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Hip Muscle Functional Performance Among Athletes with Achilles Tendinopathy

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[1] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, [2] Drafting the work or reviewing it critically for important intellectual content, [3] Final approval of the version to be published, [2] Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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A B S T R A C T

Background: Achilles tendinopathy is a condition affecting the Achilles tendon, causing discomfort, swelling, and decreased function. It's common in middle-aged athletes and runners, with overuse injuries increasing due to increased sports activity. Achilles tendinopathy causes significant pain and functional limitations in athletes. Hip muscle dysfunction may occur in athletes having Achilles tendinopathy. This study aims to determine hip muscle functional performance in athletes with Achilles tendinopathy, benefiting both athletes and the therapists by designing more effective rehabilitation protocols.

Objective: To determine functional hip muscle performance among athletes with Achilles tendinopathy.

Methodology: A descriptive cross-sectional study was conducted at 6 different sports clubs among athletes diagnosed with Achilles tendinopathy. Six months from June, 2023 to December 2023 was the total study's duration. Through the technique of non-probability convenient sampling, 80 participants who fulfilled the inclusion criteria were selected for the data collection. Data was collected by using single leg squat test and the findings were analyzed by using its three-point ordinal rating criteria. SPSS version 21 was used to analyze the data. Single leg squat test of injured and uninjured side and participant's demographic characteristics were collected as a descriptive statistic.

Results: Out of the eighty participants, 8 showed good performance, 29 fair performances, and 43 poor performances on the injured side, while 23 showed good performance, 30 fair performances, and 27 poor performances on the uninjured side. P value was found to be 0.000 (<0.05). This showed there were significant differences in functional performance of hip muscles on the injured and uninjured sides.

Conclusion: The study concluded that the athletes who were having Achilles Tendinopathy demonstrated poor functional hip muscle performance on injured side. Significant differences in functional performance were found between injured and uninjured sides.

Keywords: Achilles tendon, Athletes, Overuse injury, Physical performance, Tendinopathy

Introduction

The most frequently reported condition involving the ankle and foot in various sports is Achilles tendinopathy.[1]. Achilles tendinopathy (AT) affects the Achilles tendon, it causes swelling, discomfort and decreased function during movement.[2] Achilles tendinopathy is a frequent source of dysfunction in athletes due to the Achilles tendon's constant, persistent, and severe functional demands.[3] Achilles tendinopathy is most common in long distance runners with up to 29% of them having this injury. Prevalence of Achilles tendinopathy is (P=0.030). In middle and long distance athletes, there is highest prevalence of Achilles tendinopathy.[4]

Symptoms include pain, swelling and impaired performance.[5, 6] Soreness to palpation in the tendon's middle and morning stiffness are common complaints. Patients could also feel discomfort when performing normal everyday activities including walking and jumping.[7]

The development of Achilles tendinopathy involves a combination of intrinsic and extrinsic factors. Genetic variations and demographic characteristics (such as age, weight and height) are intrinsic risk factors. Leg length discrepancy and malalignment are local anatomical abnormalities, they are also included in intrinsic risk factors.[8] Extrinsic factors include various medications such as corticosteroids and antibiotics.[9] Other extrinsic risk factors are environmental aspects, way of using technique, equipment and training methods. A number of research studies have identified that specific anatomical characteristics, training errors and biomechanical faults are risk factors for Achilles tendinopathy.[10]

Functional performance consists of both movement quantity and quality. Movement quantity has two elements, range of motion and muscle strength. Movement execution is referred to as quality of movement. [11] Hip muscle dysfunction may occur in athletes having Achilles tendinopathy.[12] There is a strong connection between AT and hip muscle dysfunction. Gluteus Maximus and gluteus Medius dysfunction is associated with the Achilles tendinopathy.[13] Functional performance tests are frequently used to evaluate athletes for injuries, screen for injury prevention, and to decide when they should return to play.[14] Squat acts as a fundamental movement for sports performance.[15] Single leg squat test determines the hip muscle functional performance. As a functional test, the single leg squat has a great importance and it is frequently used in different clinical settings.[16]

Worldwide, most of the work regarding Achilles tendinopathy has been done. But a literature gap still exists regarding functional performance of hip muscles. This study determines hip muscle functional performance in athletes with Achilles tendinopathy. This study will have benefit both for athletes and medical community, it will help the rehabilitators to design more effective rehabilitation protocols for athletes with Achilles tendinopathy which also include focus on hip muscles strengthening and muscle functional performance.

Methodology

Eighty athletes, diagnosed with Achilles tendinopathy, participated in a descriptive cross sectional study, from different sports clubs in Lahore. The study was approved by Ethical Review Committee of Lahore College of Physical Therapy, LMDC (Ref. No. LCPT/ DPT/ERB/11). Prior the study, written informed consent was taken from the participants. The total study duration was 6 months after the approval. The sample size was calculated through census method. The census method involves collecting data from every member of the population rather than selecting a subset or sample. This approach ensures that the entire population is represented in the study, providing a comprehensive and accurate assessment of the characteristics being measured. By using the census method, we eliminate sampling errors and biases that can occur when only a portion of the population is surveyed. All the participants fulfilling the inclusion criteria reporting during the time frame were included. n=80. Sampling technique used for data collection was Non probability convenient sampling.[17]

Inclusion criteria was male athletes between the ages 25-45 years with confirmed diagnosis of Achilles tendinopathy, participating a sport that involve running and having at least 1 year of experience. Patients having Achilles tendon rupture, any hip deformity and other lower extremity injuries during previous year, any neurological and systemic disease, and corticosteroid injection in Achilles tendon in previous year, were excluded from the study.[18]

Functional performance of hip muscle groups in athletes was determined by single leg squat test. This test has moderate to excellent (0.603–0.939) Interrater reliability.[16] The process and technique was demonstrated to the participants by the investigator, before the test began. They were provided with three trial repetitions. Participants stand on one leg, perform a squat until 60 degree flexion of knee is reached, and then push them back. A goniometer was used to measure the depth of the squat. The actual test involves five consecutive repetitions recorded with a video.[2] The Physical Therapist used rating criteria, which is rating system based on an ordinal scale (good, fair, and poor) for data collection and analysis. The rating criteria were:

1) Overall performance for the five trials (including balance, stability, depth and speed).

2) Trunk posture over the pelvis (side-to-side movement, rotation, bending to the side, leaning forward).

3) Pelvic motion (focusing on side-to-side movement, rotation and tilting).

4) Hip joint posture and movement (including hip adduction and inward rotation of the femur).

5) Knee joint posture and movement (knee angle and knee position relative to foot position).

A participant's performance on the single-leg squat was considered as poor if a participant failed to meet at least one criterion for all test repetitions. If a participant met all requirements for one, two, or three criteria during all test repetitions, their performance was rated as fair. A performance was rated as good when a participant fulfilled all requirements for at least four out of five criteria for all test repetitions.[16] Data entry and analysis was done by using SPSS (version 21).

Single leg squat test of injured and uninjured side and demographic characteristic of the participant was collected as a descriptive data.

Results

The participant had a mean age of 29.81 ± 4.89 years and a mean body weight of 74.61 ± 7.74 kg. The participant had a mean BMI of 24.55 ± 2.85 kg/m. The mean height of participant was 174 ± 7.84 cm. The mean sports experience of participant was 4.47 ± 2.95. There were 42 (52.5%) runners and 38 (47.5%) footballers. Four (5%) participants were training for less than 3 hours per week, 29 (36.2%) were training for 3-7 hours per week, 47 (58.8%) were training for more than 7 hours per week.

On injured side, out of 80 participants, 8 participants exhibited good performance, 29 participants demonstrated fair performance and 43 participants showed poor performance. On uninjured side, 23 participants exhibited good performance, 30 participants' demonstrated fair performance and 27 participants showed poor performance. (Table I)

For comparison of the variable (functional hip muscle performance of injured and uninjured side), Paired sample T test was used. Mean ± SD on injured side was 2.43 ± 0.67 and on uninjured side Mean ± SD was 2.05 ± 0.79 with P value 0.000 which is less than 0.05. It indicates a significant difference exists between both sides. (Table II)

Table I: Descriptive data of Single Leg Squat Test.

Single Leg Squat Test	Injured Side		Uninjured Side	
	N	%	N	%
Good	8	10.0	23	28.8
Fair	29	36.2	30	37.5
Poor	43	53.8	27	33.8

Table II: Comparison of injured and uninjured side

Single Leg Squat Test	Injured Side	Uninjured side	P Value
	Mean ± SD	Mean ± SD	
	2.43 ± 0.67	2.05 ± 0.79	0.000

Discussion

The aim of current study was to evaluate hip muscle performance in athletes with Achilles tendinopathy. Single leg squat test was used for functional hip muscle performance. The study concluded that majority of the participants with Achilles tendinopathy were rated as poor functional hip muscle performance. There were significant differences of functional hip muscle performance between injured and uninjured sides.

In 2017, a systematic review was conducted by Matthew D. Mucha at al. The purpose of study was to find out the relationship between strength of hip abductors and running related lower extremity injuries in distance runners. The study concluded that hip abductors weakness may be linked to lower extremely running related injuries (Achilles tendinopathy, Iliotibial band syndrome and other conditions). The currents study showed similar results and revealed that athletes having Achilles tendinopathy were reported with poor functional hip muscle performance. [19]

In 2017, a study was conducted by B Habets et al. The aim of the study was to assess hip muscle strength and functional performance in middle aged athletes with mid-portion Achilles tendinopathy. It found weakness in both hips abductors, external rotators, and extensors. Furthermore, there was no major difference in the performance of the hip muscles between the injured side and the uninjured side. In contrast, current study found significant differences between injured and uninjured sides. Previous study included smaller sample size of 24. So, the smaller sample size may be the cause of variations in the results.[2]

In 2011, a study was conducted by Kay M Crossley at al. titled as performance on single leg squat test indicates the function of hip abductor muscle. The study concluded that the individuals who performed good on single leg squat test had better functional hip muscle performance than those who showed poor performance. However, current study is consistent with these findings.[20]

Another study in 2017, a systematic review was conducted by Nili Steinberg at al. The purpose of study was to find out the association between hip muscle performance and injuries to the leg, ankle and foot. There was little evidence in the study to suggest that hip muscle performance factors and injuries to the legs, ankles and feet are connected. However, the current study was not consistent with the previous study findings.[21]

This information can be used by coaches, trainers, medical experts and Physical Therapists to increase awareness among the athletes about the importance of hip muscles strengthening and functional performance, it will help the rehabilitators to design more effective rehabilitation protocols for athletes with Achilles tendinopathy (which also include focus on hip muscles strengthening and muscle functional performance).

This study has some limitations. First this study included only club level athletes. In addition, some participants showed no cooperation for the video analysis. Finally, the Severity of Achilles tendinopathy was not considered. Further studies must be conducted with different variable and large sample size that can give more generalized results. Future researchers can also consider the severity of Achilles Tendinopathy by using VISA-A Questionnaire.

Conclusion

The study concluded that the athletes who were having Achilles Tendinopathy demonstrated poor functional hip muscle performance on injured side. Significant differences in functional performance were found between injured and uninjured sides. This study suggests implementing evidence-based strategies to promote physical health among athletes to effectively address this growing issue.

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