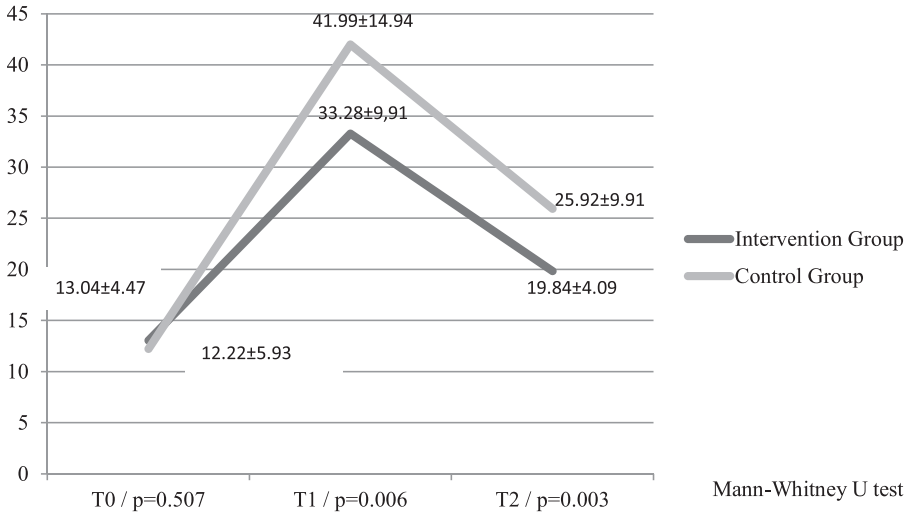
This study found that SIL decreased in both groups at T1 and T2 measurements. Similarly, in both groups, SGL increased at T1 and T2. The decrease in SIL in the IG was more pronounced than that in the CG. Similarly, SGL was less in the IG than in the CG ($p>0.05$). Surgery causes a pronounced transient decrease in insulin sensitivity. Disruption of insulin sensitivity is an indicator of SR. An increase in SCL caused by surgery incision leads to glycogenolysis, gluconeogenesis, and protein degradation in the liver. High SCL results in insulin resistance, which prevents cells from using glucose and increases SGL. Decreased insulin production, insulin resistance, and increased SGL are directly related to the severity of SR.[47] Although this study's findings are consistent with the literature, there was no statistically significant difference between the groups in terms of SIL and SGL means ($p>$ 0.05). Thus, there is a need for more extensive research with larger samples.

Anxiety increases pain perception and analgesic need and can lead to hypertension and rhythm disorders.[21] Plotek et al. reported that high levels of preoperative anxiety may affect postoperative pain intensity as well as cognitive dysfunction, which may prolong hospitalization.[48] In the current study, although STAI-S scores decreased more in the IG than in the CG at T1 and T2, the groups were similar in terms of pain scores. Since the research was performed during the early period of CABG, we can say that the drugs used for sedation affected the patients' pain perceptions. Pulmonary complications in patients undergoing CABG are the most important cause of mortality and morbidity.[49] In Roncada et al.'s study, it was determined that SCL increase in patients undergoing CABG caused a decrease in pulmonary functions.[17] These situations can increase the duration of intubation, sedation, and ICU stay.

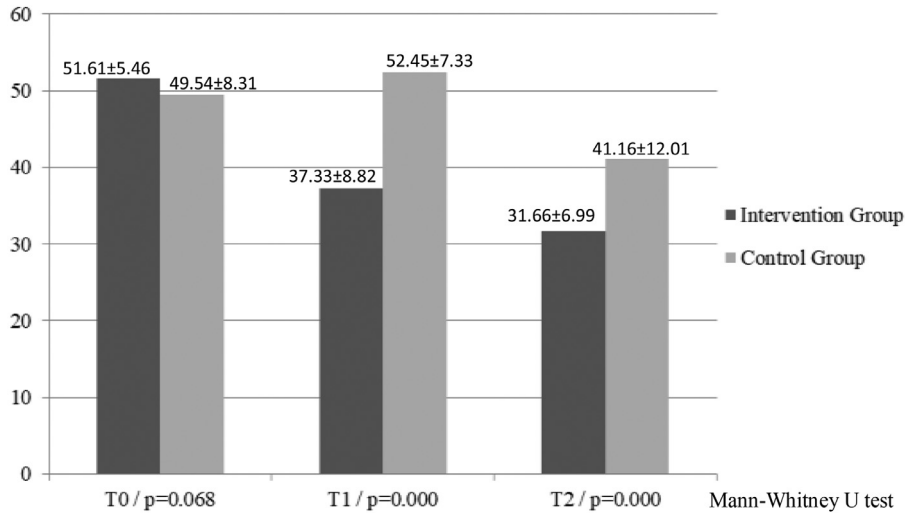
The shortened durations of sedation and intubation found among the IG patients could decrease the duration of ICU stay by approximately three hours. In Sato et al.'s study, the mean duration of intubation after cardiac surgery was 7.8 h, and the mean duration of ICU stay was 20 h; an increase in SR can increase these times.[50] Plotek et al. reported that flexible patient visits shortened the duration of ICU stay.[48] Considering the present study's findings along with those of prior studies, we can suggest that the presence of IFMs in the ICU during the awakening process of patients undergoing CABG can effectively shorten the duration of sedation, intubation, and ICU stay by reducing the need for sedative medication.

Conclusions

In conclusion, the presence of IFMs was found to be effective for decreasing SCL, state anxiety, sedative drug requirements, and the



Graph 1. Comparison of serum cortisol levels determined by T0 (9:00 a.m., one day before surgery), T1 (surgery day, six hours after extubation), T2 (9:00 a.m., one day after surgery) measurements of the Intervention and Control Group $N = 73$.



Graph 2. Comparison of STAI-S scores in T0 (9:00 a.m., one day before surgery), T1 (surgery day, six hours after extubation), T2 (9:00 a.m., one day after surgery) measurements of the Intervention and Control Group ($N = 73$).

duration of intubation, sedation, and ICU stay after CABG. The results of this study suggest that in the awakening process after CABG, in addition to routine treatment and care, the presence of IFMs increases patients' perceptions of safety and can hasten their recovery by decreasing anxiety and SR.

Limitations

Environmental stress factors such as noise, lights, bad odors, and the presence of other patients in the ICU environment could not be standardized. The fact that the study was conducted without randomization is a limitation, but randomization was not found to be appropriate in terms of ethics. Nevertheless, since this is the first study to examine the effects of the presence of IFMs in the ICU on stress response, its findings are unique.

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Declaration of Competing Interest

In this study, there is no conflict of interest between the authors.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.hrtlng.2020.11.006.

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