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Original article

Effects of Cardiovascular Rehabilitation on Exercise Tolerance and Quality Of Life in Elderly with Coronary Artery Disease

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SUMMARY

Introduction/Aim. Cardiovascular rehabilitation (CVR) is of utmost importance in primary and (especially) in secondary prevention of coronary artery disease (CAD). The aim of our paper was to examine whether elderly patients with CAD benefit equally from CVR program as CAD patients of younger age.
Methods. The study involved 1,697 patients referred to the CVR program after surviving myocardial infarction, percutaneous coronary intervention or surgical myocardial revascularization. Patients were divided in two groups: group I involved patients younger than 65 years (1099 patients, 64.76%), whereas group II comprised patients 65 years old or older (598 patients, 35.24%). At the beginning and at the end of CVR, exercise stress tests were done (EST1 and EST2). Also, the quality of life was assessed at the beginning and at the end of CVR by validated questionnaire Short-Form 36 Health Status Survey (SF-36). The results were compared between the groups.
Results. Younger patients showed better exercise tolerance on EST1 and EST2. However, both groups showed better exercise tolerance on EST2. Namely, in both groups patients achieved higher strain level and longer duration on EST2 compared to EST1. Also, higher percentage of patients finished the test by achieving submaximal heart rate on EST2 compared to EST1. Also, our patients showed a significant improvement in all QOL areas except emotional health of patients ≥ 65 of age due to borderline statistically significant limitation.
Conclusion. Our study showed that CVR improves the quality of life and physical exercise tolerance in elderly CAD patients. This is why the utilization rate and adherence of these patients to CVR programs should be vigorously encouraged.

Keywords: **coronary artery disease, cardiovascular rehabilitation, exercise tolerance, quality of life**

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INTRODUCTION

With 8.9 million deaths annually (1), coronary artery disease (CAD) represents the leading cause of death in the world (2). CAD is defined as a condition with lower blood and oxygen supply to the heart which is usually caused by intraluminal atherosclerotic plaque (3). It is classified as chronic and acute coronary syndrome (ACS), and ACS is further classified as acute myocardial infarction (MI) (with and without ST segment elevation) and unstable angina. MI is the most lethal presentation of CAD and cardiovascular diseases (CVD) in general (4). Furthermore, patients who survive MI have five to six-fold higher mortality rate compared to individuals without CAD (5).

Cardiovascular rehabilitation (CVR) is of utmost importance in primary and (especially) in secondary prevention of CVD. A personalized, well-designed and guideline-recommended CVR leads to weight (6) and blood pressure (BP) reduction (7), has an anti-inflammatory effect (8), improves hemodynamic characteristics (9) and quality of life (QOL) (10), reduces the risk of recurrent ACS (11), mortality rate, and other major cardiovascular events (12, 13).

These beneficial effects of CVR are proven in patients with MI, percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), heart failure, arterial hypertension and heart valve interventions, regardless of patients' gender (10, 14), ejection fraction (15), or age. This is why all societies give the highest class of recommendation for CVR (16-19). However, the utilization rate of CVR is extremely poor (20), especially in elderly and female patients (21).

The aim of our paper was to examine whether elderly patients with CAD benefit equally from CVR program as CAD patients of younger age.

MATERIALS AND METHODS

The study involved 1,697 patients referred to the CVR at the Institute for Treatment and Rehabilitation Niška Banja after surviving MI, PCI or CABG. Patients were divided in two groups: group I involved patients younger than 65 years (1099 patients, 64.76%), whereas group II patients were 65 years old or older (598 patients, 35.24%). At the beginning and at the end of CVR exercise, stress test was done on the Treadmill (3017 Full Vision Drive, Newton, Kansas, USA) according to the Bruce protocol. Tests were limited by submaximal heart rate (SHR - calculated as 85% from the 220-age equation), dizziness-like symptoms and signs, chest pain, dyspnea, etc., a sudden increase in systolic BP to the values ≥220 mmHg, or a decrease in systolic BP > 10 mmHg, complex heart rhythm disorders, and/or ischemic changes on the electrocardiogram which were defined as horizontal and/or down-sloping ST depression ≥ 1 mm. Also, the quality of life (QOL) was assessed at the beginning and at the end of CVR by validated questionnaire Short-Form 36 Health Status Survey (SF-36). The results were compared between the groups.

Statistics

We used percentages and frequencies to express qualitative data. Quantitative data were expressed as mean ± standard deviations. Kolmogorov-Smirnov test was used to test normality of distribution. Student's t test was used for the comparison of normally disturbed data, and abnormally distributed data were compared by the Mann–Whitney test and Wilcoxon test. The comparison of frequencies was done by using the Chi- square test. Value $p < 0.05$ was accepted for statistical significance. Data were analyzed using the SPSS (version 20) software.

RESULTS

There was no difference in gender and ejection fraction between the groups. The incidence of MI and PCI was higher in Group I. On the other hand, CABG was more common in group II (Table 1).

The incidence of arterial hypertension, hyperlipidemia and diabetes mellitus was higher in group II, while heredity for CVD and smoking status were more common in group I (Table 2).

All patients performed EST at the beginning (EST1) and at the end (EST2) of CVR. The comparison between the results is shown in Table 3. Patients showed better exercise tolerance on the EST2 by achieving higher level of exercise and longer duration of test. Also, more patients achieved SHR at EST2.

The differences in exercise tolerance on EST1 between the groups are shown in Table 4. Tests lasted longer in group I ($p < 0.001$) and patients in

Table 1. *Distribution of MI, PCI and CABG among the groups*

	Group I Pts (%)	Group II Pts (%)	Z/χ^2	p
Gender (male)	855 (77.8)	448 (75.04)	1.651[a]	.199
MI	935 (85.08)	419 (70.18)	53.299[a]	**.000**
PCI	699 (63.6)	259 (43.38)	64.347[a]	**.000**
CABG	377 (34.3)	332 (55.61)	72.194[a]	**.000**
EF (%)	51.11±9.39	50.82±9.64	-.075[b]	.941

Legend: MI – myocardial infarction, PCI – percutaneous coronary intervention, CABG – coronary artery bypass grafting, EF – ejection fraction. aChi-squared test, bMann-Whitney U test

Table 2. *Risk factors for cardiovascular diseases*

	Group I Pts (%)	Group II Pts (%)	Z/χ^2	p
HLP	960 (87.35)	555 (92.96)	12.783	**.000**
HTA	877 (79.8)	548 (91.79)	41.441	**.000**
DM	247 (22.47)	182 (30.49)	13.138	**.000**
Smoking	684 (62.3)	248 (41.54)	67.299	**.000**
Heredity	515 (47.3)	220 (36.9)	17.065	**.000**

Legend: HLP – hyperlipidemia, HTA – arterial hypertension, DM – diabetes mellitus

Table 3. *Comparison between the first and the second exercise stress test in all patients*

	EST1	EST2	Z/χ^2	p
EST level	2.30±0.92	2.63±0.94	-17.132[b]	**.000**
EST duration (min)	5.34±2.56	6.36±2.67	-21.906[b]	**.000**
Double product before	9789.11±4806.95	9696.62±2073.31	-1.883[b]	.060
Double product after	21426.87±7397.68	21940.56±3704.65	-7.897[b]	**.000**
ST depression	183 (10.8)	232 (13.68)	6.726[a]	**0.010**
Submaximal heart rate	884 (52.12)	1117 (65.86)	67.396[a]	**0.000**
Chest pain	26 (1.53)	15 (0.88)	2.961[a]	0.085

Legend: EST1 – first exercise stress test, EST2 – second exercise stress test; aChi-squared test, bWilcoxon test

group I achieved a higher level of exertion compared to patients in group II (p < 0.001). Also, the double product (DP) which was defined as systolic blood pressure x heart rate, was higher in group I after the test (p < 0.001). On the other hand, ST depression was more present in group II (p = 0.006). The incidence of chest pain and SHR did not differ between the groups.

The differences in exercise tolerance on EST2 between the groups are shown in Table 5. Tests lasted longer in group I (p < 0.001), and patients in group I achieved a higher level of exertion compared to patients in group II (p < 0.001). Also, DP after the test (p < 0.001) as well as the percentage of patients achieving SHR (p = 0.015) were higher in group I. On the other hand, ST depression was once again more present in group II (p < 0.001).

Table 6 shows a comparison between EST1 and EST2 in group I. The average strain level was significantly higher on EST2 (p < 0.001). Also, the duration of tests was significantly longer on EST2 (p < 0.001). DP before the test was significantly higher on EST1 (p = 0.021), but DP after the test was significantly higher on EST2 (p < 0.001). Also, the percentage of patients achieving SHR was higher on EST2 (p < 0.001).

The average strain level in group II was significantly higher on EST2 (p < 0.001). Likewise, the EST2 lasted significantly longer than EST1 (p < 0.001). Also, DP after the EST2 was higher compared to EST1 (p < 0.001). Furthermore, the percentage of patients with ST depression (p = 0.039) and SHR (p < 0.001) was higher on EST2. The percentage of patients experiencing chest pain did not differ between the tests (Table 7).

The effects of CVR on the quality of life in 360 patients (299 men and 61 women) with CAD were assessed by validated questionnaire SF-36. In Table 8, the comparison of mean scores for SF-36 subscales in all examined patients before and after CVR is shown. All parameters were improved after CVR: physical functioning (Z = -10.091; p < 0.001), limitations due to physical health (Z = -6.774; p < 0.001), limitations due to emotional problems (Z = -5.350; p < 0.001), energy/fatigue (Z = -8.441; p < 0.001), emotional well-being (Z = -8.580; p < 0.001), social functioning (Z = -5.770; p < 0.001), pain (Z = -8.032; p < 0.001), general health (Z = -8.178; p < 0.001) and health change (Z = -7.133; p < 0.001).

Table 4. *The first exercise stress test*

	Group I	Group II	Z/χ^2	p
Level	2.47±0.93	1.97±0.81	-10.544	**.000**
Duration	5.87±0.08	4.38±0.09	-11.467[b]	**.000**
Double product before	9741.69±117.42	9865.75±251.29	-.207[b]	.836
Double product after	22034.05±262.57	20293.58±152.52	-7.337[b]	**.000**
ST depression n (%)	102 (9.28)	81 (13.59)	7.452[a]	**.006**
Submaximal heart rate n (%)	591 (53.78)	293 (49.08)	3.421[a]	.064
Chest pain n (%)	19 (1.73)	7 (1.17)	.786[a]	.375

achi-squared test, bMann Whitney U test

Table 5. *The second exercise stress test*

	Group I	Group II	Z/χ^2	p
Level	2.81±0.03	2.31±0.03	-10.450[b]	**.000**
Duration	6.87±0.08	5.42±0.09	-10.839[b]	**.000**
Double product before	9722.94±62.69	9648.17±84.72	-.902[b]	.367
Double product after	22357.74±115.46	21172.68±136.95	-6.924[b]	**.000**
ST depression n (%)	125 (11.42)	107 (17.95)	13.934[a]	**.000**
Submaximal heart rate n (%)	746 (68.13)	371 (62.25)	5.950[a]	**.015**
Chest pain n (%)	11 (1)	4 (0.67)	.488[a]	.485

achi-squared test, bMann Whitney U test

Table 6. *Comparison between the first and the second exercise stress test in group I*

	EST1	EST2	Z/χ[2]	p
Level	2.47±0.93	2.81±0.94	-13.478[b]	**.000**
Duration	5.87±2.58	6.87±2.73	-16.558[b]	**.000**
Double product before	9746±3894.71	9722.94±2076.47	-2.300[b]	**.021**
Double product after	22040.09±8710.41	22357.74±3824.2	-5.489[b]	**.000**
ST depression n (%)	102 (9.28)	125 (11.37)	2.694[a]	0.101
Submaximal heart rate n (%)	591 (53.78)	746 (67.88)	47.462[a]	**0.000**
Chest pain n (%)	19 (1.73)	11 (1)	2.133[a]	0.144

aChi-squared test, bWilcoxon test

Table 7. *Comparison between the first and the second exercise stress test in group II*

	TFO1	TFO2	Z/χ[2]	p
Level	1.98±0.81	2.31±0.85	-10.641[b]	**.000**
Duration	4.38±2.2	5.42±2.28	-14.548[b]	**.000**
Double product before	9868.44±6144.74	9648.17±2068.35	-.084[b]	.933
Double product after	20298.18±3727.96	21172.68±3343.36	-5.959[b]	**.000**
ST depression n (%)	81 (13.59)	107 (17.92)	4.269[a]	**0.039**
Submaximal heart rate n (%)	293 (49.08)	371 (62.14)	20.960[a]	**0.000**
Chest pain n (%)	7 (1.17)	4 (0.67)	0.826[a]	0.363

achi-squared test, bWilcoxon test

Table 8. *Comparison of mean scores for SF-36 subscales in all patients before and after cardiovascular rehabilitation*

	Before rehabilitation	After rehabilitation	Z	p
Physical functioning	61.17±24.51	69.86±22.01	-10.091	**.000**
Limitations due to physical health	28.36±36.75	39.59±40.1	-6.774	**.000**
Limitations due to emotional problems	37.51±38.68	46.86±40.4	-5.350	**.000**
Energy/fatigue	60.17±19.41	66.12±19.81	-8.441	**.000**
Emotional well-being	70.1±20.39	75.41±20.05	-8.580	**.000**
Social functioning	69.6±22.82	74.61±22.37	-5.770	**.000**
Pain	63±24.27	70.58±23.33	-8.032	**.000**
General health	53.84±16.67	58.81±17.61	-8.178	**.000**
Health change	51.44±37.26	59.55±34.47	-7.133	**.000**

Wilcoxon test

Table 9 shows the comparison between SF-36 results before and after CVR in group I. All parameters were improved after CVR: physical functioning (Z = -8.757; p < 0.001), limitations due to physical health (Z = -5.201; p < 0.001), limitations due to emotional problems (Z = -5.067; p = 0.000), energy/fatigue (Z = -8.441; p < 0.001), emotional well-being (Z = -8.580; p < 0.001), social functioning (Z = -5.770; p < 0.001), pain (Z = -8.032; p < 0.001), general health (Z = -8.178; p < 0.001) and health change (Z = -7.133; p < 0.001).

Table 10 shows the comparison between SF-36 results before and after CVR in Group II. All parameters were improved after CVR except limitations due to emotional problems (Z = -1.932, p = 0.053): physical functioning (Z = -5.086; p < 0.001), limitations due to physical health (Z = -4.605; p < 0.001), energy/fatigue (Z = -6.237; p < 0.001), emotional well-being (Z = -5.032; p < 0.001), social functioning (Z = -2.842; p = 0.004), pain (Z = -4.628; p < 0.001), general health (Z = -5.810; p < 0.001) and health change (Z = -4.360; p < 0.001).

Table 9. *Comparison of mean scores for SF-36 subscales in group I before and after cardiovascular rehabilitation*

	Before rehabilitation	After rehabilitation	Z	p
Physical functioning	62.3±24.83	71.62±21.79	-8.757	**.000**
Limitations due to physical health	31.55±37.79	42.39±41.07	-5.201	**.000**
Limitations due to emotional problems	40.66±39.07	51.57±40.68	-5.067	**.000**
Energy/fatigue	61.18±20.09	66.76±20.39	-8.441	**.000**
Emotional well-being	70.67±19.87	75.77±19.51	-8.580	**.000**
Social functioning	69.32±22.88	74.59±22.71	-5.770	**.000**
Pain	62.21±23.98	69.8±23.6	-8.032	**.000**
General health	54.13±17.12	58.65±17.72	-8.178	**.000**
Health change	47.81±38.14	55.73±36.22	-7.133	**.000**

Wilcoxon test

Table 10. *The comparison of mean scores for SF-36 subscales in group II before and after cardiovascular rehabilitation*

	Before rehabilitation	After rehabilitation	Z	p
Physical functioning	58.69±23.7	66.02±22.09	-5.086	**.000**
Limitations due to physical health	21.2±33.35	33.3±37.22	-4.605	**.000**
Limitations due to emotional problems	30.41±36.94	36.24±37.8	-1.932	.053
Energy/fatigue	57.9±17.64	64.67±18.43	-6.237	**.000**
Emotional well-being	68.81±21.53	74.61±21.26	-5.032	**.000**
Social functioning	70.24±22.76	74.64±21.67	-2.842	**.004**
Pain	64.78±24.92	72.34±22.69	-4.628	**.000**
General health	53.18±15.65	59.16±17.41	-5.810	**.000**
Health change	59.6±33.95	68.15±28.44	-4.360	**.000**

DISCUSSION

Over the past decades, CVR has evolved from simple monitoring from the safe return to physical activities to a multidisciplinary effective care approach focusing on the improvement of the physical and emotional well-being of an individuals who has suffered a cardiovascular event (22). Historically, CVR's context and central concept has been having MI survivors return to work (22). Nowadays, CVR includes health education, physical training, psychosocial support, and lifestyle changes. It is designed to improve the quality of life in cardiovascular patients and to teach them how to help themselves in preventing future cardiovascular events. This approach demands a multidisciplinary team which usually includes cardiologist, nurse, psychologist and dietitian. If personalized and guideline-guided, CVR can lead to the reduction of the risk of MI (both, fatal and non-fatal) and all-cause hospitalization (20, 23).

Favorable epidemiological transition in the 20th century with prolonged life expectancy and accelerated epidemic burden of CVD concern (24) shifted the challenges of CVD care to other subsets of society, including older adults, women, those of low socioeconomic status, patients living in rural areas, and ethno-cultural minorities (25). Nevertheless, although with proven CV benefits, CVR remains considerably underutilized in these social subsets primarily due to shared "Indication or limitation?" (26) question regarding frailty and multimorbidity, making the CVR a "Cinderella of treatments" (27) in age-related circumstances as well.

The most common indication for CVR is CAD. Around 126 million people in the world suffer from CAD and its prevalence rises with age (28). CAD is the most lethal disease in both developed and undeveloped countries (29), older patients having worse prognosis (30). About 32% of deaths around the globe are due to cardiovascular diseases, and 85% of them are caused by heart attack or stroke (31). Furthermore, patients who survive MI usually suffer from disabilities and CAD is the major cause of loss of Disability Adjusted Life Years (DALYs) globally (2). CVR improves the QOL and decreases the number of hospitalization and mortality rate in CAD patients (32). These beneficial effects of CVR are proven in PCI, CABG, angina pectoris and acute MI (33). Also, its positive effects are shown in both genders (8, 10), irrespective of ejection fraction (15).

Even though literature on the positive effect of CVR in older patients is more visible than ever (14), numerous comorbidities and disabilities usually limit CVR in elderly patients causing this group of patients to be underrepresented in many studies (34, 35). Also, these patients are less fit and less active, and have more complications after MI or revascularization procedures. However, positive effects of CVR are proven (even) in this group of patients. For example, it is showed that CVR in elderly leads to greater improvements in oxygen consumption compared to younger counterparts (36). Moreover, resistance training increases mobility, exercise capacity and muscle strength in these patients (37). However, only 62% of patients above the age 65 who survive MI are referred to CVR and only 1/3 of them attend one session (38). Considering the current longevity trends, there is a growing need for more data on the impact of specifically defined CVR interventions as the secondary prevention tool of improvement on the general health conditions of these patients, such as quality of life, physical function, and maintenance of independence (10).

The cornerstone of CVR is exercise training (ET). Physical activity can lead to lipid, BP and weight reduction (39). It also improves myocardial flow reserve and endothelial function (40), attenuates atherosclerotic progression and improves event-free survival in patients with symptomatic CAD (41, 42). There are few studies which showed that ET can even lead to the regression of coronary stenosis (43). Moreover, physical activity can reduce symptoms and, what is the most important, mortality rate in patients with CAD (43).

In our study, the patients underwent a three-week exercise-based CVR which included a dosed and individualized aerobic training with aerobic exercises, walking for 45 minutes per session, and bicycle riding – two times daily, five days a week. Exercise tolerance was assessed by EST performed at the beginning and at the end of CVR. Results were compared between the groups. Younger patients showed better exercise tolerance on EST1 and EST2. These findings were expected. However, both groups showed better exercise tolerance on EST2. Namely, in both groups the patients achieved higher strain level and longer duration on EST2 compared to EST1. Also, higher percentage of patients finished the test by achieving SHR on EST2 compared to EST1. This data confirms our thesis that CVR leads to better exercise tolerance in CAD patients irrespective of their age.

This study also aimed to assess the impact of the CVR program on the QOL in older patients compared to younger patients via SF-36 questionnaire at the baseline and at the end of the CVR program. As hypothesized, regardless of age group, all studied patients reported significantly higher levels of physical (PRQOL) and mentally-related quality of life (MRQOL) at the end of CVR when compared to normative baseline regarding the levels of physical functioning, limitation due to physical and emotional health, fatigue, bodily pain, general health perceptions, emotional and social role functioning, and mental health. These findings on the positive effectiveness of CVR on PRQOL are consistent with Huang et al.'s (44) robust statistical analysis published in 2021, while similar inputs regarding improvement in MRQOL in patients of similar settings are consistent with Cochrane's updated review in 2020 (45).

Many summarized meta-analyses (46) are similar to our SF-36 data but with follow-up score differences between exercise and control groups instead of an intra-individual score approach. Although their results are comparable to our post-CVR follow-up intra-individual score, their approach inhibits direct comparison of the effect levels to score changes. On the other hand, a more recent individually orientated prospective cohort study by Angst and colleagues (47) reported significant improvement in all MRQOL subsets. For clinical purposes, the same author proposed at least two mental health scales and one coping scale for a comprehensive and specific assessment of MRQOL. Regarding this view, using a single evaluation tool is a limitation of our study.

In our study, in the examined group of younger patients (< 65 of age), both PRQOL and MRQOL were reported higher after the completion of rehabilitation. These findings are supported by previous data. However, our sample also showed a significant improvement in all MRQOL areas except borderline statistically significant limitation due to emotional health in patients ≥ 65 years of age on discharge (47). These findings are comparable with Marchionni et al.'s (48) and Stewart et al.'s findings (49), who compared CVR program outcomes in the same-age patients. They found that the elderly group significantly improved all aspects of the quality of life studied and demonstrated that improved fitness enhances patients' quality of life and can help older adults live more independently after CVR.

These positive effects of CVR on the physical exercise tolerance and QOL in elderly CAD patients are an interesting observation when related to the globally reported significant underutilization of CVR programs in this group of patients (50) on one hand and CVR being a class I recommendation in the European Society of Cardiology guidelines on the other (51).

CONCLUSION

Our study showed that CVR improves the quality of life and physical exercise tolerance in elderly CAD patients. This is why the utilization rate and adherence of these patients to CVR programs should be vigorously encouraged.

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Efekti kardiovaskularne rehabilitacije na toleranciju fizičkog napora i kvalitet života kod starijih pacijenata sa koronarnom arterijskom bolešću

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SAŽETAK

Uvod/Cilj. Kardiovaskularna rehabilitacija (KVR) od izuzetnog je značaja za primarnu i (posebno) sekundarnu rehabilitaciju pacijenata sa koronarnom arterijskom bolešću. Cilj ovog rada bio je da se ispita da li je korist od KVR-a kod starijih pacijenata sa koronarnom arterijskom bolešću jednaka koristi koja je zapažena kod pacijenata mlađeg uzrasta.
Metode. Studijom je obuhvaćeno 1697 pacijenata upućenih na program KVR-a nakon što su preživeli infarkt miokarda, perkutanu koronarnu intervenciju ili hiruršku revaskularizaciju miokarda. Pacijenti su podeljeni u dve grupe: u grupi I bili su pacijenti mlađi od 65 godina (1099 pacijenata; 64,76%), a u grupi II pacijenti stariji od 65 godina (598 pacijenata; 35,24%). Na početku i na kraju KVR-a urađeni su testovi fizičkim opterećenjem (TFO1 i TFO2). Takođe, kvalitet života bio je procenjen na početku i na kraju KVR-a validiranim upitnikom *Short-Form 36 Health Status Survey* (SF-36). Rezultati su upoređeni između grupa.
Rezultati. Iako su mlađi pacijenti pokazali bolju toleranciju fizičkog napora na TFO1 i TFO2, i jedna i druga grupa pokazale su bolju toleranciju napora na TFO2. Naime, pacijenti su u obema grupama dostigli viši nivo opterećenja i duže trajanje na TFO2 nego na TFO1. Takođe, veći procenat pacijenata završio je test postizanjem submaksimalne srčane frekvencije na TFO2 nego na TFO1. Kod pacijenata je uočeno i značajno poboljšanje u svim oblastima kvaliteta života osim emocionalnog zdravlja kod pacijenata starih ≥ 65 godina, usled graničnog statistički značajnog ograničenja.
Zaključak. Naša studija je pokazala da KVR poboljšava kvalitet života i toleranciju fizičkog napora kod starijih pacijenata sa koronarnom arterijskom bolešću. Stoga, treba energično podsticati učešće ovih pacijenata u programima KVR-a.

***Ključne reči*: koronarna arterijska bolest, kardiovaskularna rehabilitacija, tolerancija fizičkog napora, kvalitet života**