Association between body composition, physical performance and physical functioning in coronary artery disease patients

Brigita Vaičiūnienė [1], Nijole Kažukauskienė [2], Elena Bovina[3], Julija Brožaitienė [4]

Lithuanian University of Health Sciences, Academy of Medicine, Institute of Behavioral Medicine, Lithuania
E-mail: *[1]brigita@ktl.mii.lt, [2]nijolekazukauskiene@yahoo.com, [3]elenbovina@yahoo.com, [4]jbro@ktl.mii.lt*

Keywords: body composition, physical performance, physical functioning, CAD.

Introduction

The population is aging, which is associated with an increased prevalence of people reporting physical limitations. Studies showed that 40% of individuals older than 65 years reported at least one limitation. Moreover, physical performance (PP) can predict disability, institutionalization, and death. Body composition has been found to be related to lower PP in elderly persons. It is known also, that obesity and waist-to-hip ratio are the risk factors in CAD patients.

The aim of this study was to investigate the relationships between body composition, physical performance and physical functioning in coronary artery disease patients (CAD) during cardiac rehabilitation program.

Methods and contingent

In this study 123 patients (93 (74.8%) men and 31 (25.2%) women, age mean 56.3±8.9 years) with coronary artery disease were evaluated during cardiac rehabilitation program. The majority of patients were NYHA functional class II (78.9%). Mean aerobic capacity – 4.24±1.04 MET.

Body composition was assessed using caliperiometry. We calculated lean and fat mass. A relative measure of body composition, the lean-to-fat ratio, was calculated by dividing lean mass (fat free mass, FFM) by fat mass (FM).

Body mass index (BMI) was determined from height and weight measured (weight in kilograms/height in meters^2). Waist-to-hip ratio (WHR) was calculated by dividing waist circumference by hip circumference. It shows central adiposity. The waist circumference was measured in the standing position from midway between the lowest rib and the iliac crest (at the smallest section of the waistline). The hip circumference was measured in the standing position from the plane of both major femoral trochanters (widest part of the gluteal region).

Physical performance domains (muscle strength, balance, muscle endurance, flexibility, and aerobic capacity) were indicated by some tests. Muscle strength was testing by handgrip test – dynamometry (kg). Participants performed the hand grip strength test three times for both hands, and the best score was used for analysis. Balance evaluated by one leg standing test with closed eyes. Participants were standing for 30s and were count mistakes. Endurance measured by calf muscle endurance test (times per minute). Flexibility was assessed by sit and reach test (cm), side bending tests (cm). Cardiovascular capacity (aerobic capacity) was estimated by symptom- limited bicycle ergometric test (MET kGm).

All participants filled in Short-Form 36 (SF-36) questionnaire measuring health related quality of life. The SF-36 consists of 8 subscales measuring physical and mental health. Scores for each subscale range from 0 to 100; higher scores indicate better health status. For this study,

only Physical functioning scale (10 items) of the 8 subscales of the SF-36 was analyzed. The physical functioning (PF) subscale was analyses because these items ask questions about walking, lifting, climbing, and bending showing mobility and physical functioning.

Results

Correlation between body composition and physical performance domains showed that fat free mass-to-fat mass ratio positively correlated with flexibility (waist bending to the right) (r = .23, p<.05), dynamometry of both hands, right hand (r = .47, p<.001), and left hand (r = .42, p<.001), muscle endurance (r = .25, p<.05) and cardiovascular capacity (r = .22, p<.05).

BMI was negatively correlated with patients flexibility (waist bending forward) (r = .25, p<.05), aerobic capacity (r = .30, p<.05). Physical functioning positively correlated with, flexibility: waist bending right (r = .26, p<.05) and left (r = .21, p<.05), muscle strength: dynamometry of right hand (r = .34, p<.000), left hand (r = .35, p<.000), muscle endurance (r = .23, p<.05) and free fat mass-to-fat mass ratio (r = .26, p<.05).

We used multivariate linear regression analyses to examine association of body composition with physical performance components, adjusted for age, gender, NYHA class.

We found that muscle strength was associated with BMI (β = .22, p<.05) and waist-to-hip ratio (β = .18, p<.05). Cardiovascular capacity was associated with NYHA (β = .35, p<.000). In another models analyzed association physical functioning (SF–36) with body composition and physical performance components, adjusted for age, gender, NYHA class. Physical functioning was associated with BMI (β = –.17, p<.05) and central adiposity (waist to hip ratio) (β = –.29, p< .05).

Conclusions

In CAD patients, undergoing rehabilitation, fat free mass, and body mass index is related to physical performance domain and physical functioning is associated to central adiposity and body mass index. Physical functioning was better for men with less central adiposity. Our result may suggest that weight management intervention would be helpful to maintain and improve physical performance and physical functioning during rehabilitation.

References

[1] **Haight T, Tager I, Sternfeld B, Satariano W, van der Laan M**. Effects of body composition and leisure-time physical activity on transitions in physical functioning in the elderly. Am J Epidemiol 2005, 162: 607–617.

[2] **Sternfeld B, Ngo L, Satariano WA, Tager IB**. Associations of body composition with physical performance and self-reported functional limitation in elderly men and women. Am J Epidemiol 2002, 156: 110–121.

[3] **Tager IB, Haight T, Sternfeld B, Yu Z, van Der Laan M**. Effects of physical activity and body composition on functional limitation in the elderly: application of the marginal structural model. Epidemiology 2004, 15: 479–493.

[4] Body Mass, Fat-Free Body Mass, and Prognosis in Patients with Chronic Obstructive Pulmonary Disease from a Random Population Sample. Findings from the Copenhagen City Heart Study. Am J Respir Crit Care Med, 2006 Vol 173, p. 79–83.