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Research Article

The Effect of Cupping and One Exercise Session on Levels of Creatine Kinase and Lactate Dehydrogenase among the Members of a Handball Team

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Abstract

Physical exercise acts as a mechanical stressor that can provoke biochemical alterations. Accordingly, muscular effort is able to modify blood concentrations in some cellular enzymes. Cupping is one of the traditional methods used to restore and revive the balance of the budy. This study aimed to evaluate the impact of cupping and a practice session on the level of some liver enzymes in men handball team members of Zahedan city, Iran. The participants were all the members of the Zahedan men handball team with the mean age of 23.66 ± 5.86 years, mean height of 177.19 ± 4.58 cm, mean weight of 80.12 ± 12.58 kg and mean body mass index (BMI) of 24.53 ± 3.60 kg/m^2. All the team members, as the samples, were chosen via voluntary sampling method on a voluntary basis. They were randomly positioned into two groups of training (n = 12) and cupping (n = 10). Serum concentrations of creatine kinase (CK) and lactate dehydrogenase (LDH) were measured before and immediately and 24 hours after the training and cupping using the enzyme-linked immunosorbent assay (ELISA) methods. Data were analyzed using independent-t test and multi variety. There was a significant difference between the average concentration of the enzymes in before, next, and 24 hours after the test. According to the results of this study, the exercise and cupping caused muscle damage and increased the damage markers in blood.

Keywords: Cupping; Exercise; Creatine kinase (CK); Lactate dehydrogenase (LDH)

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1. INTRODUCTION

Since skeletal muscles are the main tissues involved in physical activities, studies on changes and damages have always been considered to this tissue during various exercise activities. According to different studies, intentional and accidental trauma to the tissues can lead to the disruption of the plasma enzyme activity. Several studies have confirmed the relationship of the muscle damage and the muscle enzymes release [1]. On the other hand, it seems that exercise can be accompanied by muscle fiber damage and rapture of the myofibrils and Z line. Muscle damage may be caused in response to the various stimuli resulting from tedious exercise that have been shown in previous studies [2].

In different studies, creatine kinase (CK) and lactate dehydrogenase (LDH) have been used as the indicators of cell damage assessment [3], [4]. Creatine kinase functions as a key enzyme that causes muscle cell metabolism and accelerates the conversion of creatine to phosphate or vice versa [5]. In healthy individuals, this enzyme rests within the cell membrane and its amount in blood is low. By increasing physical activities, its plasma level rises. According to several studies, creatine kinase is considered as the most sensitive marker for muscle damage [1]. Lactate dehydrogenase is an enzyme which is abundant in the cytoplasm of all body tissues with different concentrations and accelerates the pyruvic acid transformation into lactic acid or vice versa in course of anaerobic glycolysis [1].

If mechanical trauma, ischemia, drugs, muscle activities to be intensive or long, it becomes possible to increase these enzymes [1], [6]. Examining the acute and long-term responses to physical activities can be considered among the most important parts of investigations to achieve health for all the societies include changes of serum enzymes, a suitable indicator to determine the damage and destruction of tissue and cell [7]. Given the role of metabolism and clinical factors of enzymes and also the effects of physical activity, it is important in use of enzymes in assessment of diseases and damages and diagnosis of various tissues [5]. Intense activities and dynamic exercise most probably cause damage to the cell membrane and release enzymes into the blood [8], [9]. In intense exercise, the amounts of hematological and biochemical parameters change. These changes depend on factors such as the practitioner's status, age and gender, and environmental and nutritional characteristics [10].

Several studies have focused on changes of level of serum enzymes after exercise and physical activity [11], [12], [13]. Poprzêcki et al. examined the effect of centralized and decentralized exercise on creatine kinase and lactate dehydrogenase activity in healthy adults. Both methods significantly increased serum creatine kinase and lactate dehydrogenase. After resting for 24 hours, creatine kinase was still in rising mode while lactate dehydrogenase had reached to its pre-test level. After 7 and 24 hours post-exercise recovery, the levels of creatine kinase increased [13]. Machado et al. conducted a study on examining the effects of intermittent exercise on muscle damage indicators. Fifteen professional soccer players participated in a double-blind protocol. Considering the results of this study, exercise increases creatine kinase and lactate dehydrogenase in serum that indicates increased muscle damage after physical activity [11]. Otag et al. examined the effect of exercise on creatine kinase among the active and inactive men. Subjects were asked to exercise on a treadmill according to the Bruce protocol. The results of this study indicated that creatine kinase levels increased significantly after exercise protocol [12].

In addition, compared to the regular exercise, irregular exercise in which large muscle groups are utilized creates noticeable tissue damage. Moreover, the duration and intensity of activity may also affect the severity of the damage. Today, we know that athletes involved in team sports such as handball, require periodic repetition and intense activities during the game. Repetition and intense activities and exercises put athletes in risk of reduced performance and possible damage. Besides, the ability to produce a quick burst activity and recovery are important

factors in determining the game fate.

On the other hand, by advances in technology and medical science, medical issues have entered into the world of sport more than ever by using massagers, physiotherapists and physicians, and new approaches to fatigue and injury. Due to physical exercising, other problems have been arisen, but among all modern methods, still the traditional tools play a significant role in reducing the athletes' problems. One of these ways is cupping. Cupping is used as a means to reduce muscle pain and fatigue among athletes. Moreover, it is one of the traditional methods of treatment that is used to restore and revive the balance of the organism. According to the documentary evidences, it is used in different societies [14]. Cupping is used in different ways and at different times, including blood-letting (wet cupping) or without blood-letting (dry cupping). Cupping is one of the most important pillars of Islamic medicine and it is highly recommended for the treatment of many diseases [15]. In cupping practice, it is setting on T2-T5 vertebrae that increases local blood pressure and then through scratches and renewed cupping removes blood from the area [16].

Although our sources of cupping in traditional medicine are rich, our knowledge in this field is based on the traditional practices and backs to literature from the past. Likewise, through clarifying scientific evidences and biological mechanisms of cupping, its usage can be appropriate and safe. In that case, it makes it possible to introduce related indications and contraindications to modern medical community with a strong backing. While there have not been any studies about the effect of cupping on liver enzymes, there are many studies regarding the effect of cupping on treatment of diseases and improvement of blood factors. According to some of the studies in this field, cupping can be effective in treatment of migraine and headache, toothache, back pain, leg pain, neck pain, blood pressure, skin diseases, internal diseases, and also reduction of harmful blood fat levels [17]. According to other similar works in study of cupping, it lowers the level of blood glucose, cholesterol and triglycerides [18]. Since cupping is a kind of therapy without medication and its mechanism is not clear it has been suspected more than other forms of traditional medicine and there have been different views from the scientific and nonscientific references about it. On the other hand, despite the significant progresses in various fields of hematology and exercise, there are few studies about the effect of cupping on cell damage indicators and its effectiveness in the treatment of diseases inside and outside of the country. So far, the simultaneous effect of exercising and cupping on blood enzymes of creatine kinase and lactate dehydrogenase has not been investigated. Consequently, the main purpose of this study was to examine the effect of cupping and an exercise session on the serum levels of creatine kinase and lactate dehydrogenase among the members of a handball team.

2. METHODS

This was a cross-sectional, functional and quasi-experimental study in its method. The participants were all members of Zahedan men handball team (Iran) with the age range of 17 to 32 years. All the members of this population, after completing a health questionnaire and signing a consent form, were chosen based on the voluntarily sampling method. To end with, they were randomly assigned into two groups, 12

Table 1. The physical characteristics of the subjects

Characteristics	Training group	Cupping group
Age (Year)	21.25 ± 4.41	26.08 ± 7.32
Height (cm)	178.17 ± 4.78	176.21 ± 4.39
Weight (kg)	78.12 ± 13.21	82.83 ± 11.96
BMI (kg/m^2)	24.60 ± 4.09	26.46 ± 3.11

BMI: Body mass index

participants in exercise group and 10 participants in cupping group (Table 1). These participants were healthy and were not under any medication from 6 months earlier.

Before the activity and cupping, all the subjects passed three stages of an initial test. After receiving the consent of cooperation in the study and collection of personal data, in the first stage, anthropometric measurements [height, weight, and body mass index (BMI)] were carried out and sampling was decided to be conducted a few days later. Then, the participants were asked to have a light and the same style dinner before 7 pm and to keep fasting for 12 to 14 hours after dinner until the time of blood sampling.

In the second stage, the participants attended to the blood sampling location from 8 am. In order to measure the amount of creatine kinase and lactate dehydrogenase in fasting state, blood samples were prepared for each of them. According to the coordinated program, all participants were randomly allocated into two groups of exercise and cupping consisting of 12 and 10 participants, respectively. Participants in cupping group were cupped by a trained phlebotomist. Participants in exercise group were divided into two teams, each included 6 participants and they played a real handball match. One session exercise consisted of 2 halves of a handball game, each of them 30 minutes. The blood samplings were taken by three stages; first, before the tests from 8 am to 9 am while fasting; second, immediately after the test; and third, 24 hours after exercise and cupping. All these steps were taken in the gym room of University of Sistan and Baluchestan. Five milligram of blood was spilled in two separate test tubes. When blood clots came in, blood was poured into special tubes for serum preparation, and after centrifugation the required serum was prepared. Similarly, to assess the intended factors special kits were used.

For data analyses, SPSS software version 16 (SPSS Inc., Chicago, IL) was utilized. After checking the validity of data distribution through Kolmogorov-Smirnov test, descriptive data were used to set tables, graphs, and frequency. Multivariate testing and independent-t test were used in the inferential section.

2. RESULTS

As can be seen in table 2, the mean of serum concentration of creatine kinase and lactate dehydrogenase among the members of this handball team increased in immediate measurement. 24 hours after cupping, it shows a significant difference ($P < 0.05$).

Correspondingly, as can be seen in table 3, the mean of serum concentration of creatine kinase and lactate dehydrogenase among the members of a handball team increased in immediate measurement after doing exercise with significant difference ($P < 0.05$). The serum concentration of creatine kinase in a measurement after 24 hours after doing exercise increased significantly ($P < 0.05$). But, the concentration of lactate dehydrogenase, 24 hours after exercise, shows a significant reduction ($P < 0.05$).

4. DISCUSSION

As mentioned, lactate dehydrogenase and creatine kinase are among the most important markers of muscle damage released in blood after doing exercise and physical activity, and consequently, their serum level increase [1]. Creatine kinase is often used as an indirect indicator of muscle damage and its release from muscle tissue into the blood is accompanied by cell membrane rapture. The intensity of muscle damage is related to both intensity and duration of activity. However, the intensity of activity plays a more important role [4].

Table 2. The mean and standard deviation of variables at pre-test, post-test and 24 hours after cupping

Characteristics (U/l)	Pre-test	Immediately after cupping	24 hours after cupping	P-value*		
				P1	P2	P3
Creatin kinase	239.40 ± 115.73	411.60 ± 327.28	260.8 ± 100.6	0.0001	0.0001	0.0001
Lactate dehydrogenase	456.50 ± 58.71	514.70 ± 91.59	481.30 ± 183.39	0.0001	0.0001	0.0001

P1*: Comparing pre-test and post-test, P2*: Comparing pre-test and 24 hours after the test, P3*: Comparing post-test and 24 hours after the test

Table 3. The mean and standard deviation of variables at pre-test, post-test and 24 hours after exercise training

Characteristics (U/l)	Pre-test	Immediately after training	24 hours after training	P-value*		
				P1	P2	P3
Creatin kinase	318.25 ± 264.71	339.50 ± 240.45	350.57 ± 241.99	0.0001	0.0001	0.0001
Lactate dehydrogenase	478.08 ± 64.20	486.66 ± 83.06	428.00 ± 58.44	0.0001	0.0001	0.0001

P1*: Comparing pre-test and post-test, P2*: Comparing pre-test and 24 hours after the test, P3*: Comparing post-test and 24 hours after the test

The results of this study indicate a significant effect of an exercise session and cupping on the levels of these two enzymes. Several studies have been conducted to examine the serum levels of creatine kinase and lactate dehydrogenase after doing exercise and physical activity. Hojjati et al. examined the effect of anaerobic test (Radioallergosorbent test or RAST) on these amounts among 10 active and 10 inactive women. According to their results, creatine kinase and lactate dehydrogenase increased significantly through exercise among both inactive and active women that were harmonious with the present results [19].

Machado et al. examined the effect of intermittent exercise on muscle damage indicators among 15 professional soccer players. They observed significant increases in lactate dehydrogenase and creatine phosphokinase after exercise [11]. Moreover, Poprzêcki et al. studied the effect of centralized and decentralized exercise on the activity of creatine kinase and lactate dehydrogenase among 10 students of physical education. Both methods lead to significant increase of lactate dehydrogenase. After resting for 24 hours, lactate dehydrogenase value reached to its pretest level [13].

Otag et al. observed the effect of exercise on creatine kinase in 30 healthy men in 2 groups of non-professional and inactive individuals. The participants were asked to exercise on treadmill based on Bruce protocol. According to their results, after the exercise protocol, level of creatine kinase increased significantly [12].

The results of our study are compatible with the results of those studies examined the effect of an exercise session on increase of creatine kinase and lactate dehydrogenase indicators [20], [21]. Since it has already been proven that increase in the presence or activity of these serum enzymes is not necessarily a sign of muscle damage, and it is not limited to skeletal or cardiac muscle damage. Damage to other tissues may increase these values [22]. The prominent role of glycolysis in heavy and intense exercises and the rate of pyruvic acid transformation to lactate acid are considered as the measurement scales of this sample of activities.

In this process, enzymes have an essential role in catalyzing chemical reactions [13]. Understanding the characteristics of enzymes function during exercise is essential to develop a better understanding of exercise and recovery procedures [23]. Some of the key enzymes of glycolysis considerably change through aerobic and anaerobic exercises [24] that the results of the current study have indicated it. But, it must be understood that the intensity of activity affects the change of this enzyme in a way that the enzyme increase is less in light physical activities. Besides, those who exercise have less enzyme activities compared to the control group in similar activity [25]. In range of sport activities such as football, boxing, wrestling and basketball, enzyme activities increase. However, most of the increases are in activities such as running in which the athlete bears the body weight [26].

Furthermore, the results of the present study show that serum concentration of creatine kinase and lactate dehydrogenase among the members of the handball team increased after cupping. There are few studies on examining blood enzymes and factors after cupping; hence, the present study is an exclusive one. Among many studies, we can

refer to a study by Daniali et al. which compared the venous blood and the blood came from cupping in biochemical and hematological parameters and also immunological responses [27]. As well, Ramazani et al. examined the effect of cupping on oxidative stress indicators and blood factors among the patients with type 2 diabetes [28]. According to the results of these two studies, cupping improves blood factors and it is recommended as a complementary treatment.

According to a study by Shariatzadeh and Maleki-Rad, the effect of cupping on oxidative stress was examined. The results of this study showed that cupping reduced some of the oxidative stress indicators [29].

Due to the cupping mechanisms from the modern medicine point of view, immunomodulatory and regulation of endocrine and exocrine glands and their effect on the sympathetic and parasympathetic systems and body toxins are among the most important effects of cupping on body that are unknown along with them. Similarly, in inflammation, different cytokines of skin keratinocytes are hidden as well. These cytokines can cause changes in cell surface receptors that can facilitate the healing process.

In general, the findings of the present study show that the levels of creatine kinase and lactate dehydrogenase increased in immediate measurements after cupping and physical activity among the members of the handball team with a significant difference. The results of this study are compatible with other recent studies and support muscle damage after cupping and an exercise session. Due to some limitations of the present study such as subjects' nutrition, emotions, and other psychological factors, it seems that controlling these limitations, changing duration and intensity of exercise, limiting the age range and increasing the number of participants based-on physiological differences among people are essential in order to evaluate research findings accurately. In addition, since not much is known about cupping and its effects on enzymes, comprehensive studies are necessary in this area.

5. Conflict of Interests

Authors have no conflict of interests.

6. Acknowledgments

None

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