Prevalence of Muscle Strain among Cricketers-An Observational Study

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ABSTRACT:

Introduction: Cricket is one of the world's major team sports. Injuries in cricket are common, particularly to fast bowlers. The physical demands of the fast bowling action can have a damaging effect on the bowlers concerned. Hamstring muscle strains are common in sports that involve sprinting, acceleration, deceleration, rapid change in direction and jumping actions. There is a high hamstring muscle injury rate in fast-bowlers compared to that of other roles like batsmen and fielders any other players in cricket(1). The occurrence of hamstring strain injuries during high-speed running is generally believed to occur during terminal swing phase of the gait cycle. The aim of the study is find out the prevalence of hamstring muscle strain in fast bowlers with posterior knee pain. **Methodology:** The study was a observational survey study .100 male fast-bowlers between the age of 15 to 30 years, with at least 2 years of training from cricket institutions across chennai. Having posterior thigh pain was recruited for the study. Single-leg hamstring bridge test, take-off-shoe test, Bent-knee stretch test (3,4,5) and Resisted knee flexion test were used for evaluation. **Result:** Among the 100 players 62.17% of the players have Lateral Hamstring strain and 37.83% have Medial Hamstring strain. With 64.87% Hamstring was prevalent in dominant leg. **Conclusion:** There is prevalence of Hamstring muscle strain in fast bowlers

KEY WORDS: Cricket, hamstring strain, Single-leg hamstring bridge test, take-off-shoe test, Bent-knee stretch test, Resisted knee flexion test

INTRODUCTION:

Cricket is one of the world's major team sports. Injuries in cricket are common, particularly to fast bowlers. The physical demands of the fast bowling action can have a damaging effect on the bowlers concerned. Strains usually occur in the biceps femoris, and the most common location is near the muscle-tendon junction. Muscles injuries represent a continuum from mild muscle cramp to complete muscle rupture, and in between is delayed onset muscle soreness and partial strain injury.

Hamstring muscle strain is common in sports that involve sprinting, acceleration, deceleration, rapid change in direction and jumping actions. The physical demands of the fast bowling action can have a damaging effect on the bowlers concerned. There is a high hamstring muscle injury rate in fast-bowlers compared to any other players in cricket(1). Comparing fast bowlers to that of other roles, batsmen and fielders, the fast bowlers had an injury rate of 16% which was almost double the injury rate of the batting and fielding roles.

The occurrence of hamstring strain injuries during high-speed running is generally believed to occur during terminal swing phase of the gait cycle. The greatest musculotendon stretch is incurred by the biceps femoris,

which may contribute to its tendency to be more often injured than the other hamstring muscles (semimembranosus and semitendinosus) during high-speed running[2]. Running-related hamstring strain injuries typically occur along an intramuscular tendon or aponeurosis, and the adjacent muscle fibres.

Most studies suggest that hamstring strains occur during the later part of the swing phase when the hamstrings are working to decelerate knee extension-that is, the muscle develops tension while lengthening. It has been suggested that it is during this rapid change from eccentric to concentric function that the muscle is most vulnerable to injury. The diagnosis of a hamstring injury has traditionally relied on various clinical measures (e.g., palpation, swelling, manual resistance), as well as the use of diagnostic imaging. But a few studies have suggested the use of specific clinical tests that may be helpful for the diagnostic process like-

- Single-leg hamstring bridge test.[3,4,5]
- Take-off-shoe test.[3,4,5]
- Bent-knee stretch test[3,4,5]
- Resisted knee flexion test[3,4,5]

The study will help us to find out the rate of hamstring strain injury in fast-bowlers, and accordingly. Despite of various studies done in relation to these topics no studies have been done to assess and evaluate exact component affected in hamstring muscle strain which is of at most importance for better rehabilitation to improve athletic performance and efficiency. The aim of the study is to find out the prevalence, percentage of injury rate and influence of dominance in hamstring muscle strain injury in fast bowlers.

MATERIALS AND METHODS:

The study was a observational survey study .100 fast-bowlers from cricket institutions across Pune having posterior thigh pain were recruited for the study. Single-leg hamstring bridge test, take-off-shoe test, Bent-knee stretch test [3,4,5] and Resisted knee flexion test were used for evaluation. All male Professional fast-bowlers with at least 2 years of training in the age group of 15-30 years having non-traumatic onset of posterior thigh pain in past 3 months were included in the study. All male Professional fast-bowlers with history of any lower limb surgery during past one year and any history of major trauma or fracture to lower limb in past one year were excluded from the study.

PROCEDURE:

All samples satisfying inclusion criteria were examined in their respective clubs with their prior permission. They were explained with the aim and objectives of the study. The consent forms were filled by the players. In this study the players were divided into various age groups like-15 to 18 years, 19 to 22 years of age, 23 to 26 years of age and 27 to 30 years of age. The individual selected had undergone baseline evaluation. The athletes fitting in the inclusion criteria were evaluated by the outcome measures of special tests viz-single leg hamstring bridge test, take-off-shoe-test, modified bent knee test, resisted knee flexion test. Individuals were demonstrated with clinical tests mentioned as our outcome measure and the data was collected, co-related and statistical analysis was done.

SINGLE LEG HAMSTRING BRIDGE TEST[3,4,5]:

Players were instructed to lie down on the ground with only one heel on a box measuring 60 cm in height. The non-testing leg was hip knee flexed and unsupported on the ground. The test leg was positioned in 20° knee flexion, instructions were given to push the heel down to lift the bottom off the ground with arms crossing over the chest followed by extension at the hip to 0°.Repetition maximum was recorded and the test was then repeated on the opposite leg.

TAKE-OFF-SHOE-TEST[3,4,5]**:**
In standing, the patient is asked to take off the shoe on the affected side with the help of his other shoe. While performing this manoeuvre, the affected legs hind foot must press the longitudinal arch of the non-involved foot with approximately 90° of external rotation at the hip and 20° to 25° of flexion at the knee.

MODIFIED BENT KNEE STRETCH TEST[3,4,5]**:**
The patient lies in the supine position with the lower extremity fully extended. The clinician grasps the symptomatic limb behind the heel with one hand and at the knee with the other. The clinician maximally flexes the hip and knee, and then rapidly straightens the knee

RESULTS:

TABLE–1 AGE DISTRIBUTION:

AGE(IN YEARS)	NUMBERS
16-18	20
19-22	29
23-25	11
26-30	0

GRAPH–1 AGE DISTRIBUTION

INFERRENCE-THE MEAN AGE OF THE SAMPLES WAS INFERRED AS **20.35±2.547**

ABLE–2 PREVALANCE OF INJURY

STATUS	NUMBERS
INJURED	37
NON INJURED	63

GRAPH–2 PREVALANCE OF INJURY

INFERRENCE-37% of samples were found to be having hamstring injury

TABLE 3 DISTRIUTION OF INJURY

PART OF MUSCLE	NUMBERS
MEDIAL HAMSTRING	14
LATERAL HAMSTRING	23

GRAPH–3 DISTRIUTION OF INJURY

INFERRENCE-The study shows higher incidence of lateral hamstring muscle strain (62.17%) than medial hamstring (37.83%) in fast bowlers.

TABLE–4 DISTRIUTION OF DOMINANCE

DOMINANCE	NUMBERS
DOMINANT	13
NON DOMINANT	24

GRAPH–4 DISTRIUTION OF DOMINANCE

INFERRENCE- Hamstring muscle strain is more common in dominant leg (64.87%) than in Non-dominant leg(35.13%) of fast bowlers.

GRAPH–5 DISTRIBUTION OF DOMINANCE IN HAMSTRING INJURY
TABLE–5 DISTRIBUTION OF DOMINANCE IN HAMSTRING INJURY

	DOMINANT	NON DOMINANT	TOTAL

MEDIAL HAMSTRING	3	11	14
LATERAL HAMSTRING	10	13	23

DISCUSSION:

The study was to find out prevalence of hamstring strain injury in fast-bowlers. A survey based study was performed in which 100 individuals with posterior thigh pain were examined with clinical tests viz-single-leg hamstring bridge test, take-off-shoe test, bent-knee stretch test and resisted knee flexion test [3,4,5]. From amongst these tests, take-off-shoe test is particularly performed to test lateral hamstring strain. Through the present study it is concluded that the prevalence of hamstring muscle strain injury in fast bowlers is 37% which is confirmed through the clinical tests. Studies done on sprinting athletes assessed peak musculoskeletal length of biceps femoris muscle showing that biceps femoris muscle is more injured than the medial hamstring muscles during the phase of late swing and early stance[2].

Koulouris and Connell et al, 2003 published an article which interpreted that 80% involves biceps femoris muscle strain because of the anatomy and physiology and the biomechanics of the muscle during sprinting[6]. B.C Heiderscheit et al. studied about clinical biomechanics of hamstring strain. Based upon the earliest indications in marker trajectories, a 130 ms period during the late swing phase of the gait cycle was identified as the period of injury. During this period, the biceps femoris reached a peak musculo tendon length that was estimated to be 12% beyond the length seen in an upright posture and exceeded the normalized peak length of the medial hamstrings. This proved that involvement of biceps femoris muscle in strain injuries is greater than medial hamstring muscles. [2,7]

The biceps femoris has a smaller knee flexion moment arm than the medial hamstring and thus the knee flexion during late swing phase reduces the length of biceps femoris but the biceps femoris has comparable higher moment arm at hip extension. The net effect is that, of the biarticular hamstrings the biceps femoris experiences the greatest overall stretch relative to upright length[2]. Hamstring force production increases as running speed increases. The eccentric phase of the sprinting gait has been considered for the time of injury, and generally injuring biceps femoris muscle. In sprinting gait there is requirement of hamstring lengthening and force of hamstring muscle increases to counter acting as brake, the propulsion contraction principally pf the hip flexors and quadriceps muscles. The biceps femoris requires higher propulsion contraction during hamstring lengthening because the biceps femoris muscle share longer moment arm at hip and exerts stronger force during the eccentric contraction phase[8,2].

Of the two heads of Biceps femoris long head originates from ishialtubericity and short head originated from the lateral leneaaspira, lateral supracondylar line and intramuscular septum. The distal Biceps femoris tendon inserts in the head of Fibula, lateral condyle of Tibia and the facia of the leg. Because of extensive attachment it is thought to be more prevalent for the tear. The long head is innervated by Tibial portion of the sciatic nerve and short head by the Proneal division. BisepsFemoris is having dual innervation which results into synchronised uncoordinated initiation of stimulation of two heads. Because of mismatched contraction the frequency of Hamstring tear is more[9]. Through the present analysis it is observed that the lateral hamstring or the biceps femoris muscle is more prone to muscle strain injury because of its anatomy and biomechanics during the sprinting gait which supports the results of Koulouris and connell et al who stated that lateral hamstring or biceps femoris muscle strain involves mostly 80% of the total hamstring strain injury. B C Heiderscheit et al studies also supports this findings[2,7,10].

The study also reported that out of the total injury, 13 players reported injury to the dominant or the back leg whereas, remaining 24 fast bowlers reported injury to the non-dominant or the front leg. This can be also stated as, 35.17% players demonstrated had injury to the dominant leg while 64.83% fast bowlers demonstrated had injury to the non-dominant leg. The non-dominant leg has to bear high ground reaction force (GRF) than the

opposite leg while the time of releasing the ball. Studies shows that the dominant leg has to bear maximum amount of body weight at the time of landing from a jump and releasing the ball. Thus the front leg or the dominant leg has to bear high GRF[11].

A variety of risk factors have been proposed for hamstring injuries, including inadequate warm-up, strength imbalance, lower extremity flexibility, core stability, muscle weakness, fatigue, dehydration and history of previous injury. Alteration in hamstring: quadriceps strength can also led to hamstring strain injury[12,13]. Training errors in the fast bowlers were found. Irregular stretching, warm-ups and cool-downs, improper sports drills before practicing and improper training and conditioning of the previous injured players were observed which all contribute to the hamstring strain injury and other lower extremity injuries. If these techniques and conditioning are properly and regularly performed then it may lower the risk of the hamstring injuries[13,12].

Studies showed that there are many risk factors that appear to have correlation with hamstring muscle strain injuries, which are BMI, height, VO2 max, various measures of anaerobic fitness, pain provocation test, standing jump, etc [14,12]One of the study done by GM Verrall al. in Clinical Risk factor for Hamstring muscle strain muscle concluded that 1] Age–more is the age more are the chances for Hamstring injury 2] Aboriginal descent 3] Having a past history of knee injury 4] Osteoid Pubis 5] Weak muscles 6] Lake of flexibility 7] Increasing muscle stiffness 8] Poor lumber posture 9] Poor warm up 10] Muscle fatigue along with these factors other factors are Height, Weight, Race of the athlete and previous injuries to the back, knee and groin are also be considered[15].

CONCLUSION:

1. There is a prevalence of hamstring muscle strain injury in fast-bowlers with 37% within which 62.17% have lateral hamstring muscle strain more prone than medial hamstring muscle strain with 37.83%
2. The dominant leg demonstrated with 64.17% injury whereas the non-dominant leg demonstrated with 35.83% of the total hamstring muscle strain.

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Received on 30.05.2018 Modified on 26.06.2018
Accepted on 24.07.2018

Research J. Science and Tech. 2018; 10(3):211-216.
DOI: 10.5958/2349-2988.2018.00029.3