

# Comparison of Postoperative Anxiety, Depression, Somatization, and Somatosensory Perception Levels of Patients After Off-Pump and On-Pump Coronary Artery Bypass Graft Surgery

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## ABSTRACT

**Introduction:** This study investigated the effect of coronary artery bypass grafting surgery performed using either the on-pump or off-pump technique on the levels of postoperative anxiety, depression, somatization, and somatosensory amplification in patients.

**Methods:** There were 100 participants in this cross-sectional study who completed the "Sociodemographic Data Form", the "Hospital Anxiety and Depression Scale", the "Somatization Scale (SS)", and the "Somatosensory Amplification Scale".

**Results:** Compared with the off-pump group, the on-pump group had a higher mean SS score.

**Conclusion:** Because the mean SS score was lower in patients after off-pump surgery, it may be more advantageous to perform off-pump surgeries in the future. Before the superiority of the off-pump over the on-pump can be definitively established, however, data from large, randomized trials are required.

**Keywords:** Coronary artery bypass graft surgery, off-pump, on-pump, CABG, depression, anxiety, somatization

## Introduction

Even with advances for treating cardiovascular diseases, these diseases continue to be the leading cause of death worldwide (1). For treating coronary artery disease (CAD), the most commonly used method is coronary artery bypass grafting (CABG). In most health centers, cardiac surgery is performed with very low mortality due to rapid technological advancements, knowledge, and experience (2). Essentially, CABG provides continuity of circulation by creating an alternative route between the proximal and distal parts of the occluded coronary artery. The use of this procedure reduces mortality in patients with extensive CAD (3).

There are two main ways of performing CABG: CABG with the use of a cardiopulmonary bypass machine (CPBM) (on-pump) and CABG without the use of a CPBM (off-pump). The surgeon begins both methods by preparing blood vessels from the leg, chest, or arm to be used as grafts for the revascularization procedure. With on-pump CABG surgery, blood flow to the body is provided via CPBM, which allows for blood revascularization

in a bloodless and stable state. The following revascularization, the heart is restarted once the body is removed from the CPBM (4,5). On the other hand, on-pump CABG is associated with an inflammatory response of the whole body, leading to postoperative complications such as systemic inflammatory response syndrome (6), neurocognitive dysfunction, renal failure, myocardial depression, and bleeding (3,7,8).

During off-pump CABG, the heart is left unconnected to the CPBM while performing systole and diastole as usual. Studies have demonstrated definite benefits in patients with extensive atherosclerotic disease of the aorta, renal insufficiency, or prior cerebrovascular disease, as well as providing a less invasive approach to surgical revascularization of the heart (3,9). While there is disagreement regarding the long-term efficacy of off-pump CABG, studies indicate that it reduces operative duration as well as the length of hospitalization in intensive care units (ICUs), blood transfusion rates, and early morbidity (10).



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As a dominant and persistent mood disorder, depression is experienced internally and negatively affects one's behavior and perception of the world. Anxiety is characterized by a persistent, unpleasant, and vague sense of negativity. Everyone is susceptible to this condition, which is often accompanied by autonomic symptoms. Symptoms of anxiety can vary and differ from person to person (11).

Somatization disorder is a psychiatric condition characterized by unexplained physical or somatic symptoms. Rather than a well-defined diagnostic class or disorder, somatization refers to a comprehensive clinical assessment. Thus, patients with somatization represent a very heterogeneous group. In addition to the length and severity of somatization, the extent and severity of the mood component, as well as the ability of individuals to recognize and describe their emotions, vary greatly between individuals (12,13). In general, somatization refers to the manifestation of emotions through the body rather than verbal expression (14). The concept of somatosensory amplification refers to the tendency to perceive ordinary somatic sensations as severe, intense, disturbing, and harmful (15). In people with somatic complaints, the tendency to amplify somatic sensations is prominent (16).

Cardiovascular diseases continue to be one of the leading causes of mortality and morbidity worldwide. Although there are various methods of treating this disease, including lifestyle changes and medical treatments, surgical methods play a crucial role as a last resort. Similar to other surgical procedures, cardiovascular surgery may result in a number of complications. The CABG procedure causes significant metabolic, physical, and psychological stress in patients (17,18). A high level of anxiety has also been reported to be associated with a high level of postoperative pain in patients undergoing CABG surgery (19). Additionally, patients with high levels of postoperative anxiety have poorer long-term psychological outcomes (17,18).

Although there are studies that examine anxiety, depression, somatization, and somatosensory amplification in patients undergoing CABG, the number of studies that compare these parameters based on the technique used in surgery (on-pump, off-pump) is quite limited. Accordingly, the purpose of this study was to investigate the effects of CABG surgery performed using on-pump or off-pump techniques on postoperative anxiety, depression, somatization, and somatosensory amplification levels in patients.

## Methods

### Design and Participants

The population of this cross-sectional study consisted of 140 patients who underwent CABG surgery with an on-pump or off-pump technique in the cardiovascular surgery clinic of a hospital in the eastern region of Turkey between December 2021 and February 2023.

A total of 100 patients were included in the study who were willing to participate between the specified dates, had no communication difficulties, had no history of cerebrovascular events, and had no mental illness diagnosis, and planned to undergo CABG with either an on-pump or an off-pump technique. Fifty of these patients underwent CABG surgery using the On-Pump technique, and the remaining 50 underwent CABG surgery using the off-pump technique.

### Data Collection

The Sociodemographic Data Form, Hospital Anxiety and Depression Scale (HADS), Somatization Scale (SS), and Somatosensory Amplification Scale (SSAS) were administered to the patients after their verbal/written consent was obtained. During the preoperative period, patients were asked to complete a "Sociodemographic Data Form." A face-to-face interview was performed in approximately 15-20 minutes to collect "HADS", "SS" and "SSAS" data at the 1<sup>st</sup> month postoperatively.

### Data Collection Tools

**Sociodemographic Data Form:** The information form, which was prepared by the researchers in line with the literature, consisted of questions about the descriptive characteristics of the patients.

**Hospital Anxiety and Depression Scale:** This self-assessment tool was designed to assess the risk of anxiety and depression in patients with physical diseases, as well as those applying for primary health care services, and to measure the level and change in severity of symptoms (20). It was adapted into Turkish by Aydemir (20), and a validity and reliability study was conducted. The scale had subscales for anxiety and depression. A Cronbach's alpha value of 0.85 was found for the anxiety subscale, and 0.77 was found for the depression subscale. The item total score correlation coefficients ranged between 0.81 and 0.85 for the anxiety subscale and 0.73 to 0.77 for the depression subscale. The two-half reliability was found to be  $r=0.85$  for the anxiety subscale and 0.80 for the depression subscale (20). In this study, the Cronbach's alpha value of the scale was found to be 0.86.

**Somatization Scale:** The SS was created from the items related to Somatization Disorder of the Minnesota Multiphasic Personality Inventory created by Hathaway and McKinley (21). The scale included 33 questions that could be answered as true or false. Participants received 1 point for each "true" answer and 0 point for each "false" answer when responding to positively scored questions. The participants scored 0 when they left the question blank. The items numbered 2, 3, 8, 9, 12, 13, 14, 14, 15, 16, 17, 18, 24, 25, 28, 29, 30, and 31 in the scale were scored reversely. The total score obtained from the scale was ranging from 0 to 33. Because of the validity and reliability study of the scale conducted by Dülgerler (22), Cronbach's alpha value was found to be 0.83. In this study, the Cronbach's alpha value of the scale was found to be 0.84. This value indicates that the scale is highly reliable.

**Somatosensory Amplification Scale:** Barsky and Wyslak (23) developed a scale to measure the mechanisms used by individuals during somatization. As part of the dependent validity test, participants were asked to evaluate 10 different somatosensory expressions, most of which did not reflect disease or problems under normal conditions, on a scale between "1- Not at all true" and "5-Extremely true". Because of summing the scores obtained from the items, the amplification score was calculated, which provided information regarding the tendency of individuals toward somatization. A test-retest reliability of the original version of the scale, which was validated for Turkish validity and reliability by Güleç et al. (24), was reported to be 0.73, and Cronbach's alpha was 0.76 in the patient group. Based on the results of this study, the Cronbach's alpha value for the scale was 0.74.

## Data Collection Process

### Ethical Aspects of the Study

A clinical research ethics committee approval from the Clinical Research Ethics Committee of the Erzincan Binali Yıldırım University Clinical Research Ethics Committee where the study was conducted as well as institutional permission from the relevant hospital were obtained in order to conduct this study in accordance with ethical principles (approval number: 15/06, date: 21.02.2022). The participants who volunteered to participate in the study were informed about the study and informed consent was obtained from them. Informed patients were assured that their personal information would remain confidential.

### Statistical Analysis

The data was analyzed using IBM SPSS Statistics 21 (IBM Corporation, Armonk, New York, USA). The descriptive statistics used were frequency, percentage, median (interquartile range), mean, and standard deviation. To evaluate the conformity of the numerical data to a normal distribution, Skewness-Kurtosis (+3 and -3) was applied. Student's t-tests were used to compare numerical variables with normal distribution, and Mann-Whitney U tests were used to compare variables comparing two independent groups that did not fit the normal distribution. The categorical variables were compared using the chi-square test. The variables affecting the numerical data were determined using comparative correlation analyses (Pearson, Spearman). Cronbach's alpha coefficient was calculated for reliability analysis of the scales. At a confidence interval of 95%, the results were interpreted at a level of significance of  $p < 0.05$ .

## Results

The distribution of patients according to their descriptive characteristics is presented in Table 1. The on-pump group consisted of 52% female patients with a mean age of  $60.77 \pm 10.87$  years and a body mass index (BMI) of  $29.45 \pm 5.52$  kg/m<sup>2</sup>. In the same group, 48% were male patients with an average age of  $57.21 \pm 12.01$  years and a BMI of  $30.97 \pm 3.58$  kg/m<sup>2</sup>. In the off-pump group, 44% were female patients with an average age of  $67.59 \pm 7.04$  years and a BMI of  $29.05 \pm 5.73$  kg/m<sup>2</sup>, and 56% were male patients with an average age of  $66.64 \pm 8.35$  years and a BMI of  $28.36 \pm 2.39$  kg/m<sup>2</sup>.

In the on-pump group, 66% lived in the city, 70% were married, 30% were university graduates, 72% had a moderate economic status, 46% smoked and 14% used alcohol, 38% were retired, 58% had a known chronic disease, 58% had a family history of psychiatric disease, and 44% had two coronary artery revascularizations. In the off-pump group, 68%

lived in the city, 76% were married, 26% were primary school graduates, 68% had a medium economic status, 46% smoked, 22% used alcohol, 50% were retired, 76% had a known chronic disease, 68% had a diagnosis of psychiatric disease in their family history, and 38% had two coronary artery revascularizations.

The mean scores of HADS-Anx, HADS-Dep, SS, and SSAS after CABG are presented in Table 2. Therefore, the mean scores of HADS-Anx, HADS-Dep, and SSAS did not differ between the groups; however, the mean score of SS was statistically significantly higher in the on-pump patient group ( $p = 0.02$ ).

After the off-pump operation, the mean scores of HADS-Anx, SS, and SSAS were significantly higher in females than in males ( $p = 0.00$ ,  $p = 0.04$ ,  $p = 0.00$ , respectively). The mean SS scale scores of non-smokers were significantly higher than those of smokers ( $p = 0.00$ ). The mean scores of those with a diagnosed chronic disease were significantly higher than those without a diagnosed chronic disease ( $p = 0.01$ ).

After the on-pump operation, it was observed that females had significantly higher mean scores on the SSAS than males ( $p = 0.01$ ). The mean SSAS scores of non-smokers were significantly higher than those of smokers ( $p = 0.00$ ).

When compared in terms of gender, the mean scores of HADS-Anx, HADS-Dep, and SSAS were significantly higher in females ( $p = 0.00$ ,  $p = 0.03$ ,  $p = 0.00$ , respectively). The mean scores of HADS-Anx and SS were significantly higher in non-alcohol users ( $p = 0.022$ ,  $p = 0.003$ , respectively). Similarly, the mean SSAS scores were significantly higher in non-smokers ( $p = 0.001$ ).

**Table 1. Comparison of sociodemographic characteristics of the on-pump and off-pump groups**

	On-pump (n=50)		Off-pump (n=50)	
	Number (n)	%	Number (n)	%
Female	26	52	22	44
Male	24	48	28	56
	<b>Age</b>		<b>Age</b>	
	Avg. $\pm$ SS		Avg. $\pm$ SS	
Female	60.77 $\pm$ 10.87		67.59 $\pm$ 7.04	
Male	57.21 $\pm$ 12.01		66.64 $\pm$ 8.35	
	<b>BMI</b>		<b>BMI</b>	
	Avg. $\pm$ SS		Avg. $\pm$ SS	
Female	29.45 $\pm$ 5.52		29.05 $\pm$ 5.73	
Male	30.97 $\pm$ 3.58		28.36 $\pm$ 2.39	

SS: Somatization Scale, BMI: Body mass index, Avg.: Average

**Table 2. Comparison of the mean scores of HADS-Anx, HADS-Dep, SS, and SSAS between the on-pump and off-pump groups**

	HADS-Anx Avg. $\pm$ SS	HADS-Dep Avg. $\pm$ SS	SS Avg. $\pm$ SS	SSAS Avg. $\pm$ SS
Off-pump	10.14 $\pm$ 3.79	8.64 $\pm$ 3.49	<b>32.86<math>\pm</math>2.52</b>	31.34 $\pm$ 8.31
On-pump	10.90 $\pm$ 4.93	9.74 $\pm$ 5.02	<b>34.04<math>\pm</math>2.57</b>	28.78 $\pm$ 8.82
p	0.39	0.20	<b>0.02</b>	0.13

HADS: Hospital Anxiety and Depression Scale, SS: Somatization Scale, SSAS: Somatosensory Amplification, Avg.: Average.

**Table 2. Continued**

	Off-pump				On-pump			
	HADS-Anx	HADS-Dep	SS	SSAS	HADS-Anx	HADS-Dep	SS	SSAS
<b>Gender</b>								
Female	<b>11.73±3.62</b>	9.45±3.00	<b>33.68±2.37</b>	<b>34.95±6.47</b>	11.81±3.69	10.73±4.32	34.00±2.53	<b>31.73±8.08</b>
Male	<b>8.89±3.48</b>	8.00±3.77	<b>32.21±2.48</b>	<b>28.50±8.59</b>	9.92±5.91	8.67±5.58	34.08±2.68	<b>25.58±8.61</b>
p	<b>0.00</b>	0.14	<b>0.04</b>	<b>0.00</b>	0.18	0.14	0.91	<b>0.01</b>
<b>Smoking</b>								
Yes	10.26±4.37	8.91±3.80	<b>31.87±2.07</b>	29.61±8.83	10.48±4.98	9.65±4.87	34.52±2.53	<b>24.57±7.21</b>
No	10.04±3.29	8.41±3.27	<b>33.70±2.59</b>	32.81±7.69	11.26±4.95	9.81±5.24	33.63±2.58	<b>32.37±8.57</b>
p	0.83	0.61	<b>0.00</b>	0.17	0.58	0.91	0.22	<b>0.00</b>
<b>Diagnosed as a chronic disease</b>								
Yes	10.47±3.84	8.97±3.02	<b>33.37±2.36</b>	<b>31.89±8.64</b>	12.00±4.87	10.76±5.13	33.62±2.61	30.41±9.01
No	9.08±3.57	7.58±4.69	<b>31.25±2.41</b>	<b>29.58±7.20</b>	9.38±4.70	8.33±4.63	34.62±2.47	26.52±8.22
p	0.27	0.35	<b>0.01</b>	<b>0.01</b>	0.06	0.09	0.17	0.12
<b>Alcohol use</b>								
Yes	8.82±3.15	7.36±3.64	<b>30.45±1.63</b>	32.18±5.58	7.71±4.88	7.57±4.57	34.00±2.58	<b>21.86±8.49</b>
No	7.36±3.64	9.00±3.41	<b>33.54±2.31</b>	31.10±8.97	11.42±4.79	10.09±5.05	34.05±2.60	<b>29.91±8.43</b>
p	0.19	0.17	<b>0.00</b>	0.70	0.06	0.22	0.96	<b>0.02</b>

HADS: Hospital Anxiety and Depression Scale, SS: Somatization Scale, SSAS: Somatosensory Amplification Scale

**Table 3. Comparison of the mean scores of HADS-Anx, HADS-Dep, SS, and SSAS according to age**

	HADS-Anx	HADS-Dep	SS	SSAS
Age	R :0.084 P: 0.406	R: -0.036 P: 0.719	<b>R: -0.133</b> <b>P: 0.018</b>	<b>R: 0.268</b> <b>P: 0.007</b>
HADS-Anx	*	<b>R: 0.742</b> <b>P: 0.00</b>	R: 0.097 P: 0.339	<b>R: 0.380</b> <b>P: 0.00</b>
HADS-Dep	<b>R: 0.742</b> <b>P: 0.00</b>	*	R: 0.115 P: 0.253	<b>R: 0.282</b> <b>P: 0.004</b>
SS	R: 0.097 P: 0.339	R: 0.115 P: 0.253	*	R: -0.056 P: 0.580
SSAS	<b>R: 0.380</b> <b>P: 0.00</b>	<b>R: 0.282</b> <b>P: 0.004</b>	R: -0.056 P: 0.580	*

HADS: Hospital Anxiety and Depression Scale, SS: Somatization Scale, SSAS: Somatosensory Amplification Scale

According to Table 3, there was a significant correlation between the patient’s age and the mean scores on the HADS-Anx, HADS-Dep, SS, and SSAS. The correlation between age and SS was negative, whereas the correlation between age and SSAS was positive. HADS-Anx was positively correlated with HADS-Dep and SSAS. The correlation between HADS-Dep and SSAS was positive.

A comparison of off-pump and on-pump in terms of gender is presented in Table 4. As a result, there was no difference between the off-pump and on-pump in females in this context. In terms of males, the mean SS score was significantly higher in the on-pump group.

### Discussion

According to our knowledge, this is the first study to investigate the effects of CABG surgery performed using two different techniques, on-pump and off-pump, on patients’ anxiety, depression, somatization, and somatosensory perception.

It is no longer sufficient to consider surgery the only safe or effective method for treating cardiovascular disease because of technological advancements in this field. The length of hospital stay, level of pain, speed of recovery after surgery, and severity of postoperative complications are also critical factors for both patients and their relatives.

Although CABG surgery significantly reduces mortality rates, it remains a significant life event with significant psycho-emotional implications (25,26). Furthermore, CABG is one of the surgical interventions most associated with postoperative depression and anxiety, in addition to spinal surgery, cholecystectomy, and hysterectomy (27).

In the study, although there was no significant difference in terms of the technique used, it was observed that the patients experienced moderate anxiety and depression in the postoperative period. CABG is a traumatic procedure, and patients’ depression and anxiety levels increase in the postoperative period. Although there is a relationship between CABG and depression, its onset is not clear (28,29). Patients feel anxious and

**Table 4. Comparison of mean scores of HADS-Anx, HADS-Dep, SS, and SSAS according to gender**

Gender	Female		Male	
	Off-pump	On-pump	Off-pump	On-pump
HADS-Anx	11.73±3.62	11.81±3.69	8.89±3.48	9.92±5.91
	p=0.94		p=0.44	
HADS-Dep	9.45±3.00	10.73±4.32	8.00±3.77	8.67±5.58
	p=0.23		p=0.61	
SS	33.68±2.37	34.00±2.53	<b>32.21±2.48</b>	<b>34.08±2.68</b>
	p=0.65		p=0.01	
SSAS	34.95±6.47	31.73±8.08	28.50±8.59	25.58±8.62
	p=0.13		p=0.22	

HADS: Hospital Anxiety and Depression Scale, SS: Somatization Scale, SSAS: Somatosensory Amplification Scale

depressed in the postoperative period because they are isolated from their families, friends, and work life and face a series of problems such as pain, sleep disorders, loss of status, sexual and social ability, inability to adapt to treatment, and fear of death (27-29). The results of our study indicate that patients undergoing CABG surgery today experience mood disorders at a significant level. The vital importance of the heart as well as the patient's fear of death because the individual's heart will be operated upon increases the risk of postoperative depression and anxiety (30,31). Therefore, it is essential for patients undergoing CABG surgery to receive psychological support before and after surgery.

According to our study, there was no significant difference in anxiety or depression between male and female patients treated with on-pump or off-pump techniques. The issue of gender has remained controversial in the CABG literature. Although female gender seemed to be a risk factor for postoperative depression, it was observed in a systematic review by McKenzie et al. (32) examining postoperative depression and anxiety in individuals undergoing CABG surgery found no significant difference between males and females in terms of depression. Furthermore, in the same study, it was found that gender was not a determining factor in postoperative anxiety (32). A subsequent study conducted by Vaccarino et al. (33) reported that females had a more difficult recovery after CABG than males. In comparison to male patients, female patients experienced more complications and depressive symptoms and were almost twice as likely to be readmitted to the hospital (33,34). Because of the different social roles between males and females and the fact that females had greater domestic responsibilities and expectations, it is possible to suggest that females had more fatigue, insomnia, and depressive symptoms (33).

Although some theories have been proposed, the evidence regarding the effects of gender on postoperative anxiety and depression remains unclear (32,33,35). Different characteristics of the sample groups included in the studies may explain this difference.

Comparing the mean SSAS scores between the groups did not reveal any significant differences in this study. Although CABG surgery is intended to alleviate or eliminate some symptoms associated with CAD, complications may occur in the postoperative period (36,37). Accordingly, patients with these complications were more sensitive to their somatosensory perceptions and tended to amplify them (38,39).

In comparison with the off-pump group, the on-pump group scored higher on the SS. Several studies have highlighted the advantages of off-pump surgery in terms of reducing renal damage, respiratory complications, perioperative bleeding, postoperative ventilation time, ICU stay, and mortality (40-43). Patients may have developed somatization disorders because of these negative outcomes following an on-pump procedure.

The correlation between HADS-Anx, HADS-Dep, and SSAS was positive. The most common somatic symptoms of depression include pain, weakness, fatigue, dizziness, shortness of breath, palpitations, weight loss, and others involving almost every organ system (13,44). In the same way as with depression, somatization is clearly related to anxiety disorders (45). The prevalence of somatic symptoms is higher among patients with anxiety disorders than among healthy individuals. Shortness of breath, chest pain, dizziness, palpitations, and sweating are examples of somatic symptoms associated with anxiety (13,45,46). Those who suffer from depression or high anxiety tend to catastrophize their somatic symptoms and attribute them to serious physical disorders. Therefore, by increasing their interest in and attention to the body, they can amplify and externalize their pre-existing fears and anxieties. Previous studies support our findings (38).

When the age of the patients was compared to the mean scores of HADS-Anx, HADS-Dep, SS, and SSAS, it was noted that there was a negative correlation between age and SS and a positive correlation between age and SSAS. This study concluded that age had no significant effect on postoperative depression and anxiety in patients. However, different findings were found when the literature was reviewed. Based on the findings of Koivula et al. (47) and Redeker (48), young patients experienced higher levels of anxiety during the postoperative period due to concerns about their ability to return to their preoperative independence (47,48). It was determined in a study conducted by McCrone et al. (30) that participants aged 70 years experienced lower levels of depression and anxiety than participants aged 60 to 70 years. Considering the differences in age classifications among the studies, these findings were not surprising.

The level of somatic symptoms in the postoperative period decreased with increasing age in this study. This result may be attributed to the



individual's gradual adjustment to the disease and changes in life associated with aging. There was also an increase in the amplification of somatic symptoms with age (49). The findings of this study support the recommendation for psychosocial support for CABG patients both during the disease and before surgery to facilitate their recovery following surgery.

### Study Limitations

There were some limitations to this study. Most importantly, there was a limited number of patients. The use of self-report scales for determining anxiety, depression, and somatization, as well as the absence of a structured clinical interview, were also limitations of this study.

Another limitation of the study was that participants were not interviewed for an extended period following surgery. Our findings were limited by these limitations, which prevented them from being generalized. There is a need for further studies to be conducted in large sample groups with a much larger number of participants.

### Conclusion

CABG surgery is an anxiety-provoking procedure for patients. The low score on the SS scale in this study, especially among patients who underwent off-pump surgery, i.e., surgery without stopping the heart, suggests that future CABG surgeries may benefit from off-pump surgery. However, large, randomized trials are necessary before definitive conclusions can be drawn regarding the superiority of off-pump treatment over on-pump treatment.

In this study, the off-pump CABG group experienced fewer postoperative somatic reactions than the on-pump group. Multiple evaluations at different time points (1, 3, 6, and 12-months) may be recommended in studies with larger sample sizes to confirm this finding.

From the moment CABG is determined as a treatment option, it is essential that patients receive training and counseling to support their mental health throughout their hospital stay, postoperative period, and after discharge, as well as assistance from mental health professionals.

**Ethics Committee Approval:** The study was approved by the Erzincan Binali Yıldırım University Clinical Research Ethics Committee (approval number: 15/06, date: 21.02.2022).

**Informed Consent:** The participants who volunteered to participate in the study were informed about the study and informed consent was obtained from them.

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### References

- Malakar AK, Choudhury D, Halder B, Paul P, Uddin A, Chakraborty S. A review on coronary artery disease, its risk factors, and therapeutics. *J Cell Physiol.* 2019; 234: 16812-23.
- Sheikhy A, Fallahzadeh A, Sadeghian S, Forouzannia K, Bagheri J, Salehi-Omran A, et al. Mid-term outcomes of off-pump versus on-pump coronary artery bypass graft surgery; statistical challenges in comparison. *BMC Cardiovasc Disord* 2021; 21: 412.
- Lamy A, Devereaux PJ, Prabhakaran D, Taggart DP, Hu S, Paolasso E, et al. Effects of off-pump and on-pump coronary-artery bypass grafting at 1 year. *N Engl J Med* 2013; 368: 1179-88.
- Khan MS, Islam MY, Ahmed MU, Bawany FI, Khan A, Arshad MH. On pump coronary artery bypass graft surgery versus off pump coronary artery bypass graft surgery: a review. *Glob J Health Sci* 2014; 6: 186-93.
- Shekar PS. Cardiology patient page. On-pump and off-pump coronary artery bypass grafting. *Circulation* 2006; 113: e51-2.
- Wan S, LeClerc JL, Vincent JL. Inflammatory response to cardiopulmonary bypass: mechanisms involved and possible therapeutic strategies. *Chest* 1997; 112: 676-92.
- Knipp SC, Matatko N, Wilhelm H, Schlamann M, Massoudy P, Forsting M, et al. Evaluation of brain injury after coronary artery bypass grafting. A prospective study using neuropsychological assessment and diffusion-weighted magnetic resonance imaging. *Eur J Cardiothorac Surg* 2004; 25: 791-800.
- Maitra G, Ahmed A, Rudra A, Wankhede R, Sengupta S, Das T. Renal dysfunction after off-pump coronary artery bypass surgery- risk factors and preventive strategies. *Indian J Anaesth* 2009; 53: 401-7.
- Sahdev N, Hamid O, Kyriazis PG, Punjabi PP. Off Pump Coronary Artery Bypass Grafting. In: Punjabi, PP, Kyriazis PG, (eds) *Essentials of Operative Cardiac Surgery*. Springer, Cham; 2022.
- Ishida M, Kobayashi J, Tagusari O, Bando K, Niwaya K, Nakajima H, et al. Comparison of off-pump and on-pump coronary artery bypass grafting in midterm results. *Jpn J Thorac Cardiovasc Surg* 2004; 52: 240-6.
- Karamustafaloğlu O, Yumrukçal H. Depression and anxiety disorders. *The Medical Bulletin of Sisli Etfal Hospital* 2011; 2: 64-74.
- Kesebir S. Depresyon ve somatizasyon. *J Clin Psy* 2004; 7: 14-9.
- Lipowski ZJ. Somatization and depression. *Psychosomatics* 1990; 31: 13-21.
- Spinhoven P, van der Does AJ. Somatization and somatosensory amplification in psychiatric outpatients: an explorative study. *Compr Psychiatry* 1997; 38: 93-7.
- Barsky AJ, Goodson JD, Lane RS, Cleary PD. The amplification of somatic symptoms. *Psychosom Med* 1988; 50: 510-9.
- Yager J, Gitlin MJ. Clinical Manifestations of Psychiatric Disorders. Kaplan, Sadock's *Comprehensive Textbook of Prospective Psychiatry*. In: Sadock BJ, Sadock VA, (eds). Edition 7th. Baltimore: Lippincott Williams & Wilkins, 2000: p. 818.
- Doğrusöz P, Öztürk Ş. The Effect of Music on Anxiety and Pain Level in Patients Who Had Coronary Artery Bypass Graft Surgery. *FBU-JOHS* 2023; 3: 78-91 (Turkish).
- Gallagher R, McKinley S. Stressors and anxiety in patients undergoing coronary artery bypass surgery. *Am J Crit Care* 2007; 16: 248-57.
- Nelson FV, Zimmerman L, Barnason S, Nieveen J, Schmaderer M. The relationship and influence of anxiety on postoperative pain in the coronary artery bypass graft patient. *J Pain Symptom Manage* 1998; 15: 102-9.

20. Aydemir Ö. Reliability and Validity of the Turkish version of Hospital Anxiety and Depression Scale. *Turkish Journal of Psychiatry* 1997; 8: 280-7.
21. Hathaway SR, McKinley JC. The Minnesota multiphasic personality inventory 2. University of Minnesota Press 1943: 19-55.
22. Dülgerler Ş. Validity and reliability study of the somatization scale in primary school teachers (Yüksek lisans tezi). Ege University Institute of Health Sciences; 2000 (Turkish).
23. Barsky AJ, Wyshak G. Hypochondriasis and somatosensory amplification. *Br J Psychiatry* 1990; 157: 404-9.
24. Güleç H, Sayar K, Güleç MY. The Reliability and Validity of the Turkish Form of the Somatosensory Amplification Scale. *Düşünen Adam* 2007; 20: 16-24 (Turkish).
25. Isik, NA, Emir İ. The effect of preoperative anxiety on postoperative symptoms in patients without a history of anxiety scheduled for coronary artery bypass grafting." *Galician Medical Journal* 29.3 2022.
26. Emir İ, Işık NA. Relationship between surgical fear level and postoperative pain and sleep quality in coronary artery bypass graft patients. *International Heart and Vascular Disease Journal* 2022; 36: 17-26.
27. Wilson BR, Tringale KR, Hirshman BR, Zhou T, Umlauf A, Taylor WR, et al. Depression After Spinal Surgery: A Comparative Analysis of the California Outcomes Database. *Mayo Clin Proc* 2017; 92: 88-97.
28. Oldham MA, Hawkins KA, Lin IH, Deng Y, Hao Q, Scoult LM, et al. Depression predicts delirium after coronary artery bypass graft surgery independent of cognitive impairment and cerebrovascular disease: An analysis of the neuropsychiatric outcomes after heart surgery study. *Am J Geriatr Psychiatry* 2019; 27: 476-86.
29. Takagi H, Ando T, Mitta S. ALICE (All-Literature Investigation of Cardiovascular Evidence) group. Meta-Analysis Comparing  $\geq 10$ -Year Mortality of Off-Pump Versus On-Pump Coronary Artery Bypass Grafting. *Am J Cardiol* 2017; 120: 1933-8.
30. McCrone S, Lenz E, Tarzian A, Perkins S. Anxiety and depression: incidence and patterns in patients after coronary artery bypass graft surgery. *Appl Nurs Res* 2001; 14: 155-64.
31. Jiang W, Kuchibhatla M, Cuffe MS, Christopher EJ, Alexander JD, Clary GL, et al. Prognostic value of anxiety and depression in patients with chronic heart failure. *Circulation* 2004; 110: 3452-6.
32. McKenzie LH, Simpson J, Stewart M. A systematic review of pre-operative predictors of post-operative depression and anxiety in individuals who have undergone coronary artery bypass graft surgery. *Psychol Health Med* 2010; 15: 74-93.
33. Vaccarino V, Lin ZQ, Kasl SV, Mattera JA, Roumanis SA, Abramson JL, et al. Gender differences in recovery after coronary artery bypass surgery. *J Am Coll Cardiol* 2003; 41: 307-14.
34. King KM, Koop PM. The influence of the cardiac surgery patient's sex and age on care-giving received. *Soc Sci Med* 1999; 48: 1735-42.
35. Czajkowski SM, Terrin M, Lindquist R, Hoogwerf B, Dupuis G, Shumaker SA, et al. Comparison of preoperative characteristics of men and women undergoing coronary artery bypass grafting (the Post Coronary Artery Bypass Graft [CABG] Biobehavioral Study). *Am J Cardiol* 1997; 79: 1017-24.
36. Pačarić S, Turk T, Erić I, Orkić Ž, Petek Erić A, Milostić-Srb A, et al. Assessment of the Quality of Life in Patients before and after Coronary Artery Bypass Grafting (CABG): A Prospective Study. *Int J Environ Res Public Health* 2020; 17: 1417.
37. Tsai MF, Tsay SL, Moser D, Huang TY, Tsai FC. Examining symptom trajectories that predict worse outcomes in post-CABG patients. *Eur J Cardiovasc Nurs* 2019; 18: 204-14.
38. Hoehn-Saric R, McLeod DR, Funderburk F, Kowalski P. Somatic symptoms and physiologic responses in generalized anxiety disorder and panic disorder: an ambulatory monitor study. *Arch Gen Psychiatry* 2004; 61: 913-21.
39. Nakao M, Barsky AJ. Clinical application of somatosensory amplification in psychosomatic medicine. *Biopsychosoc Med* 2007; 1: 17.
40. Al-Ruzzeh S, Nakamura K, Athanasiou T, Modine T, George S, Yacoub M, et al. Does off-pump coronary artery bypass (OPCAB) surgery improve the outcome in high-risk patients?: a comparative study of 1398 high-risk patients. *Eur J Cardiothorac Surg* 2003; 23: 50-5.
41. Reddy SL, Grayson AD, Oo AY, Pullan MD, Poonacha T, Fabri BM. Does off-pump surgery offer benefit in high respiratory risk patients? A respiratory risk stratified analysis in a propensity-matched cohort. *Eur J Cardiothorac Surg* 2006; 30: 126-31.
42. Lamy A, Devereaux PJ, Prabhakaran D, Taggart DP, Hu S, Paolasso E, et al. Off-pump or on-pump coronary-artery bypass grafting at 30 days. *N Engl J Med* 2012; 366: 1489-97.
43. Radhakrishnan, J. Off-pump or on-pump coronary artery bypass grafting at 30 days. *Kidney International* 2012; 82: 3-4.
44. Katon W, Lin E, Von Korff M, Russo J, Lipscomb P, Bush T. Somatization: a spectrum of severity. *Am J Psychiatry* 1991; 148: 34-40.
45. Simon G, Gater R, Kisely S, Piccinelli M. Somatic symptoms of distress: an international primary care study. *Psychosom Med* 1996; 58: 481-8.
46. Rodin GG. Depression and the medically ill: an integrated approach. Routledge, 2017.
47. Koivula M, Tarkka MT, Tarkka M, Laippala P, Paunonen-Ilmonen M. Fear and anxiety in patients at different time-points in the coronary artery bypass process. *Int J Nurs Stud* 2002; 39: 811-22.
48. Redeker NS. Symptoms reported by older and middle-aged adults after coronary bypass surgery. *Clin Nurs Res* 1993; 2: 148-59.
49. Şahpolat M, Adıgüzel M, Arı M. Focusing on physical symptoms and psychological trauma of patients with bruxism. *Med J Bakirkoy* 2018; 14: 283-8 (Turkish).