



A COMPARATIVE STUDY TO DETERMINE THE EFFECTIVENESS OF KINESIOTAPING AND RIGID TAPING WITH ECCENTRIC EXERCISE IN MANAGING PAIN AND FUNCTION IN TENNIS PLAYERS WITH ANTERIOR KNEE PAIN

Bopanna C S

MPT Sports Physiotherapy

Dr Yashaswini S

PT, Assistant Professor, Florence College of Physiotherapy

Dr Reshell R Fernandez

PT, Assistant Professor, Florence College of physiotherapy

KEYWORDS :

1. INTRODUCTION

Anterior knee pain, clinically recognized as patellofemoral pain syndrome (PFPS), is among the most prevalent musculoskeletal issues encountered in sports medicine, particularly affecting athletes involved in sports with repetitive knee loading and dynamic movements, such as tennis¹. Tennis players are particularly vulnerable due to the biomechanical demands, including rapid directional changes, abrupt decelerations, repetitive eccentric loading, and high-impact movements, all of which significantly strain the patellofemoral joint².

The exact cause of patellofemoral pain syndrome (PFPS) is not fully established; however, alterations in lower limb biomechanics and structural alignment are believed to play a key role in its development. These alterations can create both static and dynamic imbalances, increasing the likelihood of symptom onset or progression.

Muscle imbalances, particularly decreased strength and activation of the VMO, have been extensively documented as a significant contributor to patellar instability and malalignment¹⁰. Weakness of the quadriceps musculature, especially in eccentric functional loading conditions, compromises patellar stabilization during dynamic knee movements frequently executed in tennis, such as lunges and rapid changes of direction. This biomechanical dysfunction exacerbates pain and diminishes functional capacity, leading to performance limitations and compensatory strategies that may further predispose athletes to secondary injuries¹¹.

Given the complex biomechanical demands inherent to tennis, effective management strategies for PFPS require integrative approaches combining muscle strengthening, neuromuscular training, proprioceptive enhancement, and functional support through adjunctive interventions during lunging and rapid directional changes. Hence, rehabilitation protocols for tennis-related PFPS must align specifically with sport-specific movement patterns and functional demands to ensure comprehensive restoration of function and prevention of symptom recurrence.

However, comparative evidence specifically evaluating KT versus RT in conjunction with eccentric exercises in tennis players remains limited. Thus, there is a pressing need for a rigorous, comparative evaluation to guide clinicians on the optimal taping method in conjunction with eccentric exercises for effective rehabilitation of tennis players suffering from anterior knee pain

Objectives

- To find the effectiveness of kinesiotaping combined with eccentric exercise on reducing pain and improving functional outcomes in tennis players with anterior knee pain (patellofemoral pain syndrome)
- To find the effectiveness of rigid taping combined with eccentric exercise on reducing pain and improving

functional outcomes in tennis players with anterior knee pain (patellofemoral pain syndrome)

- To compare the effectiveness of kinesiotaping and rigid taping, when combined with eccentric exercise, in reducing pain and improving functional outcomes in tennis players with anterior knee pain (patellofemoral pain syndrome)

METHODOLOGY

Study Design: Pre-post comparative study

Study Subjects: Tennis players with anterior knee pain

Sample Size: 52 center and affiliated tennis training facilities.

Sampling Method: Convenience sampling

Study Duration: The duration of the study is approximately 6 months.

Inclusion Criteria

- Tennis players aged between 18 and 35 years, both male and female¹²
- Diagnosed clinically with anterior knee pain persisting for at least 4 weeks
- Pain during functional activities such as squatting or stair climbing
- Voluntary participation and signed informed consent

Exclusion Criteria

- Recent knee surgery or trauma
- Diagnosis of meniscal injury, or ligament injury
- Allergic reaction to tape adhesives
- Use of corticosteroids or anti-inflammatory medication in the past month

Method of Data Collection

- The study obtained ethical approval from the institutional ethical committee, and patients were provided written consent (ANNEXURE –II) by signing a form. In both groups, the participants performed a structured eccentric quadriceps training protocol thrice weekly under direct supervision for six weeks. The protocol is scheduled for three times a week over a six-week duration under direct supervision, utilizing a program adapted from the research of Frohm et al. and Baldon et al. Each session begins with a 5-minute warm-up on a stationary cycle ergometer at a moderate intensity.

Fig.1 Kinesiotaping



Fig.1.1 Eccentric Quadriceps Training – Lateral Step Downs

Treatment Protocol**Group A (Kinesiotaping + Eccentric Quadriceps Training)**

Kinesiotaping: A Y-strip was anchored proximally at the anterior superior iliac spine, with the two tails directed distally towards the patella along the course of the rectus femoris and vastus medialis oblique (VMO), applied with 15–25% tension.

Group B (Rigid Taping + Eccentric Exercise Regimen)

Rigid Taping: - Group B participants received rigid taping based on the McConnell technique, which aimed to provide mechanical correction to the patella, particularly addressing lateral glide and tilt. A hypoallergenic under wrap was first applied to protect the skin, followed by a rigid, non-elastic sports tape of 38 mm width. The primary correctional force was directed medially, commencing from the lateral border of the patella and extending across the medial patellar surface.

Statistical Analysis

Collected data were anonymized and entered into a secure database for analysis. Statistical analysis was conducted using SPSS software version 23.0. The normality of continuous variables was tested using the Shapiro-Wilk test.

Table – 6: Comparison of Lefs Score within Group – A and Group - B Between Pre Test and Post Test

Groups	Pre Test		Post Test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group- A	51.11	3.16	61.61	5.15	-13.08	.001**
Group- B	50.53	2.33	65.50	3.06	-20.02	.001**

The above table reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre- test and post-test within Group – A & Group – B.

Table – 7 Comparison of Kujala Score within Group – A and Group - B Between Pre Test and Post Test

Groups	Pre Test		Post Test		t - test	Significance
	Mean	S.D	Mean	S.D		
Group- A	66.00	4.69	73.69	4.34	-16.48	.001**
Group- B	65.42	3.45	78.34	5.49	-10.03	.001**

There is a Statistically Significant Different Between the Pre-test and Post-test Values Within Group A and Group B at $P \leq 0.05$.

RESULTS

On comparing the Mean Values of Group A & Group B on VAS Score, it shows a significant decrease in the post test mean values in both groups, but (Group B) shows $2.57 \pm .856$ which has the lower mean value is more effective than (Group A) $3.30 \pm .679$ at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing the Mean Values of Group A & Group B on LEFS Score, it shows a significant increase in the post test mean values in both groups, but (Group B) shows 65.50 ± 3.06 which has the higher mean value is more effective than (Group A) 61.61 ± 5.15 at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing the Mean Values of Group A & Group B on KUJALA Score, it shows a significant increase in the post test mean values in both groups, but (Group B) shows 78.34 ± 5.49 which has the higher mean value is more effective than (Group A) 73.69 ± 4.34 at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing Pre-test and Post test within Group A & Group B on VAS Score, LEFS Score & KUJALA Score shows significant difference in the mean values at $P \leq 0.05$. significant increase in the post test mean values in both groups, but (Group B) shows 78.34 ± 5.49 which has the higher mean value is more effective than (Group A) 73.69 ± 4.34 at $P \leq 0.05$. Hence the null hypothesis is rejected.

On comparing Pre-test and Post test within Group A & Group B

on VAS Score, LEFS Score & KUJALA Score shows significant difference in the mean values at $P \leq 0.05$.

DISCUSSION

Our study objective is to compare effectiveness of kinesiotaping and rigid taping in combination with eccentric exercise on pain and functional outcomes in tennis players with anterior knee pain. The results demonstrated that both interventions were effective in reducing pain and improving function; however, rigid taping combined with eccentric exercise showed superior outcomes compared to kinesiotaping.

At baseline, no statistically significant differences were observed between the two groups across all measured variables, including pain (VAS), functional ability (LEFS), and knee-specific function (Kujala score). When comparing between groups, rigid taping demonstrated significantly greater improvements than kinesiotaping across all outcome measures. This suggests that the type of taping used in conjunction with exercise influences the overall treatment effectiveness. The enhanced outcomes observed with rigid taping may be explained by its mechanical effects on the patellofemoral joint. Rigid taping provides external support that can improve patellar alignment and reduce excessive lateral tracking, which is a key contributing factor in anterior knee pain. By stabilizing the patella during dynamic activities, rigid taping may reduce joint stress and improve movement efficiency.

In this context, rigid taping may have provided an additional biomechanical advantage by directly addressing patellar alignment, while kinesiotaping contributed through sensory modulation. The superior outcomes observed with rigid taping in the present study therefore support the notion that interventions offering both mechanical correction and exercise-based rehabilitation may yield greater clinical benefits, particularly in physically active populations such as tennis players

In conclusion, the present study highlights the effectiveness of combining taping techniques with eccentric exercise in managing anterior knee pain among tennis players. While both kinesiotaping and rigid taping contribute to pain reduction and functional improvement, rigid taping appears to offer superior benefits. These findings provide valuable insight for clinicians in selecting appropriate adjunct interventions for optimizing rehabilitation outcomes in athletic populations.

REFERENCES

- Lockie RG, Schultz AB, Callaghan SJ, Jeffries MD. The relationship between dynamic stability and multidirectional speed. *J Strength Cond Res*. 2016;30(11):3033-43.
- Vicenzino B, Cleland JA, Bisset L. Joint manipulation in the management of lateral epicondylalgia: a clinical commentary. *J Man Manip Ther*. 2007;15(1):50-6.
- Jiao H, Tao M, Cui X. Efficacy on pain and knee function of Kinesio taping among patients with patellofemoral pain syndrome: a systematic review and meta-analysis. *BMC Musculoskeletal Disorder*. 2025 Dec 1;26(1). doi:10.1186/S12891-025-08627-7 PubMed PMID: 40259274.
- Hasan S, Alonazi A, Anwer S, Jamal A, Parvez S, Altaif FAS, et al. Efficacy of Patellar Taping and Electromyographic Biofeedback Training at Various Knee Angles on Quadriceps Strength and Functional Performance in Young Adult Male Athletes with Patellofemoral Pain Syndrome: A Randomized Controlled Trial. *Pain Res Manag*. 2022;2022:8717932. doi:10.1155/2022/8717932 PubMed PMID: 35958675.
- Day JM, Bush H, Nitz AJ, Uhl TL. Scapular muscle performance in individuals with lateral epicondylalgia. *J Orthop Sports Phys Ther*. 2015;45(5):414-24.
- Kamonski DH, Gonçalves GA, Liu CY, Júnior IL. Effect of stretching with and without muscle strengthening exercises for the foot and hip in plantar fasciitis. *Man Ther*. 2016;23:76-82.
- Rupareliya D, Shukla Y, Bhise A, Prabhakar M. Effect of eccentric loading exercises of calf muscles in plantar fasciitis. *Physiotherapy*. 2015;101:e1303-4.
- Stasinopoulos D, Johnson MI. Effectiveness of extracorporeal shock wave therapy for tennis elbow (lateral epicondylitis). *Br J Sports Med*. 2005;39(3):132-6.
- Powers CM, Witvrouw E, Davis IS, Crossley KM. Evidence-based framework for a pathomechanical model of patellofemoral pain. *Br J Sports Med*. 2017;51(24):1713-23.

10. Crossley KM, Stefanik JJ, Selfe J, Collins NJ. Patellofemoral pain consensus statement from the 4th International Patellofemoral Pain Research Retreat, Manchester. *Br J Sports Med.* 2016;50(14):839-43.
11. Myer GD, Ford KR, Di Stasi SL, Foss KD, Micheli LJ, Hewett TE. High knee abduction moments are common risk factors for patellofemoral pain. *Br J Sports Med.* 2015;49(19):1263-8.
12. Petersen W, Ellermann A, Gösele-Koppenburg A, Best R, Rembitzki IV, Brüggemann GP. Patellofemoral pain syndrome. *Knee Surg Sports Traumatol Arthrosc.* 2014;22(10):2264-74.
13. Young JL, Snodgrass SJ, Cleland JA, Rhon DI. Usual medical care vs combined exercise therapy for patellofemoral pain: a randomized controlled trial. *JAMA Network Open.* 2020;3(4):e203636.
14. Baldon RM, Lobato DF, Carvalho LP, Santiago PR, Benze BG, Serrao FV. Effect of functional stabilization training on lower limb biomechanics in women. *Med Sci Sports Exerc.* 2012;44(1):135-45.
15. Van der Heijden RA, Lankhorst NE, Van Linschoten R, Bierma-Zeinstra SM, Van Middelkoop M. Exercise for treating patellofemoral pain syndrome: an abridged version of Cochrane systematic review. *Eur J Phys Rehabil Med.* 2016;52(1):110-33.
16. Werner S. Eccentric training in the treatment of tendinopathy. *J Orthop Sports Phys*