



Research Article

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The Effect of Mindfulness-Based Cognitive Therapy on Anxiety of Patients Undergoing Coronary Artery Bypass Graft Surgery: A pilot Quasi Randomised Controlled Trail

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Abstract

Aims and objectives: Many patients experience anxiety while awaiting coronary artery bypass graft (CABG) surgery, an experience that adversely affects the surgery and patient outcomes. This study aimed to evaluate the effects of a mindfulness-based cognitive therapy (MBCT) program on anxiety level (primary outcome) and blood pressure (secondary outcome) of patients undergoing CABG.

Methods: This was a two-arm parallel-group pilot quasi randomized controlled trail. A total of 60 participants (30 patients for each arm), admitted for CABG surgery, were recruited from Modares Hospital, Tehran. Participants were randomly allocated to either intervention group to receive MBC-therapy or to control group to receive standard care. The Beck's anxiety questionnaire and a mercury manometer and stethoscope were used to assess participants' anxiety level and blood pressure (BP), respectively before intervention on admission day (Time 1), after intervention on the day before the surgery (Time 2) and on day three post-surgery (Time 3). Changes in anxiety and blood pressure of participants were assessed using repeated measure ANOVA.

Results: MBCT was found effective in decreasing the anxiety of participants in intervention group compared to control group ($p=0.001$). Eta coefficient suggested that about 20% reduction in anxiety scores was related to mindfulness-based cognitive therapy. The differences between groups were not statically significant for blood pressure ($p=0.057$).

Conclusion: Participants in mindfulness-based cognitive therapy group experienced less anxiety before and after CABG surgery. Nurses can use mindfulness-based cognitive therapy to help reduce their patients' anxiety before and after surgery.

Keywords: Mindfulness; Anxiety; Hypertension; Complementary therapies; Coronary artery bypass graft

Introduction

Cardiovascular disease (CVD) remains the leading cause of death globally [1]. Treatment options include medical, surgical or a combination of both depending on the extent and location of atherosclerotic lesions. New strategies, such as nanotechnology, robotic surgery, and stem cells are also showing promising results in treatment of coronary artery disease (CAD) [2]. In some patients, however, heart surgery remains the only method to treat the disease and increase lifespan. Coronary artery bypass grafting (CABG) is the most common heart surgery performed worldwide [3,4], including in Iran. Nearly 60,000 heart surgeries [5] are performed annually in Iran, of which about 30,000 to 40,000 are CABGs [6].

Patients who await CABG often experience a high level of anxiety due to the type and extent of the surgery [7] and the associated complications [8,9], and this negatively affect surgery and patient outcomes [10]. Anxiety can lead to increased blood pressure, the oxygen demand of myocardial tissue, delay in wound healing, need for higher doses of anesthetics, and poorer recovery [11]. These adverse outcomes could be avoided by appropriate assessment and management of patients' anxiety [12]. Pre-operative anxiety can be reduced by the use of anxiolytic premedication, such as benzodiazepines, but these medications cause side effects, or they may not be the patient's preference [13]. Therefore, non-pharmaceutical interventions, such as meditation, yoga, and mindfulness seem to be safe alternatives to anxiolytic medications [14].

Mindfulness-based cognitive therapy (MBCT) is a third-generation cognitive anxiety reduction technique that combines mindfulness techniques with cognitive behavioral therapy [15]. This technique helps enhance the focus of the person on the present moment instead of worrying about the future or regretting of the past. MBCT can be used as a nurse-governed strategy in the clinical settings; that is a strategy applied by the patient under the guidance of a nurse [16,17]. In this technique, mind is trained to note distressing thoughts and feelings, hold such experiences in awareness, nurture acceptance and self-compassion, and avoid judgmental reactions to events.[18]. MBCT helps the patient to focus on the choices they currently encounter in the life. It encompasses acceptance of the reality and avoidance of cognitive rumination [16].

The mental health benefits of mindfulness technique have been demonstrated in different settings, and on general populations as well as specific patient and population groups. For example, Hosseini, et al. [19] study showed that mindfulness had positive effect on reduction of strain in family caregivers of Alzheimer's patients [19], or Janssen, et al. [20] showed the beneficiary effects of mindfulness on emotional exhaustion (a dimension of burnout), psychological distress including stress, depression, anxiety, and work-related stress of employees [20].

Nelson et al. [21] conducted a systematic review of the effectiveness of pre-surgical mind-body based therapies on post-operative outcome measures. In this study, the effectiveness of three types of mind-body interventions, including relaxation, guided imagery and hypnotic interventions was reviewed. The results of this systematic review suggested that mind-body interventions had positive effects on psychological well-being of surgery patients and reduced their need for analgesic intake [21]. There is also some evidence that mindfulness exercises have positive physiological effects, such as reduction in heart rate, systolic blood pressure, and endocrine responses [22,23], however, the systematic review by Nelson, et al. [21] suggested that the physiological benefits were not significant [21]. The effect size of mindfulness exercises on reduction of stress and prevention of depression relapse was studied in a systematic review by Fjorback, et al. [24], who found that mindfulness intervention can have moderate effects on the psychological outcomes [24], but the authors concluded that the quality of the included studies was questionable and suggested further high quality randomized controlled trials to reliably study the benefits of mind-body therapies for surgery patients. Likewise, a meta-analysis review of studies that investigated the effects of mindfulness-based therapy on anxiety and depression concluded that mindfulness-based therapy had moderate effects on improving anxiety (Hedges's $g = 0.63$) and depression (Hedges's $g = 0.59$) in patient population [25]. The aim of our study was to examine the effects of MBCT on anxiety and blood pressure of patients awaiting CABG.

Method

This was a two-arm parallel-group pilot quasi randomized controlled trial. Study population included patients who were admitted for CABG to the Cardiac Unit at Modarres Hospital in Tehran. Modarres Hospital is a tertiary referral hospital for CABG operation, admitting patients from entire Iran. Approximately, 400 CABG operations are performed in this hospital annually. Patients are admitted to the hospital and remain under control for about two weeks before they undergo surgery.

Inclusion criteria for current study included: being admitted to the Cardiac Unit of Modarres Hospital for CABG surgery, being able to communicate in Persian language, and being above 45 years of age. Patients who were on regular sedative medication or strong tranquilizers were excluded. Sample size included 60 participants who were randomly allocated to intervention group ($n=30$) to receive MBC-therapy or to control group ($n=30$) to receive standard care. Random allocation was completed based on patients' medical record numbers; participants with odd numbers were allocated to control group and those with even number to intervention group. The flow chart for participants' recruitment was presented in Figure 1. Blinding of the participants or researchers was not possible due the nature of the intervention. This trial is registered with the Iranian Registry of Clinical Trials.

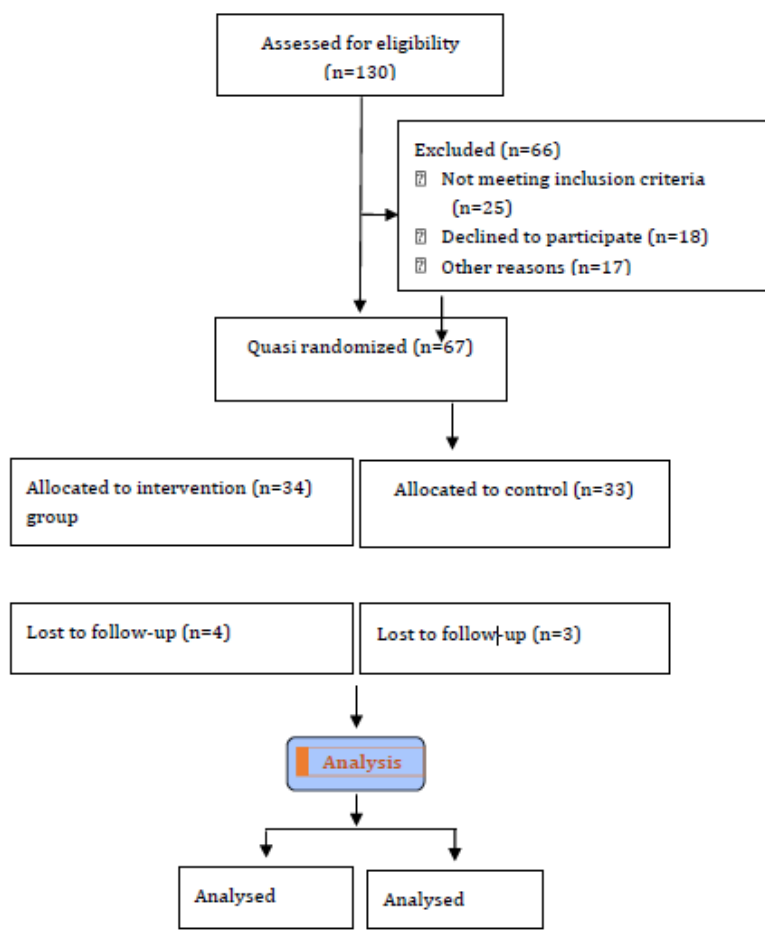


Figure 1: Participant recruitment flowchart.

Measurements

The demographic information and clinical history of participants were collected, which included information on age, sex, education level, history of heart disease. Blood pressures were taken manually using a mercury manometer and stethoscope. Beck's Anxiety Inventory (BAI) was used to measure participants' anxiety. This questionnaire consists of 21 items, with response options ranging from 0 (never) to 3 (high), on a four-point Likert scale. Total anxiety scores can range from 0 to 63. The BAI scores

are classified as minimal (0-7), mild anxiety (8-15), moderate anxiety (16-25), and severe anxiety (30-63). Beck and Clack (1988) reported the internal consistency of the inventory, as measured by Cronbach's alpha and the test-retest reliability, 0.92 and 0.75, respectively [26]. The psychometric properties of the Persian version of BAI have been confirmed in clinical and non-clinical settings [27]. Anxiety level and blood pressure of participants were measured before intervention on admission day (Table 1), after intervention on the day before surgery (Table 2) and three days post-surgery (Table 3).

Table 1: Baseline characteristics of the study participants.

Variables		Control Group (n=30, n/%)		Intervention Group (n=30, n/%)	
Sex	Male	13	43.3	18	60
	Female	17	56.7	12	40
Age	35-45	8	26.7	3	10
	45-60	7	23.3	11	36.7
	60-75	14	46.7	13	43.3
	>75	1	3.3	3	10

Education	Uneducated	3	10	2	6.7
	Elementary school	8	26.7	4	13.3
	High school	9	30	12	40
	Post school Education	10	33.3	12	40
History of CHD	<1 year	8	26.7	13	43.3
	1-3 years	15	50	12	40
	3-5 years	3	10	4	13.3
	>5 years	4	13.3	1	3.3

Table 2: The mean and standard deviation scores of patients' anxiety and BP in before, after and follow up stages among both groups.

Mean \pm SD	Mean \pm SD	Mean \pm SD	Group	Variable
17.43 \pm 6.06	19.46 \pm 7.17	28.7 \pm 10.55	Control	Anxiety
8.03 \pm 3.62	13.20 \pm 5.43	30.06 \pm 10.88	Intervention	
13.13 \pm 0.97	13.36 \pm 0.96	13.33 \pm 1.21	Control	Blood pressure
11.93 \pm 1.08	12.16 \pm 1.66	14.16 \pm 2.22	Intervention	

Table 3: The results of repeated measured ANOVA comparing anxiety and blood pressure data bet between groups.

Variable	Source	df	Mean Square	F	Sig.	Partial Eta Squared
Anxiety	Intercept	1	59368.7	647.771	0	0.918
	Group	1	1201.25	13.107	0.001	0.184
	Error	58	91.651			
Blood pressure	Intercept	1	30498.1	9375.17	0	0.994
	Group	1	12.272	3.773	0.057	0.061
	Error	58	3.253			

Intervention

Participants in intervention group participated in daily mindfulness sessions for eight days while they were awaiting surgery at the Cardiac Unit. The sessions were held face and in small groups (4-5 participants in each session) and were facilitated by a nurse and a psychologist. The control group received only routine care, which included routine nursing care and medical therapy. Participants in both intervention and control group were administered Oxazepam if only they asked for an anxiolytic agent before surgery. The measurements were performed similarly for all participants in intervention and control groups. Intervention included training about anxiety and its effects and potential benefits of mindfulness. On the first day of training, participants learnt to sit in a relax position and practice mindful raisin eating exercise. On day two, participants practiced on the skills they leant on day one, and the training focused on mindfulness of breathing, being aware of the internal (thoughts) and the external (sights, smells, and sounds), training on sitting meditation and body scanning exercise, mindfulness movements, and the 3-minute breathing spaces. On day three, participants were trained about the second series of mindfulness movements (10 movement exercise), 3-minute

breathing spaces, awareness of routine daily activities, four-dimensional meditation, and awareness about the consciousness at the moment [28]. From day four today eight, participants practiced on the mindfulness skills they had learnt over the three days mindfulness training sessions, and their practice was guided by a nurse and a psychologist. The mindfulness intervention was developed based on mindfulness techniques described by Crane [29]. Day one and day two sessions consisted of 45 minutes of training, 45 minutes of practice, and 15 minutes break in between, while the sessions from day 3 to day 8 lasted 45 minutes.

Ethical Considerations

The intervention protocol for this study was reviewed and approved by a panel of four experts in the field of Mindfulness-Based Cognitive Therapy. The study received the ethical approval of the ethics committee of the participating hospital. The objectives of the study were explained to participants and informed consents obtained. Participation was voluntarily and participants had the right to withdraw from the study at any time without any penalty. Control group participants received a free educational CD and handbook about MBCT. In addition, they were given chance to participate in a two-hour mindfulness practice session.

What does this paper contribute to the wider global clinical community?

- A Mindfulness-Based Cognitive Therapy is an effective intervention in decreasing anxiety among patients Undergoing Coronary Artery Bypass Graft surgery
- Mindfulness-Based Cognitive Therapy could be effective intervention to reduce anxiety among patients Undergoing Coronary Artery Bypass Graft surgery, but further assessment will be offered.

Data analysis

Statistical Package for the Social Sciences (SPSS) version 19 was used to analyze the data. The normal distribution of anxiety and blood pressure data was confirmed by the Kolmogorov-Smirnov test. The effect of mindfulness intervention on participants' anxiety was analysed using repeated measurement of analysis of variance. The significance level was considered to be $p < 0.05$.

Result

Table 1: summarizes participants' demographic information and history of heart disease. There were no significant differences in baseline data between the groups. Table 2 shows the mean and standard deviation of patients' anxiety and blood pressure in the pre-intervention, post-intervention and follow-up stages among the intervention and control groups. The result of repeated measure ANOVA test with a Greenhouse-Geisser correction demonstrated that mean anxiety scores were statistically significant between control and intervention groups ($p = 0.001$). Eta coefficient suggested that about 20% reduction in anxiety scores was related to mindfulness-based cognitive therapy. Blood pressure of participants in intervention group decreased in Time 2 and Time 3 compared to before intervention (Table 1), however, between-group differences were not statistically significant ($p = 0.057$), (Table 3).

Discussion

In this study, MBCT showed significant effects in reducing the anxiety of patients who were awaiting CABG. Consistent with this finding, several previous studies have reported positive effects of mindfulness interventions on psychological outcomes [30-32]. We could not find a study that was comparable to our study in terms of both study population and type and length of the intervention, however, the available evidence on the effects of different mind-body interventions on diverse patient population show almost consistently positive effects on psychological outcomes [7,17]. The study by Heidarian, et al. [17] examined the effectiveness of eight two-hour sessions of mindfulness education on female patients with breast cancer and found that mindfulness intervention increased the patients' resilience of the patients and decreased their cognitive rumination [17]. Kiran, et al. [7] found that patients who participated in Rajyoga meditation training showed less anxiety level on day 2 post-CABG in comparison to control group (3.12 ± 1.45 vs. 6.12 ± 0.14 , respectively; $p < 0.05$), and the beneficiary effects continued on to day 5 post operation (0.69 ± 1.1 vs. 5.6 ± 1.38 , respectively, $p < 0.05$). In this study, the serum cortisol level was also decreased

by the practice of Rajyoga meditation [7]. Similarly, a study that examined the effects of relaxation therapy, consisting of listening to a breath relaxation and guided imagery tape for 20 minutes daily, in patients who had undergone joint replacement therapy found that relaxation therapy decreased the need of the patients for analgesic medications post-surgery, however, the intervention failed to show statistically significant effects on patients' anxiety [33]. Further, the positive effects of mindfulness meditation were investigated by Ponte, et al. [32], who found that mindfulness technique had beneficiary effects on physiological and psychological responses of patients with arterial hypertension and mindfulness group participants were less judgmental and depressed and more accepting compared to control group [32].

Consistent results have also been reported when mindfulness interventions were tested on non-patient populations [34-36]. The results of a systematic review suggested that mindfulness was beneficial in reducing psychological distress including stress, anxiety, depression, and feeling of burnout as well as improving job satisfaction among nurses [35]. Mindfulness intervention was also tested out in a small sample ($n=9$) of care givers of frail elderly, and the results were that the caregivers reported less perceived stress, depressive symptoms, and burden during the 8-week intervention. At one month follow up, further improvements were reported in relation to stress and burden, however, depressive symptoms returned to baseline level. Further, the participants reported that their mindful attention and feeling of calmness increased during the program [34]. Also, consistent results were found on a small sample of ($n=28$) caregivers of patients with dementia. Caregivers in this pilot study reported improved self-efficacy measure and cognitive measures. There also were significant correlations between mindfulness intervention and self-rated mood and stress [36].

In our study, participants in mindfulness group demonstrated reduction in their blood pressures post intervention, which were clinically meaningful; however, between-group differences were not statistically significant. This finding is consistent with the result of a systematic review by Nelson et al. [21], which suggested that the physiological benefits of mind-body interventions in postoperative patients were insignificant [21]. Likewise, Lin, et al. (2011) failed to find statistically significant benefits on blood pressure from on patient post-joint replacement therapy surgery [33]. However, Ponte, et al. [32] found that mindfulness resulted in statistically significant difference in blood pressure levels of patients with arterial hypertension [32]. The inconsistent results with our findings may relate to the difference in the methodology of these two trails, including study population and study time. They delivered their mindfulness program to patients with arterial hypertension and the time of intervention was not relate to surgery.

It is important to note that although the method of MBCT was different in those studies, the factor of time and duration of intervention is a very effective variable on post-test and follow up outcomes. Therefore, the longer the MBCT time, the more anxiety and blood pressure are expected to decrease.

Conclusion

The results of this study showed that MBCT was effective on reducing the anxiety of patients undergoing CABG before and after surgery. The beneficiary effects of MBCT on blood pressure levels, although clinically meaningful, it was not statistically significant.

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Conflicts of Interest

There is no conflict of interest for the authors of this paper.

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