Comparison of Lower Organ Disorders between Wrestlers with Meniscal Injury, Anterior Cruciate Ligament (ACL) and Healthy People in Kermanshah

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Abstract

Introduction: The present paper studied three lower organ linear disorders, including tibial rotation (rotating tibia bone around linear axis) (femoral anteversion), femoral normal rotation, and varus complications as possible risk factors of common sports injuries of knee.

Methods: In this comparative descriptive study, 60 men were divided into three meniscal injury, anterior cross ligament and healthy groups (n=20). All of the participants were current wrestlers at different clubs of Kermanshah province and towns who had at least four years of experience in various sports events. The samples of the injured groups were selected through questionnaire and referral to sports clubs and the healthy group sample was randomly selected. The healthy individuals had no record of knee injury.

Results: The results of the present study revealed that anteversion (internal rotation of femur) affected both common anterior cruciate ligament and meniscal impairments, and tibial rotation only significantly affected meniscal injury not anterior cruciate ligament. Also, increase of knee varus angle did not have any effect on meniscal and anterior cruciate ligament injuries.

Conclusion: The results of this study can be helpful to recognize the risk factors of sports injuries.

Key words*: lower organ linear disorders, wrestlers, anteversion, knee varus angle*

Introduction

Movement is an inseparable part of all living organisms. This vital factor is provided by the muscular-skeletal system of the living organism[1-4]. Proper physical condition with no threatening motor diseases is one of the requirements of the living organism. Lower organ is the supporting surface, balance factor and motor element for the organism[2,5-7]. Thus, the disorders associated with this organ, in addition to changing the standing position, affect movements, too. As the largest joint of the body, knee is where most threatening factors and lower organ disorders occur[3, 4, 7-9]. Anatomical disorders and various distortions are seen in knee joints and rotation of lower organ as valgus, varus, hyperextension, anteversion

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femur and tibia, which can be a reason for ligaments ' injury and stabilizing elements of knee joint[10]. Increase in varus and valgus angles are associated with diseases like osteoarthritis and other types of arthritis. Nowadays, various studies are being conducted to investigate the effect of disorders such as knee joint disorders, rotation of lower organ, and incidence rate of injuries in this region. A lot of these studies have been conducted to prevent common sports injuries and to identify the possible risk factors of knee injury[11-13]. Age, gender, body type, flexibility, joint laxity, muscular power, previous injuries, rehabilitation programs and anatomical disorders are the risk factors of lower organ injury[14], among which anatomical disorders are the most important causes. Based on the previous studies, knee joint includes most of the lower organ injuries so that 4.35% of the injuries, followed by the highest frequency, are associated with knee. According to the report by the orthopedics faculty of the United States, meniscal injury is the second most common knee injury and is often followed by 22- 86% anterior cruciate ligament injury. The annual cost of the injuries resulting from the sports around the world is estimated one billion dollars, a large sum of which is on knee injury treatment. Researchers have predicted remarkably lower costs for injury than treatment. In line with this, many researchers have been trying to find the risk factors causing common and costly traumas[15-20]. Since dealing with injury is mainly focused on the preventive measures, identification of factors and predisposing risk factors of injuries are the most important issues to be taken into account to prevent injury[21,22]. Previous research indicates that lower organ disorders are not known from the risk factors of common injuries in lower organ[22-25]. The present study was aimed to study three lower organ linear disorders, including tibial rotation (rotating tibia bone around linear axis) (femoral anteversion), femoral normal rotation, and varus complications as possible risk factors of common sports injuries of knee. The results of this study can be helpful to recognize the risk factors of sports injuries.

Material and Methods

In this comparative descriptive study, 60 men were divided into three meniscal injury, anterior cross ligament and healthy groups (n=20). All of the participants were current wrestlers at different clubs of Kermanshah province and towns who had at least four years of experience in various sports events. The samples of the injured groups were selected through questionnaire and referral to sports clubs and the healthy group sample was randomly selected. The healthy individuals had no record of knee injury. Having signed the consent forms, the participants were informed about the study process and the orthopedics specialist explained the possible dangers of x-ray. Personal information, including height, weight, age, activity record, injury type, and time length after injury and time of inactivity due to injured foot, internal or external meniscal tear, time after surgery, superior leg and non-superior leg, body mass index (BMI) in both injured meniscus and anterior cruciate ligament was collected. Then, using 16-slide CT scan machine, the disorders of 100 people, including anteversion, rotation angle of tibia and varus angle were determined. Finally, the angles of disorders acquired for each person and each group were drawn and compared with the healthy group by the radiology specialist. In this study, 16- slide CT scan (Siemens, Germany) machine was used at Imam Hossein hospital in Kermanshah. To calculate the anteversion, intended cuts were taken from the pelvic region and distal part of femur. Then, in each region the best cut was chosen by the radiologist and by passing an imaginary transverse line through the same region, the tangent was drawn and the tangents on both distal and proximal parts of the femur were drawn to cross each other. The obtained angle from the crossed tangents was considered as anteversion angle. To calculate the rotation angle of tibia, taking the diagnosis of the radiologist into account, first the best cuts were selected from the proximal region of tibia and its distal region, respectively, then, the crossing lines and tangent on them were drawn and the obtained angle from the crossing lines was calculated as tibia rotation angle. Further, varus angle was calculated using the CT scan images and drawing the angle between the two imaginary transverse lines of the upper part and lower part of tibia. Finally, the angle of the acquired disorders in both groups of injured

meniscus and anterior cruciate ligament were calculated by the radiologist and compared with the healthy group. Descriptive and inferential statistics were used to analyze the data. Also, Kolmogrov Smirnov was used to determine the normal distribution of the data. Then, independent t-test was used to determine the differences between healthy group and other groups. To analyze the data, SPSS (version 18) was used and Excel software was used to draw the graphs.

Findings

The findings indicated a significant difference between the tibial rotation of meniscal injury group (88.4±25.19) and healthy group (67.3±22.2) (p= 0.037), but there was no significant difference between rotation of tibia in anterior cruciate ligament injury group (58.3± 85.21) and healthy group (88.4± 25.19) (P=0.50).

In contrast, the anteversion level of the meniscal injury group and healthy group was statistically significant (p= 0.01), which was 73.1± 50.13 in the healthy group and 03.3± 65.15 in the meniscal injury group.

However, there was no significant difference between the anteversion level of anterior cruciate ligament injury group and healthy group (p=0.100), which was 73.1± 5.13 in the healthy group and 16.3± 85.16 in the anterior cruciate ligament injury group. Moreover, no significant differences were observed between the knee varus angles of the meniscal injury group (79.2±70.7), anterior cruciate ligament injury group (65.2± 75.7) and healthy group (59.3± 10.7) (p=0.50).

Table 1 Personal data of the samples, including age, height, and weight

	Age (year)	Height (cm)	Weight (kg)
Healthy	38.3± 88.28	62.7± 85.177	70.6± 9.76
Injured meniscus	38.5±65.26	69.4± 6.175	39.9± 3.77
Injured ACL	42.3± 57.26	35.5± 85.175	66.6± 55.77
Total	23.4± 37.27	20.6± 43.176	57.7± 25.77

Table 2 Comparison of lower organ disorders between meniscal injury, ACL and healthy people

	Healthy	Meniscal injury	Anterior cruciate ligament injury
Tibial rotation angle	88.4± 25.19	67.3± 2.22	58.3± 85.21
Anteversion angle	73.1± 50.13	03.3± 65.15	16.3± 85.16
Knee drug angle	59.3± 10.7	79.2± 70.7	65.2± 75.7

Discussion

The results of the present study revealed that anteversion (internal rotation of femur) affected both common anterior cruciate ligament and meniscal impairments, and tibial rotation only significantly affected meniscal injury not anterior cruciate ligament. Also, increase of knee varus angle did not have any effect on meniscal and anterior cruciate ligament injuries. However, increase of anteversion angle can be due to possible risk factors of common knee injuries. Therefore, based on the results of this study, it is necessary to identify the athletes with abovementioned disorders. Various studies have studied the effect of anatomical disorders on sports injuries and analyzed anatomical disorders as one of the predisposing risk factors.

Stanitski et la. in his study titled "anterior cruciate ligament tear in individuals with skeletal disorders" reported problems of skeletal disorders of lower organ as one of the most important causes of acute anterior cruciate ligament tear (about 6%). Scoville and Williams (2003) compared the injury rates and identified the risk factors associated with contact injury of anterior cruciate ligament between males and females on 859 people in a four-year period using a questionnaire. They reported that only 24 (16 male and 8 female) had noncontact injuries and other injuries were contact injuries. They also reported rotation of lower organ and dysfunctions of knee joint performance in them[4]. Alison Chang (2011) conducted a study on 90 people, divided into two groups, 46 with ACL injury and 44 healthy people. They analyzed the relationship between acute tear and inter condylar urethral stricture which is an anatomical disorder of the lower end of femur. Analysis of MRI for the knees of people with anterior cruciate ligament tear as well as the healthy people indicated a significant difference ($p=0.001$), and inter condylar urethral stricture was significantly associated with acute tear. chang (2011) investigated the rotation disorders of the lower organ on 50 people. The average time of anteversion for the right and left feet were 6.15° and 8.15°, respectively and the average time for tibial rotation in the right and left feet were 1.29° and 9.30°, respectively. Further, no significant difference was observed between rotation of different parts of right and left feet[21].

Sung et al (2008) examined 53 people, 24 with tibial rotation and 29 healthy people. They showed more knee joint slipping and laxity in people with extra rotation of tibia than people with normal rotation. Thus, they suggested the extra rotation of tibia as an influential factor in knee injuries[17].Braten et al. evaluated the anteversion angle in 50 male and female adults. They reported a significantly higher anteversion level in female than in male[26].

Schmitz et al. (2008) investigated the internal and external rotations and increase of varus and valgus angles in men and women and reported more slipping and laxity of joints in people with higher varus and valgus angles. They also reported more possible injury for retaining and supporting ligaments of knee joint in people with internal and external rotation of knee than in other people. Further, they showed higher rotations and higher varus and valgus angles for females than in males[7]

Conclusion

Based on the obtained results in this study regarding the significant effect of anteversion on common knee injuries as well as the effect of femur rotation on meniscal injury, it is recommended that incorrect sitting and sleeping habits of children be corrected. It is also suggested that exercises that cause an increase in disorders in athletes be avoided. Further studies are suggested to investigate the male and female athletes in other sports and compare them with non- athletes to analyze the effect of other disorders on common injuries in wrestlers and to examine the effect of disorders in terms of time duration after injury.

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Conflicting Interest : The authors declare that they

have no competing interests

Consent for publication: We obtained informed written consent from all participants

Availability of data and material: The data used to support the findings of this study are available from the corresponding author upon request

Ethical Clearance: This trial was conducted in accordance with the Declaration of Helsinki and it was approved by the Razi University of Kermanshah, Vice-Chancellor for Technology Research with grant No. and the Ethics Committee of Razi University of Kermanshah endorsed the study protocol with reference number. Before the study, the objectives and methods were explained to all of the participants, and they were assured that their responses would remain confidential. Written informed consent was obtained from all participants before the study.

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