



## The Study of Types, Causes and Mechanism of the Musculoskeletal Injuries with the Elite Iranian Male Tennis Players

### KEYWORDS

musculoskeletal Injuries, Tennis, Premier League, Contact Injuries, Non- Contact Injuries.

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**ABSTRACT** *Background: The purpose of this research was to study the types, causes and mechanism of the musculoskeletal injuries with the outstanding tennis players.*

*Methods: A number of 100 of those male players present in the Premier League, First Division League and Futures Tournament who had injuries during a year past, were involved in this research. In collecting the profiles of the injuries, Injuries Report Forms, and in statistical analysis, the Chi-square (x<sup>2</sup>) Non-Parametric Test, within P<0.05 of Significance Level, were applied.*

*Results: On the basis of the results concluded, muscle strain (29%), significantly, is the most prevalent type of injuries with the top tennis players (P<0.05). The most prevalent mechanism of injuries was the muscular twist (17%) which shows significant in terms of statistics (P<0.05). Most of injuries (88%) were significantly of non-contact type (P<0.05). Injuries caused by ball strikes, proved to be the most prevalent ones, but not significant statistically (P<0.05). besides, in non- contact injuries, stress (27.27%), significantly, was the cause of the injuries (P<0.05).*

*Conclusions: According to the findings of the present research, it can be said that, most of the injuries are of the muscular strain type. Therefore, it should be suggested that, trainers, athletes, body-builders and physicians pay due attention to the above-mentioned items and bring them into consideration in their injuries prevention planning. Furthermore, it is proposed that, a psychologist would be employed to be beside the teams, so that, considering the novelty of the psychological issues in country's sports, and its direct relation with the injuries, we could take an apace in the prevention of the emergence of the injuries.*

### Introduction:

Tennis is a professional sport in which, millions of Dollars are given as prizes to the men and women in the tournaments. In Netherlands, with more than one million participants, out of a 16 million inhabitants, it is counted for the second spectator sport of the country (13), the favorability of which has been growing during the past twenty years. To be successful in professional levels for this sport, the athletes are active in this field, from the childhood, and spend a lot of hours in a week, in practicing and playing. This factor, in combination with their efforts to increase the speed of the racket in today's tennis, is elevating the causes of injuries with the tennis players (18). By considering the information released by the International Tennis Federation (ITF), there would be, approximately, a 10,000 hours of effective exercise, for a player, in order to find a way through the first 100 players of the world, which would last for several years. Hence, injuries, when are raised, would delay the process for a player to step up to the higher levels or, might have caused not getting a result by no means at all. Injuries in sports are counted as a common problem for the players, trainers and in general, for the clubs.

We like it or not, injuries should be looked at as part of the sport. Nevertheless, some specific factors are leading to injuries, and in other words, there are different mechanisms for injuries which, through preventive procedures we

could decrease their frequency or their severity. The research have shown that the requirements in sport of Tennis affects the lower, upper organs, as well as the trunk of the professional tennis players which could be resulted in injury patterns and specific musculoskeletal adaptations. Frequent stresses and consecutive loadings also cause some sort of muscular unbalancing specific to this sport (3).

A tennis player, during the game, is subject to unpredictable, sudden and/or energized dangerous factors. These general pressures to the body, during the game, as well as unpredictable incidents are associated with several types of acute, mild and chronic injuries extended all over the body.

Differences in skill levels, play court level and physical fitness of the player, can also be affective in occurrence of complicated injuries (2).

During the London Olympic games, 21 percent of tennis players were afflicted with injuries, which 66.6 percent of them were throughout the games, where the other 33.4 percent occurred during the exercises. But, as a contrast, in Beijing Olympic games, only 6 percent of the tennis players were injured (5).

Total rate of injuries in tennis, is reported by the amounts

between 0.04 to 21.5 injuries for each thousand hours of play. This difference is resulting from the differences in defines the injuries (10). Despite the fact that a lot of injuries which are occurring in sport of tennis are similar with what happens in other sports, it looks like the tennis possesses a unique profile of injuries (17).

A great number of injuries to which the tennis players are afflicted, could be classified as injuries due to "workout".

Carrying out of repetitive motions for prolonged hours of exercises and during competitions can result in muscular or tendons disability. For instance, service and forehands are responsible for 75 percent of the injuries during a regular competition game.

"Workout" (sprains, tendon inflammations, backaches, etc.) are comprising around 66 percent of the injuries with the tennis players. "Workout" injuries may occur in all the body areas and might be associated with the technique and muscular skeletal system changes of the athlete.

Sudden injuries (sprains, muscular strain, fractures and so on) also include 33 percent of the injuries which are observed in connection with the age and level of activities of the player. Most of the sudden injuries take place in lower organs. The injuries, while none of them are not in relation with the tennis techniques, are not easily preventable (16). Previous studies on tennis players show that most of the damage occurs in the lower extremities (39-65%), followed by the upper extremities (24-46%), and trunk / head (8-22%). Ankle sprain and thigh muscle strain are the most common injuries in the lower extremities; and tendon injury of shoulder muscles and elbow complications of tennis players are the most common injuries in upper extremities (2). Shoulder tendinitis is the second most common chronic injury in tennis (4). Maquirriain J and Ghisi (2006) conducted a case study on professional tennis players and assessed the injury to abdominal oblique muscle. This unusual lesion caused by unusual rotation of trunk and MRI imaging helped to confirm this diagnosis (14). The way of taking grip is also associated with injury type and severity (6,8). Baxter-Jones et al. (1993) in a study on elite tennis players reported that successful performance is associated with extent of damage (1). Jayanthi et al. (2005) in a study on recreational level tennis players with different skill levels reported that there was no significant difference between tennis players with different skill levels (11). Miller (2005) studied the needs of professional male athletes in tennis and the results showed that modern tennis racket and ball reduced elbow pain from tennis (15). Although there is no study on other different parts of the racket, the size of different parts of the racket could have a role in the extent and severity of injury (7). Hjelm et al. (2012) in a study on 55 Swedish tennis players (35 male and 20 female) aged 12-18 years showed that 100 injuries occurred in 39 players (male: 73 injuries, female: 23 injuries). The occurrence rate of injury is 1.7 injuries per 1000 hours for boys and 0.6 per 1000 hours for girls (9). Jayanthi et al. (2005) in a study on 140 male tennis players and 388 female tennis players in the league showed that most injuries were of overuse and the incidence of injuries in the upper extremities (41%), lower limbs (49%), and trunk and neck (3%) (11). In a 6-month study on 60 competitive level athletes and 50 recreational level athletes aged 35-16 years, Kuhne et al. (2004) reported that cramps, sprains and strains were the most common injuries and also the prevalence of injuries was 25% in the upper extremities, 64% in lower limbs and 11% in trunk and neck (12). Silva et al. (2003) in one-year study on 7,700 young elite tennis players under 18

years reported muscle cramps as the most common injuries (20). Vriend et al. (2000-2003) in a study on 10,000 tennis players in the Netherlands in a of 5-year-old period reported the prevalence of upper extremity injuries (29.1%), lower limbs (53.6%) and trunk and neck (10.2%) (21). Sallis et al. (2001) in a study of 15 years on 3767 college tennis players aged 18-23 reported the prevalence of upper extremity injuries (23.1%), lower limbs (62.2%) and trunk and neck (14.6%) (19). Despite some estimates of the prevalence, mechanisms, and causes of injury in tennis players in the world, there is no research aimed to study the prevalence and causes of injury in Iranian tennis players. Providing a scientific profile of musculoskeletal injuries in tennis players would help to develop preventive strategies to reduce the injury.

**Method**

The target population consisted of tennis players is International Futures Competitions, Premier League, and Division One competitions in Iran in 2013-2014. Samples were selected with available sampling from the Premier League, Division One, and Futures. About 400 injury report forms were distributed among the players. At the end, 100 eligible players (those who were hurt in the past year) participated in this study. General characteristics of the subjects are presented in Table 1.

**Table 1: Mean (SD) characteristics of the subjects**

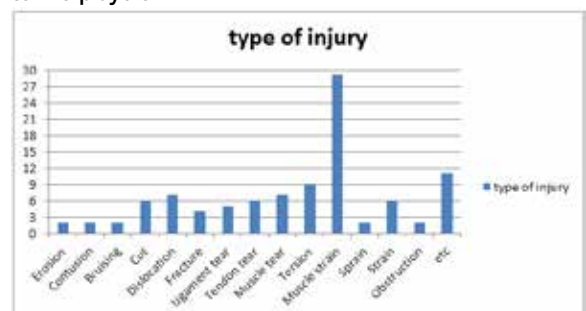
back-ground (year)	weight (kg)	height (cm)	age (year)	Males (n)
(8.0) 4.6	(8.3) 06.78	(4.5) 6.179	(4.1) 44.25	100

The tool consisted of a two-part injury report form. The first part included personal information of the players (age, height, weight, etc.) and was completed by the players as self-report. The second part consisted of type, mechanisms, and causes of the injury. To study the profile of musculoskeletal injuries of Iranian elite tennis players, nonparametric chi-square test was used. Data analysis was done using SPSS20 and the significance level of tests was considered less than 0.05.

**Results**

The results of Figure 1 show that muscle strain (29%) is the most common type of injury in male elite tennis players, showing a statistically significant difference between the types of injury (P=0.001 and  $\chi^2=96.5$ ).

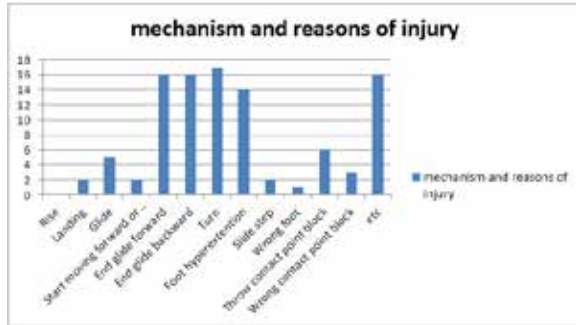
**Figure 1. Types of musculoskeletal injuries in male elite tennis players**



The results of Figure 2 show that the most common

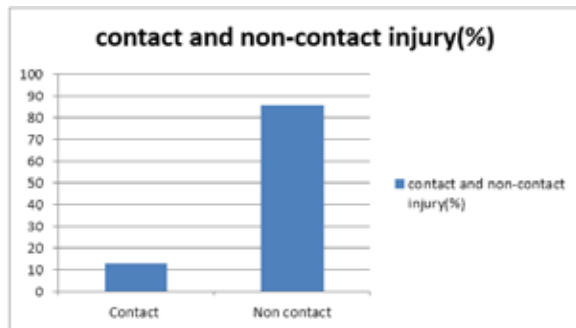
mechanism of injury in male elite tennis players was rotation, which was statistically significant ( $P=0.001$  and  $\chi^2=60.32$ ).

**Figure 2. Mechanism and reasons for musculoskeletal injuries of elite male tennis players**



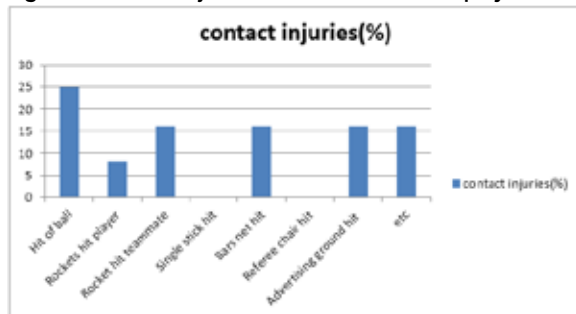
Results of Figure 3 show that the most injuries of elite men tennis players were non- contact injuries (88%), which the difference was also statistically significant ( $\chi^2=57.76$  and  $p=0.000$ ).

**Figure 3 contact and non- contact injuries of elite men tennis players**



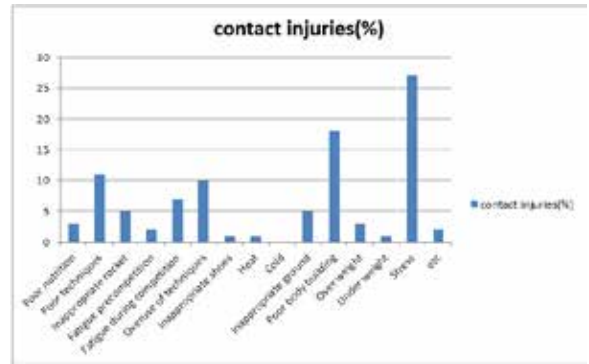
Results of Figure 4 show that the injuries caused by the contact of the ball (25%) were the most common type of contact injuries of elite men tennis players which the difference was not statistically significant ( $\chi^2=1$  and  $p=0.963$ ).

**Figure 4 contact injuries of elite male tennis players**



Results of Figure 5 show that the injuries caused by stress (27.27%) were the most common type of non-contact injuries of elite men tennis players which the difference was also statistically significant ( $\chi^2=90.5$  and  $p=0.000$ ).

**Figure 5: Non- contact injuries of elite male tennis players**



**Discussion and Conclusion**

The aim of the present study was to identify a profile of musculoskeletal injuries in elite tennis players. The results showed that the strain of muscle (29%) was significantly the most common type of injuries than other injuries among elite male tennis players. The results of the present study is consistent with some previous studies and is inconsistent with some others. Perhaps, the reason of inconsistency of the present research with some studies conducted would be related to the definition of injury, study methodology, study population, data collection methods and data collection period. Perhaps, muscle strain in this study would be due to the factor of fatigue and also muscle weakness and poor physical fitness. Therefore, attention to the physical condition of athletes is required.

The results of the present study show that the most common cause of injury is the rotating mechanism (17%) that was statistically significant. The findings also showed that non-contact injuries (88%) occur in male tennis players, that was statistically significant. The results indicate that most athletes know the rotation as the main reason of injury, and despite the fact that most injuries are non- contact, it may indicate that athletes do not have enough information on the biomechanics of movements in terms of precise doing of movements. Therefore, it is required that, coaches and physicians with specializing the exercises and use of the principle of sport specification, would prepare the conditions for learning kinematic techniques of movement for the athletes to prevent injuries as much as possible. The results suggest that stress-induced injuries in men (27.27%) were the most common type of non- contact injuries of elite male tennis players that was statistically significant. In Iran, a psychologist is not employed to be at the side of the tennis teams and this may be because of insufficient scientific information of the coaches or team managers. When a player is not mentally prepared enough, of course, the occurrence of injury should be predicted. Therefore, to prevent injury to the coaches, teams and even the players themselves it is recommended to use a psychologist along with the team and the player. The results suggest that the severity of injuries occurred in elite tennis players (62%) it was mild, which was statistically significant. Results of this study are consistent with some studies. Due to the consistency with most studies, it is possible that the nature of the injury in tennis may be mild acute injuries, but, considering that tennis is a heavy sport and even in some references, period of the game has been mentioned several hours and even a few days, more researches are needed to be conducted.

From the findings of this study it can be concluded that

the majority of injuries are among the type of strain and common injuries in tennis have mild intensities and ankle injury is the most talented area. Also, most injuries are occurred in individual competitions, in the third set and in the end zone of the tennis court. Hence, it is recommended that coaches, athletes, bodybuilders and physicians would have due regard to the mentioned cases and consider these issues in injury prevention programs, and also, more attention would be paid to the role of physical fitness in athletes.

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