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Effect of Wet Cupping Application on Blood Lactate Level in Athletes

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Abstract

Blood lactate level is one of the most important indicators of fatigue. Our aim is to investigate the effect of wet cupping application on blood lactate level. 14 male participants aged between 20-24 were included in the study voluntarily. Volunteers ran on the treadmill until they reached maximum heart rate according to the Bruce protocol. After the run, the volunteer rested for 60 minutes. After resting, 6 cups with a diameter of 6 cm were applied to the volunteer's back area. One minute after the cup application, the cups were removed, small incisions were made in the epidermal area with a scalpel, the cups were placed again and vacuum was applied. After waiting for one minute, 2 cc of blood was taken from the cup with the help of a syringe and transferred to the vacuum tube. While this application was performed, a 2 cc blood sample was taken from the antecubital vein and transferred to a vacuum tube. Lactate values from blood samples were measured by spectrophotometric method. The results were analyzed with student t test. Venous blood lactate level was found to be 20.35 mg/dL, cup blood lactate level was found to be 20.36 mg/dL. There was no statistically significant difference between venous blood and cup blood lactate levels (p: 0.896).According to these results, it was determined that lactate could be removed from the body by wet cupping application, but this amount was not more than venous blood.

Keywords: Cupping, Lactate, Fatigue, Hijama.

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Spoculardа Islak Kupa Uygulamasının Kan Laktat Düzeyine Etkisi

Öz

Kan laktat düzeyi yorgunluğun en önemli belirteçlerinden biridir. Amacımız ıslak kupa uygulamasının kan laktat düzeyine etkisini araştırmaktır. Yaşları 20-24 arasında değişen 14 erkek katılımcı gönüllü olarak çalışmaya dahil edildi. Gönüllüler Bruce protokolüne göre maksimum kalp atış hızına ulaşana kadar koşu bandında koşturuldu. Koşunun ardından gönüllü 60 dakika dinlendirildi. Dinlendikten sonra gönüllünün sırt bölgesine 6 adet 6 cm çaplı kupa uygulaması yapıldı. Kap uygulamasından 1 dakika sonra kupalar çıkarılarak bistüri ile epidermalde küçük kesiler yapılarak kupalar tekrar yerleştirilerek vakum uygulandı. Bir dakika bekledikten sonra kupa içinden enjektör yardımıyla 2 cc kan alınarak vakumlu tüpe aktarıldı. Bu uygulama yapılırken antekubital venden 2 cc kan örneği alınarak vakumlu tüpüne aktarıldı. Kan örneklerinden laktat değerleri spektrofotometrik yöntemle ölçüldü. Sonuçlar student t testi ile analiz edildi.Venöz kan laktat düzeyi; 20.35 mg/dl, kupa kanındaki laktat düzeyi 20.36 mg/dl olarak bulundu. Venöz kan ve kupa kanı laktat düzeyleri arasında istatistiksel olarak anlamlı fark bulunamadı (p: 0.896). Bu sonuçlara göre ıslak hacamat uygulamasıyla laktatın vücuttan uzaklaştırılabildiği ancak bu miktarın venöz kandan fazla olmadığı belirlendi.

Anahtar kelimeler: Kupa, Laktat, Yorgunluk, Hacamat.

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Introduction

The interest of athletes in traditional and complementary medicine (TCM) has been increasing recently. The growing number of elite athletes receiving TCM applications has raised questions regarding its impact on athletic performance. The most well known TCM application and the most performed one by athletes is cupping. The history of cupping in Asia and the Middle East goes back to 3300 BC (Bridgett, et al., 2018). There are many cupping methods (Aboushanab and AlSanad, 2018). The most frequently used methods today are dry cupping and wet cupping (hijama). Dry cupping involves vacuuming the skin without incisions, whereas wet cupping involves small skin incisions to extract blood and interstitial fluids.

Cupping is used in many diseases, especially in pain relief (Cao et al., 2010). It is accepted that cupping decreases muscle pains, accelerates regenerations, and, as a result, increases sportive performance (Bridgett et al., 2018). In addition, it enhances the immune system and increases the pain threshold (Emerich et al.,2014; Zeng and Wang, 2016). It is reported that cupping is helpful in reducing neck pains and back pains (Kim et al., 2011; Lauche et al., 2012). Cupping accelerates the excretion of metabolic waste and recovery by increasing local microcirculation (Arslan et al., 2015). In the region where dry cupping is applied, firstly, microcirculation decreases; hypoxia, lactate accumulation and metabolic acidosis develop, and secondarily, vasodilatation and microcirculation increase (Tham et al., 2006; Emerich et al., 2014). According to the wet cupping mechanism explained according to the Taibah theory, blood, interstitial fluid and accompanying toxicants accumulated in the subcutaneous region are taken out via the incisions made on the skin (al Jaouni et al., 2017).

Fatigue is an important parameter for athletes in sportive success. Especially in sports such as wrestling, weightlifting, boxing etc. that are held after short rest intervals, early recovery is very important for the next competition. Therefore, athletes must benefit from resting phase very well. Fatigue is divided into two as central and peripheral fatigue. While central fatigue is related to nervous system, depletion of ATP and CrP, depletion of glycogen stores, increase in intramuscular temperature, reducing the transmitters in the neuromuscular junction and increasing metabolic waste such as lactic acid and H+ cause peripheral fatigue. In the recovery phase, restoring ATP, CrP and glycogen stores is related to the nutrition of the athlete. While the lactic acid formed as a result of anaerobic glycolysis turns into lactate, the released H+ leads to acidosis by lowering the pH of the environment. Acidosis affects enzymatic activities and leads to a decrease in muscle functions and fatigue. Lactic acid enters oxidative phosphorylation by means of pyruvate in an oxygenated environment or is converted into glucose in the liver by involving the circulation (Kenny et al., 2012).

It is known that some Olympic champion athletes have cupping application. However, studies on the effect of this practice on fatigue are insufficient. This study hypothesizes that wet cupping facilitates the removal of both blood and interstitial fluid, potentially accelerating lactate elimination and recovery. The aim of this study is to compare between the lactate amount in the cup blood and the lactate amount in venous blood in wet cupping application.

Methods

Research Model

This study employed a within-subject design, where each participant served as their own control to compare lactate levels between venous and cupping blood samples.

Study Group

The study was conducted in Kayseri in the year 2021-2022. The universe of this research consists of young men who do regularly sports or exercise. Study group consisted 14 voluntarily men aged between 20-24 years. Power analysis was conducted using G*Power 3.1 software according to paired t-test. Assuming effect size of 0.30, alpha level of 0.05 and power of 0.80, a minimum sample size of 14 was calculated. This age group was chosen because the study was conducted on university students. Participants who regularly engaged in aerobic exercise (at least 60 minutes, two days per week) were included. Among the suitability of the exercise, it was examined from the health check in the Sports Medicine Outpatient Clinic. Patients with hypertension, kidney disease, heart disease, drug use, bleeding diathesis, those who cannot adapt to exercise were excluded. After the anthropometric measurements of all volunteers were taken, their maximal heart rate was calculated according to the formula of 220-age. The volunteers were divided into five groups so that 3 volunteers per day had tests and cupping.

Data Collection Tools

Applications were performed between 10:00-12:00 in the morning after 2-hour fasting and one-day protein free diet. Before the test, 10 minute of slow tempo warm-up and afterwards stretching exercises involving large muscle groups were performed. Then, the volunteers were asked to run until they reached the maximal heart rate according to Bruce protocol. Heart rates were monitored via pulse oximeter. Thus, all volunteers were ensured to exceed the lactate threshold. After running, the subjects rested for 60 minutes and they had a warm shower. After the rest, 6 cupps with 6 cm diameter applied to the subjects' back as they were lying prone by a specialist and certified physician. Cups were applied on the top corner of the two scapula and between vertebral columns, on C7 spinous process, on the kahil point, on the bottom corner of the two scapula and between vertebral columns.

1 minute after the cupping, the cups were removed and small epidermal incisions were performed with a scalpel. Cups were placed again and vacuum was applied. After waiting for 1 minute, 2 cc blood was taken from the cup on the left top scapula corner via an injector, and it was transferred to a vacuumed tube (Figure 1). While the blood was taken from the cup, 2 cc blood samples were taken from the antecubital vein at the same time. Cups were removed 10 minutes later, incision areas were cleaned with antiseptic solution, and each was covered with a clean sponge. Lactate analysis were performed on the blood samples using spectrophotometric method

Figure 1. Application of Hijama

Statistical Analyes

Data analyses were performed in SPSS 22 version program. The conformity of the data to normal distribution was evaluated using histogram, Q-Q plots and Post-hoc test. Descriptive statistics, including mean, standard deviation, minimum, and maximum values, were calculated. In the comparison of the groups, paired-t test was applied. Statistical significance level was accepted as $p < 0.05$.

Ethics of Research

Ethics committee approval was received from Local Ethic Committee (10.06.2020/3) and Ministry of Health (77979112-2020). All volunteers were informed about the study. The Helsinki Declaration was adhered to throughout the study. All procedures were conducted in accordance with the Higher Education Council's Scientific Research and Publication Ethics Directive of Turkiye.

Results

The average age was 21.85 years, average height is 174.90 cm and average body weight was 75.30 kg for all volunteers (Table 1).

Table 1

Descriptive Statistics of Participants' Physical Characteristics

	n	$\overline{X}$	S.d
Age (years)	14	21.85	1.20
Height (cm)	14	174.90	5.25
Weight (kg)	14	75.30	8.30

Venous blood lactate level was found to be 20.35 mg/dL, cupping-extracted bloodlactate level was found to be 20.36 mg/dL (Table 2). There was no statistically significant difference between venous blood and cup blood lactate levels (p: 0.896).

Table 2

Comparison of Lactate Levels Between Venous Blood and Cupping Blood

	n	$\overline{X}$	S.d	p
Lactate levels in venous blood	14	20.35	6.16	0,896
Lactate levels in cuppblood	14	20.36	5.66	

Discussion and Conclusion

Many athletes were have undergone cupping therapy to reduce fatigue, to relieve pain or to improve performance. It has been claimed that cupping to be effective mostly in reducing back and neck pains (Lauche et al., 2011; Lauche et al., 2012; Bridgett, et al., 2018;). It was stated that cupping application on the myofascial trigger points of the football players having back pain reduced the trigger point sensitiviy when compared to the control group (Fousekis and Kounavi,2016). In addition, cupping reduces pain in nonspecific back pain of football players and increases the range of

motion (Hong et al., 2006; Tarek, 2016).It is suggested that cupping application does not increase the flexibility of hamstring, while it increases waist flexibility (Doozan, 2015; Williamset al., 2019). Also, a significant effect was observed in increasing flexibility in the iliotibial band syndrom in football players (Doozan, 2015).

There are a few studies regarding that cupping reduces fatigue in athletes. It was stated that cupping increases local microcirculation and accelarets the removal of the metabolic waste (Arslan et al., 2015). The effects of moxibustion and moxibustion combined cupping application on CK levels after exercise in gymnasts were examined, and it was observed that moxibustion combined cupping application reduced CK levels more quickly (Sun et al., 2012). Conversely, cupping does not reduce CK and LDH levels (Khalil Kargar-Shoragi et al, 2016). In addition, a decrease was observed in oxidant stress factors after the cupping (Tagil et al., 2014).

The effect mechanism of wet cupping is explained according to Taibah theory.[21] Accordingly, the skin region applied cupping and elevated with negative pressure works like the bowman capsula of the kidneys. Heavy metals, nociceptors, triglycerides, cholesterol, immune complexes, inflammatory mediators, aging blood cells, cytokines, prostoglandins and metabolic waste in the interstitial fluid and blood accumulate in the skin layer rising into the cup with applied negative pressure. These substances are taken out via incisions made on the skin (El Sayed et al., 2013). Lactate is also one of these metabolic waste.

Among the multiple causes of fatigue, lactic acid accumulation plays a major role**.** As a glycolytic path product pyruvic acid, turns into lactic acid in anaerobic environment. Lactic acid dissociates, converting to the lactate and accumulating hydrogen ions. As a result, hydrogen ion accumulation lowers pH and causes acidosis in muscles. Acidosis affects enzymatic activities and leads fatigue (Kenny et al., 2012). The aim of this study was to evaluate whether lactate elimination is accelareted by cupping application. As a result of this study, it was detected that blood lactate values were the same with the lactate amount in the cup blood. Although wet cupping did not significantly enhance lactate removal in this study, further research with larger samples and alternative measurement techniques is needed to clarify its potential effects". However, it must be remembered that according to Taibah theory, there is not only blood in cup blood, but there is also interstitial fluid. This can decrease lactate concentration in the cup blood. Therefore, in further studies, the interstitial fluid amount can be determined in the cup blood and lactate amount correction should be done.

Any study about the effect of the cupping application on performance could not be found. However, it can contribute the performance by especially increasing the pain treshold, decreasing pain mediators, increasing cortisol level and decreasing the pain felt. Therefore, a great deal of study is needed in this field.

Limitations: Since negative pressure is applied to the cups, some interstitial fluid is filled into the cup along with the blood. The filled interstitial fluid may reduce the lactate concentration. Our most important limitation is that this effect cannot be taken into account.

According to these results, it was determined that lactate could be removed from the body by wet cupping, but this amount was not more than venous blood. However, it was considered that since a negative pressure occurs in cupping, a fair amount of interstitial fluid mixed with cup blood, and this probably reduces lactate concentration.

Ethics Committee Approval Information

Ethics committee: Kayseri City Hospital GETAT Clinical Research Ethics Committee (Additionally, approval for clinical research was obtained from the Ministry of Health)

Date of ethics approval document: 10.06.2020

Approval number of the ethics document: 3

Author Contribution Rates

All three authors contributed equally to all stages of the research.

Conflict of Interest

Authors were declareted no conflict of interest

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