Investigation of the Oxidative Stress Parameters of Elite Boxers

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Abstract: Research group of this study consisted of total 10 boxers who are actively involved in Turkish big male national boxing team. Blood samples were taken twice from boxers constituting the research group before and after the match after the camp program of eight weeks applied for research group. Data and laboratory results are utilized as covariant. Relative changes in the data obtained are analyzed by SAS package program and by utilizing PROC MEANS procedure. Significance level of changes observed is specified by Paired t test that adds significance at the level of P<0.05. Increase in the measurement of MDA levels as one of the oxidative stress serum parameters of boxers before and after the match is statistically found meaningful. Also it is determined that 8-ISO values before and after the match have increased and this increase is statistically found significant. Decrease in the 4-HNE values is also found statistically meaningful. However, decrease in 8-OHdG values before and after the match is found statistically insignificant. Changes in C Vit values before and after the match are found statistically insignificant. According to the results of the research, it is determined that there are important changes in all of the blood values of national boxing team athletes before and after the match, however the changes in malondialdehyde, 8-Isoprostane, 4-hydroxynonenal parameters are found statistically significant. Accordingly it may be said that significant alterations are observed in the oxidative stress parameters of malondialdehyde, 8-Isoprostane and 4-hydroxynonenal.

Key words: Boxer, Oxidative Stress, Malondialdehyde, 8-Isoprostane, 4-hydroxynonenal, 8-hydroxy-2'-deoxyguanosine

INTRODUCTION

A combat sport, also known as a fighting sport, is a competitive contact sport where two competitors fight under certain rules of engagement. Boxing is an example of combat sports and one of the oldest sports. Two opponents make effort for success using their fists (Varlık, S., 1982). Superior performances of today’s athletes described as the whole of various physiological, psychological and biomechanical factors for the performance to be at the highest level (Zorba, E., 1999). The relationship between the body structure and its functions has been a research subject in the studies related with sports. Besides physiological, psychological and tactical factors body position and structure have an extensive importance in the determination of performance (Viviani, F., F. Baldin, 1993). It is known that there are changes in blood parameters in line with the intensity, duration and type of the exercise. Changes may be observed in the blood values during and after an intense exercise because of differences such as exercise status of the individual, environmental conditions and nutrition. Besides the researches informing positive improvements in the blood biochemistry as a result of acute exercise, there are also studies suggesting changes by long-duration exercises rather than acute exercises (Şekeroğlu, M.R., 1997). It is established that regular exercises have a positive effect on all body systems, and prevent formation of health problems (Griffith, H.W., 2002; Sönmez, G.T., 2002; Ergen, E. Fatigue and Dealing Ways, 2002; Fox, E.L., 1999). Exercises bring along wide range of positive adaptations muscular force, reaction time, neuromuscular coordination, balance, body composition, mitochondrial increase, aerobic-anaerobic capacities (Cooper, D.M., 2004). Some negative effects are also observed such as exercise-induced free radical regeneration and consequently lipid peroxidation and formation of mechanisms that damage the organism (Allession, H.M., 1993; Kanter, M., 1995; Sahlin, K., 1991). Intense exercise and severity of exercise are two factors that disturb this balance. In both cases excess free radical formation has potential of causing oxidative damage. Acute exercising may have potential adverse effects besides its benefits (Ji, L.L., 1995). Certain oxidative stress parameters of athletes of Turkish national boxing team, who have to make training continuously, are investigated before and after the match.

Method:

In this study, total 10 big male boxers from Turkish National Boxing Team having average 22.40 age/year constitute the material of the research. Information stating that this research shall be realized in line with the ethic rules is notified to the Presidency of Ethical Committee of Adıyaman University Medicine Faculty and
Approval of Ethical Committee is obtained. Blood samples of boxers before and after the match are taken from front forearm vein by 10 cc injectors to gel biochemical tubes, and after a period of ten minutes of waiting period, they were centrifuged by means of Hettich trade mark Universal 320 model. After eluting the serums of blood samples taken by centrifuging at 4000 revolutions for 5 minutes, they were taken into eppendorf tubes, and they were preserved in the Hettich freezer at -80 °C in the laboratory of Firat University Faculty of Veterinary Science Department of Animal Nutrition until the time of analysis. Analyses of oxidative stress serum samples are made in the laboratory of Firat University Faculty of Veterinary Science Department of Animal Nutrition. Malondialdehyde (MDA) levels are analyzed according to the method notified by Karatepe (Karatepe M., 2004). 8-Isoprostane (8-ISO; Cat: 516351, Cayman Chemical Company, Michigan, ABD), 4-hydroxynonenal(4-HNE; Cat: 0903339, Cell Biolabs Inc., San Diego, ABD) and 8-hydroxy-2'-deoxyguanosine (8-OHdG; Cat: 589320, Cayman Chemical Company, Michigan, ABD) levels in the serum samples were determined by utilizing commercial ELISA kits and by means of the ELISA device (Elx–800; Bio-Tek Instruments Inc, Vermont, ABD). Vitamin C (C Vit) measurement is performed on THERMO HPLC by using commercial test kits. Vitamin C peaks are obtained at 254 nm by adjusting the flow rate to 0.75 ml/minute in the Bischoff Prontosil AQ 5µmcolumn on HPLC.

Data obtained and laboratory results are utilized as covariant. Relative changes in the data obtained at the end of match are analyzed by SAS package program and by utilizing PROC MEANS procedure (SAS Institute, 2002). Significance level of changes observed is specified by Paired t test that adds significance at the level of P<0.05.

Findings:

Table 1: Age, weight, height and BMI values of the athletes (n=10).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before match</th>
<th>After match</th>
<th>Difference</th>
<th>t value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Men ± SD)</td>
<td>22.40 ± 2.84</td>
<td>22.40 ± 2.84</td>
<td>0.00</td>
<td>1.00</td>
<td>0.312</td>
</tr>
<tr>
<td>Weight (kg) (Men ± SD)</td>
<td>66.10 ± 16.62</td>
<td>66.10 ± 16.62</td>
<td>0.00</td>
<td>1.00</td>
<td>0.312</td>
</tr>
<tr>
<td>Height (cm) (Men ± SD)</td>
<td>173.70 ± 8.19</td>
<td>173.70 ± 8.19</td>
<td>0.00</td>
<td>1.00</td>
<td>0.312</td>
</tr>
<tr>
<td>BMI (kg/cm²) (Men ± SD)</td>
<td>20.89 ± 4.57</td>
<td>20.89 ± 4.57</td>
<td>0.00</td>
<td>1.00</td>
<td>0.312</td>
</tr>
</tbody>
</table>

Average age of the boxers is determined as 22.40 years in our study. Average body weight of the boxer group participated in our research is determined as 66.10 kg. Average height of the athletes participated in our research is determined as 173.70 cm. Body-mass index, it is determined as 20.89 kg/cm². (Table 1).

Table 2: Blood and oxidative stress levels of the athletes (n=10).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before match</th>
<th>After match</th>
<th>Difference</th>
<th>t value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDA (µmol/L)</td>
<td>0.77 ± 0.23</td>
<td>0.16 ± 0.14</td>
<td>0.62 ± 0.19</td>
<td>6.41</td>
<td>0.0001**</td>
</tr>
<tr>
<td>8-ISO (pg/ml)</td>
<td>77.56 ± 11.92</td>
<td>95.03 ± 3.86</td>
<td>-18.00 ± 8.86</td>
<td>-1.69</td>
<td>0.0528**</td>
</tr>
<tr>
<td>4-HNE (nmol/L)</td>
<td>8.89 ± 0.10</td>
<td>8.67 ± 0.11</td>
<td>0.22 ± 0.10</td>
<td>0.23</td>
<td>0.0009*</td>
</tr>
<tr>
<td>8-OHdG (ng/ml)</td>
<td>1.90 ± 0.43</td>
<td>1.59 ± 0.30</td>
<td>0.31 ± 0.37</td>
<td>1.65</td>
<td>0.1227</td>
</tr>
<tr>
<td>C Vit (mg/ml)</td>
<td>1.21 ± 0.43</td>
<td>1.09 ± 0.35</td>
<td>0.12 ± 0.39</td>
<td>0.62</td>
<td>0.5443</td>
</tr>
</tbody>
</table>

It is found that MDA measurements as one of the oxidative stress serum parameters of the boxers were 0.77±0.47 µmol/L before the match, and 0.16±0.37 µmol/L after the match, and the difference in the plasma level before and after the match is statistically considered significant (P<0.0001), (P<0.05; Table 2).

When the difference between 8-ISO measurements are investigated, it is seen that the value is 77.56±3.45 pg/ml before the match and 95.03±1.96 pg/ml after the match, and the difference in the plasma level before and after the match is statistically found significant (P=0.0282), (P<0.05; Table 2).

It is seen that 4-HNE measurements are 8.89±0.31 nmol/L before the match and 8.67±0.33 nmol/L after the match, and the change in the plasma level is found statistically meaningful (P=0.0009), (P<0.05; Table 2).

When the difference between 8-OHdG measurements are investigated, it is observed that the value is 1.90±0.65 ng/ml before the match and 1.59±0.54 ng/ml after the match, and the change in the plasma level before and after the match is not considered statistically meaningful (P=0.1227), (P<0.05; Table 2).

It is found that C Vit measurements are 1.21±0.65 mg/l before the match and 1.09±0.59 mg/l after the match, and the difference in the plasma level before and after the match is not found statistically important (P=0.5443), (P<0.05; Table 2).

Discussion:

Average age of the boxers is determined as 22.40 years in our study in which we examine oxidative stress parameters of athletes of Turkish national boxing team before and after the international matches they had. When we examine the similar literature; averages ages are determined as 21.65 age/years of Turkish national boxing team (18); 20.77 age/years of Turkish national boxing team, 20.35 age/years Ukrainian national boxing...
team (19); 22.66 age/years of Azerbaijan national boxing team (20); 24.88 age/years of Georgia national boxing team (21). These results are supporting our findings.

Sevim & Savaş 1993 indicate that especially athletes of elite level are between ages 20 and 30, and that optimal success level in boxing is 21-25 age/years and maturity and top level stage is between 26 and 28 age/years.

Average height of the athletes participated in our research is determined as 173.70 cm. Average height of Turkish national boxing team is determined as 174.40 cm (Pala, R., Y. Savucu, 2011); Turkish national boxing team as 177.46 cm, Ukrainian national boxing team as 178.07 cm (Çınar, V., 2009); Azerbaijan national boxing team as 163.30 cm (Beyleroğlu, M., 1998); Georgia national boxing team as 180.11 cm (Çakmakçı, O., 2000). These results are supporting our findings.

One of the most efficient criteria determining the performance in sports is the body weight (Sevim, Y., S. Savaş, 1993). Average body weight of the boxer group participated in our research is determined as 66.10 kg. When we examine the similar studies in the literature; average weight of Turkish national boxing team is determined as 67.94 kg (Pala, R., Y. Savucu, 2011); Turkish national boxing team as 71.91 kg, Ukrainian national boxing team as 72.72 kg (Çınar, V., 2009); Georgia national boxing team as 70.73 kg (Çakmakçı, O., 2000). We can say that these different results take its source from heavy weight athletes being not so heavy and other athletes maintaining their own weights.

When we examine body-mass index, it is determined as 20.89 kg/cm². When we examine the similar studies in the literature; Body-Mass Indexes of Turkish national boxing team is specified as 22.11 kg/cm² (Pala, R., Y. Savucu, 2011); Turkish national boxing team as 22.83 kg/cm², Ukrainian national boxing team as 21.66 kg/cm² (Çınar, V., 2009); Elite handball players as 21.68 kg/cm² and basketball players as 20.10 kg/cm² in the researches of (Savucu, Y., 2006); tennis players as 22.30 kg/cm² (Cohen, D.B., 1994). In a similar way, when we compare BMI measurements realized for elite athletes with the findings of our study, it is seen that these results are supporting our findings.

Increase in the MDA levels of boxers before and after the match is found statistically significant. When we examine the similar studies in the literature; results of elite male beach handball players before and after the match (Güzel, A.N., S. Eler, 2002); elite swimmers and sedentaries before and after aerobic and anaerobic exercises (Dağlıoğlu, Ö., 2009); elite male handball players before and after the match (Marin, D.P., 2011) show parallelism with our findings.

Increase in the 8-ISO values of boxers before and after the match is found statistically significant. When we examine the similar studies in the literature; (Mastaloudis, A., 2001) have determined that 8-ISO levels of marathon runners have increased before and after the exercises. These results show parallelism with our findings.

Decrease in the 4-HNE values of boxers before and after the match is found statistically meaningful. When we examine the similar studies in the literature; decrease in the values of elite boxers before and after the camp; and boxing coaches before and after the match is observed, however this decrease is found statistically insignificant (Pala, R., 2012). These results are different than our findings.

Decrease in the 8-OHdG values of the boxers before and after the match is not considered significant statistically. When we examine the similar studies in the literature; values of elite boxers before and after the camp and boxing coaches before and after the match (Pala, R., 2012) are supporting our findings.

Changes in the C Vit values of the boxers before and after the match are not meaningful statistically. When we examine the similar studies in the literature; C Vitamin levels of elite boxers before and after the camp decreased (Pala, R., 2012). Also, it is reported that values of coaches before and after the match have also decreased (Pala, R., 2012). These results are different than our findings.

Conclusion:
According to the results of this study; it can be stated that there were significant changes in all of the oxidative stress blood values of athletes of national boxing team before and after the match; however there is a statistically significant difference in the malondialdehyde, 8-Isoprostane, 4-hydroxynonenal parameters.

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REFERENCES


