Noninvasive method to determine severity of sports injury for elite soccer players

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Many pathological processes lead to increased production of free radicals that targets critical macromolecules such as proteins, DNA. Lipids and extracellular matrix. Malondialdehyde may be used as an index of free radical. Hence, our objective was to investigate the relationship between the biochemical responses and degree of sports injury intensity for elite soccer players. Twenty five elite soccer players from the Amman club (the first team) suffer from musculoskeletal injuries (strain, sprains and dislocation) divided into three groups according to the three degrees of sports injury, urine samples and blood samples were drawn, urinary Malondialdehyde was analyzed using the spectrometer, together with serum CK and LDH. The correlation was statistically estimated between Malondialdehyde result and creatine Phosphokinase and lactate dehydrogenizes enzymes.

Key words: *urine Malondialdehyde, musculoskeletal injuries, biochemical variables, lactate dehydrogenizes.*

Introduction

Soccer is one of the most popular sports in the world and it is characterized by short duration and high intensity motor actions, and one of the frequently appearing disorders caused by high levels of repetitive loading and lateral movement involved in the sport. These forces can cause injuries.

The scientists agree that the sports injury is detrimental change occurs as a result of an unexpected event was during physical activity results in damage to the physiological and anatomical for athlete and leads to the pain accompanying through practice the physical activity.

According to Fuller et al. 4, these injuries should be classified according to their site, laterality, type, mechanism of injury and recurrence. Within this context, Hamza (2012) classified sports injury depending on the severity of the injury from mild (1st degree injury), moderate (2nd degree injury), to severe (3rd degree injury). Each classification has specific signs and symptoms that can be evaluated to determine the specific grade of injury.

1st degree injury occurs by 88: 90%.2nd degree injury hinders the performance of the player for a period ranging from one week to four weeks. 3rd degree injury ranging between one month and one year has forced the player to retire early.

Many pathological processes lead to increased production of free radicals that targets critical macromolecules such as proteins, DNA. Lipids and extracellular matrix (Balazy.2000) Malondialdehyde may be used as an index of free radical (Reda, 2001)

Although the direct demonstration of muscle damage is histologically, in practice the diagnosis is largely based on the measurement of plasma enzyme concentration.

According to (Osamu, et al. 1999) the serum level of skeletal muscle enzymes is a marker of the functional status of muscle tissue and varies widely in both pathological and physiological conditions. An increase in these enzymes may represent an index of cellular necrosis and tissue damage following acute and chronic muscle injuries. Thus, this study is an attempt to use new method without injection in determining the severity of sports injuries for athletes generally and soccer player's especially according to that sports injury diagnosis may be supported by the biochemical and clinical parameters, hence, our objective was to investigate the relationship between the biochemical responses and degree of sports injury intensity for elite soccer players.

Material and Methods
Participants

Twenty five elite soccer players from the Amman club (the first team) suffer from musculoskeletal injuries (strain, sprains and dislocation) divided

into three groups according to the three degrees of sports injury, urine samples and blood samples were drawn, urinary Malondialdehyde was analyzed using the spectrometer, together with serum CK and LDH. The correlation was statistically estimated between Malondialdehyde result and creatine Phosphokinase and lactate dehydrogenases enzymes. The participants did not report use of any anti-seizure drugs, alcohol and cotton consumption, nor cigarette smoking. All participants were fully informed about the aims of the study and gave their voluntary consent before participation. The measurement procedures were in agreement with ethical human experimentation.

Procedures

The sports medicine specialist classified the players into three groups according sports injury diagnosis and severity.

Statistical Analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between the three groups were reported as mean difference $\pm95\%$ confidence intervals (mean diff $\pm$ 95% CI). Pearson's correlation coefficient was used to determine the correlation between the biochemical parameters in the three groups. The level of significance was set at $p \leq 0.05$.

Results

Table 1 shows the age and training experience of the subjects. No significant differences were observed in

the age, anthropometric characteristics or training experience of the subjects in the three groups.

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Table 1. Anthropometric characteristics of the studied athletes

Variables	N	Age (years)	Body mass (kg)	Body height (cm)	Training experience (years)
Mild group	12	25.43±2.45	75.94±10.23	181.88±7.95	12.23±2.11
Moderate group	9	22.43±4.68	76.23±11.66	177.80.6±8.03	10..65±1.93
Severe group	4	24.15 ± 1.9	76.54 ± 9.1	177.22 ± 8.2	14.15 ± 3.4

Figure 1 shows the differences between three groups

Figure 1 shows significant differences that were observed in biochemical parameters for the three groups.

Table 2. The correlation between severity of the injury and the biochemical parameters

Variables	Severity of sports injury		
	mild	moderate	severe
CK	0.784	0.558	0.694
LDH	0.614	0.478	0.599
Urine MDA	0.881	0.734	0.824

* The level of significance was set at p≤0. 05.

Table 2 Shows the correlation between severity of the injury and the biochemical parameters.

Discussion

The goal of this study was to identify the relationship between the biochemical responses and degree of sports injury intensity for elite soccer players. The results indicated that significant differences were observed in biochemical parameters between the three groups and an increased Malondialdehyde concentration in the urine together with increased CK and LDH enzymes in musculoskeletal Sports injuries compared with the healthy persons with no injury problems.

The results indicated that correlation between urinary Malondialdehyde and serum CK and LDH.

So, Malondialdehyde in the urine can be used to determining the severity of sports injuries and dispensing obtain blood samples from athletes, this method is characterized by the ease, speed and accuracy.

In addition, it has traditionally been felt that the events following the initial injury, including inflammation, are necessary for optimal repair. The inflammatory response to eccentric exercise as well as stretch injury consist of neutrophilia, neutrophil activation, and the accumulation of neutrophils within the injured muscle as early as one to two hours. In this early

inflammatory stage, cellular debris is removed by the infiltrating neutrophils and is followed by a regenerative response. During which satellite cells proliferate to replace the previously damaged and phagocytized muscle. (Smith, 1991; Pizza, et al. 1995)

According to (Coudreuse, et al. 2004) the molecular diagnosis of muscle damage is largely based on measurement of the plasma activity of different sarcoplasmatic enzymes (creatine kinase (CK) and lactate dehydrogenase (LDH)). These enzymes are normally strictly intracellular, and their increased activity in plasma reflects their escape via membrane structures.

Lactate dehydrogenase is of medical significance because it is found extensively in body tissues, such as blood cells and heart muscle. It is released during tissue damage, so it is a common marker of injuries and disease.

Creatine Phosphokinase CK enters the blood rapidly following damage to muscle cells. At first CK seemed to be an excellent marker for acute myocardial infarction (heart damage) or skeletal muscle damage. Unfortunately, the CK levels rise and fall rapidly and coincide with a variety of other circumstances including surgical procedures, vigorous exercise, a fall, or a deep intramuscular injection. The measurement of CPK levels still provides valuable differentiating diagnostic information.

Previous data show the high level of lipid peroxidation from detection the malondialdehyde (MDA) represented the oxidative stress in the body (Halliwell and Gutteridge, 1999). Scavenging of all free radicals produced in vivo by both enzymatic- and non-enzymatic antioxidants usually occur.

These results not constant with (Antonio, et al. 2007) noted that total CK levels were higher in uninjured than in injured sportspeople indicates that this parameter is not a good marker of skeletal muscle damage.

Practical Applications

It may conclude that: urinary Malondialdehyde might be used as a simple noninvasive method as a musculoskeletal sport injury index. It may be recommended to widen the scope of research in bigger number of cases and other sport injury cases.

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