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Influence of physical activity during leisure time in patients in the two-year follow-up period after CABG

Influência da atividade física no tempo livre em pacientes no seguimento de até dois anos após CRM

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Abstract

Objective: **To investigate the effect of physical activity in leisure time (LTPA) on the prognosis of patients two years after coronary artery bypass grafting (CABG).**

Methods: **Cohort study with 202 elective CABG patients, mean age of patients was 62 ± 10 years, 134 (66%) men divided into sedentary and active according their LTPA. Followed for two years after CAGB where the occurrence of major adverse cardiac events (MACES) were found, and changes in physical activity.**

Results: **Thirty-eight had MACES. Twenty-nine were sedentary, nine active (*P*=0.18). Active: three (4.5%) readmissions, three (4.5%) deaths and two (3%) stroke. Sedentary: seven (5.1%) acute myocardial infarction (AMI), seven (5.1%) readmissions, 16 (11.6%) deaths and one (0.7%) stroke. LTPA decreased from preoperative to the postoperative period. Sedentary: 2.09 (± 0.58) and 2.08 (± 0.57); active: 2.53 (± 0.73) and 2.33 (± 0.71). The leisure and locomotion activities in the preoperative and postoperative: Sedentary increased 2.08 (± 1.09) and 2.13 (± 0.78); active reduction 2.53 (± 0.73) and 2.27 (± 1.12). The 6-minute walk test increased pre and postoperative. Sedentary: 255 m (± 167.06 m) and 377 m (± 190.63 m); active: 337 m (± 172.42 m) and 405 m (± 148.93 m). The veterans specific activity questionnaire increased the pre and postoperative. Sedentary: 4.39 (±1.80) and 6.99 (± 3.08); active: 4.44 (± 1.82) and 8.50 (± 3.16).**

Conclusion: **The results indicate that LTPA does not modify the late prognostic of CABG patients, but CABG itself promotes physical activity and improves long-term functional capacity.**

Descriptors: **Exercise. Physical education and training. Myocardial revascularization.**

Resumo

Objetivo: **Verificar a influência da atividade física no tempo livre (AFTL) no prognóstico dos pacientes até dois anos após a cirurgia de revascularização do miocárdio (CRM).**

Métodos: **Coorte com 202 pacientes, idade média de 62 ± 10 anos, sendo 134 (66%) homens, encaminhados para CRM, divididos em ativos e sedentários, conforme a AFTL. Acompanhados até dois anos após CRM onde foi verificada a ocorrência de eventos cardíacos adversos maiores (ECAM) e as modificações na prática da atividade física.**

Resultados: **Trinta e oito apresentaram ECAM, 29 eram sedentários e nove ativos (*P*= 0,18). Ativos: três (4,5%) reinternações, três (4,5%) óbitos e dois (3%) acidente vascular cerebral (AVC). Sedentários: sete (5,1%) infarto agudo do miocárdio (IAM), sete (5,1%) reinternações, 16 (11,6%) óbitos e um (0,7%) AVC. AFTL diminuiu do pré para o pós-operatório. Ativos: 2,53 (±0,73) e 2,33 (±0,71); sedentários: 2,09 (±0,58) e 2,08 (±0,57). Atividade de lazer e locomoção diminuiu do pré para o pós-operatório nos ativos: 2,53 (±0,73) e 2,27 (±1,12) e aumentou nos sedentários 2,08 (±1,09) e 2,13 (±0,78). O teste de caminhada de 6 minutos (TC6) aumentou no pré e pós-operatório em ativos 337 (±172,42) e 405 (±148,93) e sedentários 255 (±167,06) e 377 (±190,63). O *Veterans Specific Questionaire Activity* (VSAQ) aumentou do pré para o pós-operatório em ativos 4,44 (±1,82) e 8,50 (±3,16) e sedentários 4,39 (±1,80) e 6,99 (±3,08).**

Conclusão: **A AFTL não modifica o prognóstico tardio dos pacientes submetidos a CRM. A CRM promove a atividade física e melhora a capacidade funcional dos pacientes em longo prazo.**

Descritores: **Exercício. Educação física e treinamento. Revascularização miocárdica.**

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INTRODUCTION

The practice of frequent and persistent physical activity is an important behavior for the health of individuals and populations [1]. The influence of leisure-time physical activity (LTPA) performed by patients undergoing coronary artery bypass graft (CABG) in the late prognosis has been poorly evaluated in studies. Hirschhorn et al. [2] performed a clinical trial with 93 patients with the aim of determining whether a cardiac rehabilitation phase 1, with or without respiratory and musculoskeletal exercises, could improve walking capacity in patients undergoing CABG. It was confirmed that the walking exercise program significantly improved submaximal exercise capacity at hospital discharge. The results of breathing and musculoskeletal exercises do not show any additional advantage.

Herdy et al. [3] performed a randomized clinical trial with 56 patients in the CABG preoperative period, with the aim of evaluating the effect of a cardiopulmonary rehabilitation program before and after surgery. The study revealed that, cardiopulmonary rehabilitation in patients on the waiting list for CABG reduces the occurrence of postoperative complications such as pneumonia, atrial fibrillation, pleural effusion, atelectasis and hospital stay, without influencing the occurrence of major adverse cardiac events (MACE). Therefore, there is evidence that an increase in physical activity in the preoperative period may improve patient's prognosis undergoing CABG in the immediate postoperative period. However, it was not checked in relation to the occurrence of hard and long-term outcomes. We checked the influence of LTPA practice in the prognosis of patients until two years after CABG.

METHODS

A prospective cohort study where 202 patients were consecutively evaluated, and non-hospitalized adults of both genders, who had been admitted to hospital for elective CABG. Patients were recruited from three university hospitals from January 2006 to March 2007. Patients operated on emergency basis with acute coronary syndrome, concomitant congenital heart disease and valvulopathies were excluded.

Until a two-year follow-up period, the occurrence of MACE was detected. We considered major cardiac events, such as: death, rehospitalization, cerebrovascular accident (CVA), acute myocardial infarction (AMI) [4] established by the cardiologist responsible and validated by the authors when two of the following criteria had been met: an increase of 5 (five) times and typical fall in serum creatine kinase (CK-MB) levels accompanied by at least one of the following criteria:

a) Myocardial ischemia symptoms;

b) Development of pathologic Q waves;

c) Coronary intervention (e.g. percutaneous transluminal coronary angioplasty);

When patients had more than one event, the most severe was considered for analysis.

Ethics

The study complied with the standards of Helsinki, and it was approved by the Research Ethics Committee at the institutions where the study was conducted and we obtained the patients' consent.

Instruments

A structured questionnaire was administered and, we also researched information on demographic, anthropometric and clinical data.

Patients were divided into two groups according to the LTPA practice: group I, active patients, those involved in physical activities during free time three or more times per week and for 30 minutes or more in the past two weeks and group II, sedentary patients [5]. To make this classification more consistent, we applied: Baecke Questionnaire of Habitual Physical Activity which investigates the habitual physical activity over the last 12 months [6], the six-minute walk test (6MWT), performed according to standards of the American Thoracic Society [7], the Veterans Specific Activity Questionnaire (VSAQ) [8], which consists of a list of activities present in progressive order as metabolic equivalent (MET) and measures functional capacity. The MET value associated with each activity was derived from multiple sources that conform to the Compendium of Activities [9].

Waist and hip circumference were determined by a standardized protocol [10]. The body mass index was calculated by the formula: weight (kg) divided by height (m) squared and waist-hip ratio by the formula: waist circumference (cm) divided by hip circumference (cm).

Statistical analysis

The data were collected and analysed with the aid of the Statistical Package for Social Sciences (SPSS) version 15.0. The categorical variables are presented by absolute frequencies and percentages. The continuous variables with normal distribution are presented by mean and standard deviation, and those variables without normal distribution by median and interquartile range.

To evaluate the demographic, anthropometric and clinical characteristics, and make the comparison between the group of active and sedentary patients, the Student t test was used for continuous variables and McNemar test for categorical variables. The Mann-Whitney U test was used to compare the medians between two samples. In all analysis a P value <0.05 was considered statistically significant.

RESULTS

Table 1 shows the demographic, anthropometric and clinical variables of the patients. It is observed that the samples were similar in both groups, except for gender, where the active patient group had a higher proportion of men.

In Table 2, it is related the present comorbidities and medications used by patients in the preoperative period. We can note a greater proportion of patients taking antiplatelet agents in the active patients group.

Table 3 describes the occurrence of MACE in active and sedentary patients in two years, with no significant difference among the cases when compared with physical activity. It is observed that seven patients died in hospital, six of them during the 60-day postoperative period and four (who were sedentary before surgery) could not be contacted. It can be observed that, patients who were active in the preoperative period, had fewer occurrences of MACE.

Among the 202 patients who entered the study, 38 had events (two patients had two events at the same time), while 29 were sedentary and nine were active ($P = 0.18$).

Table 1. Baseline characteristics of patients undergoing coronary artery bypass grafting, stratified regarding physival activity*

Characteristics	Active Patients (n = 66)	Sedentary Patients (n = 136)	*P* Value
Mean age (SD), years	60 ± 10	62 ± 10	0.14
Male	51 (77.3)	83 (61)	0.02
BMI	27 ± 4	27 ± 5	0.97
WHR	0.96 ± 0.07	0.96 ± 0.11	0.99
Number of grafts	3 ± 1	3 ± 1	0.67
Ejection fraction	61 ± 14	60 ± 13	0.70

*BMI = body mass index, WHR = waist-hip ratio. * Values are expressed as number (percentage), except those indicated*

Table 2. Comorbidities and medication use in the preoperative period in patients stratified by physical activity

Characteristics	Active Patients (n = 66)	Sedentary Patients (n = 136)	*P* Value
Comorbidities			
Smoking (%)	42 (63.6)	87 (64)	0.95
Diabetes mellitus (%)	21 (31.8)	51 (37.5)	0.43
Systemic arterial hypertension (%)	58 (87.9)	119 (87.5)	0.94
Prior AMI (%)	20 (30.3)	36 (26.5)	0.57
Peripheral vascular disease (%)	8 (12.1)	20 (14.7)	0.62
COPD (%)	4 (6.1)	9 (6.6)	1.00
Dyslipidemia (%)	14 (21.2)	38 (27.9)	0.31
Preoperative Use			
Beta-blocker (%)	49 (74.2)	105 (77.2)	0.63
ACE inhibitor (%)	45 (68.2)	97 (71.3)	0.65
Antiplatelet (%)	59 (89.4)	108 (79.4)	0.08
Antiarrhythmic (%)	13 (19.7)	37 (27.2)	0.25
Hypoglycemic (%)	12 (18.2)	24 (17.6)	0.93
Vasodilator (%)	6 (9.1)	19 (14)	0.31
Statin (%)	42 (63.6)	84 (61.8)	0.80

AMI = acute myocardial infarction, COPD = chronic obstructive pulmonary disease, angiotensin converting enzyme (ACE) inhibitor

Table 3. Distribution of MACE in the 2-year follow-up period after CABG in active and sedentary patients

Events	Active Patients			Sedentary Patients		
	Hospitalization (66)	Follow-up of patients (66)	Total	Hospitalization (136)	Follow-up of patients (119)	Total
AMI n(%)	1 (1.5)	0 (0)	1	5 (3.7)	2 (1.7)	7
Rehospitalization n(%)	0 (0)	3 (4.5)	3	1 (0.7)	6 (5)	7
Death n(%)	1 (1.5)	2 (3)	3	12 (8.8)	4 (3.4)	16
CVA n(%)	0 (0)	2 (3)	2	0 (0)	1 (0.8)	1
TOTAL	2	7	9	18	13	31

*AMI = acute myocardial infarction; CVA = cerebrovascular accident; *= Death in Hospitalization and 60 days*

Table 4. Characteristics of active and sedentary patients in relation to the instruments' scores of physical activity evaluation and functional capacity

Instruments	Preoperative (202)			Postoperative (179)		
	Active Patients n (66)	Sedentary Patients n (136)	*P* Value	Active Patients n (123)	Sedentary Patients n (56)	*P* Value
BAECKE						
LTPA	2.53 (0.73)	2.09 (0.58)	0.00	2.33 (0.71)	2.08 (0.57)	0.01
LLA	2.53 (0.73)	2.08 (1.09)	0.02	2.27 (1.12)	2.13 (0.78)	0.42
Total*	5.06 (1.14)	4.17 (1.11)	0.01	4.6 (1.08)	4.21 (0.99)	0.00
6MWT	337 (172.47)	255 (167.06)	0.01	405 (148.93)	377 (190.63)	0.30
VSAQ***	4.44 (1.82)	4.39 (1.80)	0.87	8.50 (3.16)	6.99 (3.08)	0.02

Baecke = Baecke Questionnaire of Habitual Physical Activity; LTPA = Leisure-Time Physical Activity, LLA = Leisure and locomotion activity. 6MWT = six-minute walk test. VASQ= Veterans Activity Specific Questionnaire.
** Sum of the Baecke questionnaire scores; ** Walked meters, *** MET = metabolic equivalent of task.*
Values are expressed as mean (standard deviation)

Table 4 shows the physical performance of active and sedendary patients in the pre-and postoperative period, in a two-year follow-up period. In the assessment of LTPA and LLA, as determined by the Baecke questionnaire, there is a decrease of these activities, both in active and sedentary patients. In the 6MWT, there was an increase of the distance walked in the active and sedentary groups. When evaluating VSAQ, it is also noted an increase of active patients in relation to sedentary ones, showing a change in patients for developing healthier activities.

DISCUSSION

The practical influence of LTPA performed by patients undergoing CABG in the late prognosis has been rarely addressed in studies. Our study showed that active patients before CABG had fewer MACE than sedentary individuals, but this difference was not significant during the two-year follow-up period.

Nery [11] has observed in his studies that, active patients a year before CABG were 78% less likely to have MACE during hospitalization.

Cook et al. [12] sought to quantify the in-shape patients and determine whether it could improve the outcome in a group of patients referred for CABG. It was observed that patients with high body fat percentage and low aerobic capacity are at high risk for at least one postoperative complication, and a longer hospital stay.

Shephard [13] performed a comprehensive review of observational studies, including physical activity (PA) and cardiovascular diseases. The great majority of them showed a lower incidence of coronary artery disease (CAD) and mortality from all specific causes, due to age in the most active groups. In most cases, there was a two or three times higher risk associated with a sedentary lifestyle.

Wannamathee et al. [14] showed a reduction greater than 50% in morbidity and mortality from cardiovascular diseases in patients with CAD, who became or remained active, compared to those who remained sedentary.

Conforming to Ditmyer et al. [15], a program including PA before an orthopedic surgery improves the patients' functional capacity, leading them to better withstand the inactivity period associated with the procedure.

In Cook's study et al. [12], patients with a history of prior physical activity reported better quality of life one year after CABG, even patients who had stopped physical activity for more than a year before the surgery.

Takeyama et al. observed that a two-week supervised

aerobic training after CABG is associated with immediate improvement and long-term physical capacity [16]. Sato et al. conducted a study to determine whether or not the inclusion of physical activity in an external cardiac rehabilitation program could accelerate the improvement of heart rate recovery in patients after CABG. The results suggest that the inclusion of physical activity during cardiac rehabilitation could lead to an improvement of heart rate recovery in patients after CABG. However, after CABG patients had to increase their level of physical activity to improve their cardiac autonomic control, besides the cardiac rehabilitation [17].

The improvement of functional capacity in these studies was also observed by us, both in active and sedentary patients, in the postoperative period measured by the 6MWT and VSAQ.

Paradoxically, there was no increase in habitual physical activities, determined by LTPA and LLA tests, which may be related to physical limitations of patients and / or comorbidities. It was also observed by Apullan et al. [18] in a cohort of 14,021 patients with suspected CAD, which sought to determine the prognostic value of LTPA in a long-term period.

Markou et al. [19] evaluated the influence of CABG on PA one year after surgery, and its preoperative practice in connection with the postoperative period. They also identified that low levels of preoperative PA was a risk factor to decrease the level of postoperative PA.

In the study conducted by Hirschhorn et al. [2], patients were divided into three groups: group 1 - intervention with minor mobilization exercises, group 2 - moderate walking exercises, group 3 - moderate intensity walking exercise plus musculoskeletal and breathing exercises. It was confirmed that the walking exercise program significantly improved submaximal exercise capacity at hospital discharge. The results of breathing and musculoskeletal exercises did not provide any additional benefit [2].

In Herdy's study et al. [3], the group underwent an exercise protocol consisting of progressive exercises starting with phase 1 cardiac rehabilitation, progressing from passive movements on the first day after surgery to walking, and ending with two flights of stairs on the fifth day. The study revealed that, cardiopulmonary rehabilitation in patients on the waiting list for CABG reduces the occurrence of postoperative complications such as pneumonia, atrial fibrillation, pleural effusion, atelectasis and hospital stay, without influencing the occurrence of major adverse cardiac events (MACE).

CONCLUSION

The LTPA practice did not affect the patients' prognosis within two years after CABG, in relation to the occurrence of MACE. The functional capacity has clearly improved and habitual physical activities decreased. The numbers of active patients have increased in a two-year follow-up period.

REFERENCES

1. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al; American College of Sports Medicine; American Heart Association. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Circulation. 2007;116(9):1081-93.

2. Hirschhorn AD, Richards D, Mungovan SF, Morris NR, Adams L. Supervised moderate intensity exercise improves distance walked at hospital discharge following coronary artery bypass graft surgery: a randomised controlled trial. Heart Lung Circ. 2008;17(2):129-38.

3. Herdy AH, Marcchi PL, Vila A, Tavares C, Collaço J, Niebauer J, et al. Pre- and postoperative cardiopulmonary rehabilitation in hospitalized patients undergoing coronary artery bypass surgery: a randomized controlled trial. Am J Phys Med Rehabil. 2008;87(9):714-9.

4. Alpert JS, Thygesen K, Antman E, Bassand JP. Miocardial infarction redefined: a consensus document of The Joint European Society of Cardiology/American College of Cardiology Committee for the redefinition of miocardial infarction. J Am Coll Cardiol. 2000;36(3):959-69.

5. Yusuf HR, Croft JB, Giles WH, Anda RF, Casper ML, Caspersen CJ, et al. Leisure-time physical activity among older adults. United States 1990. Arch Intern Med. 1996;156(12):1321-6.

6. Florindo AA, Latorre MR, Santos EC, Negrão CE, Azevedo LF, Segurado AA. Validity and reliability of the Baecke questionnaire for the evaluation of habitual physical activity among people living with HIV/AIDS. Cad Saude Publica. 2006;22(3):535-41.

7. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002;166(1):111-7.

8. Myers J, Bader D, Madhavan R, Froelicher V. Validation of a specific activity questionnaire to estimate exercise tolerance in patients referred for exercise testing. Am Heart J. 2001;142(6):1041-6.

9. Ainsworth B, Haskell WL, Whitt MC, Irwin ML, Swartz AM, Strath SJ, et al. Compendium of physical activities: an update of activity codes and MET intensities. Med Sci Sports Exerc. 2000;32(9 Suppl):S498-504.

10. Ferreira MG, Valente JG, Gonçalves-Silva RMV, Sichieri R. Acurácia da circunferência da cintura e da relação cintura/quadril como preditores de dislipidemias em estudo transversal de doadores de sangue de Cuiabá, Mato Grosso, Brasil. Cad Saude Publica 2006;22(2):307-14.

11. Nery RM. Valor prognóstico da atividade física no pós-operatório da cirurgia de revascularização do miocárdio [Dissertação de Mestrado]. Porto Alegre:Instituto de Cardiologia; Programa de Pós-Graduação em Ciências da Saúde;2007.

12. Cook JW, Pierson LM, Herbert WG, Norton HJ, Fedor JM, Kiebzak GM, et al. The influence of patient strength, aerobic capacity and body composition upon outcomes after coronary artery bypass grafting. Thorac Cardivasc Surg. 2001;49(2):89-93.

13. Shephard RJ. Exercise in coronary heart disease. Sports Med. 1986;3(1):26-49.

14. Wannamethee SG, Shaper AG, Walker M. Physical activity and mortality in older men with diagnosed coronary heart disease. Circulation. 2000;102(12):1358-63.

15. Ditmyer MM, Topp R, Pifer M. Prehabilitation in preparation for orthopaedic surgery. Orthop Nurs. 2002;21(5):43-51.

16. Takeyama J, Itoh H, Kato M, Koike A, Aoki K, Fu LT, et al. Effects of physical training on the recovery of the autonomic nervous activity during exercise after coronary artery bypass grafting. Effects of physical training after coronary artery bypass grafting. . jpn circ j. 2000;64:809-13.

17. Sato S, Makita S, M M. Additional physical activity during cardiac rehabilitation leads to an improved heart rate recovery in male patients after coronary artery bypass grafting. circulation j. 2005;69:69 -71.

18. Apullan FJ, Bourassa MG, Tardif JC, Fortier A, Gayda M, Nigam A. Usefulness of self-reported leisure-time physical activity to predict long-term survival in patients with coronary heart disease. Am J Cardiol. 2008;102(4):375-9.

19. Markou AL, Lasten PJ, Noyez L. Physical activity post myocardial revascularization. Will surgery improve my mobility? J Cardiovasc Surg (Torino). 2007;48(2):201-6.