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ORIGINAL ARTICLE

The role of depressive and anxiety symptoms in the evaluation of cardiac rehabilitation efficacy after coronary artery bypass grafting surgery

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Abstract

OBJECTIVES: The aim of this study was to evaluate the efficacy of early 3-week cardiac rehabilitation (CR) in terms of the reduction of negative psychological symptoms, and to determine which factors predispose patients to worse rehabilitation results in this regard.

METHODS: The study involved a random group of 50 patients (11 women and 39 men) who had undergone coronary artery bypass grafting, with a mean age of 63.3 (±7.2) years. The following screening tests were used: Beck Depression Inventory, State-Trait Anxiety Inventory and Acceptance of Illness Scale. The pulse rate during the first session of physical training was recorded (t_1 P), and after training the patients assessed their level of exertion (t_1 E) on the Borg Scale (BS). The same procedure was repeated at the end of the rehabilitation (t_2 P, t_2 E).

RESULTS: Among the psychological parameters examined at t_1 (at baseline), the strongest relationship with poor acceptance of illness after 3 weeks of rehabilitation was indicated by the level of depression ($P < 0.001$), with a slightly lower correlation with the state anxiety and the trait anxiety results ($P = 0.005$ and 0.027, respectively). A relationship was also found between the severity of depression in t_1 and the level of exertion measured by the BS at the end of rehabilitation ($P = 0.007$). Before rehabilitation, depressed patients exhibited higher levels of both trait and state anxiety ($P = 0.009$ and 0.018, respectively). After rehabilitation in the depressed subgroup, there was no improvement in the subjective assessment of exertion or reduction of state anxiety. Sex and co-morbidities also had considerable importance in the context of CR efficacy. The women showed more severe depressive symptoms ($P = 0.01$), a higher personality tendency to anxiety ($P = 0.036$) and poorer results of rehabilitation (in relation to the level of exertion after physical training and the intensity of state anxiety symptoms). There was no reduction of state anxiety in patients who suffered from at least two co-morbidities.

CONCLUSIONS: The presence of severe anxiety–depressive symptoms before rehabilitation has an effect on its outcome. Psychiatric symptomatology should be diagnosed as early as possible and patients should receive additional therapeutic support.

Keywords: Coronary heart disease • Beck Depression Inventory • Spielberger's State-Trait Anxiety Inventory • Acceptance of Illness Scale • Psychiatric disorders • Post-hospital rehabilitation

INTRODUCTION

Coronary artery bypass grafting (CABG) is one of the most frequently performed surgeries in cardiac clinics around the world. The basic purpose of the operation includes: extending the patient's life, reducing the somatic symptoms associated with coronary artery disease and enhancing the quality of life. The development of advanced surgical techniques, modern post-operative care and contemporary pharmacotherapy have reduced peri-operative mortality and prolonged the life of the patient. Long-term improvement of the quality of life and the prevention of further progression of coronary heart disease are the aims of cardiac rehabilitation (CR). CR is a complex and multistage process, requiring co-operation within teams of professionals and the active participation of the patient. The pillars of CR are physical rehabilitation and lifestyle modification.

Exercise training after CABG surgery leads to improvements in the physical capacity and overall fitness of the patient, allowing restoration of independence in daily functioning. Psychological therapy is required at the same time in order to reduce the negative psychological symptoms related to both heart disease itself and the cardiac surgery performed. The most difficult, long-term and important task of CR is to build and strengthen motivation for lifestyle changes in order to sustain the effects of

treatment and to prevent further advancement of the disease. Without such rehabilitation, the effect of highly specialized and expensive medical procedures (such as CABG) will be incomplete and short-lived. An example of CR failure is the ever-growing number of people repeatedly undergoing further coronary angioplasty surgery.

Given that in the absence of complications after cardiac surgery, the patient stays on the ward for no more than a few days, not all CR tasks are performed at this time. The main objective of the first stage of CR is the achievement of independence in the basic activities of daily living. The second stage of early CR, depending on where rehabilitation takes place (hospital, clinic and home) lasts from 3 to 12 weeks. During this time, it is extremely important to improve the physical capacity of the organism, as well as strengthening psychological interactions. At this stage, CR tasks include: the reduction of mental tension, increasing the level of acceptance of the illness and the limitations resulting from it, and education covering the role of risk factors in the development of heart disease and in the recovery process. Successful completion of the second stage of early CR should significantly improve the quality of life of patients and should spark and strengthen the need for a change in lifestyle to one that promotes the patient's health and that the patient will consistently implement in the final, third stage of CR.

The aim of this study was to evaluate the efficacy of early 3-week CR (second stage conducted in-hospital conditions) in terms of the reduction of negative psychological symptoms accompanying heart disease, and to determine which factors predispose patients to worse CR results in this regard.

MATERIALS AND METHODS

The study involved a random group of 50 patients (11 women and 39 men), staying at the Department of Cardiac Rehabilitation, Lower Silesian Centre for Heart Diseases (Poland) after CABG. The criteria for exclusion from the study were as follows: lack of informed consent of the patient, inability to self-complete the research questionnaires, age below 50 and clinical complications after CABG preventing commencement of CR within a standard time. The age of the assessed patients ranged from 51 to 81 years, with a mean of 63.3 (±7.2) years. Among the respondents, the majority had received vocational education (38%, $n = 19$) and post-high school education (38%, $n = 19$), basic education was reported by 12% ($n = 6$) and higher education by the same number of individuals. Most of the group were retirees (58%, $n = 29$) and pensioners (24%, $n = 12$), and only 9 people (18%) were actively working. The average number of years in employment was 35.3 (±8.0). Married persons accounted for 80% of the group ($n = 40$), 12% were widowed ($n = 6$) and 8% were unmarried ($n = 4$).

All patients were diagnosed with coronary heart disease. Almost half of the group (48%, $n = 24$) had already been through one myocardial infarction (MI), 9 patients (18%) had had 2 MI and 17 individuals (34%) had had no MI to date. The majority of the group (94%, $n = 47$) had already undergone cardiac surgery, 2 (4%) patients had had two surgeries and 1 had had four surgeries. Half of the group (52%, $n = 26$) also suffered from one of the following diseases: stroke, diabetes or hypertension. Two co-morbidities occurred in 16% of patients ($n = 8$), mostly diabetes and hypertension. One person in this group had all the above-mentioned diseases. Thirty-two percent of persons ($n = 16$) did not suffer from any of these illnesses. None of the patients had previously been diagnosed with mental disorders (such as psychosis, depression, anxiety) and, for this reason, had never been treated psychiatrically either in the past or at the time of the study.

The following screening tests were used:

(i) the Beck Depression Inventory (BDI),
(ii) the State-Trait Anxiety Inventory (STAI),
(iii) the Acceptance of Illness Scale (AIS).

Each patient filled in the STAI (part X2) once, on the first day of rehabilitation. The STAI (part X1), BDI and AIS were completed twice—once at the start of CR (t_1) and once following the completion of CR (t_2).

The personal and clinical data questionnaire developed for this study collected basic sociodemographic data (gender, age, marital status, education, current occupational status, number of years worked) and clinical data regarding both somatic and mental states. Additionally, during the first cycloergometer training, the pulse rate was recorded at the peak of training (t_1 P). After training, the patients assessed their level of exertion (t_1 E) on a 20-degree Borg Scale (BS). On this scale, values from 6 to 8 indicate extremely light exertion, 9—very light, 10–12—light, 13—somewhat hard, 14–16—hard, 17—very hard, 18–19—extremely hard and 20–maximum exertion. The BS is one of the most commonly used tests for monitoring the exercise intensity experienced by the patient [1]. The same procedure was carried out during the last training session, at the end of CR (t_2 P, t_2 E).

The BDI was used to assess the severity of depressive symptoms [2]. The BDI is considered an accurate and reliable tool for assessing depressive symptoms and has been successfully used for psychopathology research in cardiac surgery patients. The scale contains 21 questions that relate to all the most significant symptoms of depression. The first 13 questions concern the cognitive–affective area (specific alteration in mood associated with self-reproach and self-blame, regressive and self-punitive wishes etc.). Other questions concern the somatic problems accompanying mood disorders (sleep disorders, fatigue, loss of appetite, weight loss, somatic ailments, loss of libido). Severe somatic disease usually affects the number of somato-vegetative symptoms reported by patients, which are related to the total BDI score. To avoid the effect of inflating the overall BDI score due to high values on the somato-vegetative subscale, only the cognitive–affective part was taken into account when assessing the severity of mood disorders. The threshold for dividing patients into depressed and non-depressed subgroups was a score of 10, in accordance with guidelines given by Beck *et al.* [3].

The STAI developed by Spielberger *et al.* [4] was used to assess the level of anxiety as a state and as a personality trait. The subscale of anxiety as a state (indicated by X1) is used to study the current mood of the respondent (worrying, nervousness, fear, etc.). The trait anxiety subscale (indicated by X2) illustrates how the assessed person usually feels. Measurement does not include somatic manifestations of anxiety. The threshold for dividing patients into subgroups with low and high levels of anxiety for the subscale X1 was a score of 44, and for the subscale X2, a score of 46 was used.

The AIS was used to assess the level of acceptance of illness. Scores ranged from 8 to 40 points. A higher score means greater acceptance of illness, better adjustment to the constraints associated with it and a lower sense of psychological discomfort [5].

Statistica Version 7.0. of Statsoft Poland was used to carry out the statistical analysis. Given the nature of the data collected, non-parametric tests were used in the analysis. Wilcoxon's pair sequence test was used for dependent groups, the Mann–Whitney test for two independent groups and the Kruskal–Wallis test for three or more groups. Spearman's rank correlation coefficient was determined to examine the relationships between variables. *P*-value <0.05 was adopted as a boundary for significance.

The outline of CR: during the 4 weeks after cardiac surgery, patients completed 3 weeks of CR, comprising the early stage of post-hospital CR. During this stage of CR, the rehabilitation programme was as follows. Each day began with morning exercises lasting 30 min. For the first 10 days, all patients performed inhalation in order to increase lung capacity, improve ventilation and make coughing up mucus, which may persist in the lungs and bronchi after cardiac surgery, easier. Based on the results of the physical capacity test, each patient was assigned to a particular model of exercises (B, C, D, E) according to which endurance training on a bike cycloergometer took place as well as general rehabilitative exercises. Relaxation took place every afternoon. Health education lectures were held as well as meetings with a psychologist. Each person also received educational materials describing the possibilities for life after cardiac surgery.

RESULTS

Before rehabilitation, the average score for the severity of depressive symptoms (BDI) in the studied group was 14.4 (±7.8). Twelve (24%) patients were classified as depressed (score of cognitive–affective subscale >10), and 38 (76%) as non-depressed. The average level of anxiety as a trait (X2) was 40.5 (±9.1), with 34 individuals (68%) classified as having low-level trait anxiety and 16 individuals (32%) as having an anxious personality. The average level of state anxiety was 35.7 (±9.7), with 41 persons (82%) being classified as having a low level of state anxiety and 9 persons (18%) as having a high level of state anxiety. A statistically significant difference ($P < 0.001$) was noted after CR (t_1 vs t_2) in terms of the average values of X1 (reduction of state anxiety), BDI (reduction of severity of depressive symptoms) and AIS (increase in acceptance of illness). The parameters of physical exercise capacity also improved. Both the heart rate recorded during cycloergometer training and the subjective feeling of exertion decreased significantly ($P < 0.001$).

The correlation analysis showed that all tested parameters of mental state (anxiety, depression, acceptance of illness) were strongly correlated with each other. Severe depressive symptoms were accompanied by high values of anxiety (trait and state) and low acceptance of illness. Similar relationships were observed both before and after CR. Among the psychological parameters examined at the first measuring point (t_1), the strongest relationship with poor acceptance of the illness after CR was indicated by the BDI value ($P < 0.001$), with a slightly lower correlation with the state anxiety result ($P = 0.005$) and the lowest correlation with the trait anxiety result ($P = 0.027$). A relationship was also found between the severity of depression in t_1 and the level of exertion measured by the BS at the end of CR ($P = 0.007$) as well as between the level of exertion and the acceptance of illness ($P = 0.014$). Patients who were suffering more severe depressive symptoms at the initial measurement experienced greater subjective fatigue after exercise and reported worse acceptance of the illness at the end of CR.

To assess the role of depression in terms of the rehabilitation efficacy, the study group was divided into two subgroups according to the severity of cognitive–affective symptoms at the beginning of CR. There were no differences in age or pulse rate between the two subgroups (depressed and non-depressed) after the first physical training session (t_1 P). However, the depressed subgroup reported stronger subjective exertion after training (t_2 P) ($P = 0.027$). The groups also differed in mental state parameters. Depressed patients exhibited higher levels of both trait and state anxiety ($P = 0.009$ and 0.018, respectively). After CR, there was no improvement in the subjective assessment of exertion in the depressed subgroup or a reduction of state anxiety (Table 1). Although there was a significant decline in the overall BDI results in the depressed subgroup after CR, 10 (83%) patients still exceeded a total score of 10 points, suggesting the presence of mood disorders. The patients who were not depressed before

Table 1: The efficacy of cardiac rehabilitation in the depressed and non-depressed group

	Depressed ($n = 12$)			Non-depressed ($n = 38$)		
	Median	First quarter—third quarter	*P*-value	Median	First quarter—third quarter	*P*-value
t_1 P	82.0	76.0–94.0	**0.013**	80.0	72.0–88.0	**<0.001**
t_2 P	72.0	68.0–78.0		72.0	68.0–76.0	
t_1 E	12.0	10.0–13.0	0.06	10.0	8.0–13.0	**<0.001**
t_2 E	10.0	6.0–11.0		6.0	6.0–8.0	
t_1 X1	41.0	35.5–48.5	0.182	33.5	26.0–39.0	**<0.001**
t_2 X1	31.5	27.0–45.5		24.0	22.0–32.0	
t_1 BDI	26.0	23.0–26.5	**0.006**	12.0	8.0–14.0	**<0.001**
t_2 BDI	14.5	11.5–23.5		5.0	2.0–9.0	
t_1 AIS	20.0	13.0–21.5	**0.015**	26.0	23.0–33.0	**<0.001**
t_2 AIS	23.5	19.0–29.5		32.0	23.0–36.0	

t_1: first measuring point (before rehabilitation); t_2: second measuring point (after rehabilitation); P: pulse rate recorded at the peak of cycloergometer training; E: level of exertion measured by the BS; X1: level of anxiety as a state measured by State-Trait Anxiety Inventory; BDI: level of depression measured by Beck Depression Inventory; AIS: level of acceptance of illness measured by Acceptance of Illness Scale. Bolded *P*-values show significant improvement between first and second measuring points (t_1 vs t_2) in particular areas (pulse rate, level of exertion, level of anxiety etc.). *P*-value <0.05 was adopted as a boundary for significance.

Table 2: The efficacy of cardiac rehabilitation in the groups with high and low intensity of state anxiety

	High-intensity state anxiety ($n = 9$)			Low-intensity state anxiety ($n = 41$)		
	Median	First quarter–third quarter	*P*-value	Median	First quarter–third quarter	*P*-value
t_1 P	88.0	80.0–92.0	**0.012**	80.0	72.0–88.0	**<0.001**
t_2 P	72.0	72.0–72.0		72.0	68.0–76.0	
t_1 E	10.0	10.0–13.0	0.176	11.0	10.0–13.0	**<0.001**
t_2 E	10.0	6.0–10.0		6.0	6.0–10.0	
t_1 X1	50.0	48.0–53.0	0.06	33.0	26.0–39.0	**<0.001**
t_2 X1	42.0	33.0–50.0		24.0	22.0–29.0	
t_1 BDI	23.0	19.0–26.0	**0.021**	13.0	9.0–17.0	**<0.001**
t_2 BDI	13.0	9.0–20.0		5.0	2.0–10.0	
t_1 AIS	12.0	10.0–20.0	**0.008**	24.0	22.0–32.0	**<0.001**
t_2 AIS	23.0	16.0–25.0		32.0	23.0–36.0	

t_1: first measuring point (before rehabilitation); t_2: second measuring point (after rehabilitation); P: pulse rate recorded at the peak of cycloergometer training; E: level of exertion measured by the BS; X1: level of anxiety as a state measured by State-Trait Anxiety Inventory; BDI: level of depression measured by Beck Depression Inventory; AIS: level of acceptance of illness measured by Acceptance of Illness Scale. Bolded *P*-values show significant improvement between first and second measuring points (t_1 vs t_2) in particular areas (pulse rate, level of exertion, level of anxiety etc.). *P*-value <0.05 was adopted as a boundary for significance.

CR generally remained free from psychiatric pathology after rehabilitation, whereas depressed patients continued to suffer.

In addition to the quantitative analysis of the BDI results, the qualitative change resulting from rehabilitation was also measured. Among the 21 depressive symptoms included in the BDI, 8 changed significantly: 3 from the cognitive–affective subscale and 5 from the somatic subscale. According to the patients' evaluation, general mood, life satisfaction and self-acceptance improved significantly. Among symptoms within the somatic area, patients rated their ability to work as being higher after rehabilitation, and experienced less sleep disorder, appetite loss and fatigue and lower fluctuations in weight. The cognitive–affective sphere, represented by 13 questions on the Beck's Scale, showed a 23% improvement. Five of 8 symptoms (63%) improved in the somatic sphere.

The comparison of subgroups created according to the intensity of the state anxiety prior to rehabilitation revealed that there was no differences in age or exercise tolerance at point t_1, but there were differences related to the intensity of the trait anxiety ($P < 0.001$), depressive symptoms ($P < 0.001$) and the level of acceptance of illness ($P = 0.002$). As a result of CR, both exercise tolerance and all mental state parameters improved considerably in the group with low-intensity state anxiety. The group with high-intensity state anxiety also recorded an improvement in most studied parameters (t_1 vs t_2), although the changes were not as clear. Moreover, after 3 weeks of CR, the patients in this group experienced no significant difference in terms of the subjective feeling of exertion after physical training or state anxiety reduction (Table 2).

The analysis of the role of sociodemographic and clinical factors (age, sex, education, marital status, employment status, degree of exertion after exercise, number of MIs, number of co-morbidities) showed that only sex and co-morbidities had considerable importance in the context of CR efficacy. The groups of men and women differed from each other at the first measuring point (t_1) in terms of BDI and trait anxiety. The women showed more severe depressive symptoms ($P = 0.010$) and a higher personality tendency to anxiety ($P = 0.036$). After CR, the men reported improvement in all examined parameters, whereas there was no improvement in women in terms of reducing the level of exertion after physical training or the intensity of state anxiety symptoms (Table 3).

To assess the role of co-morbidities, the examined group was divided into the following subgroups:

(i) those who did not suffer from any co-morbidities other than coronary heart disease ($n = 16$);
(ii) those who suffered from one additional disease ($n = 26$);
(iii) those who suffered from two or more additional diseases ($n = 8$).

Significant differences were found between the groups at the first measurement point in terms of state anxiety and depression level (Figs 1 and 2); other parameters were comparable. There was no substantial reduction of anxiety in patients who suffered from at least two co-morbidities following CR.

DISCUSSION

The primary objective of cardiac surgery such as CABG is to extend a patient's life. The long-term goal of a surgical intervention is to improve the quality of a patient's life. Successful coronary artery bypass surgery initiates this process. Above all, it brings about a reduction in ischaemic changes and an improvement in the hemodynamic parameters of the cardiovascular system. A reduction in state anxiety is also observed following CABG. This reaches a very high level directly before surgery and decreases significantly within a few days after surgery [6]. The intensity of depressive symptoms is more stable. Although it may decrease slightly after the operation, there are no significant changes in this sphere [7]. Some authors have even reported an increase in the severity of depression when compared with the state prior to the CABG [8, 9]. Moreover, within 1 year after CABG, ~40% do not return to full activity [10].

Improving the quality of life after CABG is closely related to the rehabilitation outcome. The second stage of CR is

Table 3: The efficacy of cardiac rehabilitation in groups of women and men

	Women ($n = 11$)			Men ($n = 39$)		
	Median	First quarter–third quarter	*P*-value	Median	First quarter–third quarter	*P*-value
t_1 P	76.0	72.0–88.0	0.236	80.0	72.0–88.0	**<0.001**
t_2 P	76.0	68.0–80.0		72.0	68.0–76.0	
t_1 E	11.0	8.0–13.0	0.058	10.0	10.0–13.0	**<0.001**
t_2 E	6.0	6.0–10.0		6.0	6.0–10.0	
t_1 X1	35.0	26.0–40.0	0.067	36.0	27.0–42.0	**<0.001**
t_2 X1	29.0	21.0–33.0		25.0	22.0–38.0	
t_1 BDI	22.0	14.0–26.0	**0.007**	13.0	9.0–17.0	**<0.001**
t_2 BDI	8.0	2.0–15.0		6.0	3.0–10.0	
t_1 AIS	22.0	20.0–27.0	**0.028**	24.0	18.0–32.0	**<0.001**
t_2 AIS	31.0	24.0–36.0		28.0	20.0–35.0	

t_1: first measuring point (before rehabilitation); t_2: second measuring point (after rehabilitation); P: pulse rate recorded at the peak of cycloergometer training; E: level of exertion measured by the BS; X1: level of anxiety as a state measured by State-Trait Anxiety Inventory; BDI: level of depression measured by Beck Depression Inventory; AIS: level of acceptance of illness measured by Acceptance of Illness Scale. Bolded P-values show significant improvement between first and second measuring points (t_1 vs t_2) in particular areas (pulse rate, level of exertion, level of anxiety etc.). *P*-value <0.05 was adopted as a boundary for significance.

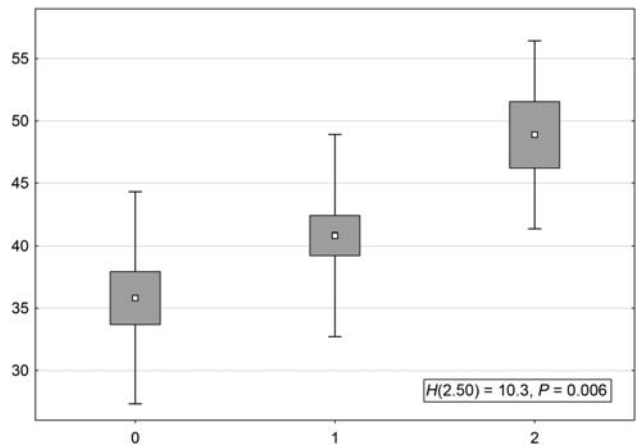

Figure 1: The level of trait anxiety (t_1 X2) in groups of varying numbers of co-morbidities. 0: no comorbidities; 1: one comorbidity; 2: two or more comorbidities

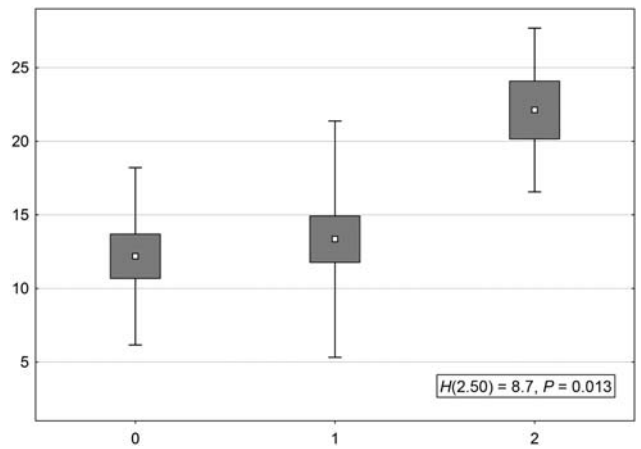

Figure 2: The severity of symptoms of depression before rehabilitation (t_1 BDI) in groups of varying numbers of co-morbidities. 0: no comorbidities; 1: one comorbidity; 2: two or more comorbidities

particularly important. This stage involves patients who have completed hospitalization in an intensive care unit and the first stage of CR. However, the effect of surgery only becomes completely apparent after the second stage (improvement of exercise capacity, reduction of psychopathological symptoms accompanying heart disease and, consequently, improvement of the quality of life). The results obtained confirm this thesis, because both exercise tolerance and the mental state of patients improved significantly following CR. However, some patients received fewer benefits from CR in comparison with other individuals. Identifying such individuals at an early stage of CR provides the opportunity to take special care of them, thus optimizing the outcome of rehabilitation. It is worth emphasizing that the mental condition of patients after the second stage of CR provides a foundation for the final, third stage, which lasts until the end of one's life. Thus, the success of the second stage of CR is crucial to the fate of these patients. They will no longer be covered by daily medical care and will continue the process in the form of self-rehabilitation. This will require major changes in lifestyle.

One of the factors that predispose patients to a poorer response to CR is the level of depression. Prior to rehabilitation, 24% of the examined patients were placed in the depressed group. This result is compatible with reports of other authors who estimated that the incidence of depression after CABG ranges from 17.5 to 28.3% [6–8]. Large differences in the reported percentage of individuals with depression arise primarily from the use of different screening scales and different cut-off points to assess depression. In this project, the BDI was chosen deliberately to assess the areas (cognitive–affective or somatic) in which the rehabilitation efficacy was the greatest. However, when assigning patients to the depressed or non-depressed subgroup, only the cognitive–affective subscale was taken into account in order to avoid inflating the overall score due to the serious somatic state of patients after CABG.

As a result of 3 weeks of CR, the non-depressed group experienced a spectacular improvement in all studied parameters related to exercise capacity as well as general well-being. After rehabilitation, none of the patients met the criteria for the

diagnosis of a depressive-anxiety disorder. Moreover, the average level of acceptance of illness at t_2 amounted to 29.6% (±8.2), which was higher than the values obtained in a Polish population of diabetics, patients with back pain or women diagnosed with migraines [11]. Given the fact that advanced coronary artery disease and cardiac surgery involve a direct threat to life, these results should be regarded as very good.

The efficacy of CR in the depressed subgroup was much lower. Following 3 weeks of intensive physical training, patients experienced no significant improvement in the subjective assessment of exertion on the BS. Nevertheless, it should be emphasized that there was improvement objectively—the heart rate during endurance training decreased significantly. The results demonstrate that the subjective assessment of exertion was not associated with the actual level of the heart rate during exercise (no correlation between these parameters), but that there was a clear correlation with the level of depression disorder. After rehabilitation, there was no significant reduction in state anxiety in this group, and 83% of patients achieved an overall BDI score over 10, confirming the presence of depressive symptoms. It can be concluded that CABG surgery in this group, although successful in clinical terms, does not lead to significant improvement of the quality of life. Even after intensive rehabilitation, the subjective exercise tolerance remained low and the level of depressive–anxiety disorders remained high.

These observations are consistent with the current body of knowledge. The correlation between depression and cardiovascular diseases is well-documented. Frasure-Smith and Lespérance [12] analysed the results of 143 studies, stating that depression or depressive symptoms are associated with the consequent development of coronary heart disease and an increased risk of MI. Other studies have shown that the presence of cardiovascular diseases often precedes the first occurrence of depressive symptoms [13, 14]. In this case, the probable mechanism linking vascular diseases with mood disorders may result from structural changes and ischaemia within the prefrontal cortex, subcortical area, hippocampus and amygdala. All these changes are associated with the pathophysiology of the development of depression [15]. It is evident that the observed dependencies have a bidirectional character and, ultimately, it is not possible to determine what is the cause and what the effect. A third model has recently been analysed, in which cardiovascular diseases and depression have the same causative agent, arising as a result of the impact of cytokines secreted in response to stress [16, 17]. Irrespective of the above, according to the present body of knowledge, there is no doubt that in the case of coronary artery bypass surgery, a high peri-operative level of depression is associated with a poor prognosis in terms of life expectancy, the risk of sudden cardiac events and patients' quality of life [8, 9, 18–22].

Similar relations are observed in the case of high anxiety levels, but this symptom shows greater peri-operative fluctuations than depression. Before CABG, 55% of patients feel a high level of state anxiety [6], but its intensity decreases significantly within a short time after surgery [6, 23]. However, there is a higher risk of death during long-term observations in patients showing strong anxiety reactions both before and after surgery [24, 25]. In the examined group, a high level of state anxiety prior to the second stage of CR was correlated with low acceptance of illness after rehabilitation. Furthermore, patients with a high level of anxiety before CR reported no improvement in physical effort tolerance (BS) or a reduction of state anxiety. It can be concluded that CR was ineffective in these two areas in this group. At this point, the co-existence of anxiety and depression must be emphasized. All patients who had a high level of state anxiety also showed severe mood disorders. Therefore, it is impossible to separate these two types of mental disorder and to state clearly which symptom is of greater importance in this case. Some authors believe that when sadness is deep it is nearly always accompanied by anxiety and treat anxiety as a consequence of affective disorders.

LIMITATIONS

In the research project described here, the focus was primarily on assessing the mental state parameters in patients undergoing CR in whom CABG procedure was conducted without complications and where rehabilitation had begun on time. The lack of detailed clinical data is a significant limitation of this project. In subsequent studies, both the data on mental state parameters and clinical parameters (parameters on the efficiency of the organism, detailed cardiological data, type of medications taken) will be taken into account and jointly analysed. This link could explain the worse performance of rehabilitation and a higher mortality and morbidity in patients with severe depressive–anxiety symptoms.

CONCLUSION

The results illustrate a 3-week period of life after CABG. Even within this short timescale, it is clear that the psychopathology observed before CR greatly affects its final outcome. It should be emphasized that severe depressive-anxiety symptoms and physical exertion intolerance, which may persist despite rehabilitation, will not improve the quality of one's life. Therefore, the psychiatric symptomatology should be diagnosed as early as possible to enable patients to receive additional support. This opens a vast opportunity for psychotherapeutic interventions, which can be an effective and relatively inexpensive way to improve the quality of life of patients suffering from psychosomatic disorders. In our opinion, a score of >10 points in the cognitive–affective subscale of BDI after CABG surgery should be an indication to undertake psychotherapy or psychopharmacology. Otherwise, the success of this highly specialized and expensive medical procedure will remain in question.

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