Effect of Dynamic Stretching and Kinesio Taping Followed by Foam Rolling in Cyclist with Iliotibial Band Tightness

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Abstract- Introduction- Iliotibial band is most commonly overused muscle among cyclists. Athletes may complain of lateral knee pain as a symptom of several underlying issues. Frequent knee flexion and extension wears down the ITB and can irritate the bursa, which may limit range of motion as a defense mechanism and make the ITB more prone to tightness.

Method- Professional cyclists with Iliotibial band tightness, using Modified Ober's test, NPRS, goniometer, willing to participate in study, having cycling experience of 3 and above 3 years were included in the study.

Result- No significant difference was found between group A and group B in increasing pain and range of motion whereas improvement in tightness using the Modified Ober's test was significantly greater in group A than in group B.

Conclusion- The study concluded that in cyclists with iliotibial band tightness, dynamic stretching and kinesio taping with or without foam rolling were equally effective in increasing range of motion and reducing pain. However, the Modified Ober's test resulted in a much higher improvement in tightness in group A than in group B.

Keywords-Kinesio, taping cyclist, iliotibial, band tight

I. INTRODUCTION

IT band (ITB), is a longitudinal fibrous sheath that runs along the lateral thigh and plays a significant role in lower extremity motion [(1)]. Iliotibial band is most commonly overused muscle among cyclists. Athletes may complain of lateral knee pain as a symptom of several underlying issues. Distance runners and cyclists are more likely to experience lateral knee pain, with Iliotibial Band Friction Syndrome (ITBS) being the most common cause of this condition [(2)]. ITBFS, which occurs between 1.6 and 12% of the time, is widely acknowledged as the most frequent lateral knee injury sustained when running. 15% of all overuse injuries to the knee region are said to be ITBFS, which is also frequently found among cyclists [(3)].

In a static standing position, the pull of the ITB is simply defined. The band is kept in place above or posterior to the hip's coronal axis at the greater trochanter by the combined pulls of the gluteus maximus muscle and tensor fascia lata at the linea aspera attachment. Maintaining the hip in extension is aided by this position. The ITB aids in keeping the knee extended laterally by positioning itself in front of the knee's coronal axis. These postures need little muscular effort to maintain, and the intrinsic strength of the ITB, the important thigh insertions, and the ground response forces brought on by static weight-bearing allow one to slouch or hang on one's hip [(4)]. Combinations of knee flexion and hip flexion happen during walking, running, climbing stairs, and sitting during the swing phase. The hip is kept in flexion during the swing phase by the ITB and pull of the TFL being anterior to the greater trochanter and axis of hip flexion/extension. When walking or running, the band is dragged posteriorly over the greater trochanter when the hip extends during the stance and push-off phases. The knee joint serves a similar purpose. The band or tract is dragged posteriorly over the lateral femoral epicondyle as the knee flexes past about 30°. In this position, knee flexion is readily maintained. Combinations of knee flexion and hip flexion happen during walking, running, climbing stairs, and sitting during the swing phase [(4)].

The ITB is thought to function as a strut during walking and riding out of the knee and hip joints, especially from the front side. Excessive hip joint

adduction causes more tensile strain on the ITB [4].

Kinesio taping (KT) improves the function of injured muscles and joints by restoring agonist motions in the joints and preventing muscle tension, which in turn reduces pain and edema. Additionally, it has been demonstrated to increase muscle endurance and strength. Taping enhances muscular function for better exercise performance while maintaining balance and posture(5). Previous research employing electromyography measures before and after taping to assess muscle activity and exhaustion found a beneficial effect. Kinesio tape is used to realign the patellar posture, enhance proprioceptive stimulation in cases of VMO muscular weakness, and release tension in the hamstring, VL, and iliotibial band muscles (6). A foam roller can be used as a potential technique to increase the ITB's flexibility. In sports and rehabilitation contexts, foam rollers are frequently used to modify muscle tone, improve range of motion (ROM), and restore tissue flexibility (8).

The self-myofascial release technique is essentially used to treat greater areas. It aids in rupturing adhesions to preserve muscular function and motion (8). Prior research utilizing foam rollers on a range of tissues shows that foam rolling improves vascular endothelial function and lessens arterial stiffness. Pain relief is a typical goal in the rehabilitation of musculoskeletal disorders, and foam rollers are utilized to help achieve this goal (7).

Worldwide, foam rolling is fast taking over as a standard component of training programs. One can observe people using foam rollers as part of their exercise routine at different training facilities, ranging from weekend warriors to professional athletes. Not enough research has been done to support the benefits of using this tool, despite its widespread appeal (8).

There has been research done on effectiveness of Dynamic Stretching and Foam Rolling in athletes, but no study has been done to analyze the combined effect of Dynamic Stretching, Kinesio Taping and Foam rolling in Cyclists with Iliotibial Band Tightness and hence the above study was conducted.

II. MATERIALS AND METHODS

The study was conducted from October 2023 to March 2024 after getting the approval from the Institutional Ethical Committee and Protocol committee of D. Y. Patil education society, Kolhapur and D. Y. Patil College of Physiotherapy, Kolhapur.54 cyclists fulfilling the inclusion and exclusion criteria were selected through simple random sampling method.

Inclusion criteria- Participants of age group between 18-30 years, belonging to both the genders, having cycling experience of 3 or more years, Professional Cyclist with Iliotibial Tightness, and those willing to participate.

Exclusion criteria- Participants with history of hip, knee and lumbar surgeries within 1 year, autoimmune disease including Fibromyalgia, Rheumatoid Arthritis, Deep vein thrombosis, Hip Dysplasia, participants with any neurological disorder that impairs lower extremity function.

54 participants were divided in two groups with each group comprising of 27 individuals. Group A (Interventional group) and Group B (Control group).

Group A: Interventional Group

Group A comprised of 27 individuals with treatment protocol of dynamic stretching, Kinesio taping followed by foam rolling in cyclist with iliotibial band tightness.

Treatment Duration: The duration of intervention was 4 weeks with 2 sessions per weeks (30 minutes)

Group B: Control Group

Group B comprised of 27 individuals with treatment protocol of dynamic stretching combined with Kinesio taping in cyclist with iliotibial band tightness.

Treatment Duration: The duration of intervention was of 4 weeks with 2 sessions per weeks (20 minutes)

Statistical analysis was recorded and result was obtained. All the statistical analysis was done using MS Excel-2016.

Fig 1: Dynamic stretching of iliotibial band

Fig 2. Kinesio taping for Iliotibial band tightness

III. RESULTS

Group A

Variable	Mean	SD
AGE	24.30	3.37
YEARS OF CYCLING EXPERIENCE	5.07	1.64
DURATION OF CYCLING (IN HOURS)	2.00	0.68

Table 1. Demographic data of the cyclists in Group A.

Outcome Measure	Time point	Mean	SD	P Value
NPRS	Pre	5.48	1.19	6.33E-14
	Post	1.67	1.07	
GONIOMETER FOR HIP ADDUCTION	Pre	15.07	1.36	2.03E-21
	Post	23.33	1.75	

Table 2. Outcome measures- NPRS and Goniometer for Hip adduction in Group A

In above table, the improved values of NPRS and Hip adduction range of motion from pre intervention 5.48 ± 1.19 to post intervention 1.67 ± 1.07 (p value= 6.33E-14) for NPRS and 15.07
± 1.36 to 23.33 ± 1.75 (p value= 2.03E-21) for hip adduction range of motion in Group A have been represented.

Outcome Measure	Pre session % of Positive	Post session % of Positive	P Value
MODIFIED OBER'S TEST	100	11.11	0.0000

Table 3. Outcome measure- Modified Ober's test in Group A

Table 3. represents the improved % of positive Modified Ober's Test from pre intervention 100% to post intervention 11.11% in Group A (P value < 0.0001)

Variable	Mean	SD
AGE	23.19	2.59
YEARS EXPERIENCE	4.70	1.49
DURATION HOURS)	1.78	0.64

Table 4. represents the demographic data of the cyclists in Group B

Outcome Measure	Time point	Mean	SD	P Value
NPRS	Pre	5.70	1.46	1.01E-15
	Post	1.96	1.16	
GONIOMETER FOR HIP ADDUCTION	Pre	14.93	1.57	7.54E-19
	Post	22.81	2.02	

Table 5. Outcome measures- NPRS and Goniometer for Hip adduction in Group B

Table 5. represents the improved values of NPRS and Hip adduction range of motion from pre intervention 5.70 ± 1.46 to post intervention 1.96 ± 1.16 (p value= 1.01E-15) for NPRS and 14.93
± 1.57 to 22.81 ± 2.02 (p value= 7.54E-19) for hip adduction range of motion in Group B.

Outcome Measure	Pre session % of Positive	Post session % of Positive	P Value
MODIFIED OBER'S TEST	100	14.81	0.0000

Table 6. Outcome measure- Modified Ober's test in group B

Table 6. represents the improved % of positive Modified Ober's Test from pre intervention 100% to post intervention 14.81% in Group B.

Outcome Measure	Group	Mean	SD	P Value
NPRS	A	1.67	1.07	0.17
	B	1.96	1.16	
GONIOMETER FOR HIP ADDUCTION	A	23.33	1.75	0.16
	B	22.81	2.02	

Table 7. Comparison between Group A and Group B- NPRS and Hip adduction range of motion

Table 7. represents post intervention comparison between group A and B which was done using unpaired t-test. In Group A, post intervention mean ± SD of NPRS is 1.67 ± 1.07 whereas in Group B, post intervention mean ± SD of NPRS is 1.96 ± 1.16 which shows there is no significant difference between NPRS of Group A and NPRS of Group B (P value >0.05). In Group A, post intervention mean ± SD of Hip Adduction range of motion is 23.33 ± 1.75 whereas in Group B, post intervention mean ± SD of Hip Adduction range of motion is 22.82 ± 2.02 which shows there is no significant difference between Hip Adduction range of motion of Group A and Hip Adduction range of motion of Group B (P value >0.05).

Outcome Measure	% of Positive in Group A	% of Positive in Group B	P Valu
MODIFIED OBER'S TEST	11.11	14.81	0.69

Table 8. Comparison between Group A and Group B- Modified Ober's Test

Table 8. represents post intervention comparison between Group A and Group B for Modified Ober's Test. In Group A, the post intervention % of positive Modified Ober's Test is 11.11 whereas in Group B post intervention % of positive Modified Ober's Test is 14.81%. There is no significant difference in post intervention % of positive between Group A and Group B (P value > 0.05). It indicates that the effect of Dynamic stretching + Kinesio taping + foam rolling and Dynamic stretching + Kinesio taping is same for reducing tightness.

IV. DISCUSSION

The above study intended to find out the combined effect of dynamic stretching and Kinesio taping with and without foam rolling on muscle tightness, pain and range of motion in cyclist with Iliotibial tightness. It has been proved IT band tightness comprises up to 24% of all overuse syndromes in cyclists. The purpose of this study was to reduce the risk of injury and enhance the cyclist overall performance.

Before engaging in physical exercise, dynamic stretching is utilized as a warm-up. Increased muscle temperature, increased blood flow to the muscle, and enhanced nerve conduction velocity are all brought on by dynamic stretching. Moreover, dynamic stretching has the potential to improve energy system metabolism and reduce muscular stiffness. Bethany L. Anderson et.al [(9)] conducted a study on The Acute Effects of Foam Rolling and Dynamic Stretching on Athletic Performance: A Critically Appraised Topic which concluded that the potential to acutely boost power and agility may be enhanced by adding foam rolling to a dynamic warm-up, as opposed to doing so after a dynamic warm-up on its own. The physiological principles of foam rolling, which include improved muscular flexibility, neurological input, and increased blood flow to the skin and muscles, may show significant benefit from this combo warm-up.

Also A. Muragod et.al [(10)] conducted a study on immediate effects of static stretching versus myofascial release in iliotibial band tightness in long distance runners- a randomized clinical trial which concluded that both static stretching and myofascial release can effectively reduce iliotibial band tension.

Kinesio Taping works by recovering the motions of agonist muscles of the joint and hamper the muscle tension, which in turn reduces pain, edema and improves the functioning of injured parts. It also helps in maintaining balance and posture and enhances function of muscle for exercise performance (gait parameter). Jianping Lin et. al [(11)] conducted a study on Effects of Kinesio Tape on Delayed Onset Muscle Soreness: A Systematic Review and Meta-analysis which concluded that regaining muscle strength is greatly aided by KT, particularly 72 hours after exercise. By exerting a pulling force that encourages alternating fascia movement, KT may augment muscular strength.

In above conducted study, Pre intervention mean and standard deviation of NPRS in group A and group B was 5.48 ± 1.19 and 5.70 ± 1.46 respectively and post intervention for the same was 1.67

± 1.07 and 1.96 ± 1.16. As a result, it was determined that interference was extremely significant of both group A and group B with values respectively. Whereas on post intervention comparison between group A and group B it was determined that there is no significant difference between NPRS of group A and

group B (P value= >0.05). Supriya Raikwar et. al [2] conducted a research on Effectiveness of Foam Rolling Versus Static Stretching on Pain, Hip Adduction ROM in ITB Tightness in Athletes which revealed that for a week, foam rolling and static stretching were both useful methods for increasing the range of motion in the hip and minimizing pain. Analysis of the two interventions revealed extremely significant increases in range of motion, but over the course of a one-week intervention plan, foam rolling outperformed the static stretching group in terms of significant outcomes. Whereas in the present study instead of static stretching dynamic stretching was used as DS can enhance athletic performance in terms of sprinting, jumping, and muscle strength because it reduces antagonistic muscle inhibition, motor unit activation or enhanced reflex sensitivity, and muscle-tendon unit (MTU) stiffness. The pre and post intervention mean for hip adduction in group A was 15.07 ± 1.36 and 23.33 ± 1.75 (p value= 2.03E-21) respectively whereas in group B it was 14.93 ± 1.57 and 22.81 ± 2.02 (p value= 7.54E-19) respectively, which revealed that the interference was extremely significant.

Both dynamic stretching and foam rolling, which are widely employed in the sports medicine and strength and conditioning domains, have been demonstrated by research to improve athletic performance. The effects of using foam rolling and dynamic stretching together as a treatment were not well studied until recently. Compared to performing a dynamic warm-up alone, it appears that a combined warm-up may have different impacts on athletic performance based on the results of the included studies. These early findings specifically imply that foam rolling and dynamic stretching may enhance distinct facets of athletic performance, with foam rolling enhancing power and agility and dynamic stretching enhancing flexibility. In the Richman et al. study, participants in the combined treatment group (dynamic stretching plus foam rolling) outperformed those in the dynamic stretching alone group in the vertical jump test by a significant margin. However, both treatment groups showed comparable acute improvements in flexibility. Similarly, the current study reflected the results wherein the interventional group with combined treatment (dynamic stretching, kinesio taping and foam rolling) showed improved range of motion, reduced pain. However, improvement in tightness using the Modified Ober's test was significantly greater in group A than in group B the results of the included studies. These early findings specifically imply that foam rolling and dynamic stretching may enhance distinct facets of athletic performance, with foam rolling enhancing power and agility and dynamic stretching enhancing flexibility. The current study reflected the results wherein the interventional group with combined treatment (dynamic stretching, kinesio taping and foam rolling) showed improved range of motion, reduced pain. However, improvement in tightness using the Modified Ober's test was significantly greater in group A than in group B.

V. CONCLUSION

The study concluded that, in cyclists with iliotibial band tightness, dynamic stretching and kinesio taping with or without foam rolling were equally effective in increasing range of motion and decreasing pain. However, improvement in tightness using the Modified Ober's test was significantly greater in group A than in group B.

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