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Comparative effects of foam roller and cross frictional massage on Iliotibial band syndrome in cyclist

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A B S T R A C T

Background: Iliotibial band syndrome is a friction syndrome, it is a common dysfunction in cyclists and runner. Manual pressure or even spontaneously pressure on iliotibial band can produce pain which may be localized or referred.

Objective: The study's goal was to compare the effects of foam roller and cross frictional massage in iliotibial band syndrome in cyclists.

Methods: This study design was experimental, the n=14 subjects were selected after meeting the inclusion and exclusion criteria of the study. The participants were divided equally into two groups. It was a single blinded Randomized clinical trial. Foam roller massage was given to group A and cross frictional massage was given to group B. For the 6-week program, outcome measurements were taken at 1st week, 2nd week, 4th week and 6th week. The Numeric pain rating scale, Knee Outcome Survey Sports Activities Scale and Pressure Algometer were used to determine the outcomes.

Results: The samples collected in this study were fourteen in number. Within the age range of 15-40 years, the participants in group A were found to be 23.8± 6.30 and group B were found to be 22.5 ± 5.31 years old. For the comparison of dependent variables non-parametric test mainly unpaired t-test was done and the value of p was seen to be greater than 0.05 in cyclists. So, it is seen that no program is superior to other showing a p-value exceeding 0.05.

Conclusion: It is concluded that both interventions were effective for treatment of iliotibial band syndrome in cyclists in this study; however, no treatment program was statistically superior to other.

Key words: Cyclists, Cross frictional massage, Iliotibial band, Foam roller

Introduction

Cycling is one of the popular sports in world for recent years. But as its popularity increasing day by day there is a subsequent increase in number of injuries so a better understanding of biomechanics is required during these movements and activities.[1] Iliotibial band syndrome is among main causes of knee pain in cyclists and runners. In all running sports iliotibial band syndrome is responsible 12% of cycling and running overuse injuries.[2] Iliotibial Band Friction Syndrome leads to 22% of injuries that involves lower limbs. Overuse injuries of knee in cycling resulting from ITBS is 15%.[3] ITBS is 2nd most common knee region injury also third overuse most common injuries in context of running injuries. Occurrence rate of injuries due to ITBFS is 4.3-7.5% in long distant runners.[4] ITBFS more likely occur in long distance runners like marathon then sprinters extended stance phase and heel strike.[5]

Different injuries has been noticed in practicing of cycling. Iliotibial band syndrome is due to overuse which is caused by friction of iliotibial band on lateral epicondyle.[6] On the outer side of the knee and hip, the iliotibial band (ITB) is a thick tendon. Iliotibial band (ITB) stabilizes hip and control adduction of femur while running. Iliotibial band (ITB) also stabilizes lateral side of knee and femur and control movements around particularly in lateral and medial side. Because of ITB insertion, it assist in flexion extension of knee.[7] When knee is in twenty degree or less than twenty degree flexion ITB appears to anterior side of lateral femoral epicondyle.[8] When knee is in thirty degree or greater than thirty degree flexion ITB found posterior to lateral femoral epicondyle. In maximum tension in

ITB present as it crosses lateral femoral epicondyle in thirty degree. It is known as angle of implication and athlete feels maximum pain at this angle. [9]

Gluteus Maximus muscle is one strong muscle in body supplied by inferior gluteal nerve arising from L1, S1 and S2. Its fibers help in hip extension and lateral rotation. Gluteus medias muscle is strongest among abductors of thigh also stabilizes pelvis when weight is shifted on single leg.[9] It is supplied by superior gluteal nerve originating from L4, L5 and S1. ITB prevents pelvis from lateral tilt. Its interior fibers assist medial rotation. However, its role in flexion and medial rotation is minimum in certain thigh positions. Tensor fascia lata control movements in stance phase. It also stabilizes pelvis and knee by posterior and lateral fibers. It assists medial rotation and flexion of upper leg. In mid-swing anterior fibers assist and posterior fibers helps in heel-strike.[10]

ITBS (iliotibial band syndrome) is an overuse condition that cause pain on lateral side of knee due to distal iliotibial band impingement on lateral femoral epicondyle. ITBS sometimes refers to hip pain caused by the ITB moving over the greater trochanter. ITBS is associated to hip abductors weakness. [11]

Cycling is considered as an intensely repetitive sports. A cyclist five thousand revolutions in a single hour on average or eighty hundred to one hundred pedals per minute. Even a very small misalignment that due to anatomical or equipment can cause discomfort, pain, dysfunction and decreased performance.[12] In road cycling, saddle is the point where pedaling occur, cyclist exert power in a range of 12 o'clock to 5 o'clock direction in a pedal stroke. Predominant movements such as hip flexion, hip extension and knee extension are involved in pedal strokes. From six o'clock small knee flexion helps pedal to get back to twelve o'clock because force acting downward on other pedal so the opposite leg contribute greater. Gastrocnemius and hamstring are main muscles to bring foot back where it started to top from bottom in pedal revolution. [13]

Cross frictional massage is a technique for pain relief and decreases inflammation in several musculoskeletal situations. In iliotibial band syndrome cross friction is a priority technique in a physiotherapy program. Cross frictional massage reduces fibrous adhesion and scare tissue gets more mobility in chronic conditions due to which soft tissue fibers realign. Mechanical action of cross frictional massage is hyperemia that helps in increased blood flow of the affected area. [14]

Foam roller is used by physiotherapists in clinical patients and physically active people. Foam roller is a recovery toll which applies for direct pressure on soft tissues. When trigger point is found, foam roller is focused in trigger point area in case of ITB it is distal aspect. This elongation gives stretch which activate stretch receptors of proximal parts, these receptors are called Golgi tendon organs. Golgi tendon organ cause autogenic inhibition, activating a physiological effect that relax muscles.[15] This pressure generates friction and thixotropic effect in soft tissues. Viscosity of fascia changes in thixotropic effect. This effect improves band tenderness, tightness and performance.[16]

Foam roller and cross frictional massage can help in treatment of iliotibial band friction syndrome. For the treatment of iliotibial band syndrome many intervention tools and techniques are used. There has not been any comparison research on effects of foam roller and cross frictional massage on iliotibial band syndrome in cyclists in the past. The intention for study was to know the comparative effects of foam roller and cross frictional massage on iliotibial band syndrome in cyclists. This will allow us to verify the findings of prior studies as well as gather information regarding the local context and current practice.

Methodology

A randomized clinical trial was conducted from January 2022 to June 2022 to compare the effects of foam roller and cross frictional massage on ITB syndrome. A sample size of 14 patients was selected through open-epi sample size calculator by taking numeric pain rating scale as variable. [11] Cyclists of both genders in age group 15 – 40 years with Ober's test positive part of a professional and competitive group for more than a year were included while cyclists with red flags who had bone or joint problems that could limit stretching , any recent surgery of lower limb or any deformity of lower limb, history of ongoing infection and history of spinal surgery were not included. The cyclists were divided into two groups. Sample was allocated randomly in each group and was done through even odd method. Group A (n1 = 7) participants were provided with foam roller massage with conventional treatment protocols. Athlete roll his body over foam roller to discover the trigger point area on Iliotibial Band. Once the trigger area is found, pressure is maintained for 120 seconds to start inhibition. Then athlete followed this procedure on other tender points as well for 120 seconds. This procedure was repeated thrice a week for six weeks.[21] The participants of Group B (n 2 = 7) were provided with Cross frictional massage with conventional treatment protocols. Athlete in side lying position with his effected leg on top. Once the trigger point is discovered therapist placed this two or three fingers over trigger point area on iliotibial band. And then therapist move his fingers perpendicular to the trigger points applying moderate pressure on lateral side of thigh.

Therapist's fingers and iliotibial band move together. Cross frictional massage were deep and uncomfortable but not painful. Therapist follow this procedure for 3 to 5 minutes thrice a week for six weeks.

This research took place at Punjab Sports Board Complex with approval from ethical review board vide letter number **REC/RCR & AHS/22/0421**, Dated January 25 2022. Non Probability Convenience Sampling technique was employed. Standardized outcome measures including Numeric pain rating scale, knee outcome survey- sports activity scale and algometer were used for data collection before and after the treatment.

Data was analyzed using by using SPSS version 25 for window software. For all the statistical tools Anova and unpaired t-test were used to calculate the significant difference within and between the two groups, Group A= FR and Group B= CFM. For all quantitative variables, descriptive statistics (Mean ± SD) along its range maximum to a minimum were calculated. For the comparison of dependent variables non parametric test mainly unpaired t-test was done, the significance value was selected at p value 0.05.

Results

In this research study, the statistical tools Anova and unpaired t-test were used to calculate the significant difference within and between the two groups, Group A= FR and Group B= CFM. All of the study's measures were given descriptive statistics, such as mean, standard deviation, minimum, and maximum values. The samples collected for this study were 14 in number; out of which 42.8% were females and 57.1% were males in each group. Within the age range of 15-32 years, the participants in group A were found to be 23.8± 6.30 and group B were found to be 22.5 ± 5.31 years old. For the comparison of dependent variables non parametric test mainly unpaired t-test was done and the value of p was seen to be greater than 0.05 in cyclists. So it is seen that no program is superior to other showing a p-value exceeding 0.05.

Table I is showing Anova Test for Group A. F statistics indicates that degree of freedom for NPRS at 2nd week is F (1,7) =.070, degree of freedom for NPRS at 4th week is F (1,7) = .0610, degree of freedom for nprs at 6th week is F (1,7) =.010. F statistics indicates that degree of freedom for knee outcome scale at 2nd week is F (1,7) =.162, degree of freedom for knee outcome scale at 4th week is F (1,7) = .021, degree of freedom for knee outcome scale at 6th week is F (1,7) =.010. F statistics indicates that degree of freedom for pressure algometer readings at 2nd week is F (1,7) =.551, degree of freedom for knee outcome scale at 4th week is F (1,7) = .421, degree of freedom for knee outcome scale at 6th week is F (1,7) =.183. P value indicates that foam roller is effective for pain pressure threshold at 2nd, 4th and 6th week.

Table II is showing Anova Test for Group B. F statistics indicates that degree of freedom for nprs at 2nd week is F (3,7) = .682, degree of freedom for nprs at 4th week is F (3,7) = .496, Degree of freedom for NPRS at 6th week is F (3,7) =.350. F statistics indicates that degree of freedom for knee outcome scale at 2nd week is F (6,7) =.966, degree of freedom for knee outcome scale at 4th week is F (6,7) = .496, degree of freedom for knee outcome scale at 6th week is F (6,7) =309. F statistics indicates that degree of freedom for pressure algometer readings at 2nd week is F (6,7) = .478, Degree of

Table I: ANOVA Group A.

NPRS		Sum of squares	df	Mean Square	F	Sig.
NPRS week 2	Within group	.000	1	.114	.000	.0701
Total		1.500	7			
NPRS week 4	Within group	.000	1	.018	.000	.0610
Total		1.500	7			
NPRS week 6	Within group	.000	1	.001	.000	.010
Total		1.500	7			
Knee Outcome Scale						
Knee outcome scale week 2	Within group	162.000	1	162.000	13.594	.162
Total		233.500	7			
Knee outcome scale week 4	Within group	21.125	1	21.125	2.548	.021
Total		70.875	7			
Knee outcome scale week 6	Within group	200.000	1	200.000	5.322	..010
Total		425.500	7			
Pressure Algometer						
Pressure Algometer week 2	Within group	15.125	1	15.125	.398	.551
Total		242.875	7			
Pressure Algometer week 4	Within group	40.500	1	40.500	2.260	.421
Total		148.000	7			
Pressure Algometer week 6	Within group	32.000	1	32.000	.746	.183
Total		289.500	7			

freedom for pressure algometer at 4th week is F (6,7) = .390, degree of freedom for pressure algometer at 6th week is F (6,7) =.182. P value indicates that cross frictional P value indicates that cross frictional massage is effective for the decrease in pain at 2nd, 4th and 6th week.

Unpaired t test for NPRS, knee outcome scale and algometer between interventional groups. P value indicates that there is non-significant difference of pain, knee pain and pain pressure threshold at 2nd, 4th and 6th week between both interventional groups.

Discussion

The goal of the study was to find out the comparison between the results of foam roller massage group A and cross

Table II: ANOVA Group B.

NPRS		Sum of squares	df	Mean Square	F	Sig.
NPRS week 2	Within group	.833	3	.278	.952	.682
Total		2.000	7			
NPRS week 4	Within group	2.000	3	.667	.621	.496
Total		2.000	7			
NPRS week 6	Within group	.208	3	.069	.167	.350
Total		1.875	7			
Knee Outcome Scale						
Knee outcome scale week 2	Within group	215.500	6	35.917	1.995	.966
Total		233.500	7			
Knee outcome scale week 4	Within group	68.875	6	11.479	5.740	.496
Total		70.875	7			
Knee outcome scale week 6	Within group	205.000	6	34.167	.155	.309
Total		425.500	7			
Pressure Algometer						
Pressure Algometer week 2	Within group	144.875	6	24.146	26.988	.478
Total		144.875	7			
Pressure Algometer week 4	Within group	208.000	6	34.667	17.333	.390
Total		210.000	7			
Pressure Algometer week 6	Within group	259.375	6	43.229	3.458	.182
Total		271.875	7			

Table III: Between Group Analysis

	Unpaired t statistics							
	Mean	Std Deviation	Std. Error Mean	95% confidence interval of the Difference		t	df	Sig (2-tailed)
				Lower	Upper			
NPRS Week 2	12.50	.707	.250	.841	.341	1.000	7	.351
NPRS Week 4	1.75	.707	.250	1.159	2.341	7.000	7	.000
NPRS Week 6	2.125	.835	.295	-2.823	1.427	7.202	7	.000
Knee Outcome Scale Week 2	22.375	5.502	1.945	-2.224	6.974	1.221	7	.262
Knee Outcome Scale Week 4	15.000	4.928	1.742	10.880	19.120	8.609	7	.007
Knee Outcome Scale Week 6	11.500	6.845	2.420	5.777	17.223	4.752	7	.002
Pressure Algometer Week 2	4.000	8.519	3.012	3.122	11.122	1.328	7	.226
Pressure Algometer Week 4	3.000	7.151	2.528	8.979	2.979	1.187	7	.274
Pressure Algometer Week 6	2.625	6.739	2.383	.009	11.259	2.361	7	.050

frictional massage group B on iliotibial band syndrome in cyclists. The n=14 participants were divided into two groups, group A=7 and group= 7, who participated in a six week program with two sessions/week to find the results measure/variables, specifically NPRS, KOS and Algometer.

Jarryd Else in 2016 conducted a research study among the runners and cyclists. It was a comparative study in which there was a comparison among the effects of foam roller and chiropractic manipulative interventions to manage iliotibial band syndrome in elite cyclists and elite runners. Thirty individuals had been chosen on premise of eligibility criteria. The general assessment age, weight, level of competition, hours of exercises, scientific and surgical records has been among the amassed from each participants. The participants of the study were randomly divided in three different groups on basis of interventions to be given. All the participants of study in group two were provided with foam roller treatment, while lumber spinal manipulation were given to group three and group three received both treatments in each session. Before and after the six week program, outcome measures were taken before and after three sessions alternated in one week. All the data were expressed using Friedman test and Krushal-Wallis tests. The results demonstrated no statistically difference between the groups. However, study revealed that both technique could be used in conjunction for better results. [17]

The findings of our study supported the conclusion of aforementioned RCT, in our current RCT trail, foam roller and cross frictional massage treatment for iliotibial band syndrome shown that the both treatments are good for pain and tenderness and improve functional status within 6 weeks. On comparing between group the value of P was greater than 0.05 in NPRS, Pressure Algometer and KOS there was no significant difference were seen in either treatment group so neither treatment in superior to the other in term of improvement, however study suggest that both treatment are useful for treating iliotibial band syndrome and can be used in combination.

Razie Maghroori with her co-researchers in 2021 conducted randomized clinical trials to compare the effects of shock wave therapy on iliotibial band syndrome and effects of dry needling on ITB. These trails were conducted on 40 participants, divided into two groups, each group with 20 participants. Group A was provided with shock wave therapy and other group with dry needling. Both groups showed similar results. Researcher concluded that both interventions were effects but none was significantly better than other ($p>0.005$). [18]

Vijay Kage in 2018 published a comparative study to compare the effects of foam roller myofascial release and effects of static stretching on hip adductor tightness. Thirty healthy adults were selected after meeting the inclusion and exclusion criteria. The ROM of hip adduction was measured by a smart phone in-clinometer prior to intervention. Participants were divided in two groups, group A was given foam roller treatment and group B was treated with static stretching. The study concluded that foam roller myofascial release was significantly more effective than static stretching. [19]

Dr. Sharsyn Agre in 2019 conducted a comparative study to check the effects of foam roller with static stretching and effects of static stretching only on hamstring muscle length in football players. Sixty footballers of age 20-29 were selected for after checking inclusion and exclusion criteria. Footballers were divided in two groups, group A received foam roller with static stretching and group B was given static stretching only. Participants were treated for six days a weeks for 4 weeks. Sit and reach box test was used to take the measurements. The results of the study suggested that group with foam roller show better improvement with static stretching than static stretching separately. Hence the study recommended foam roller treatment for footballers. [20]

Anuja Wanave in 2016 conducted a study to compare the effects of foam roller and static stretching on flexibility of hamstring muscles. Fifty healthy adults were selected for study and divided in two groups, Groups A Foam roller and Group B static stretching were given for six weeks. Straight leg raise and knee extension test were used to measurements to check hamstring tightness. Results revealed that foam roller groups showed more improvement of ROM than static stretching group. [21]

Recommendation and Limitations of study: The sample was small (n=14), which may have influenced conclusions drawn from the study's findings when compared to the large population. Unequal gender distribution, there were more males than females which is another limitation of this study. These findings may limit the research applicability to professional cyclists. Long term follow up wasn't conducted.

Conclusion

According to the study it is concluded that both groups, Group A (foam roller) and Group B (cross frictional massage) were individually useful in improving iliotibial band syndrome in cyclists. However, neither treatment plan statistically outperformed the other. As a result, the null hypothesis is believed to be true, whereas the alternative hypothesis is discarded.

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