Influence of Cognitive Behavioral Therapy on Mood and Quality of Life After Stent Implantation in Young and Middle-Aged Patients With Coronary Heart Disease

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SUMMARY

Cognitive behavioral therapy (CBT), established only a few decades ago, is widely used by clinical psychologists. This study aimed to investigate the effects of CBT on mental status and quality of life (QOL) after percutaneous coronary intervention (PCI) in young and middle-aged patients with coronary heart disease (CHD). Seventy-five anxiety/depression patients (mean age, 52.2 ± 6.2 years, including 8 individuals < 45 years old) with CHD treated with PCI were randomly divided into a CBT group ($n = 38$) and control group ($n = 37$). The CBT group received 8 weeks of CBT in addition to the routine postoperative treatment that was also administered to control patients. The 17-item Hamilton Depression Rating Scale (HAM-D17), Hamilton anxiety scale (HAM-A), and Coronary Revascularization Outcome Questionnaire (CROQ-PTCA-POST, Chinese version) were administered before, 3 days, and 8 weeks after intervention. HAM-D17 and HAM-A scores were decreased after treatment, but were more substantially reduced in patients that underwent CBT than those in the control group (11.7 ± 4.5 versus 15.1 ± 3.9 , $P = 0.001$ and 10.6 ± 3.4 versus 16.5 ± 4.6 , $P = 0.003$, respectively). QOL was improved in both groups, but overall satisfaction was higher in the CBT group compared with control patients (89.3 ± 5.2 versus 77.8 ± 9.5 , $P < 0.05$). CBT can relieve depression and anxiety after PCI in young and middle-aged patients with CHD. CBT can improve patient QOL. (Int Heart J 2016; 57: 167-172)

Key words: Cognitive behavioral therapy, Percutaneous stent implantation, Anxiety, Depression

Coronary heart disease (CHD) is one of the leading causes of death worldwide. The China Cardiovascular Disease report published in 2010 stated that the incidence of CHD in China continues to increase, and that the age at onset is decreasing.¹⁾ The relationship between CHD and a change toward a negative mental status has attracted more and more attention, particularly the clinical studies of therapeutic intervention with regards to psychological and social factors of CHD.²⁻⁴⁾ Authors agree that many patients with CHD have persistent symptoms of depression and anxiety,^{5,6)} which significantly influence their quality of life (QOL) and prognosis, often leading to a vicious cycle.⁷⁾ However, whether the presence of depressive symptoms is due to depression after CHD or originates from the CHD itself is controversial.^{8,9)} Nevertheless, there is an association between depressive symptoms and post-CHD mortality.^{10,11)}

Chinese studies performed by Li, *et al*¹²⁾ confirmed that the incidence of anxiety in young and middle-aged CHD patients who underwent percutaneous coronary intervention (PCI) was higher than that of senior patients, which is supported by other studies.¹³⁻¹⁵⁾ They stated that it might be because

young and middle-aged patients are more likely to worry about the effects of stent implantation on their work and social life. These studies also found that the incidence of depression among young and middle-aged people was slightly higher than among the older people, although no statistically significant difference was observed.

Currently, there are a number of studies about comprehensive interventions on depression and anxiety in patients with CHD. Parswani, *et al*¹⁶⁾ performed decompression therapy in patients with CHD who presented with depression and anxiety symptoms. Through a period of treatment, depression and anxiety symptoms were significantly alleviated. Cognitive-behavioral therapy (CBT)¹⁷⁾ is one of the most widely used psychotherapy methods. Although CBT was established only a few decades ago, it has been accepted and used by most clinical psychologists due to its scientific nature, short duration, high efficiency, structurization, ease of performance, and relatively low recurrence rate.¹⁸⁻²¹⁾ In CBT, cooperation between the patients and therapists can promote active participation of the patient in the treatment so as to improve their dysfunction-related thoughts and actions and to achieve therapeutic goals.

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Albus, *et al*^[22] added CBT to the treatment of patients with CHD, and found that the QOL was significantly improved; however, they recruited patients aged 18-75 years, and did not specifically assess CBT in young and middle-aged patients.

Therefore, the aim of the present study was to investigate the influence of CBT on mental status and QOL after PCI in young and middle-aged patients with CHD.

METHODS

Study design and patients: This was a prospective, randomized, controlled experiment performed in patients who underwent PCI at the Department of Cardiology, Southwest Hospital, Third Military Medical University between January 2014 and May 2014.

Inclusion criteria were: 1) diagnosis of CHD according to the “Diagnostic criteria for coronary atherosclerotic heart disease (CHD) (2007)” proposed by the Chinese Medical Society of Cardiology; 2) age between 20 and 60 years; and 3) CHD patients who required emergency or elective PCI.

Exclusion criteria were: 1) other diseases affecting lifespan (malignant tumors, heart failure, respiratory failure, severe liver and kidney dysfunction, etc.); 2) autoimmune diseases or connective tissue diseases, blood diseases, acute and chronic infectious diseases; 3) CHD combined with severe valvular heart disease or cardiomyopathy; 4) trauma or surgery within the past 3 months; 5) abuse of alcohol and/or history of drug abuse according to DSM-IV; 6) illiteracy; or 7) mental disorders.

Psychiatrists routinely examined the 128 patients with CHD who underwent PCI during this period in order to diagnose eventual depressive and anxiety symptoms. This examination was performed 3 days after PCI. The 17-item Hamilton Depression Rating Scale (HAM-D17) and Hamilton Anxiety Scale (HAM-A) were then used to assess the 75 patients with anxiety and/or depression. These 75 patients were randomly divided into the CBT or control group.

The study met the requirements of the Declaration of Helsinki and was approved by The Chinese People’s Liberation Army Third Military Medical University First Affiliated Hospital Ethics Committee (2014, scientific research, No. 19). All participants provided written informed consent.

Grouping: Computerized random number tables were used to randomly divide the 75 young and middle-aged patients with CHD into the CBT group ($n = 38$) and the control group ($n = 37$). In the sequence of hospital admission, patients were allocated numbers, which decided the grouping: the first 38 patients (1-38) were assigned to the CBT group, and the remaining 37 patients (39-75) to the control group. The Figure summarizes patient eligibility and enrollment.

The CBT group received a combination of CBT, escitalopram, and alprazolam, while controls received escitalopram and alprazolam. Escitalopram was routinely used at an initial dose of 10 mg, *qd, po*, and alprazolam at 0.4 mg, *tid, po*; these doses could be increased according to the patient’s condition. Treatment duration was 8 weeks. Treatment termination criteria were: 1) the patient did not cooperate with the study (protocol violation, lost to follow-up, etc.); 2) poor compliance; or 3) death. Routine treatment post-PCI included dual antiplatelet therapy (DAPT) and lipid regulation.

Figure. Patient flow diagram. Case numbers at each step of the study process are provided. In total, 75 young and middle-aged patients with coronary heart disease (CHD) were divided into a cognitive behavioral therapy group (CBT, $n = 38$) and control ($n = 37$) group.

Cognitive behavioral therapy: Clinical psychologists with cardiology knowledge performed the CBT. They talked with the patient one-to-one to make them understand that some of their perceptions are irrational (such as believing he might die suddenly anytime anywhere, thinking he was useless, thinking his disease might be a burden for his family, considering he might have a poor prognosis, thinking he might not live a normal life after that, believing others might despise him because of his illness, etc.), and recorded the scores of the irrational perceptions and emotions in tabular forms (patients were required to rate their emotional scores, with 0 representing no anxiety or depression and 100 representing severe anxiety or depression). The psychologists then developed plans to correct the patients’ irrational perceptions and emotions, and conducted CBT to enable the patients to be fully aware of their negative thinking, to improve their cognitive methods for adaptive ability, so as to replace their incorrect or distorted cognition.

The specific procedures included: 1) Establish a therapeutic alliance, that is, establish one-to-one, interactively operative and constructive cooperation between the patient and the therapist. 2) Identify and confirm treatment goals (reconstruction of positive thinking and moderate emotional and behavioral reactions). 3) Conduct psychological education in patients with depression and anxiety after PCI with combination of cardiology knowledge. 4) Develop and implement the CBT course. 5) Cognitive reconstruction (including: understanding and scoring their own emotions; understanding ideas behind their emotions; accessing the reasonableness of these ideas; and identifying whether there were other alternative ideas and the emotion scores under that circumstance). 6) Develop plans

for daily activities and track feedbacks. 7) Regular stage summary, in which patients were usually required to give their own summary before the end of each treatment. Stage summaries were conducted once every 3 treatments. 8) Treatment ending summary. The families were encouraged to be involved in the meeting held once every 1-2 weeks, each lasting 1 hour, for a total of 6 meetings. The meeting times were fixed after discussions with the patients during the first treatment. During the meeting, the patients were required to talk about the experience and insight of the CBT and keep a written record.

Data collection: Demographic and clinical data were recorded. HAM-D17, HAM-A, and the Coronary Revascularization Outcome Questionnaire (CROQ-PTCA-POST, Chinese version) were assessed before and after treatment.

For HAM-D17 scores: 8-17 points indicated mild depression, 18-24 points moderate depression, and > 24 points severe depression. For HAM-A scores: > 29 points indicated severe anxiety; 22-28 points significant anxiety; 15-21 points anxiety; 8-14 points possible anxiety; and 0-7 points no anxiety; the cut-off score for anxiety was 14 points. The CROQ-PTCA-POST questionnaire was developed by Schroter²³⁾ and includes 6 aspects: symptoms, physical function, mental function, cognitive function, adverse reactions, and satisfaction. The scale underwent rigorous verification and has excellent reliability and validity, and responsiveness.²³⁾ The Chinese version of the scale was completed by Cao, *et al*²⁴⁾ at Chongqing Medical University and its testing showed good feasibility, reliability, validity, and responsiveness.²⁴⁾

Mental status tests were conducted by two trained professionals at baseline, and 3 days and 8 weeks post-PCI, in a quiet and comfortable environment. Unified guidance was applied for the assessment, and the symptoms were recorded. The two professionals discussed and consulted to solve problems in case of disagreement.

Statistical analysis: Continuous data are presented as the mean $\pm$ standard deviation, and were analyzed using t-tests. Categorical variables are presented as proportions and were analyzed using the chi-square test. SPSS 17.0 (IBM, Armonk, IL, USA) was used for statistical analysis. Two-sided *P* values < 0.05 were considered significant.

RESULTS

Characteristics of patients: Table I presents the characteristics of the patients. We enrolled 53 men and 22 women, and the

mean age of the participants was 52.2 ± 6.2 years (range, 34 to 60 years). All demographic and clinical characteristics were comparable between the total population of patients who underwent PCI during the study period and the recruited patients (all *P* > 0.05).

Table II presents the characteristics of the enrolled patients according to grouping. Age, gender, income, smoking, hypertension, diabetes, hyperlipidemia, CHD causes, and all PCI parameters were similar between the two groups (all *P* > 0.05). Somatic and psychic anxiety scores were similar between the two groups. At the psychiatric examination performed 3 days after PCI, drugs were similar between the two groups (Table II). No anxiolytic drugs were used.

Anxiety and depression: At baseline, in the CBT group, there were 20 patients with depression and anxiety, 12 patients with depression, and 6 patients with anxiety. In the control group, there were 17 patients with depression and anxiety, 11 patients with depression, and 9 patients with anxiety. Baseline HAM-D17 and HAM-A scores were not different between the two groups (HAM-D17: 19.5 ± 6.8 versus 19.0 ± 7.9 , *P* = 0.77; HAM-A: 23.3 ± 7.9 versus 24.2 ± 8.1 , *P* = 0.62) (Table III).

After 8 weeks of treatment, HAM-D17 and HAM-A scores were significantly decreased in the CBT group compared with the control group (HAM-D17: 11.7 ± 4.5 versus 15.1 ± 3.9 , *P* = 0.001; HAM-A: 10.6 ± 3.4 versus 16.5 ± 4.6 , *P* = 0.003) (Table III).

Quality of life: At baseline, all CROQ-PTCA-POST aspects (symptoms, physical function, mental function, cognitive function, adverse reactions, and satisfaction) were comparable between the two groups (all *P* > 0.05, Table III). After 8 weeks of treatment, compared with controls, the CBT group showed better scores in symptoms (78.8 ± 6.9 versus 74.4 ± 9.1 , *P* = 0.02), physical function (79.6 ± 9.3 versus 75.0 ± 9.8 , *P* = 0.04), psychological function (86.9 ± 5.7 versus 80.2 ± 6.4 , *P* < 0.001), and satisfaction (89.5 ± 5.2 versus 77.8 ± 9.5 , *P* < 0.001). There was no difference in cognitive function (74.0 ± 13.4 versus 75.0 ± 14.2 , *P* = 0.77). After treatment, there were no adverse reactions or death so this score could not be compared.

DISCUSSION

The objective of the present study was to investigate the influence of cognitive behavioral therapy (CBT) on mental status and quality of life (QOL) after PCI in young and middle-

Table I. Characteristics of the Patients (all enrolled versus depression/anxiety patients)

	Total patients enrolled (<i>n</i> = 128)	Depression/anxiety patients (<i>n</i> = 75)	<i>P</i>
Age (years)	51.9 $\pm$ 5.9	52.2 $\pm$ 6.2	0.72
Gender (M/F)	90/38	53/22	0.96
Smoker, <i>n</i> (%)	65 (51)	43 (57)	0.62
Annual income (*10,000 China yuan)	8.04 $\pm$ 7.17	7.57 $\pm$ 8.17	0.67
Hypertension, <i>n</i> (%)	71 (56)	45 (64)	0.55
Diabetes, <i>n</i> (%)	43 (34)	30 (40)	0.53
Hyperlipidemia, <i>n</i> (%)	67 (52)	41 (55)	0.86
Disease type			
Stable angina pectoris, <i>n</i> (%)	82 (64)	50 (67)	0.932
Unstable angina pectoris, <i>n</i> (%)	33 (26)	18 (24)	
Acute myocardial infarction, <i>n</i> (%)	13 (10)	7 (9)	

Table II. Comparison of the Patients' Characteristics, Lesion and Stent Characteristics, and Drug Use

	CBT group (<i>n</i> = 38)	Control group (<i>n</i> = 37)	<i>P</i>
Age (years)	52.4 ± 6.3	52.0 ± 6.2	0.29
Gender (M/F)	26/12	27/10	0.85
Smoker, <i>n</i> (%)	23 (61)	20 (54)	0.77
Annual income (¥10,000 China Yuan)	6.26 ± 3.71	8.92 ± 10.93	0.16
Hypertension, <i>n</i> (%)	25 (66)	23 (62)	0.88
Diabetes, <i>n</i> (%)	16 (42)	14 (38)	0.81
Hyperlipidemia, <i>n</i> (%)	22 (58)	19 (51)	0.76
Disease type			
Stable angina pectoris, <i>n</i> (%)	24 (63)	26 (70)	0.806
Unstable angina pectoris, <i>n</i> (%)	10 (26)	8 (22)	
Acute myocardial infarction, <i>n</i> (%)	4 (11)	3 (8)	
Disease duration (months)	12.4 ± 3.7	11.6 ± 3.3	0.295
Degree of vessel lesion			
One-vessel, <i>n</i> (%)	18 (47)	16 (43)	0.850
Double-vessel, <i>n</i> (%)	12 (32)	14 (38)	
Three-vessel or more, <i>n</i> (%)	8 (21)	7 (19)	
Narrow degree (%)	83.82 ± 8.17	82.70 ± 7.42	0.62
Drugs used before PCI			
Statins, <i>n</i> , (%)	14 (37)	12 (32)	0.69
Nitroglycerin, <i>n</i> , (%)	11 (29)	15 (41)	0.29
ACEI, <i>n</i> , (%)	9 (24)	5 (14)	0.26
ARB, <i>n</i> , (%)	5 (13)	8 (22)	0.33
CCB, <i>n</i> , (%)	8 (21)	10 (27)	0.55
β-Blocker, <i>n</i> , (%)	5 (13)	7 (19)	0.50
Total number of stent implantations (<i>n</i>)	56	52	0.875
Internal diameter of stent (mm)	3.39 ± 0.62	3.47 ± 0.51	0.59
Stent length (mm)	22.40 ± 6.19	22.97 ± 5.81	0.41
Escitalopram, dose (<i>n</i> , %)	12.41 ± 4.36 (29, 76)	12.92 ± 4.64 (24, 65)	0.99
Alprazolam, dose (<i>n</i> , %)	1.58 ± 0.57 (19, 50)	1.45 ± 0.50 (19, 51)	0.48
Anxiety score			
Somatic	1.53 ± 0.64	1.57 ± 0.57	0.678
Psychic	1.79 ± 0.59	2.19 ± 1.94	0.219

PCI indicates percutaneous coronary intervention; ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin II receptor blocker; and CCB, calcium channel blocker.

Table III. HAM-D17 and HAM-A Scores and Quality of Life Indices During Treatment

	Pre-treatment			After 8 weeks of treatment		
	Treatment group (<i>n</i> = 38)	Control group (<i>n</i> = 37)	<i>P</i>	Treatment group (<i>n</i> = 38)	Control group (<i>n</i> = 37)	<i>P</i>
HAMD-17	19.5 ± 6.8	19.0 ± 7.9	0.77	11.7 ± 4.5	15.1 ± 3.9	0.001
HAMA	23.3 ± 7.9	24.2 ± 8.1	0.62	10.6 ± 3.4	16.5 ± 4.6	0.003
Quality of life						
Symptoms	47.1 ± 17.0	48.7 ± 11.8	0.64	78.8 ± 6.9	74.4 ± 9.1	0.02
Physical function	65.0 ± 11.0	68.1 ± 12.6	0.26	79.6 ± 9.3	75.0 ± 9.8	0.04
Psychosocial functioning	54.8 ± 13.0	55.1 ± 11.1	0.91	86.9 ± 5.7	80.2 ± 6.4	< 0.001
Cognitive function	73.0 ± 14.9	71.9 ± 13.3	0.74	74.0 ± 13.4	75.0 ± 14.2	0.77
Satisfaction degree	60.3 ± 13.3	61.1 ± 11.0	0.78	89.3 ± 5.2	77.8 ± 9.5	< 0.001
Adverse reaction	65.9 ± 13.7	65.7 ± 11.9	0.93	0	0	N/A

aged patients with coronary heart disease (CHD). HAM-D17 and HAM-A scores were decreased after 8 weeks, but the score reductions were greater in the CBT group than in controls. QOL was significantly improved in both groups, but the final score was better in the CBT group compared with controls.

With increases in the pressures of daily life and work as well as the dramatic changes in diet and lifestyle in modern China, young and middle-aged populations have gradually become at high risk of CHD. After onset, CHD significantly af-

fects the daily activities of the patient.²⁵⁾ The present study found that young and middle-aged patients undergoing PCI had a high incidence of depression and anxiety (58.6%). A possible reason is that young and middle-aged people may present a stronger response to the sudden illness, resulting in a higher probability of suffering from depression, anxiety, and other mental illnesses. The pathogenesis of depression and anxiety has not been fully clarified, and both biological and psychological factors might be involved.²⁶⁻²⁸⁾ However, psychological interventions in young and middle-aged coronary heart

disease patients after PCI therapy have not yet been reported.

In the present study, the combination of CBT and drug treatment was used to maximize the improvement of symptoms and enhance efficacy. In the CBT process, therapists help patients understand that the psychological obstacles come from dysfunction of their own information processing systems. The cooperation between patients and therapists will encourage patients to actively participate in the treatment, give full play to their initiative, and achieve treatment goals. Young and middle-aged patients have urgent wishes for treatment and a strong ability to accept CBT, but they also can work closely with therapists, resulting in effective treatment. This indicates that CBT combined with cardiology knowledge can effectively improve the distorted perceptions of patients, and can also improve their knowledge of depression and anxiety and CHD, so as to improve their compliance with treatment and effectively relieve the symptoms of depression and anxiety. Such an approach is supported by recent guidelines from the American Heart Association.²⁹⁾ Previous studies in patients with CHD also support the results of the present study.^{30,31)} However, these guidelines and studies did not specifically address the specific case of young and middle-age men after PCI.

After 8 weeks of treatment, the QOL of post-PCI patients was significantly improved in both groups, but the improvement in the CBT group was more marked than that in the control group. These results suggest that patients who received CBT had higher satisfaction with their treatment, indicating that using CBT combined with cardiology knowledge resulted in a more comprehensive understanding of their disease and that some of their cognitive errors were corrected, which promoted disease recovery and improved the patient's QOL. During the fully interactive process, patients increased their confidence to overcome their disease with the help of therapists, and obtained a correct understanding of the pros and cons of PCI and the discomforts after PCI. Therefore, their worries or fears were relieved and the effects of their disease on work and daily life were also alleviated. In addition, due to continuously evolving PCI technologies, post-operative discomfort in the two groups after 8 weeks mostly disappeared. The cognitive function dimension in the QOL scale represents the patient's memory, reasoning, and attention capacity. Both groups presented small changes in these items after therapy. This might be because that most of the young and middle-aged patients did not suffer from cognitive disorders at baseline, and that the above situations might be associated with body functions, resulting in insignificant improvement with CBT and drug treatments. The specific reasons require further studies.

CBT has many advantages that could benefit patients. Indeed, CBT may be as effective as medication in some cases, may be completed over a short period, may be offered using different supports (groups, self-help books, software), and the skills acquired during CBT may be used in all aspects of daily life. However, CBT has been criticized for a number of reasons. First, the patients must commit themselves, which may consume much time. CBT might not be appropriate for complex mental health statuses. Because CBT involves confrontation with anxieties, it may result in periods of more intense anxiety. Finally, CBT only focuses on the anxiety itself, and not on the source of anxiety.^{32,33)} Nevertheless, in the present study, CBT had a beneficial effect in treating anxiety and depression after PCI. Some studies have shown long-lasting ef-

fects of CBT in different populations.^{34,35)} However, it is currently unknown if CBT will still have benefits in the long-term in these specific patients after PCI.

The present study has some limitations. The number of young patients was small, but reflected what is usually seen in practice. In addition, patients with both depression and anxiety were assessed, which makes it very complicated for sample size calculation. However, in this study, we calculated α values for the current results and found 0.011 and 0.003 for depression and anxiety, respectively. The actual cause of depression was unknown. Depression symptoms could come from the CHD itself, from actual post-CHD depression, or from the PCI. However, in the present study, all patients were treated by PCI, and this effect could be ruled out. Patients with emergency PCI were combined with patients with elective PCI, and it is possible that patients undergoing emergency PCI did not have time to mentally prepare for the procedure. However, mental health status was assessed 3 days after PCI in all patients, which should minimize this effect. The follow-up duration was short, and long-term observations are required. This study was a single-center study with a small sample size. Finally, the correlations between the socioeconomic status and mental health after PCI were not analyzed. Long-term follow-up studies are necessary to identify the long-term benefits from a combination of CBT and medication.

CBT can significantly relieve depression and anxiety after PCI in young and middle-aged patients with CHD. In addition, CBT can significantly improve the QOL and reduce the inflammatory response.

DISCLOSURE

Conflict of interest: The authors declare that they have no conflict of interest.

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