38 - CK LEVELS AND ITS RELATION TO WEAR ON A PHYSICAL FOOTBALL SEASON

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doi: 10.16887/85.a2.38

INTRODUCTION

Today some of the major challenges of high-level sports are related long competitions, physical wear and recurrent injuries that they may provide the athlete. So many studies have been seeking ways to detect the physical wear seeking to avoid future injuries and the fall of physical performance. Not being different in football this problem appears very constant. In proving the high physical demands that football provides Stolen et al (2005) reports that football is a sport characterized by the large presence of jumps, disputes the ball, sprints, braking, acceleration and second Sporis et al (2010) he characterized by direction changes, which occur every 2-4s in a total of 1200 to 1400 times during a match. Thus Kane (2004) reports that besides the different ways to represent the effort of the players in a football game, physiological indicators of physical stress has been investigated.

One of the forms currently used for detection of physical stress are the plasma concentrations of creatine kinase (CK) which according Brancaccio et al (2007) is an indicator of stress due to skeletal muscle, arising from the activity and also as a factor of the load monitoring training. The more intense and lasting for the exercise, the greater the amount of muscle micro-traumas that allow extravasation of this enzyme to the extracellular medium. Durate (1993) states that effectively creatine kinase is the most commonly used biochemical indicator in the literature as an indicator of the occurrence of muscle injury and its strong presence in blood plasma suggests the existence of a high aggression on the muscle fibers with lesions of the myofilaments , sarcolemmal and sub-cellular organelles.

According Mougios (2007) Is there a concentration range between post exercise CK 300-500U / L in athletes. Beyond this assertion Mougios Clarkson et al (2006) reported that the serum concentration of CK has individual relationship and is markedly elevated 1-4 days after a workout and is an indicator of the state of training and rehabilitation of the athlete. According Jenkins and Goldfarb (1993) possibly the initial mechanism of injury that occurs in the muscle, presented by increased levels of CK are directly linked to the generation of free radicals. In addition, increase in oxygen consumption during exercise promotes increased production of reactive oxygen species (ROS). According to Hartmann & Mester (2000) the determination of CK seems to be sensitive and reliable parameter to assess any increase in muscle stress or individual tolerance to muscular exercise. Total CK values above 500 IU / L have been used as a parameter to indicate injury to muscle tissue (Martinez-Amat et al., 2005). Totsuka et al. (2002) and Brancaccio et al. (2008) adopted a value of 300 to 500 IU / L to indicate that the limit of the muscular ability was exceeded and named it the "break point" of CK. It should be noted that values of around 200-250 IU / L were considered normal for men athletes (HARTMANN & Mester 2000). With regard to wear during a season some authors have found evidence that the CK can determine the level of wear of an athlete but other as Zoppi et al. (2003) found no significant difference in plasma CK activity in athletes during a competitive season in football.

Positively CK proves an excellent biomarker of physical wear, but few studies have compared their relationship to wear during football season. Even as the studies cited above for Zoppi had limitations in their methodology. Thus the aim of this study was not only to demonstrate the increase in CK after the game, but also compare and relate to cumulative wear during the season.

METHODOLOGY

This study complied with all the standards set by the National Health Council (Res. 196/96) involving human research. Was obtained from each volunteer a free and informed consent in writing to participate in the study after clarification of all doubts from their respective reading. The study was conducted with professional players who belonged to a second division club in Rio's football contest state competitions organized by the Football Association of the State of Rio de Janeiro. 12 players participated in this study who met the following inclusion criteria: having participated in the pre-season, a minimum 700 minutes played in Series B Carioca State Championship and CK monitored both before the match (rest) and after the game with a participation minimum of 45 min in the game. The collections were made before the game being athletes fasted for 12 hours after wake up and after the game to analyze the kinetics of CK, which were termed as before-game and post-game. Subsequently, each athlete had a mean value of CK calculated at each collection time these averages being considered for analysis. All samples occurred within the facility for determination of enzymatic CK activity in plasma, 32 uL of venous blood were taken from the subjects, after cleaning of the site have been conducted with 95% ethanol. Then, after drying with cotton, to puncture a syringe was used and the blood was drained into a capillary tube hepaRev Bras Cineantropom Performance Hum 2011, 13 (3): 189-194191 rinizado (Cat No 955 053 202 Reflotron®.). Blood was analyzed in a laboratory for analyzing CK (Cat no. 1126695 Reflotron®) and placed in Reflotron Analyser®, Boehringer Mannheim. In addition to collecting CK were also analyzed through overviews and scout for game time played by each athlete during the season making its comparison with CK levels. To analyze the values of CK averages, standard deviation and Student's t test with significance level of 0.05 were used. As for the comparison of playing time played with CK levels before-game and post-game, the Pearson correlation was used.

RESULTS

Table -1 brings the anthropometric and physical characteristics of 12 volunteer athletes of this study. These values are described in their average standard deviation of the following: 24.2 ± 3.1 years, 178 ± 5.0 cm, 10.5 ± 1.2% body fat and VO2 max 65.0 ± 4.5 ml / kg / min.

TABLE-1: presentation of anthropometric and physical characteristics of the study participants.

N	Age	height	fat	$VO_{2\ Max}$
12	(years)	(cm)	(%)	(ml/kg/min)
Average	24,2	178	10,5	65,0
standard deviation	3,1	5,0	1,2	4,5

Table-2 shows the mean values of CK (before-game 333.9 ± 195.9 UI.L-1), post-game (471.6 ± 244.3) and the difference between both (137.6 ± 64 8 UI.L 1) and their respective standard deviations and Student's t test (0.14). As can be seen there was an increase of plasma concentrations of CK in the post-game, however there was no difference siguinificativa by Student t test.

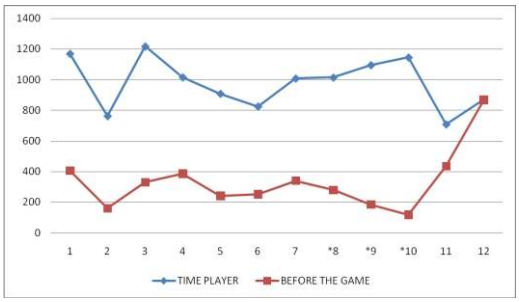
TABLE-2: Presentation of the mean CK-before game, post-game and Student's t test.

VARIABLE	BEFORE-GAME	AFTER GAME	THE DIFFERENCE BEFORE AND AFTER	TESTE T
Average	333,9	471,6	137,6	0,14
standard deviation	195,9	244,3	64,8	

Another observation was that the CK-games before (rest) had a higher average than those found by Hartmann & Mester (2000), who reported values of CK resting between 200 and 250 UI.L-1 which can be considered as normal for male athletes. As for the post-match values were on average below 500 UI.L CK-1 which according Amat-Martinez et al., 2005, this limit as a parameter to indicate injury to muscle tissue have been used.

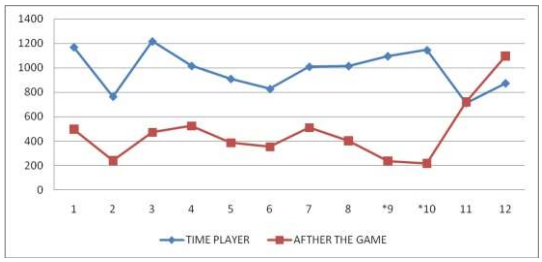
Figure-1 shows the correlation between playing time during the season and the accumulation of CK before departure. Where the correlation proved Poor Person with Negative value of -0.19. How can athletes 9, 10, 11, 12 have not followed the behavior of the other CK which athletes 9:10 even maintaining a high amount of minutes during the season to be observed resting CK was below the others, perhaps because of a ideal conditioning as athletes 11:12 declined their values played in the time graph but CK was higher. What happened to athletes 11 and 12 may be related to a non-ideal physical condition so the high accumulation of CK.

Plot- 1: Time played and accumulation of CK-Before game.



Already Graph-2 shows the correlation between playing time during the season and the accumulation of CK after departure. Where the correlation proved Poor Person with Negative value of -0.28. How athletes 9, 10, 11, 12 can also be observed lagged behavior of CK from other athletes whom the CK 9:10 post game was underwhelming compared to the minutes of the season, as the athletes 11:12 down their values in the time graph but played CK rose. What happened with 11:12 athletes may be related as previously said the ideal physical condition for 9:10 and not ideal for 11:12 so the high accumulation of CK.

Plot- 2: Time played and accumulation of CK Post-game.



Brancaccio et al. (2008) adopted a value of 300 to 500 IU / L to indicate that the limit of the muscular ability was exceeded with consequent corruption of the integrity of the cell and named it the "break point" of CK. In the study of Lazarim et al. (2009) with professional football players was adopted value of 975 UI.L for CK-1 as an upper limit to muscle overload. This value, together with other criteria such as the drop in income was used as a criterion to decrease the athlete's training load or remove him briefly in training.

So using the latter value, obtained with professional football players, as a reference, we can consider that in the present study, only 12 athletes showed similar values adopted by Lazarim et al (2009) which he said could be signs of excessive muscle overload . So this athlete was subjected to a decreased burden of workouts, diet control, use of supplements and muscle strengthening for injury prevention, even he did not report signs of fatigue, injury or loss performance during workouts.

One limitation of the study was the collection of CK in new moments after the match as 24, 48 and 72 hours trying to analyze the dynamic recovery of the athlete can thus make a more thorough correlation of removing this substance as in the study of Suzuki et al. (2004) with rugby players, there was an elevation in serum CK and LDH after a match and a significant decrease in 48 hours and 24 hours, respectively. In this same study, a significant elevation of feeling of fatigue was found shortly after departure. Similar results were found in the study of Mashiko et al. (2004) also with rugby players. Significant increase in fatigue and CK also accompanied by a significant decrease in force was found in the study of Halson et al. (2003) with cyclists during (after) two weeks of intense training.

Already Rabbit (2011) CK concentrations were higher in all post-game moments evaluated against pre situation, with the highest concentrations between 24 and 48 hours, with average values of 800U / L in these moments. Indicators of incomplete recovery were also identified until 72h post-game, with decreased strength in the lower limbs and significant DOMS. To conclude we point out that care must be taken to evaluate the average because there is a range of variation between athletes and their

respective values valore it can happen because of some physical requirements related positions, intensities and physical conditions can play individual bring a wide range of behavior in each athlete during the match.

CONCLUSION

The Court finds that CK can indeed be an excellent tool for the detection of physical wear during football season, avoiding falling growth and the onset of musculoskeletal injuries. But several aspects should be taken into consideration which can affect the athlete's performance, leaving no course of making the use of biological markers such as CK to assess the condition of each athlete. With that new studies should be done for further confirmation of these aspects improving daily assessment, prescription and maintenance of conditioning elite athletes.

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ABSTRACT

Plasma concentrations of creatine kinase (CK) has been used as an indicator of stress imposed due to skeletal muscle activity in various sports, seeking to identify the physical wear of athletes. However, there are few studies on the post-game that enzyme kinetics and a comparison with the wear of the competitive season football. The aim was to analyze the kinetics of CK concentration in sequential samples at different times before-game and post-game and their proper comparisons over time in a competitive game of the season without interrupting the schedule of trainings. Study participants were 12 professional soccer players (24.2 ± 3.1 years, 178 ± 5.0 cm, 10.5 ± 1.2% body fat and VO2 max 65.0 ± 4.5 ml / kg / min which participated in all pre-season and participated in at least 700 minutes of play). These were submitted to two moments collects a prior-game and a post-game Carioca Championship Serie B Professional. Plasma concentrations of CK showed the following values before CK-game (333.9 ± 195.9 UI.L-1), post-game (471.6 ± 244.3 UI.L-1) and the difference between two samples (137.6 ± 64.8 UI.L-1) and their respective standard deviations and Student's t test (0.14). The comparison of CK before-game and post-game played with time during the season proved the correlation Person with Low Negative value of -0.19 and -0.28 respectively. It is concluded that the values of the plasma concentration of CK can measure the physical wear of athletes on a football season.

KEYWORDS: football, creatine kinase, physical wear.

RÉSUMÉ

Les concentrations plasmatiques de créatine kinase (CK) a été utilisé comme indicateur de la contrainte imposée en raison de l'activité des muscles squelettiques dans différents sports, en cherchant à identifier l'usure physique des athletes le football. Cependant, il existe peu d'études sur l'après-match que l'enzyme cinétique et une comparaison avec l'usure de la saison de compétition. L'objectif était d'analyser la cinétique de concentration de CK dans des échantillons séquentiels à différents moments avant-match et d'après-match et leurs comparaisons valables dans le temps dans un jeu compétitif de la saison sans interrompre le calendrier des formations. Participants à l'étude étaient 12 joueurs professionnels de football (24,2 ± 3,1 années, 178 ± 5,0 cm, 10,5 ± 1,2% de graisse corporelle et VO2 max 65,0 ± 4,5 ml / kg / min qui a participé à tous les pré-saison et a

participé à au moins 700 minutes de jeu). Ceux-ci ont été soumis à deux moments recueille un jeu avant et un après-match Championnat Carioca Série B Professional. Les concentrations plasmatiques de CK ont montré les valeurs suivantes avant CK-jeu (333,9 ± 195,9 UI.L-1), après-match (471,6 ± 244,3 UI.L-1) et la différence entre deux échantillons (137,6 ± 64,8 UI.L-1) et leurs écarts-types respectifs et le test t de Student (0,14). La comparaison de CK avant-match et d'après-match joué avec le temps au cours de la saison prouvé la corrélation personne à faible valeur négative de -0,19 -0,28 et respectivement. On en conclut que les valeurs de la concentration plasmatique de la CK peut mesurer l'usure physique des athlètes sur une saison de football.

MOTS-CLÉS: le football, la créatine kinase, l'usure physique.

RESUMEN

Las concentraciones plasmáticas de la creatina quinasa (CK) se ha utilizado como un indicador de la tensión impuesta debido a la actividad del músculo esquelético en varios deportes, buscando identificar el desgaste físico de los atletas de fútbol. Sin embargo, existen pocos estudios sobre el post-juego que Enzyme Kinetics y una comparación con el desgaste de la temporada competitiva. El objetivo fue analizar la cinética de la concentración de CK en muestras secuenciales en diferentes momentos antes del juego y después de los partidos y sus comparaciones apropiadas con el tiempo en un juego competitivo de la temporada sin interrumpir el horario de entrenamientos. Los participantes del estudio fueron 12 jugadores profesionales de fútbol (24,2 ± 3,1 años, 178 ± 5.0 cm, 10.5 ± 1.2% de grasa corporal y VO2 max 65,0 ± 4,5 ml / kg / min, que participó en todos los pre-temporada y participó en por lo menos 700 minutos de juego). Estos fueron sometidos a dos momentos recoge un juego antes y un después de los partidos del Campeonato Carioca Serie B Profesional. Las concentraciones plasmáticas de CK mostraron los siguientes valores antes de la CK-juego (333,9 ± 195,9 UI.L-1), después de los partidos (471,6 ± 244,3 UI.L-1) y la diferencia entre dos muestras (137,6 ± 64,8 UI.L-1) y sus respectivas desviaciones estándar y prueba t de Student (0,14). La comparación de la CK-juego antes y después de los partidos jugó con el tiempo durante la temporada demostrado la correlación Persona con valor negativo de baja de -0,19 y -0,28, respectivamente. Se concluye que los valores de la concentración plasmática de CK pueden medir el desgaste físico de los atletas en una temporada de fútbol.

PALABRAS CLAVE: fútbol, la creatina quinasa, desgaste físico.

NÍVEIS DE CK E SUA RELAÇÃO COM O DESGASTE FÍSICO EM UMA TEMPORADA DE FUTEBOL.

RESUMO

As Concentrações plasmáticas de creatina quinase (CK) vem sendo utilizadas como um indicador do estresse imposto a musculatura esquelética decorrente da atividade em varias modalidades esportivas, buscando apontar o desgaste físico de atletas de futebol. Porem, existem poucos trabalhos sobre a cinética pós-jogo dessa enzima e uma comparação com o desgaste da temporada competitiva. O objetivo foi analisar a cinética da concentração de CK em coletas seriadas em diferentes momentos antes-jogo e pós-jogo e suas devidas comparações com o tempo de jogo em uma temporada competitiva sem interrupção do cronograma de treinamentos. Participaram do estudo 12 atletas profissionais de futebol (24,2±3,1 anos, 178± 5,0 cm de altura, 10,5±1,2% de gordura corporal e VO2 max 65,0±4,5 ml/kg/min os quais participaram de toda a pré-temporada e participaram no mínimo 700 min de jogo). Estes foram submetidos a dois momentos de coleta uma antes-jogo e outra pós-jogo do campeonato Carioca da Série B de Profissionais. As concentrações plasmáticas da CK mostraram os seguintes valores CK antes-jogo (333,9 ± 195,9 UI.L-1), pós-jogo (471,6 ± 244,3 UI.L-1) e a diferença entre as duas coletas (137,6 ± 64,8 UI.L-1) e seus respectivos desvios padrão e o Teste T de Student (0,14). Já a comparação da CK antes-jogo e pós-jogo com a tempo jogado durante a temporada se mostraram pela correlação de Person Fraca Negativa com valor de -0,19 e -0,28 respectivamente. Conclui-se que os valores da concentração plasmática de CK podem medir o desgaste físico de atletas em uma temporada de futebol.

PALAVRAS-CHAVE: futebol, creatina quinase, desgaste físico.