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Serum ghrelin in response to acute exercise in adult men with mild to moderate asthma

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Abstract

The aim of this investigation was to estimate serum ghrelin level to single bout cycling in individuals with asthma. To achieve this aim, serum ghrelin was measured before and immediately after one exercise on electrically braked ergocycle in 14 sedentary men with mild to moderate asthma. Exercise test was performed for 5 stage consecutive 3-minute and same for all participants. Student's paired 't' test was applied to compare the pre and post training values. Significance was accepted at $P < 0.05$. Data by T test showed no significant difference in serum ghrelin between pre and post test. This finding indicates that one short time exercise can not affect serum ghrelin in asthma patients.

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Introduction

Asthma is a disease of air pathways with an allergic origin which appears physiologically by narrowing of the respiratory air pathways and clinically by sudden attacks of shortness of breath, coughing and wheezing (Murdolo *et al.*, 2003). The severity of the disease appears due to inflammation and over-response of respiratory pathways (Busse *et al.*, 2001). The National Heart Forum and the World Health Organization also introduce asthma is a chronic inflammatory disease of the respiratory pathways in the outbreak of which certain cells, particularly mast cells, eosinophils and lymphocytes play an important role (Mayr *et al.*, 2003). Most recent studies have found that the presence or history of severe asthma is associated with 6-fold increased risk of death in the coming years (Kay, 2001). Understanding of asthma as an inflammatory disease has led to numerous studies on the symptoms of the incidence of inflammation, such as certain cytokines and the related proteins in respiratory pathways inflammation.

Among peptide mediators, the plasma levels of ghrelin 28-aminoacid peptide hormone plays an important role in the regulation of hunger and metabolism of carbohydrate or fat as well as short and long-term regulation of energy homeostasis (Briatore *et al.*, 2003; Tschop *et al.*, 2000), although there are few studies available on the mechanisms of this phenomenon and its impact on energy production processes, especially metabolism of carbohydrate or fat. This peptide hormone is secreted primarily by the stomach and stimulates growth hormone secretagogue receptors (Howard *et al.*, 1996). Although the literature on the molecular mechanisms of ghrelin's role in asthma is limited, the findings of another study showed that plasma levels of ghrelin in chronic obstructive pulmonary disease, which is another type of respiratory disease, is much higher than in normal subjects (Itoh *et al.*, 2004). Furthermore, another study suggests an inverse relationship between plasma levels of ghrelin and IgE in allergic patients (Matsuda *et al.*, 2006). In another study the important role of ghrelin in inflammatory processes is reported in asthmatic patients (Yuksel *et al.*, 2012).

The role of exercise on ghrelin levels in patients with asthma has not been studied yet. However, the findings from studies on short or long term effects of exercise protocols on ghrelin levels in other obese or ill populations are inconsistent. In this context, the findings of one study showed that a single session of submaximal exercise decreased plasma ghrelin levels in obese rats (Malkova *et al.*, 2008). In another study, too, plasma ghrelin levels are reported to have decreased following a 60-minute exercise (Broom *et al.*, 2007). However, contrary to these findings, another study showed that the postprandial ghrelin levels do not change due to submaximal acute exercise (Catia *et al.*, 2007). This study also intends to explore the effect a short-term moderately intense exercise on the levels of ghrelin levels in patients with asthma.

Materials and method

Subjects, Inclusion and exclusion criteria

This study aimed to serum ghrelin response to single bout exercise included 15 min cycling in asthma patients (FEV1/FVC; 68.57 +/- 3.23, FEV1; 87.7 +/- 9.38). Therefore, the effect of exercise test on serum ghrelin levels was investigated in 14 adult men with chronic asthma. Subjects were sedentary and none trained.

Asthma diagnosis at least for 3 years was main inclusion criteria. Participants were non-smokers and non-alcoholics. Participants were included if they had not been involved in regular physical activity/diet in the previous 6 months. None of the subjects used drugs or therapies for obesity, and none had a past history of disease or injury that would prevent daily exercise. Subjects with history of smoking and patients with gross abnormalities of the thoracic cage which may interfere with lung function test were also excluded from the study. Subjects with a history or clinical evidence of impaired fasting glucose or diabetes, recent myocardial infarction, active liver or kidney disease, the other chronic were excluded.

Ghrelin measurement and exercise protocol

Blood samples were collected in order to serum ghrelin measuring before and immediately after exercise test. After sampling in ETDA- or serum-tubes, blood was immediately chilled on ice, centrifuged and aliquots were frozen at – 80˚C until assayed. Samples were centrifuged immediately for 10 minutes with 3500 rpm in +4˚C in order to measure serum ghrelin levels. Serum ghrelin was measured by ELISA method using commercial kits made by Austrian Biovendor Company. Exercise test was performed on cycle ergometer (Mullis *et al.*, 1999) that included 5 stage consecutive 3-minute and same for all participants. The subjects were advised to avoid any physical activity or exercise 48 hours before the exercise test.

Statistical Analysis

The data were reported as mean ± SD, and analyzed using the SPSSW statistical package, version 15.0. The Kolmogorov-Smirnov test was applied to determine the variables with normal distribution. Student's t-tests for paired samples were performed to determine significance of changes in serum ghrelin by exercise test in asthma subjects. A P-value <0.05 was considered statistically significant.

Results

Data of descriptive statistic showed that mean and standard deviation of anthropometrical markers were: age: 38.17 +/- 8.15 year, weight: 93.1 +/- 10.4 kg, height: 173.8 +/- 1.19 cm, BMI: 30.75 +/- 3.47 kg/m2, body fat: 29.03 +/- 4.58 (%). Serum ghrelin did not change by exercise test in studied patients (pre, 65.3 +/- 9.9 to post, 62.8 +/- 3.2 p = 0.428, Fig 1). These was no significant correlation between serum ghrelin and FEV1/FVC (p = 0.68, r = 0.12, Fig 2).

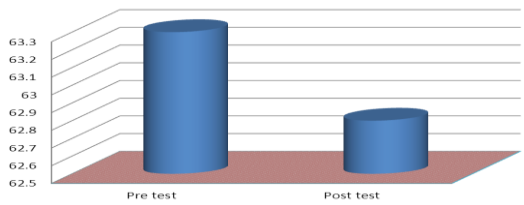

Fig. 1. Serum ghrelin before and after exercise test in studied patients.

Discussion

So far there has been no study dealing directly with effect of exercise or long-term training program on serum ghrelin levels in patients with asthma, and this study is carried out for the first time with this intention. The findings of this study showed that a 15-minute exercise session in form of relatively heavy biking would not change ghrelin levels in men with mild to moderate asthma. Nevertheless although several studies have been conducted on the impact of long-term training program on serum or plasma levels of this peptide hormone in other populations, such as obese or diabetic patients and each also had a contradictory response, there are few studies on the response of serum ghrelin to exercise, even in other obese and ill populations. In a recent study, a bout of resistance exercise led to a significant reduction in ghrelin levels, but 24 hours after that a significant increase was observed in systemic levels of this hormone (Ghanbari-Niaki, 2006). The findings of another study report plasma ghrelin concentrations decrease after running for 60 minutes (Broom *et al.*, 2007). In another study, a short-term intense exercise session led to a significant reduction in ghrelin levels (Stokes *et al.*, 2005). In contrast, the findings of another study showed that 30 minutes of physical activity below lactate threshold would increase plasma ghrelin concentration (Erdmann *et al.*, 2007). Also 19 minutes of exercise on an ergometer bike significantly increased ghrelin immediately after cessation of exercise, but after 30 minutes of recovery it was restored to the original state (Jaak *et al.*, 2007). Some studies in line with the findings of this study, report no change in ghrelin levels in response to an exercise session. Plasma ghrelin levels did not change in a study following 60 minutes of exercise on a treadmill (Wang *et al.*, 2008). The findings of another study also showed that a single bout of exercise with %50-90VO2max intensity would not lead to a change in serum ghrelin levels (Schmidt *et al.*, 2004). The said studies as well as some other studies reporting no change in ghrelin levels following a short single session of running (Stokes *et al.*, 2005) suggest that a single exercise session would not affect the levels or secretion of ghrelin (Martins *et al.*, 2008).

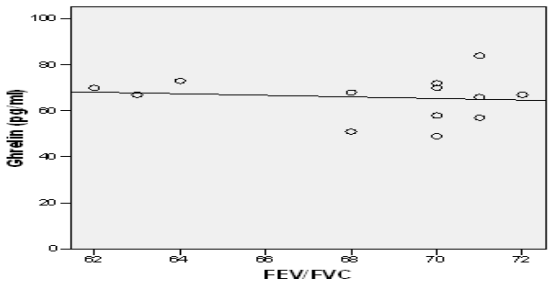

Fig. 2. The 1orrelation between serum ghrelin and FEV1/FVc in studied patients.

No change in serum ghrelin levels in response to exercise in this study may be attributed to several confounding factors. Some studies have attributed the discrepancies between the findings of these studies to the measuring instrument, time of sampling; type of exercise intervention, the population studied or to changes in plasma volume. In the present study, although no significant changes in ghrelin levels may be attributed to the small sample size of the study or the distribution of ghrelin changes in the test subjects since the exercise test lasting only 15 minutes caused only a little energy expenditure, this lack of change may be attributed to the relatively low energy expenditure of the subjects during the exercise test, because some previous studies have expressed it so that only those exercise tests associated with high energy expenditure or leading to a negative energy balance can affect cytokine levels or peptide mediators (p 47). Therefore no change in this mediator peptide levels in response to short term exercise is not too unexpected.

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