ARAŞTIRMA YAZISI / RESEARCH ARTICLE

KARDİYAK REHABİLİTASYONUN FONKSİYONEL EGZERSİZ KAPASİTESİ, YAŞAM KALİTESİ VE DEPRESYON ÜZERİNE ETKİLERİ

EFFECTS OF CARDIAC REHABILITATION ON FUNCTIONAL EXERCISE CAPACITY, QUALITY OF LIFE AND DEPRESSION

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ÖZET

AMAÇ: Kardiyak rehabilitasyon programı (KRP), hastaya özel geliştirilmiş geniş kapsamlı bir programdır. KRP, fonksiyonel egzersiz kapasitesini, yaşam kalitesini ve psikososyal durumu iyileştirmeyi amaçlar. Bu çalışmadaki amacımız, perkütan koroner girişim (PKG) yapılan koroner arter hastalığı (KAH) ve koroner arter bypass grefti (KABG) olan hastalara uygulanan KRP'nın etkinliğini retrospektif olarak araştırmaktır.

GEREÇ VE YÖNTEM: PKG yapılan KAH (n= 38) ve KABG'li (n=12) olan 50 hasta retrospektif olarak değerlendirildi. KRP 5 dk ısınma, 10 dk eklem hareket açıklığı,15 dk büyük kas gruplarını içeren güçlendirme egzersizleri, 30 dk bisiklet ergometresi (Ergoselect 200, Ergoline GmbH,Bitz, Germany) kullanılarak sabit kalp hızı yöntemi ile aerobik egzersiz (constant heart rate training program) ve 5 dk soğuma egzersizlerini içeriyordu. Toplam 30 seans uygulandı. Hastaların demografik verileri kaydedildi. Hastaların rehabilitasyon öncesi ve sonrası fonksiyonel egzersiz kapasitesi, yaşam kalitesi ve depresyon durumları sırasıyla 6 dk yürüme testi (6 DYT), Short Form- 36 (SF-36) ve Beck Depresyon Ölçeği (BDÖ) ile değerlendirildi.

BULGULAR: KAH'da rehabilitasyon sonrası 6DYT'nde (p=0.00), yaşam kalitesi parametrelerinden fiziksel fonksiyon (p<0.001), fiziksel rol güçlüğü (p=0.001), emosyonel rol güçlüğü (p=0.01), ağrı (p=0.03), genel sağlık (p=0.04) skorlarında ve BDÖ'nde (p<0.001) anlamlı iyileşme gösterildi. Ek olarak; KABG'lilerde rehabilitasyon sonrası 6 DYT'nde (p<0.001), yaşam kalitesi parametrelerinden fiziksel rol güçlüğü ve emosyonel rol güçlüğünde (p=0.001) ve BDÖ'nde (p<0.001) anlamlı iyileşme saptandı.

SONUÇ: KAH ve KABG olan hastalarda, bisiklet ergometresi ile uygulanan kardiyopulmoner aerobik egzersiz programının fonksiyonel egzersiz kapasitesini ve yaşam kalitesini arttırdığı; depresyon seviyesini azalttığı gösterildi.

ANAHTAR KELİMELER: Kardiyak rehabilitasyon, Efor kapasitesi, Yaşam kalitesi, Depresyon

ABSTRACT

OBJECTIVE: Cardiac Rehabilitation Program (CRP) is a comprehensive program developed specifically for the patients aims to improve functional exercise capacity, quality of life, and psychosocial status. This study aims to investigate the effect of CRP in retrospectively on patients who went through percutaneous coronary interference (PCI) with coronary artery disease (CAD) diagnosis and coronary artery bypass graft (CABG) history.

MATERIAL AND METHODS: 38 patients with CAD diagnosis and 12 patients with CABG history who underwent through PCI were assessed retrospectively. CRP consists of 5 minutes of warm-up, 10 minutes of joint range of motion, a 15 minute-to-ne-up exercise for the greater muscle groups, 30 minutes of aerobic exercise through constant heart rate training program by using bicycle ergometer exercise and 5 minutes of cool-down exercise. A total of 30 sessions were applied. The demographic data of the patients were recorded. 6-minute-walk-test (6-MWT), Short Form- 36 (SF-36), and Beck depression inventory were used respectively to assess the functional exercise capacity, quality of life, and the level of depression of the patients for their before and after the rehabilitation process.

RESULTS: Physical function (p<0.001), physical role (p=0.001), emotional role (p=0.01), pain (p=0.03), overall health (p=0.04) of life quality parameters, 6-MWT (p<0.001) and value of Beck depression inventory (p<0.001) showed significant improvement after the rehabilitation process of patients with CAD diagnosis. Furthermore, significant improvement was found in physical role difficulty and emotional role (p=0.001), which are from the quality of life parameters, and 6 MWT (p<0.001) and BDI (p<0.001) after rehabilitation in patients with CABG.

CONCLUSIONS: The cardiopulmonary aerobic exercise program that is applied together with cycle ergometer exercise improves the functional exercise capacity and the life quality of the patients with CAD diagnosis and CABG history and helps bring down the depression level of the patients.

KEYWORDS: Cardiac rehabilitation, Effort capacity, Quality of life, Depression

INTRODUCTION

Coronary Artery Disease (CAD) is one of the highest mortality rate diseases both in our country and around the world. Coronary artery patients experience difficulties in daily activities requiring functional capacities such as walking, running, and climbing stairs due to respiratory difficulties characterized by pain, dyspnea, and fatigue (1). Cardiac rehabilitation aims to modify the cardiovascular risk factors, to minimize the negative psychological effects on patients, to improve the function and exercise capacity, and to reduce mortality and morbidity by bringing down the symptoms. Preventing additional cardiovascular diseases and exercise training are the main elements of the Cardiac Rehabilitation Program (CRP) (2).

The main aim of the CRP is to modify the changeable risk factors which play an important role in the development of CAD. A meta-analysis aimed at investigating the effect of exercise on patients with coronary heart diseases shows that exercise improves the quality of life as well as the capacity of functional exercise whereas it brings down depression level, total cholesterol levels, triglyceride, systolic blood pressure, mortality, and morbidity as well as the frequency of smoking (3). In the Cochrane review by Taylor et al. (2015), it was detected that CRP increased exercise capacity and health-related quality of life while reducing reinfarction, cardiac-associated hospitalization, and mortality as well as improving modifiable coronary risk factors (4).

Myocardial Infarction (MI) and Coronary Artery Bypass Grafting (CABG) patients with depression might have an increased risk of having another attack independent of other risk factors (5). According to the literature, exercise programs applied to patients with CAD diagnosis and CABG history showed positive effects on depression levels (6, 7).

This study aims to investigate the effect of CRP conducted on the patients with CAD diagnosis and CABG history in the setting of the hospital through the cycle ergometer exercise, on functional exercise capacity, quality of life, and depression.

MATERIALS AND METHODS

A total of 50 patients who visited the Cardiopulmonary Rehabilitation department of Kutahya Health Sciences University between February 2018 and February 2019 period for CRP were assessed in this study retrospectively. Patient files were divided into two groups according to the diagnosis received in the Cardiology clinic. Patients with CAD (n = 38) and CABG (n = 12) who underwent Percutaneous Coronary Interference (PCI), who completed a total of 30 sessions, and who received the constant heart rate training program were included in the file search.

Patients who received CRP due to other cardiac pathologies, whose ejection fraction (EF) level was less than 50%, and who could not use a bicycle ergometer due to musculoskeletal pain were excluded from the study. All assessment scales were evaluated by the same researcher before the sessions started and immediately after 30 sessions. The aerobic exercise capacity of the patients before the rehabilitation process was determined through a metabolic equivalent of task (MET) scale by conducting an effort test which was performed according to Bruce protocols. The Bruce protocol is the most commonly used test, starting at a speed of 2.7 km / h, with a 10% gradient, and is applied by increasing speed and gradient every three minutes (8). MET and heart rate reserve values, which take into account the maximum heart rate and resting heart rate obtained by exercise test, are used to determine exercise intensity (9). CRP consists of 5 minutes of warm-up, 10 minutes of joint range of motion, 15 minutes of tone-up exercise for the greater muscle groups, 30 minutes of aerobic exercise through constant heart rate training program by using cycle ergometer exercise (Ergo select 200, Ergoline GmbH, Bitz, Germany) and 5 minutes of cool-down exercise.

Vital signs of the patients such as pulse, blood pressure, heart rhythm, and oxygen saturation levels were monitored every 3 minutes during the exercise process. The demographic data of the patients were recorded. Functional exercise capacity 6- minute walking test (6-MWT), quality of life (SF-36), and the depression levels (Beck Depression Inventory) are evaluated as a

routine practice in our department before and after the rehabilitation process. Therefore in our study, we analyzed these parameters which are evaluated as a routine. 6MWT is one of the submaximal exercise tests which shows a positive correlation with cardiopulmonary exercise. It is a tenable field test used to evaluate the functional exercise capacity of cardiopulmonary patients and follow up on prognosis (10). Patients were requested to walk at the fastest pace possible for 6 minutes in a 30-meter measured corridor. After 6 minutes, the distance for each patient was measured and recorded. The walk was suspended when angina, dyspnea, and unbearable musculoskeletal pain were experienced.

SF-36 survey was used to evaluate the overall health conditions and the overall quality life of the patients. Reliability and validity studies of the Turkish version of this survey were conducted by Koçyiğit et al. (1999) (11). The quality life of the patients is evaluated in the following 8 sub-parameters; physical function, physical role, pain, emotional role, fatigue, emotional wellbeing status, social function, and overall health condition. Sub parameters of the SF-36 survey evaluate the health condition in a 0 to 100 value range. 0 shows poor health condition whereas 100 shows perfect health. Beck depression inventory is used to evaluate the depression levels of the patients. Reliability and validity studies of this survey's Turkish version were conducted by Hisli et all. This inventory includes 21 articles and it is used to identify the negative symptoms of depression observed at emotional, motivational, and cognitive aspects. According to this inventory the scores are classified as follows; 0-13 points normal, 14-19 points mild depression, 20-28 points moderate depression, and 29-63 points severe depression (12).

Ethical Committee

The approval of the study was obtained from the Non-interventional Medical Ethics Committee of Kutahya Health Sciences University (2019/15).

Statistical Analysis

Statistical analyses were performed using SPSS version 21.0 (Statistical Package for the Social Sciences Inc., Chicago, IL, USA). Descriptive sta-

tistics were obtained from the demographic features of the participants. The normality of the distribution for the continuous variables was assessed with the Kolmogorov–Smirnov test. Wilcoxon signed-rank test or paired samples T-test were used to compare pre and post-test scores where appropriate. A p value< 0.05 was assumed to be statistically significant.

RESULTS

Demographic data are shown in **Table 1**. The mean ages of CAD diagnosed patients and CABG patients are 60. 3± 8.2 years and 66.2± 6.0 years respectively.

Table 1: Demographic parameters

	CAD (n= 38)	CABG (n= 12)
Age (Mean±SD)	60.63 ± 8.2	66.2± 6.0
M/F (n)	50/4	50/4
Duration of disease(months)	28.4 ±26.2	30.4 ±25.0

CABG: coronary artery bypass graft; CAD: coronary artery disease; SD: standard deviation.

CAD patients' 6MWT mean distance significantly increased from 393.6±79.4 to 486.3±10.38 (m) after the rehabilitation process (p<0.001). The mean distance of the 6 MWT of the CABG patients increased from 367.38 ±79.4 to 429.41 ±75.6 (m) (p<0.001) after the rehabilitation process **(Table 2)**.

Table 2: Functional exercise capacity

	Pre- CR 6MWT (m) (Mean±SD)	Post- CR 6MWT (m) (Mean±SD)	P value
CAD	393.6 ±79.4	486.3 ±10.38	<0.001
CABG	367.38 ±79.4	429.41 ±75.6	<0.001

6-MWT: six-min walk test; CABG: coronary artery bypass graft; CAD: coronary artery disease; SD: standard deviation; Pre-CR: pre-cardiac rehabilitation; Post-CR: post-cardiac rehabilitation.

After the rehabilitation process of the CAD patients, there was a significant increase in the scores of the physical function (p<0.001), physical role (p=0.001), emotional role (p= 0.01), pain (p=0.03), and overall health (p=0.04) of the SF-36 quality of life parameters **(Table 3)**.

Table 3: Pre-CR and Post-CR SF-36 parameters of patients with CAD

	Pre-CR (Mean±SD)	Post-CR (Mean±SD)	p value
Physical Function	63.94 ±23.3	74.4 ±20.01	**<0.001**
Physical Role Difficulty	59.21 ±43.21	79.39 ±32.58	**0.001**
Emotional Role Difficulty	50.52 ±40.20	68.63 ±35.55	**0.011**
Fatigue	61.63 ±18.03	64.42 ±20.18	0.41
Emotional Well-being	61.84 ±14.17	61.05 ±20.92	0.84
Social Function	67.73 ±16.11	71.13 ±19.50	0.28
Pain	66.71 ±20.35	75.28 ±24.37	**0.03**
Overall Health	52.71 ±18.75	57.97 ±20.98	**0.04**

CAD: coronary artery disease; Post-CR: post-cardiac rehabilitation; Pre-CR: pre-cardiac rehabilitation; SD: standard deviation; SF-36: Short form 36

There was a significant increase also in the scores of the physical role and emotional role (p= 0.01) of the CABG patients after the rehabilitation process **(Table 4)**.

Table 4: Pre-CR and Post-CR SF-36 parameters of patients with CABG

	Pre-CR (Mean±SD)	Post-CR (Mean±SD)	p value
Physical Function	68.75±26.55	67.07 ±21.04	0.74
Physical Role Difficulty	58.33 ±45.61	91.66± 16.28	**0.01**
Emotional Role Difficulty	61.16 ±42.20	77.83 ±26.0	**0.01**
Fatigue	66.66 ±12.49	69.83 ±14.65	0.34
Emotional Well-being	61.33 ±9.39	66.66 ±13.46	0.24
Social Function	70.08 ±17.30	64.91 ±22.47	0.45
Pain	71.75 ±23.15	69.28 ±19.83	0.70
Overall Health	60.41 ±21.35	59.58 ±13.39	0.90

CABG: coronary artery bypass graft; Post-CR: post-cardiac rehabilitation; Pre-CR: pre-cardiac rehabilitation; SD: standard deviation

Beck depression inventory scores of the CAD patients significantly decreased from 10.5 ±7.0 to 7.1±4.76 after the rehabilitation process (p<0.001). Similarly, it decreased from 8.58±4.5 to 5.0±4.45 for CABG patients (p<0.001) **(Table 5)**.

Table 5: Pre-CR and Post-CR BDI scores of patients with CAD and CABG

	Pre-CR (Mean±SD)	Post-CR (Mean±SD)	P değer
CAD	10.5 ±7.0	7.1±4.76	**<0.001**
CABG	8.5 8±4.5	5.0±4.45	**<0.001**

BDI: Beck Depression Inventory; CABG: coronary artery bypass graft surgery; CAD: coronary artery disease; Post-CR: post-cardiac rehabilitation; Pre-CR: pre-cardiac rehabilitation; SD: standard deviation.

DISCUSSION

Our study showed that 30 sessions of CRP applied through cycle ergometer exercise for the CAD and CABG patients provided significant improvement on functional exercise capacity, quality of life, and the levels of depression experienced.

6MWT is a field test frequently used to evaluate the treatment response and prognosis as well as the functional exercise capacity of cardiovascular diseases (13). In our study, we identified a significant improvement of the 6MWT scores of both patient groups after the rehabilitation process. Similar to the methodology of our study, Herbert used an exercise program including 5-10 minutes of warm-up exercise, 15-20 minutes of aerobic exercise (including the cycle ergometer training), 10-15 minutes of strength training, and 5-10 minutes of cool-down exercise on PCI and CABG patients for 3 days a week for 6 weeks. At the end of 6 we-

eks, a significant increase in 6MWT scores was observed in patients for both groups (14). Pavy et al. (2011) applied the CRP which included 30 minutes long respiratory physiotherapy and 30 minutes long (including the training) aerobic exercise to 202 artery disease patients. Similar to our study, they noticed a significant improvement in the 6MWT scores after the rehabilitation process (15). Shabani et al. (2010) applied CRP which included a 10 to 15 min warm-up, 15 to 20 min aerobic, 10 to 15 min strengthening, and 10 minutes of cool-down exercises in a hospital environment for 30 female CABG patients for 12 weeks in their study; whereas the other 30 female CABG patients in the control group did not have any other activities than daily ones. After the 12th week, there was a significant improvement of the 6MWT scores of the group CRP applied to (16). Although this study has differences in terms of its method compared to our study, it is similar in terms of functional results.

The World Health Organization defines the quality of life as "individuals' personal perception about their aims, expectations, standards and the concerns about their lives in the context of the cultural structure and the values of that structure they are in" (17). The SF-36 survey is used frequently to evaluate the life quality of patients with CAD diagnosis and CABG history (5, 18).

The overall health condition of the patients as well as the desire and the expectations which are reflections of the personal and socio-cultural characteristics of them plays an important role in the quality of life-related to health. Additionally, the reactions and the emotional status of the patients when faced with difficulties to accomplish this desire and the expectations have effects on the quality of life (19). Surveys including general health assessment features are frequently used to show the effects of objective quality of life. One of these is the SF-36 quality of life survey which has reliability and validity in Turkish (11). According to the findings of our study, there was a significant improvement in the scores of all the elements of the SF-36 quality of life scale except fatigue, emotional wellbeing, and social function for the CAD

patients after the rehabilitation process. There was a significant improvement in physical and emotional roles for CABG patients. The study of Lee et al. (2017) shows significant improvement in the scores of SF-36 sub-parameters of pain, physical function, physical role when a CRP with a moderate continuous exercise program used after MI on patients who underwent PCI (20).

The study of Seki et al. (2003) aimed to investigate the impact of phase 3 cardiac rehabilitation on quality of life showed that all sub-quality of life scores except emotional role improved after the 24 sessions of CRP on 20 CAD patients whereas it showed significant improvement in general health, pain, vitality and mental health values (21). These studies from the literature and our results support that CRP increases the quality of life.

Depression is a chronic situation that happens frequently in CAD and CABG patients and it affects the treatment and the rehabilitation results negatively. Beck depression inventory which was developed to measure the severity of the depression, to monitor the developments happening with the treatment, and to be able to identify the situation was used in the studies conducted much earlier to evaluate the effects of the CRP on the mood of the patients (22, 23).

Our study shows a significant decrease in depression levels after the rehabilitation process for both patient groups. The study of Sharif et al. (2012) shows a significant decrease in anxiety and depression levels of CABG patients after the CRP (7). A total of 21 of 24 studies in a review aimed at investigating the effect of cardiac rehabilitation on psychosocial factors identified a significant decrease in the depression scores after the CRP and throughout the follow-up process of CRP (6).

Aksoy et al. (2018) evaluated the effectiveness of cardiac rehabilitation in 60 obese and non-obese patients, 20 of them with CABG and 40 with PCI. In this study, an exercise stress test in the Bruce protocol was used to determine the effort capacity of patients before CRP. As CRP, patients were subject to 30 sessions which included 5 minutes of warm-up exercises, 10 minutes of joint range of motion exercises, 30 minutes cycling with aerobic exercise, and 5 minutes of cool-down exercises. They found significant improvement in 6 MWT, SF-36 quality of life, and Beck Anxiety Inventory evaluation parameters in both patient groups (24). This study applied the similar CRP and found similar outcomes to our study.

Our study is a good example of retrospective studies that show the effectiveness of CRP conducted for 30 sessions. This study shows that the cardiopulmonary aerobic exercise program, conducted through constant heart rate training by using the cycle ergometer exercise, which was applied to CAD and CABG patients improved the effort capacity and the quality of life and decreased the level of depression experienced. However there is a need for further randomized controlled, large sample numbered, and long-term follow-up studies which will support our findings.

Study limitations

Our study had certain limitations. Being a retrospective and heterogeneous study as well as having a low number of patient groups and unavailability of a control group are among these limitations.

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