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EFFECT OF ENDURANCE AND RESISTANCE TRAINING ON C - REACTIVE PROTEIN AND EJECTION FRACTION IN OBESE MEN

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ABSTRACT

Obesity and overweight are common epidemic in all of world and increase risk of many disease such heart failure. CRP is an inflammatory biomarker that its level increase in obese/ overweight people and ejection fraction is a functional indicator for heart. Therefore if we can find a proper method for weight loss we can decrease risk of disease. The aim of this study was determine and comparison effect of low caloric dietary, low caloric diet+ endurance training and low caloric diet+ resistance training on CRP and EF. For these purpose 34 healthy obese/ overweight men randomly assigned in three groups: low caloric diet (D)(n=10), D+Endurance training (DE) (n=12) and D+Resistance training (DR) (n=12). Subjects in diet group received a dietary program that its energy was 3500 kcal/week less than their routine diet. In two exercises group dietary program's energy was 2500 kcal/week less than their ordinary diet and energy expenditure through exercise was about 1000kcal/week. After 12 weeks intervention weight and CRP levels decrease significantly in all groups. There is significantly difference in weight loss between D and DE, D+DR. EF increase significantly in DE and DR groups. Thus we concluded that D, D+R and D+E can be proper methods to weight loss, decrease risk of disease but if propose was improve heart function D+E and D+R methods are better.

Key words: obesity, C - reactive protein (CRP), Ejection fraction (EF)

INTRODUCTION

In recent years, prevalence of obesity and overweight are increasing among children and adults. Obesity lead to destructive consequences of economical and physical and mental health and it is the risk factor of many diseases like heart failure. Adipose tissue secretes the pro-inflammatory cytokines such InterLukin-6(IL-6), Inter Lukin-1 (IL-1) and Tumor Necrosis Factor (TNF-α) (Ridker et al., 2000). C- Reactive Protein (CRP) is synthesized and secreted by the liver in response to IL-6 and IL-1. A kind of cardiac myopathy associated with dilation of left ventricle has been observed in individual who are severely obese. Increase the pressure to the left ventricle wall in response to obesity leads to cardiac hypertrophy; also, obesity is associated with changes in the heart loading, particularly the flow rate of blood in mitral valve, isovolumetric resting time, and ejection fraction. As the obesity is a threat to cardiovascular health, weight loss is a therapeutic purpose for heart disease patients. It is suggested that the obesity is treated by a combination of physical training and diet to prevent of obesity after weight loss. Continuous training decreases all causes of mortality in healthy individuals regardless of the duration of activity from moderate to severe intensity. After the aerobic exercising, the blood pressure and the systemic inflammation indices will reduce. The resistance training is a way to lose weight too. This type of training increases the muscle mass and thus increases the resting energy expenditure. Some researchers demonstrated the increase of VO2max and mitochondrial biogenesis indicators (Schjerve et al., 2008), reduction of abdominal fat, improve of metabolic parameters in diabetes of type 2 and reduction the incidence of osteoporosis after resistance training. Resistance training is along with reducing of the risk of diseases which are related to mild inflammation. Although resistance training increases the cytokines of plasma, acute adaptation to resistance training leads to reduce cytokines of plasma during the resting and training.

Although there are some reports about exercise training and CRP levels and cardiac function, but differences between effects of endurance training and resistance training are unclear. So the purpose of the present study was the analysis and comparison the effect of 12 weeks endurance or resistance training on weight, C reactive protein (CRP) and injection fraction (EF).

MATERIALS AND METHODS:

Subjects were 208 obese/overweight men, 30-45 year that were referred to a weight control clinic in Isfahan-Iran at 2011 summer. They were healthy and their BMI was 28-32kg/m2. Subjects were assigned randomly to one of three groups: low caloric diet (n = 10), low-caloric diet with endurance training (n = 12) and low-caloric diet with resistance training (n = 12).The variables including body weight that were measured by a digital scale Seca (Seca-G CRP was assessed by ELISA kit (IBL-International, Germany) with accuracy less than 1*mg/ml* and injection fraction that were evaluated by echocardiography method via the use of the device (Vingmed, vivid 3, USA).Before intervention, subjects' peakVO2 was determined using an incremental exercise test on treadmill (h/p/cos mos Mercury med, Germany). Respiratory and metabolic variables were obtained for each breath by measuring gaseous respiratory exchanges using a gas analyzer (Powercube, Ganshorn, Germany). All subjects instructed to take a well balanced supplemental food every day. In diet only group energy intake/week was 3500 *kcal* less than their previously energy intake and in training groups was 2500 *kcal* less than previously energy intake. Diet consists of 50-55% carbohydrate, 15-25% protein, 25-30% lipid.

Subjects evaluated 3 days before intervention. First day, weight, height, VO_2peak (peak oxygen consumption) were measured and blood samples were collected. After 12 weeks intervention, 48 hours after it all variables measured again.

Statistical analyses were performed using *SPSS* statistical soft ware (version21). Paired sample *t*-test performed for evaluated changes in each group and co-variance analyses were used to test differences in changes between variables in all groups. Ben fronni post hoc analysis was applied when the ANOVA interaction term was significant. *P*-values less that 0.05 were considered statistically significant.

FINDINGS

Statistical results showed that weight had a significant reduction in all groups, and the rate of this reduction had a significant differences between groups ($p \leq 0.01$).Bonferroni post hoc test has shown significant differences between DE and diet only groups, and DR and diet only groups ($p \leq 0.008$) and it was higher in DE. Data analysis showed that CRP had significant decrease in all groups and the rate of reduction had no significant differences between groups ($p > 0.831$).These results shows ejection fraction increased in all groups, but this increase only in DE group

($p \leq 0.005$) and DR group ($p \leq 0.002$) was significant. There are not any significant differences between groups ($p > 0.21$).

DISCUSSION

Recommended therapeutic methods for weight loss include the medication therapy, surgical methods, physical activity, diet and changes in lifestyle. Selection of the weight loss method depends on obesity, complications resulting from the obesity, success of previous weight loss methods, and characteristics of individual life style. Exercise does not make a considerable weight loss and alongside of the low caloric diet increases the energy consumption. As well as, it plays a role to prevent the weight gain after losing it. In the present research, weight loss in all groups were significant, but has significant differences between endurance training and diet group, and resistance training and diet group and in DE was more. It seems that because of muscle hypertrophy and increasing fat free mass, less weight loss can be seen in resistance training; although it is possible there is no difference in fat loss in this type of training and endurance training. Some researches show that, the resistance training did not prevent from the reduction of muscle mass and in the other researches; the weight loss had no significant difference after the endurance and resistance training. These differences can be resulting from different trainings methods, intensity, duration, and sessions of training. On the other hand, making some physiological changes needs more time and short time training can be a factor for inability of making changes. Imamaya et al. (2012) showed that t weight loss was led to decrease CRP and IL-6 with or without exercising. Also, in the research Hamedinia and colleagues (2009), the aerobic exercising was led to reduce of CRP. Nicholas et al. (2004) showed that the diet was led to reduce of CRP, IL-6, TNF-α alone, but training had no significant effect on inflammatory indices alone. Also, in the research Woong et al. (2009), strength and aerobic exercising were led to decrease BMI and fat masses in obese adolescences, but CRP did not change significantly. On the other hand, in the Arsenalt et al. (2009) demonstrated that exercising in menopausal obese women was led to weight loss and decrease waist circumference, but CRP, IL-6, TNF- α did not change significantly. Hormonal differences due to differences in age and gender of the subjects can be a reason for the different results of these researches. Some researchers have confirmed the incidence of mild inflammation as the result of obesity or overweight. The obesity and increase of fat

tissue lead to production and secretion of inflammatory factors from the fat tissue. By increasing fat stores, increases secretion of IL-6, IL-1, TNF-α from the adipose tissue; these cytokines, particularly IL-6 in the liver, lead to expression, production, and secretion of CRP gene. Abdominal obesity appears to have a greater effect on the secretion of inflammatory cytokines than the subcutaneous obesity. Decrease of inflammation and inhibition of CRP plasma levels have been proved due to the exercising. Weight loss programs along with change in lifestyle decrease the increased physical activity of CRP, IL-18, IL-6, and the insulin resistance. Some anti-inflammatory effects of exercising are mediated by producing cytokines in the other tissues such as skeletal muscle and mononuclear cells. CRP is directly related to the heart diseases regardless of other risk factors (Haskell et al ., 2007). Several roles for CRP has been considered, including binding to damaged cells of phospholipids for activation of complement and increasing the removal of these cells by macrophages, activating of endothelial cells for adhesive molecules and reducing the expression and availability of nitric oxide syntheses of endothelial. Physical activity causes to prevent of cardiac diseases by reducing inflammation. Some researchers have shown that the endurance training make a greater reduction in CRP than resistance training. Mechanism of inhibition and reduction of CRP due to exercise is still not clearly understood. CRP production in the liver is stimulated by IL-6 and to a lesser amount by IL-1, TNF-α. Adipose tissue in obese people causes CRP production. Weight loss via low calorie diet and physical activity reduces the inflammatory indices. Some of these effects may be associated with a reduction in secretion of the CRP from the adipose tissue and related muscles. In summary, it seems that exercise reduces CRP directly through decreasing production and secretion of cytokines from adipose tissue, muscles and mononuclear cells and indirectly by increasing insulin sensitivity, improving endothelial function and loss body weight. Exercise improves systolic function of heart in overweight persons and reduces end diastolic volume of them. Results of this research showed that 12-week progressive training significantly improved ejection fraction in obese men, but weight loss did not cause significant changes in ejection fraction alone. The research Salamat and colleagues (2010) showed that 3 months endurance training increases EF. In Skravan-Hinderling research, endurance training increases in EF

too. Hulk and colleagues demonstrated no change in EF after resistance trainings. Obesity causes heart failure because storage of fat in heart tissue. Accordingly, it is expected that weight loss improves cardiac function which EF is a valid indicator for it. Researches show that fat reduction can improve systolic function of heart. EF increasing due to improvement of contractibility decreases after-load or increase pre-load. Thus , increasing EF post-training may be caused by improving contractibility of cardiac as a result of the elimination of cardiac ischemia, because increase of the pre-load improves the blood supply and decreases cardiac ischemic. Another positive effects of exercising on heart functioning is created due to changes in the regulatory systems of ca2+.Increase the content of fatty acids affects on stimulation-contraction couples the other factors related to control of ca 2+.This research showed that weight loss may lead to reduce of CRP through diet and diet along with endurance or resistance trainings can lead to increase of the EF.

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