The Effect of Single Bout of Competitive Training on Muscle Damage and Liver Enzymes in University Student Wrestling and Taekwondo Athletes

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Authors’ contributions

This work was carried out in collaboration among all authors. All authors participated in the design of the study, experimental applications (exercises), laboratory applications (sample collection and biochemical analyzes) data collection and evaluations. All authors contributed the manuscript writing and have read the final version of the manuscript. All authors read and approved the final manuscript.

ABSTRACT

Aims: The effects of exercise/training on biochemical parameters may vary according to the characteristics of individuals, physical conditions, duration and intensity of exercise, and different lipid values. The purpose of this study was to investigate the alterations in muscle damage and liver enzyme parameters of male university student wrestling and taekwondo athletes after single bout of competitive training.

Methodology: The participants of the present study, sampled voluntarily. The research sample consists of 6 elite level male wrestlers (age=17.33 ± 0.54) and 6 elite level male taekwondo (age=17.66 ± 0.54) athletes. First of all, blood samples from all athletes were taken to evaluate the pre-test levels of serum AST, ALT and CK. After 15 minutes of warm-up, in accordance with the competition conditions of the relevant sports branch, the match was made in a total of 6 minutes, with appropriate loading intensity and rest interval. After at least 15 minutes of training blood samples were taken again to evaluate the post-test levels of AST, ALT and CK. Serum samples were studied in an auto analyzer.

Results: The results showed that after single bout of competitive training, serum levels of aspartate
1. INTRODUCTION

Doing intense physical activity increases the production of reactive oxygen species and leads to oxidative damage [1]. The liver is one of the tissues exposed to damage from oxidative stress. Researchers demonstrated that aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), and lactate dehydrogenase (LDH) are vital enzymes and indicate muscle damage [2]. The effects of exercise on biochemical parameters may vary according to the characteristics of individuals, physical conditions, duration and intensity of exercise, and different lipid values. With exercise, a damage occurs in the muscles at the cellular level. This damage is expressed in the literature in terms of 'micro trauma, micro injury and muscle damage' [3]. This damage is mainly explained by 2 ways. First one; the unfamiliar exercise, the second one, although not fully characterized, is the occurrence of some metabolic and chemical events with tissue damage, with the contribution of muscle ischemia. Two methods are basically used to detect muscle damage: The first is imaging techniques [4]. The second is the determination of muscle-specific enzyme activities in serum samples. The increase in the amount of isoenzymes in the serum, which are genetically determined to which tissue they belong, plays a decisive role in determining the damage and rate of damage in the relevant tissue [5]. Structures used in studies to detect skeletal and cardiac muscle damage; mainly creatine kinase (CK) and its sub-isoforms, myoglobin, aspartate aminotransferase (AST), lactate dehydrogenase (LDH), brain natriuretic peptide (BNP), atrial natriuretic peptide (ANP), carbonic anhydrase, troponin and muscle building proteins, commonly used are structures. The most important and most used of these structures is CK [6]. Serum CK activity is increased in muscle injuries and when use of proteins as energy metabolism [5].

ALT and AST are biomarkers that show liver cell destruction. The levels of these enzymes may increase in diseases that are thought to affect the liver, toxic effects of some substances (such as drugs) in the liver, degeneration in the muscle caused by excessive muscle strain [7-10]. In addition to these, when there is muscle damage due to exercise, the activity of CK, an intracellular enzyme in plasma and serum, increases [11,12]. Muscle damage: It is an acute condition that causes fatigue, loss of function, loss of strength and muscle pain as a result of unusual and intense exercise [13]. In case of muscle damage, the activity of CK, which is an intracellular enzyme in plasma and serum, increases. Creatine kinase, which is an indicator of muscle damage, also increases after exercise [14]. The aim of this study was to evaluate the circulating levels of muscle damage and liver enzyme activities after single bout of competitive training in 17-18 year old male wrestling and taekwondo athletes.

2. MATERIALS AND METHODS

2.1 Participants

The participants of the present study, sampled voluntarily. The research sample consists of 6 elite level male wrestlers (age=17.33 ± 0.54) and 6 elite level male taekwondo (age=17.66 ± 0.54) athletes.

2.2 Procedure

First of all, blood samples from all athletes were taken to evaluate the pre-test levels of serum AST, ALT and CK. After 15 minutes of warm-up, in accordance with the competition conditions of the wrestling and taekwondo, the match was made in a total of 6 minutes, with appropriate

Keywords: Single bout of exercise; university student athletes; liver enzymes; muscle damage enzyme; wrestling; taekwondo.
loading intensity and rest interval. After the training blood samples were taken again to evaluate the post-test levels of AST, ALT and CK in 15 minutes. Serum samples were analyzed in an auto analyzer.

3. RESULTS

When the liver enzymes of athletes were examined, there was a statistically significant difference in AST pre-test (11.4 + -6.27) and post-test (31.18 + -13.26) in wrestlers and AST pre-test (11.15 + -6.10) and post-test (30.26 + -13.61) in taekwondo players (p<0.05). Similarly there was a statistically significant difference in ALT pre-test (17.76 + -7.41) and post-test (24.05 + -8.44) in wrestlers, ALT pre-test (17.50 + -6.43) and post-test (23.88 + -7.78) in taekwondo players (p<0.05).

When the CK pre-test (172.38 ± 62.30 U / L) and post-test (488.16 ± 217.61 U / L) results in wrestlers and CK pre-test (166.86 ± 66.91 U / L) and post-test (459.16 ± 191.84 U / L) results of taekwondo players are considered, there was a significant difference in muscle damage in wrestlers with more intensive loading (p <0.05) Table 1.

4. DISCUSSION

The main purpose behind conducting of this study was to examine the effect of the single bout of competitive training on muscle damage and liver enzymes serum levels in two different type of one on one combat sports. In this research, biochemical changes were monitored by making a loading suitable for the competition conditions. Considering the excitement of the competition moment, of course it is impossible to create exactly this environment. However, we think that the study is effective enough, since our aim is to create a condition of loading in competition violence rather than psychological effects. In this section, information in the literature within our research findings will be discussed.

Similar to our study, in a research conducted on football players by Akyüz (2007), it was determined that the CK level increased at the end of the match and peaked 24 hours after the end of the match [15]. In a study conducted on marathoners, serum CK was found to be 21 times higher after the run than before the run and returned to normal 4 days after the run [16]. Creatine kinase (CK) and lactic acid values were found in the blood and according to these findings; it was found that the creatine kinase value increased after exercise, but this increase was not significant [17]. In a study on creatine kinase and lactate, the effect of vitamin E supplementation on oxidant and antioxidant capacity and muscle damage was investigated in endurance training athletes. As a result of biochemical analysis, it was reported that there was a significant difference in CK and LDH values after exercise [18]. In a study conducted on football players, blood samples were taken before, immediately after, 6 hours, 24 hours, 48 and 72 hours after the training program and CK values were determined in samples. Pain values for the trained muscles of the subjects were determined with the Likert pain scale. It was determined that plasma CK started to increase after training and started to decrease at the 48th hour when it peaked 24 hours after training and approached the level immediately after training at the 72nd hour [19].

Similar to our study, it has been reported that the increase in the intensity and duration of the exercise generally increases ALT and AST levels [20]. Mashiko et al. reported a significant increase in ALT and AST levels after a 20-day training program applied to athletes during the camp period [21]. An increase in ALT and AST values was reported at the end of the 5-week training program applied to 16 male and 8 female judo athletes [22].

Table 1. Changes in the activity of liver and muscle damage serum enzymes after single bout of competitive training

<table>
<thead>
<tr>
<th></th>
<th>Mean(pre-post)</th>
<th>Std.Dev. (pre-post)</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrestling AST</td>
<td>11.45-31.18</td>
<td>6.27-13.26</td>
<td>4.34</td>
<td>0.007*</td>
</tr>
<tr>
<td>Wrestling ALT</td>
<td>17.76-24.05</td>
<td>7.41-8.44</td>
<td>4.62</td>
<td>0.006*</td>
</tr>
<tr>
<td>Wrestling CK</td>
<td>172.38-488.16</td>
<td>62.30-217.61</td>
<td>4.10</td>
<td>0.009*</td>
</tr>
<tr>
<td>Taekwondo AST</td>
<td>11.15-30.26</td>
<td>6.10-13.61</td>
<td>3.92</td>
<td>0.011*</td>
</tr>
<tr>
<td>Taekwondo ALT</td>
<td>17.50-23.88</td>
<td>6.43-7.78</td>
<td>5.09</td>
<td>0.004*</td>
</tr>
<tr>
<td>Taekwondo CK</td>
<td>166.86-459.16</td>
<td>66.91-191.84</td>
<td>4.10</td>
<td>0.009*</td>
</tr>
</tbody>
</table>
A statistically significant increase was found in AST and ALT levels after acute exercise in 12 sedentary male subjects with a mean age of 25 [23]. Exercise is known to cause short- or long-term changes in blood biochemistry [24,25].

5. CONCLUSION

As a conclusion; it is known that acute or regular exercise practices regulate circulating biomarkers. In the present study we examine the effect of the single bout of competitive training on muscle damage and liver enzymes serum levels in two different type of one-on-one combat sports. This acute load of exercise caused an increase in both muscle damage and liver enzyme parameters. When this increase is compared between the two combat sports, it was seen that the parameters of the wrestlers were higher. There may be many different reasons for this difference. This increase caused by exercise will differ depending on the situation of training. In this case, the liver enzymes and muscle damage parameters may have been higher because the wrestlers in our sample group were less trained. If these biomarkers increase so much during competition, this will negatively affect the performance of the athletes. In order to prevent this, success can be achieved by ensuring that the athletes are trained sufficiently and prepared for the competition during the pre-competition preparation period.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


