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THE OCCURRENCE OF MUSCLE DAMAGE IN MALE SOCCER PLAYERS

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ABSTRACT

The purpose of this study is to determine the occurrence of muscle damage in male footballers during the game.

A total of 13 amateur soccer players with an average age of 25.23 $\pm$ 5.36 years were participated in to this study..

Six times blood samples were taken from the participants as before the match at rest , at half time, at the end of the match and at 24, 48 and 72 hours after the match in order to determine the CK, CK-MB, CK-MM and Myoglobine values .

It was observed that the pre match CK-MB and CK-MM values were significantly lower than those observed for half time, end of the mach , just 24, 48 and 72 hours after the match which indicate the muscle damage of the players during the match ($p<0.05$). The myoglobine , CK, CK-MB and CK-MM values showed a significant increase in half time and after the match ($p<0.05$) and myoglobine level assumed the resting values 24 after the match. However the CK, CK-MB and CK-MM did not to assume their normal values even after 72 hours after the match and the difference between these respective values was statistically significant.

As conclusion; significant amount of muscle damage was observed in soccer players during the match.

Keywords: Muscle Damage, Soccer, Creatine Kinaze.

Introduction

The number of studies related to the muscle damage caused by exercise at different intensities has shown a rapid increase in recent years. They are mainly focused on the determination of the damage caused on skeleton muscles**.** (P.M. Clarkson, M.J. Hubal, 2002, D.J. Newham, D.A. Jones, 1986, K, Nosaka P.M. Clarkson, 1997, H.K. Vincent, K.R. Vincent, 1997, J.B. Shumate, M.H. Broke, J.E. Carroll, J.E. Davis, 1979, C.M, Schneider C.A. Dennehy, S.J Rodearmael, J.R Hayvard, 1995).

Muscle damage is an acute situation which cause exhaustion, loss of functionality, loss of strength and pain in muscles as a result of unaccustomed and intensive exercise (P.M. Clarkson, M.J. Hubal, 2002). Although skeleton muscle damage is related to the intensity and volume of training it is much more apparent after unaccustomed exercise.

Damage in skeleton muscles results in the diffusion of the muscles specific components from the membrane to the blood circulation system. The components used in the determination of the skeleton and heart muscle damage are mainly Creatine Kinase (CK) and its sub isoforms (CK-MB, CK-MM), myoglobine, aspartate aminotransferase (AST), laktate dehiyrogenase (LDH), brain natriuretic peptide (BNP), atrial natriuretic peptide (ANP), carbonic anhydrase, troponine and muscle constrictive proteins . Among these components the most important and the widely used one is CK. CK is the enzyme which renews ATP consumed in the contraction and transport cycles of muscles. CK becomes physiologically active in muscle cells. ATP is formed from creatine phosphate in

contraction cycle of the muscle. This keeps the ATP level of the muscle constant. CK acts as a catalyst in this reversible reaction. (R.K. Murray, D.K. Granner, P.A. Mayes, V.W. Podvar; 1998). The peak time of CK level after the exercise depends upon the type, intensity and the duration of the exercise It is reported in literature that the CK level reaches to its peak value 1-5 days after the exercise (Sr.,Staron S.,Hikita 2000, C.M, Schneider C.A. Dennehy, S.J Rodearmael, J.R Hayvard, 1995, H.K. Vincent, K.R. Vincent, 1997, P.M. Clarkson, W.C. Byrnes, K.M. Mccormick, L.P. Turcotte, J.S White, 1986, D.J. Newham, D.A. Jones, 1986).

In a study the CK level reached to its maximum value 3-4 days after leg resistance exercise (H.K. Vincent, K.R. Vincent, 1997, Clarkson et. al ,1986), applied eccentric contraction to the leg flexors to young and elderly women and determined their CK levels. It was observed that the CK levels of the elderly women remained high even at the 5th day after the exercise while the levels of the young women showed a decrease (P.M. Clarkson, W.C. Byrnes, K.M. Mccormick, L.P. Turcotte, J.S White, 1986). In another study post race serum CK levels of the marathon runners were found to be 21 times higher than its resting value and came back to their normal values 4 days after the competition (C.M, Schneider C.A. Dennehy, S.J Rodearmael, J.R Hayvard, 1995).

Damage in both the skeleton and hearth muscles is highly undesirable. During a 90-minute game, elite-level players run about 10 km at an average intensity close to the anaerobic threshold (80-90% of maximal heart rate). Within this context, numerous explosive bursts of activity are required, including jumping, kicking, tackling, turning, sprinting, changing pace, and sustaining forceful contractions to maintain balance and control of the ball against defensive pressure (T. Stolen, K. Chamari, C. Castagna, U. Wisloff, 2005). In literature the number of studies related to this subject is highly limited. This study is related to the determination of the muscle damage of male soccer players throughout the game.

Methods

This study was carried out to determine the muscle damage in male soccer players throughout the game. A total of 13 players with an average age of 25.23 $\pm$ 5.36 years, an experience of 8.92 $\pm$ 4.75 years, height of 174.00 $\pm$ 7.55 cm and body weight of 68.77 $\pm$ 4.55 kg in two different teams in Erzurum Super Amateur league were voluntarily participated in to this study.

There were 13 players selected from the players who played in the whole game between Erzurum Sağlık Spor and Erzurum Palandöken Spor which determined the runners up place in Erzurum Super Amateur league. There were 6 venous blood samples collected from the arms of the participants at rest , in half time , at the end of the match, 24, 48 and 72 hours after the game in order to determine serum CK, CK-MB, CK-MM and myoglobine levels.

The collected blood samples were immediately transferred to the laboratory where they were centrifuged to separate their serums. Then they were subjected to total C ,CK- MB and CK- MM with the use of radiodiagnostic kit of the Hitachi brand auto analyzer.

The myoglobine analysis was carried out with Immulite One 2000 apparatus .

The data analyses were carried out by SPSS 10.0 statistical software. All the data were subjected to Kolmogorov–Smirnov test to test the normality. Non-parametric Friedmen test were applied to non normal values to determine the difference .Multi comparative Benforoni test was employed in order to determine the source of the difference.

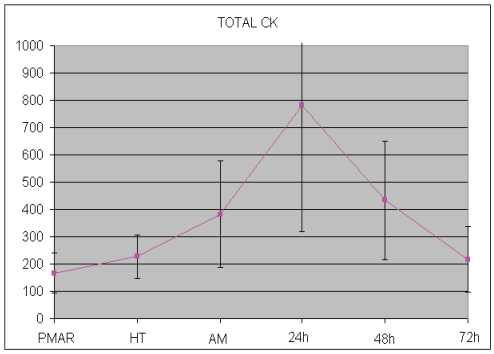
The significance level was taken as 0.05.

Results

Table 1. Physical parameters of the players

Parame-ters	Age (year)	Experience (year)	Height (cm)	Body weight (kg)
N=13	25.23±5.36	8.92±4.75	174±7.55	68.77±4.55

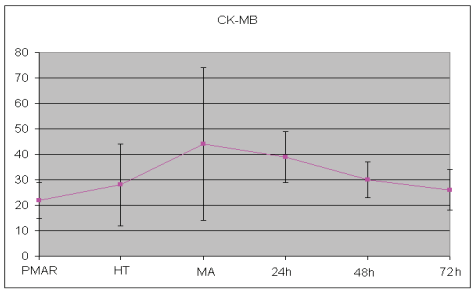
Figure 1. Total CK (U/L) values of the participants



PMAR: Pre-match at rest , HT:Half time , AM: After the match , 24h: 24 hours after the match , 48h: 48 hours after the match, 72 h: 72 hours after the match.

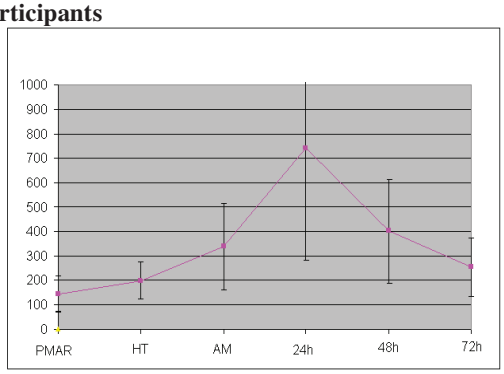
The total CK values of the participants were PMAR: 167.15±73.93 U/L, HT: 227.84±79.86 U/L, AM: 382.77±196.96 U/L, 24h: 781.69±462.90 U/L, 48h: 433.00±216.10 U/L, 72h: 280.53±120.81 U/L . There were statistically significant differences among PMAR, HT, AM , 24h,48h and 72h CK values of the participants ($p<0.05$) . There were statistically significant differences between HT and AM, between 24h and 48h values , between AM and 24h values , between 24h and 72h values and between 48h and 72 h values ($p<0.05$).

Figure 2. CK-MB (U/L) mean values of the participants



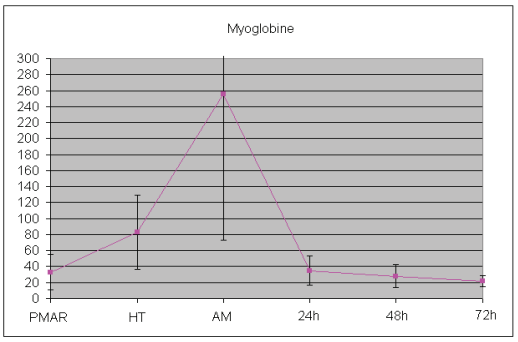
PMAR: Pre-match at rest , HT:Half time , AM: After the match , 24h: 24 hours after the match , 48h: 48 hours after the match, 72 h: 72 hours after the match. The CK-MB values of the participants were as follows :PMAR:22.24±7.75 U/L, HT: 28.16±16.91 U/L, AM: 44.33±30.09 U/L, 24h: 39.15±10.18 U/L, 48h: 30.34±7.75 U/L, and 72h: 26.31±8.85 U/L.When we look at the differences between CK-MB measurements of the participants there were statistically significant differences between PMAR and 24h values, between 48 h values and 24h and between 48 h and 72 h values ($p<0.05$)

Figure 3. Mean CK-MM (U/L) values of the participants



PMAR: Pre-match at rest , HT:Half time , AM: After the match , 24h: 24 hours after the match , 48h: 48 hours after the match, 72 h: 72 hours after the match. The CK-MM values of the participants were found as 145.84±74.29 U/L for PMAR, 199.68±76.45 U/L for HT, 338.39±177.40 U/L for AM , 742.54±459.67 U/L for 24h , 402.66±213.12 U/L for 48h and 254.23±119.19 U/L for 72h . There were statistically significant changes observed in PMAR and HT, AM, 24h, 48h and 72h CK-MM values of the participants ($p<0.05$). There were statistically significant differences between HT and AM, 24h and 48h values , between AM and 24h values, between 24h and 72h values and between 48h and 72h values ($p<0.05$).

Figure 4. Mean myoglobin (ng/dl) values of the participants



PMAR: Pre-match at rest, HT:Half time , AM: After the match , 24h: 24 hours after the match , 48h: 48 hours after the match, 72 h: 72 hours after the match. The mean myoglobine values of the participants were found as follows : PMAR: 33.49±22.93 ng/dl, HT: 83.82±46.82 ng/dl, AM: 256.27±183.74 ng/dl, 24h: 35.13±18.39 ng/dl, 48h:28.28±14.97 ng/dl and 72h: 22.98±7.31 ng/dl . When we look at the man myoglobine values of the participants we see that there were statistically significant differences between PMAR and HT and AM values , between HT and AM,24h,48h and 72 h ,between AM and 24h, 48 h and 72h values ($p<0.05$).

Discussion

The mean total CK values of the participants were found as 167.15 ± 73.93 U/L, for PMAR, 227.84 ± 79.86 U/L for HT , 382.77 ± 196.96 U/L for AM , 781.69 ± 462.90 U/L for 24, 433.00 ± 216.10 U/L for 48h and 280.53 ± 120.81 U/L for 72h (figure 1) .There were statistically significant differences among PMAR, HT, AM , 24h,48h and 72h CK values of the participants ($p<0.05$). There were statistically significant differences between HT and AM, between 24h and 48 h values , between AM and 24h values , between 24h and 72h values and between 48h and 72 values ($p<0.05$). The peak time of the increasing CK level after the exercise depends upon the type, intensity and the duration of the exercise It is reported in literature that the CK level reaches to its peak value 1-5 days after the exercise Sr.,Staron S.,Hikita 2000, C.M, Schneider C.A. Dennehy, S.J Rodearmael, J.R Hayvard, 1995, H.K. Vincent, K.R. Vincent, 1997, . P.M. Clarkson, W.C. Byrnes, K.M. Mccormick, L.P. Turcotte, J.S White, 1986, D.J. Newham, D.A. Jones, R.H. Edvards, 1986. In a study the CK level reached to its maximum value 3-4 days after leg resistance exercise (H.K. Vincent, K.R. Vincent, 1997). Clarkson et. Al, 1986, applied eccentric contraction to the leg flexors to young and elderly women and determined their CK levels. It was observed that the CK levels of the elderly women remained high even at the 5th day after the exercise while the levels of the young women showed a decrease (P.M. Clarkson, W.C. Byrnes, K.M.

Mccormick, L.P. Turcotte, J.S White, 1986). In another study the post race serum CK levels of the marathon runners were found to be 21 times higher than its original value and came back to their normal values 4 days after the competition [4]. In another study of Clarkson et al P.M. Clarkson, K. Nosaka, B Braun, 1992, the serum CK level was found to increase after a prolonged exercise and reached to its peak value 24-48 hours after the exercise. (Noakes T.D. Noakes, 1987) also observed the same results in a similar study. In our study the CK levels were found to increase after the exercise and reached its peak value 24 hour after the exercise .These results are parallel with the literature data. The fact that pre-match at rest (PMAR) CK values were found to increase at half time, just after the match and 24, 48 and 72 hours after the match shows that there was muscle damage in the players during the mach. The CK-MB values of the participants were as follows: PMAR:22.24±7.75 U/L, HT: 28.16±16.91 U/L, AM: 44.33±30.09 U/L, 24h: 39.15±10.18 U/L, 48h: 30.34±7.75 U/L, and 72h: 26.31±8.85 U/L (figure 2). When we look at the differences between CK-MB measurements of the participants there were statistically significant differences between PMAR and 24h and 48 h values, and 24h and 48 h and 72 h values, and between 48h and 72h ($p<0.05$). There are different results in literature related to exercise and troponin –t relation. There are studies reporting that exercise increases Tn-t ratio and results in myocardial damage (.F. Tucker, R.A. Collins, R. A. Anderson, 1994, S.P. Sayers, P.M. Clarkson, J. Lee, 2000). There are also studies indicating that exercise results an increase in the other chemicals related to the myocardial damage. However there are no changes in the specific Tn-t and the skeleton muscle damage is mainly related to the increase in other chemicals .(D, Konig Y.O Schumacher, L Heinrich, et al. 2003, S.Hazar, 2004, A.Bonetti, F. Tirelli, R. Albertini, et al, 1996, R.E Shave, E Dawson, P.G Whyte, et al. 2002). Hazar in his study reported that the maximal power and strength exercises caused no apparent myocardial damage and the increase in the CK-MB levels was not myocardial related and is mainly due to skeleton muscle damage (S.Hazar, 2004). In our study CK_-MB levels were found to increase after the exercise and it was mainly related to damage in skeleton muscles. The results were in good compliance with literature. The CK-MM values of the participants were found as 145.84±74.29 U/L for PMAR, 199.68±76.45 U/L for HT , 338.39±177.40 U/L for AM , 742.54±459.67 U/L for 24h , 402.66±213.12 U/L for 48h and 254.23±119.19 U/L for 72h (Figure 3). There were statistically significant changes observed in PMAR and HT, AM, 24h, 48h and 72h CK-MM values of the participants ($p<0.05$). There were statistically significant differences between HT and AM, 24h and 48h values, between AM and 24h values, between 24h and 72h values and between 48h and 72h values ($p<0.05$). It was reported that 99% of the total CK activity in the skeleton muscles was caused by CK-MM isoenzyme (C.M, Schneider C.A. Dennehy, S.J Rodearmael, J.R Hayvard, 1995). In a study carried out by Clarkson et al. 203 participants ranging 18 to 40 years in age were subjected hand flexor contraction exercises and it was found that the eccentric contraction caused an increase in CK-MM levels (P.M Clarkson, A.K Kearns, P. Rouzier,et al. 2006). In other studies he stated that CK-MM levels showed an increase 24, 48 and 72 hours after the exercise. P.M. Clarkson, K. Nosaka, B Braun, 1992, P.M. Clarkson, M.J. Hubal, 2002). The increase in total CK levels means the muscle damage .In a study investigating the muscle damage caused by maximal contraction in the elbow flexors, CK-MM levels were found to increase 3, 4 and 5 days after the exercise (K. Nosaka, P.M Clarkson, M.E Guiggin, et al. 1991). We also observed exercise related increases in the CK-MM levels of the participants. The significant increases in the CK-MM levels at the half time, just after the match and 24, 48 and 72 hours after the match compared those pre-match at rest values indicated muscle damage in soccer players. The mean myoglobine values of the participants were found as follows: PMAR: 33.49±22.93 ng/dl, HT: 83.82±46.82 ng/dl, AM: 256.27±183.74 ng/dl, 24h: 35.13±18.39 ng/dl, 48h:28.28±14.97 ng/dl and 72h: 22.98±7.31 ng/dl (Figure 4).When we look at the mean myoglobine values of the participants we see that there were statistically significant differences between PMAR and HT and AM values , between HT and AM, 24h, 48h and 72 h values and between AM and 24h, 48 h and 72h values ($p<0.05$). In a similar study of Mikkelsen and (T.S. Mikkelsen P.Toft , 2005), myoglobine levels made a peak just after the muscle damage and before the CK values. The fact that the pre-match concentrations of the myoglobine were lower than those observed at half time and just after the match was the clear indication of the muscle damage. However it assumed its original values 24 hours after the match. **In conclusion** there is a significant muscle damage caused in the players during the match.

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