ORIGINAL RESEARCH

Effectiveness of problem-solving therapy for depression and dysfunctional attitudes in patients after coronary artery bypass graft surgery: a randomized clinical trial

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Abstract

Objective: In patients with coronary artery bypass depression is common and a major cause of mortality after graft surgery. The purpose of this study was to determine the effectiveness of problem solving therapy (PST) in patients with coronary artery bypass by assessing changes in depression and dysfunctional attitudes after graft surgery.

Material and Methods: This randomized controlled trial conducted in Tehran Shahid Modarres Hospital in autumn 2018. Intervention group received PST individually in six sessions of one-hour per week and control group only received education of usual care program for two sessions. At the end of the intervention course and Follow up, both groups were tested simultaneously using the Research tools and the data were analyzed by repeated measures analysis of variance using SPSS-18 software.

Results: Patients receiving PST intervention showed significant improvement based BDI (P=0.018) and DSA-26 (P= 0.009). Also, compared with Usual Care, BDI remission of rates were superior in the PST group (P= 0.001) and larger decrease on the dysfunctional attitudes in the DAS-26 at two follow up times (P= 0.001).

Conclusions: These results shows that PST will be effective in reducing depression and dysfunctional attitudes in among patients with Coronary Artery Bypass Graft surgery. Then PST is an effective intervention that can improve problem-solving abilities and mental health-related in CABG surgery patients.

Keywords: Coronary artery bypass graft surgery, Dysfunctional attitudes, Depression, Problem solving therapy

Introduction

Cardiovascular patients have more depression than the general population(1) and depression in this patients is persistent and deadly. Over the past 20 years, researches has found that depression not only is more common in cardiac patients than in the general population, but depression is also a risk factor for cardiac morbidity and mortality, independent of traditional risk factors (2). Relationship between depression and cardiovascular disease (CVD) is bidirectional; on the one hand, depression can increases the risk of incident CVD and on the other hand, a history of CVD increases the risk of depression(3, 4). Symptoms of depression have been associated with the development and progression of CVD and a 2 to 2.5 fold increased mortality risk (5).

In the field of cardiovascular treatment, Coronary Artery Bypass Graft (CABG) surgery is a common procedure for the coronary heart disease (CHD). The primary goal of CABG surgery is to improve health status, including symptoms, functional status, and quality of life (6). Despite the improvements in symptoms and function after CABG, many patients undergoing this surgery, experience serious problems such as symptoms of depression, both pre-and postoperatively and depression reported in 20% to 25% of this patients (6, 7). Studies have shown that depression is an independent risk factor in CABG and is associated with longer hospital stay, more postoperative complications, more frequent re-hospitalizations and increased mortality in patients who underwent CABG(5, 8, 9). Furthermore, in relation to this factor, the studies supported Beck's assumption that dysfunctional attitudes are a stable marker of cognitive vulnerability to depression. The level of dysfunctional attitudes usually increases beyond the healthy range during depressive episodes(10, 11). Researches confirmed the link between dysfunctional attitudes and their predictive power of depression and also showed a significant relation between unhealthy attitudes, BDI (Beck Depression Inventory) and severe depression in patients with Coronary Artery Disease(10, 12).

In general, in the field of CVD and specifically Coronary Heart Disease, studies have shown that psychological intervention programs decreased the risk of recurrent CHD and standard psychological approaches, especially Cognitive-Behavioral Therapy can have an important role in relieve psychological symptoms, including symptoms of depression. However, there has been little research on the treatment of psychological symptoms after CABG surgery in patients with depression (13-18).

Problem solving therapy is an approach of cognitive-behavioral psychotherapy that its goal is to teach people how to solve their problems. The PST also defined as the clinical application for behavior change that teaches skills for managing life stressors and obstacles that inhibit healthful physical and emotional functioning (19, 20).

Reviews have shown that no research has been done in relation to the PST in patients undergoing CABG surgery; However, in generally, in the field of CVD, studies has been done and the findings of two studies has been suggested that intervention for PST is effective in teaching of patients in problem-solving skills, stress management for CVD risk factors and reduction of depression symptoms (21, 22). Nevertheless, the goal of this randomized controlled trial was to implement Problem Solving Therapy (PST) for patients who have CABG surgery. The intervention was designed to teach problem-solving skills in order to deal positively with the psychological consequences (depression and dysfunctional attitudes) in patients who have CABG surgery and investigate whether Problem Solving Therapy is effective in reducing symptoms of depression and modification of dysfunctional attitudes.

Materials and Methods

Study used a randomized controlled design to comparing a Problem Solving Therapy with usual care group (control group). All patients in the treatment group receive basic information about program. This study conducted at the Shahid Modarres Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran in 2018 autumn. The present research was confirmed by the research ethics committee of vice- chancellor office of research affiliated to Shahid Beheshti University of Medical Sciences in Iran by coding IR.SBMU.MSP.REC.1394.47. Also, this research was confirmed by Iranian

Registry of Clinical Trials in Iran by coding IRCT2017080835568N1.

During the autumn of 2018, after the preliminary screening of 167 patients who has been referred to Hospital, 55 patients with CABG surgery were invited to participate to study. 44 people were excluded, until the beginning of the study. According to Sedgwick (22), the minimum sample size required for RCT with α=5% and 90% power for two groups is 26 participants. Forty-four participants were recruited for the study, passed the eligibility screen, and enrolled by signing a consent form. They were randomly allocated to receive PST (N = 22) or Usual Care (UC) condition (N = 22) based simple randomization with random number table (Figure 1). Baseline measures were taken with Beck Depression Inventory (BDI) and Dysfunctional Attitude Scale (DAS) two day before the start of the intervention. All patients had a diagnosis of cardiovascular disease and meet criteria for symptoms of depressive disorder due to other medical condition based on DSM-5. This RCT is designed to definitively test for a significant and clinically meaningful difference between PST and UC on symptoms of depression and dysfunctional attitudes in male and female patients.

Participants included men and women under 70 years of age in Tehran who have had CABG surgery and passed at least 3 months of their heart bypass surgery. Inclusion criteria consist of: sufficient knowledge of the Persian language, meeting the diagnostic criteria for depression due to other medical condition according to DSM-5, age: under 70 years, the minimum official education: diploma, a minimum score of 10 on the Beck Depression Inventory, a minimum score of 26 on the Dysfunctional Attitudes Scale-26. Exclusion criteria are: already receiving psychotherapy for mental health problems, taking psychiatric drugs during the last 6 months, the presence of severe depressive symptoms (indicated by a score above 40 on the items of the Beck Depression Inventory-II; BDI-II).

In this study, depression evaluated by *Beck Depression Inventory (BDI).* The 21-item BDI is a widely used depression scale listing common symptoms of depression that the respondent may have experienced in the past week. The scale has been used extensively in

research and clinical settings and with geriatric populations(23-24). Also, *Dysfunctional Attitude Scale* used for dysfunctional attitudes. 26-item (DAS-26) — The main version of DAS composed of 40 items which was developed by Beck and Weisman(25). In order to use a shorter but still valid and reliable form of DAS in Iranian clinical population, a new version of DAS, named as DAS- 26, and consisted of 26 items was developed. Adaption and psychometric properties of DAS-26 were determined through a psychometric survey. Its Cronbach's alpha was 0.92. The correlation coefficient with original form was 0.98, and validity of its prediction was calculated through correlation with the scores of GHQ-28 (r = 0.56). The new form consisted of 26 questions using 7-point Likert scale(26). Data were analyzed using SPSS 18 software with repeated measures analysis of variance statistical method.
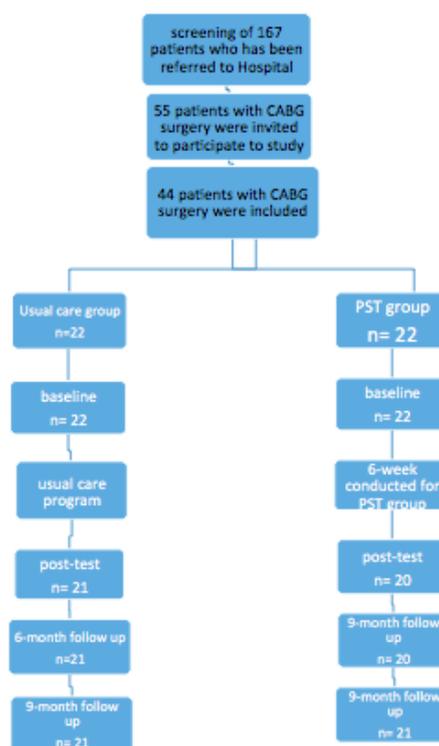

Figure 1. Sampling process of the present study

Problem Solving Therapy (PST): PST is a cooperative approach, where in therapist and patient work together actively. The goals of Problem-Solving are: 1) Help patients so that they can recognize the problems as causes of dysphoria. 2) Help patients so that they can recognize the resources to deal with their

issues (resources at their disposal). 3) Teach patients to increase their sense of control over problems. 4) Equip of patients with a way to deal with future problems(27). In this study, PST that derived from the D' Zurilla protocol, was conducted for treatment group and finally, its findings compared with usual care program that was designed for control group.

PST included 6 sessions of 60 minutes that planned individually (Table 1).

Table 1. Problem solving therapy based on D'Zurilla protocol

Session	Content and detail
1	Create a therapeutic relationship and achieve a therapeutic contract; establish Problem Solving Therapy for depression in patients with cardiovascular disease; explain relevance between medical problems, depressed mood, dysfunctional attitudes and pleasurable activities; review symptoms, medications and treatments for depression; identify patient coping responses in relation to the problem that determined and defined (heart disease and their operation and worry about relapse); realistic goal setting for overcome the problem; choose a pleasurable activity (daily scheduling); set homework activity; obtain permission to contact and update primary care physician;
2	assess the strengths and weaknesses of problem solving; Review homework and review symptoms; review coping responses to defined problem; in this session, the following question will be asked of patients: what are advantages and disadvantages of problem-solving for you? Objects as the benefits of the problem solving are including: 1) increase sense of control over the problem. 2) Obtain capabilities and abilities before surgery. 3) Increasing of self-esteem. 4) Raising the hope to live and work. Set homework; choose a pleasurable activity.
3	Review homework and pleasurable activity; review symptoms; talk about resources and facilities of patient (are including personal capabilities and external facilities) and evaluate them; three main sources of external facilities that should be considered to help problem solving are including: 1) Family 2) Friends and 3) Important people in life; Check environmental factors affecting the patient's life, including housing, financial issues and other items; set homework; choose pleasurable activity.
4	Review homework and pleasurable activity; review symptoms; generation of possible solutions, without evaluating these solutions (facilitate the patient's creative ability to produce a wide range and variety of potential solution ideas for a given problem using various brainstorming techniques); choose 1–2 solutions across possible solutions (predict consequences); try solutions with action plan, monitor, and evaluate outcome; Check environmental factors affecting the patient's life; challenge with cognitive distortions via standard cognitive techniques; set homework; choose pleasurable activity.
5	Review homework and pleasurable activity; review symptoms; review performance outcome for chosen solution; patient rewards self for efforts in attempted problem solving; generate alternative solutions; choose a solution (predict consequences); try solution with action plan, monitor, and evaluate outcome; Check environmental factors affecting the patient's life; troubleshoot any difficulties; set homework; prepare patient for clinical termination; review PST steps; choose pleasurable activity.
6	Review homework; review performance outcome for chosen solution; review symptoms; review performance outcome for chosen solution; patient rewards self for efforts in attempted problem solving; choose a solution (predict consequences); troubleshoot any difficulties; clinical termination with patient; review PST steps; choose pleasurable activity and continue it.1

Usual Care: Participants in the usual care condition received two educational sessions on cardiovascular disease and a depression brochure. Educational sessions included the following topics: 1) Medical education about heart disease and CABG surgery. 2) General education about health care after heart Bypass surgery. 3) Having a good Diet Program. 4) Having a daily walking program. The mentioned educations have been under the supervision of cardiologist.

Results

It should be noted that three participants dropped out, one from UC condition and two from PST condition after random assignment but one before taking pre-test measures and two patients during treatment due to hospitalizations. Participants in this study consisted of 41 patients (17 (54.9 %) men, 24(45.1%) female, and age range of 45 to 70.

In Table 2, the demographic data details are presented.

TABLE 2. Baseline demographic characteristics of the study population

Variables	PST Intervention (N = 20.)	UC Group (N = 21)
Age		
45-55	6 (30%)	6 (27.3%)
56-65	6 (30%)	6 (27.3%)
66-70	8 (40%)	9 (45.4%)
Gender (%)		
Female	12 (60%)	12 (54.6%)
Male	8 (40%)	9 (45.4%)
Marital status (%)		
Married	12 (60%)	14 (63.6%)
Single	8 (40%)	7 (36.4%)
Education level (%)		
Diploma	12 (60%)	12 (54.5%)
Associate Degree	4 (20%)	6 (27.3%)
Bachelor Degree	4 (20%)	3 (18.2%)

Note: N = 21. Percentages are within group.

PST= Problem Solving Therapy; UC= Usual Care

Pre and post means on outcome variables for the PST and UC conditions are brought in Table 3. Comparison of PST intervention and UC group indicated that PST was superior to UC for lowering patients' depression scores. As shown in Table 3, remission rates on the PST group than in the usual care group at 6 weeks, 6 and 9 months follow up Specifically, PST group reported a significantly larger decrease on both the depressive symptoms in the BDI and the dysfunctional attitudes in the DAS-26 than the UC group.

TABLE 3. Pre- and post-test Means and Standard Deviations for Self-Report Ratings by PST (n = 20) and UC (n = 21) Conditions.

Outcomes	PST group (N=20) M±SD	UC group (N=21) M±SD
Depression		
Baseline	23 ± 4.8	22.30 ± 3.19
Post-test	20.60 ± 5.68	23.10 ± 3.60
6 months follow up	17.50 ± 5.50	22.40 ± 4.40
9 months follow up	17 ± 4.92	21.90 ± 3.94
Dysfunctional Attitude		
Baseline	48.19±5.68	41.29±4.19
Post-test	44.58±5.13	42.11±4.60
6 months follow up	35.40±4.90	43.30±3.90
9 months follow up	33.60±4.10	41.80±4.40

PST=Problem Solving Therapy; UC=Usual Care; M=Mean; SD= Standard Deviation

As shown in table 3, change in BDI and DAS-26 scores differed among two group. At the end-of-treatment assessment, 6 and 9-month follow up, BDI and DAS-26 scores were lower in the PST group compared with the usual care group. To measure the significance of this mean reduction are used to repeated measures variance analysis.

Variance analysis with 2*4 plan repeated measures was used to study the significance of the variables' scores in the test group. In this analysis, two participant groups in the research (study group and control group) were considered as the inter-subject and

measurement of depression and inefficient attitude as intra-subject factor. Before implementing variance analysis with repeated measures, the normality of distribution and variance homogeneity were calculated. The results of Leven test were not significant for the variables (P= 0.112); therefore, the assumption of score homogenous variance holds. Finally, Shapiro-Wilk test (P=0.098) showed the normal distribution of data. Using Mauchly test showed that sphericity of the effects related to time, time and group and group are observed. Therefore, we can say that the assumption of equal intra-subject variance is observed for all variables (P=0.076).

Table 4: ANOVA with repeated measures for depression & dysfunctional attitude

Variable	Source	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Depression	Group	1	292.16	6.11	.018	.13	.67
	Time	1	108.49	74.31	.000	.66	1.00
	time * group	1	76.63	52.49	.000	.57	1.00
Dysfunctional Attitude	Group	1	868.66	6.96	.009	.16	.70
	Time	1	465.80	1555.00	.000	.98	1.00
	time * group	1	599.14	2000.11	.000	.98	1.00

As seen in table 4, the effect of group on the depression scores was significant (F (39, 1) =6/11, P=0.018). It can be concluded that without considering the measurement time, there is significant difference between depression scores in study and control groups. The effect of measurement time on the depression scores is significant (F=39,1) =74.31, P= 0.001). Without considering the study group, we can say that there is a significant difference between depression scores in pre-test, post-test and follow-up. The effect of interaction between time and group is also significant (F (39,1) =52.49, P= 0.001). It can be said that the mean difference between depression scores in different time changes by the levels of variables. Since the effect of interaction between intergroup factor of measurement time and intra-factor was significant, the naïve intergroup effect was studied by considering intra-group factor and Bonferoni method. Results showed that there was no significant difference between depression scores of study and control groups in the pre-test step. But in the post-test and 6-month and 9-month follow-up, mean difference of depression scores in the study group was significantly lower that control group. This shows that training problem-solving skills was effective in reducing depression of cardiac patients.

As seen in table 4, the effect of group on inefficient attitudes' scores is significant (F (39,1) =6.96, P= 0.009). We can conclude that without considering the measurement time, there was no significant difference between mean score of inefficient attitudes.

The effect of measurement time on inefficient attitudes' scores is significant (F (39,1) =1555.01, P= 0.001). Without considering the study group, there is a significant difference between inefficient attitudes in pre-test, post-test and follow-up. The effect of interaction between time and group is also significant (F (39,1) =2000/11, P= 0.001). It can be concluded that the difference between mean score of inefficient attitudes at different times is different due to the varied levels of group. The mean comparison by paired comparison test showed that eve after Bonferoni correction and alpha adjustment, the difference between all experimental states, i.e. between pre-test and post-test, post-test and follow-up and pre-test with follow-up is significant. In other words, the rate of inefficient attitudes has decreases in patients who had problem-solving training.

Discussion

According to the results obtained in this clinical trial, PST based on a structured treatment guideline significantly has led to reduction in symptoms of depression and modify dysfunctional attitudes in the short-term period. Patients who received PST reported greater decreases in depression symptoms on the BDI and more modify dysfunctional attitudes on the DAS-26 than participants in the control group. The common problem in all the participants in the study was heart disease and their operation and worry about relapse. According to evaluations carried out from all the patients, symptoms of depression reported in patients after heart bypass surgery and above problem proposed as the main stressor leading to depression. Nevertheless, after teaching the skills of Problem-Solving Therapy to the intervention group, patients acted to modify behavior and dysfunctional attitudes and to manage stressor. There are few studies in supporting non-pharmacological interventions for the treatment of depressive symptoms in patients with CABG surgery. Nevertheless, our research findings are consonant with previous similar studies. Christa L. Lilly and co-

workers investigated the effectiveness of a Problem Solving Intervention addressing barriers to cardiovascular disease prevention behaviors in 3 underserved populations. Their study results suggest the intervention was effective in training underserved populations in problem-solving skills for CVD risk reduction(22). In other research, Zvi D. Gellis and Martha L. Bruce evaluate Problem Solving Therapy for sub threshold Depression in Home Healthcare patients with cardiovascular disease. In this study, results for the PST-HC group compared with control group showed a significant decrease in Depression scores. The brief PST-HC intervention demonstrated that depression improved among home care elderly(21).

In the field of psychological interventions, especially Cognitive-Behavioral Therapy for CVD, Studies has shown that group therapy is more effective than individual therapy and this study suggest using of group therapy in the treatment of patients who have had CABG surgery in the future researches.

This study has several limitations. Since participants in the study have been only those who have CABG surgery, this limitation reduce generalizability of the findings to other patients with cardiovascular disease. Unselected patients under diploma, and not using strong structured interview are the other limitations in the study. As another limitation, since the intervention group was treated weekly, this may lead to better therapeutic alliance and support for the intervention group, and may reduce the symptoms of depression.

The current study, which is one of the first trials for depression in patients with CABG surgery to date, suggests that PST is associated with improvements in depressive symptoms and dysfunctional attitudes among patients with CABG surgery. PST is an effective, efficient, and easy to implement intervention that can benefit problem-solving abilities and mental health-related in CABG surgery patients. In turn, this will help patients manage their daily living activities related to their medical condition and reduce daily depressive symptoms and dysfunctional attitudes.

Acknowledgments

Conflict of interest

Authors declare no conflict of interest.

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