

Original Article

Effects of McConnell Taping on Function and Dynamic Postural Control in Athletes with Patellofemoral Pain Syndrome

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Abstract

Background: Patellofemoral pain syndrome represented by anterior knee pain is the most common condition experienced by individuals suffering from knee pathology. Pain behind the kneecap or around the kneecap is the main characteristic, can occur due to the stress on joint structures, commonly affecting athletes and females. It mostly occurs during ascending and descending stairs and remains in a sitting position for a prolonged duration. **Objective:** To determine the effects of McConnell taping on function and dynamic postural control in athletes with patellofemoral pain syndrome. **Methods:** This quasi-experimental study consisted of 38 participants with ages ranging from 18 to 40 years presenting with anterior knee pain. Data was collected from the Spine Physiotherapy clinic, Sahiwal. About 28 patients were treated with McConnell taping along with conventional physical therapy. Star excursion balance test and lower extremity functional test scale were used to assess functional and dynamic postural control before treatment and after 24 hours of treatment. **Results:** The outcomes revealed that there was a statistically significant difference within the group. The p-value was found significant ($p < 0.001$) for both variables. **Conclusion:** This study concluded that McConnell taping was effective for treating patients with patellofemoral pain syndrome for functional and dynamic postural control.

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Citation: Aslam N., A. Razzaq, S. Iftikhar. 2021. Effects of McConnell taping on function and dynamic postural control in athletes with patellofemoral pain syndrome. *The Healer Journal of Physiotherapy and Rehabilitation Sciences*, 1(1):9-14.

Keywords: anterior knee pain; McConnell taping; patellofemoral pain syndrome

Introduction

Patellofemoral pain syndrome (PFPS) represented by anterior knee pain is the most

common type of pain experienced by patients suffering from knee pathology.¹ This disorder commonly affects females and occurs due to stress on joint structures.² Pain behind or around the kneecap is the characteristic feature

of PFPS of chondromalacia patellae.³ Pain mostly occurs during ascending or descending stairs, and also in sitting for long duration.⁴

In anterior knee pain syndrome, alterations occur in the morphology of the lower limb such as tibial rotation, rotation of the deteriorated hip, increased pronation of foot range of motion (ROM), the stress in the anteverted femur in individuals suffering from anterior knee pain.⁵ As stress is placed in the region of a patellofemoral joint due to tightness in the iliotibial band and vastus medialis weakness.⁶ Due to variations in vastus medialis oblique and lateralis, it can lead to deviation of patella laterally when the knee is extended. As there are multiple factors and causes which are interlinked with each other and can lead to PFPS.⁷ The clinical manifestations of PFPS are pain anterior to the knee during functional activities, limited ROM, change in Q-angle, changes in static and dynamic stability.⁸

The prevalence of PFPS annually is estimated to be 40% in patients suffering from PFPS.⁹ It mostly affects athletes at the age between 12 to 17 years.¹⁰ According to literature anterior knee pain affect 15-40% population, especially athletes.¹¹ Risk factors of PFPS include altered biomechanics of lower extremity, weakness in quadriceps, increased strength of hip abductors, increased foot strain due to squatting or climbing stairs.¹² The conservative treatment for PFPS includes medication like NSAIDs, corticosteroid injection and physiotherapy interventions that can comprise icing, rest, bracing/ taping, therapeutic exercises, and modalities. An alternative treatment option is a surgery if it is not cured by a conservative treatment plan.¹³

In 1986 Jenny McConnell was the one who purposed the concept, method and application of McConnell taping (MT). It is similarly acknowledged as a rigid taping technique that is commonly practiced in physiotherapy

setups.¹⁴ Bestowing to McConnell's point of view, four diverse malalignment components need to be managed, that is anterior & medial tilt, medial glide and rotation.¹⁵ Option for applying McConnell taping technique depend on the patient's pathology and their complaints, and the patient might present with more than one malalignment component to be treated¹⁶.

MT is helpful and effective for relieving pain immediately after functional activities like stair climbing, squatting, etc.¹⁷ If taping seems to be not effective then alter the technique of taping application or reassess the patients.¹⁸ For example, if a patient's quadriceps inhibit its function due to pain if it is treated properly and pain intensity reduces then quadriceps again start to work its function properly like doing pain-free stair climbing or squatting. Taping with exercise seems to be effective for strengthening of quadriceps.¹⁹ Basic function of the MT technique is to limit the anomalous tracking of the patella, so maltracking between the joint surfaces can be decreased. MT theory also proposed that if the patella is stabilized medially it can activate the vastus medialis oblique muscle and if stabilized in lateral direction then it can activate quadriceps muscles.¹⁴

Some studies revealed that MT shows positive results for patellar repositioning in the groove of the femoral trochlea. This taping reduces the joint reaction forces and loads on the patellofemoral joint (PFT) which leads to a reduction of pain intensity. As the evidence is limited regarding the outcome of the taping technique on patella for modifying biomechanics effects of anterior knee joint pain.²⁰ It is purposed that taping causes medial glide of the patella during passive flexion of the knee. Evidence suggests that taping to the patella lead to an increase in the angle of the knee during flexion and extensor moments when it is compared with patients suffering from PFPS without taping. But still, there is

limited evidence and having conflicts that taping show positive results for correcting the biomechanics of a structure.²¹ This study is designed to evaluate the effects of McConnell taping techniques for assessing the dynamic balance, postural control and functional activity in athletes suffering from PFPS.

Methods

In this quasi-experimental study, data was collected from the Spine Physiotherapy clinic, Sahiwal in nine months. Almost 30 patients with anterior knee pain were enrolled in the study and treated with conventional therapy protocol and McConnell taping. The sample was calculated by using 5% level of significance, 90% power of the test, where $\sigma^2 =$ variance 1.21, $Z_{1-\alpha} =$ confidence level 95%=1.96, $Z_{1-\beta} =$ power of test 90%, $\mu_0 - \mu_a =$ mean difference of McConnell taping: $n = (\sigma Z_{1-\alpha} + Z_{1-\beta} / \mu_0 - \mu_a)^2$.

Both male and female athletes with acute anterior knee pain/PFPS from at least three months having positive Clark's test, age ranged between 18 to 40 years were included in the study.²² Patients were excluded if they have a history of any ankle and hip pathology or arthritis, fracture or surgery in the lower limb region, use of corticosteroids, pregnant females, or if they have irritation from taping.²²

All information regarding their participation in the study was provided to all participants properly and consent was taken from them in written form. McConnell taping and conventional therapy protocol was provided to the patient of anterior knee pain. The conventional protocol included exercises for quadriceps, use of TENS and therapeutic ultrasound.²³ Readings were documented before the treatment session and after 24 hours after treatment. Star excursion balance test (SEBT) and lower extremity functional scale

(LEFS) were used as outcome measure tools for assessing postural control dynamically and functional activities. In SEBT, measurements were taken in anterior, post-lateral and post-medial directions. MT was applied for 24 hours, therapeutic ultrasound (1MHZ, 0.8W/cm²) for 4 minutes, TENS (100Hz, 50 μ s pulse, 50% variation frequency) for 20 minutes, while quadriceps exercise with 10 times repetition.²³

SPSS version 23 was used to analyze the data. The $p < 0.05$ was considered as significant value. Qualitative data measured over time was represented using frequency and percentage. Wilcoxon sign test was used to measure effects within the group.

Results

In the current study, 24(86%) subjects were males and 4(14%) were females. The means and standard deviation in McConnell taping group pre and post-treatment for SEBT. The result revealed that SEBT (ant) mean and standard deviation pre-treatment was 56.82 \pm 6.23 and post-treatment it was 73.50 \pm 2.69 with a mean difference of 16.68 \pm 3.54.

SEBT (post-medial) mean and standard deviation pre-treatment was 57.86 \pm 4.14 and post-treatment it was 73.79 \pm 4.68 with a mean difference of 15.93 \pm 0.54. SEBT (post-lateral) mean and standard deviation pre-treatment was 57.89 \pm 4.80 and post-treatment it was 73.61 \pm 3.91 with a mean difference of 15.72 \pm 0.89 with $p < 0.001$ which showed significant difference.

LEFT mean and standard deviation pre-treatment was 16.00 \pm 2.86 and post-treatment it was 28.96 \pm 4.20 with a mean difference of 12.96 \pm 1.34 with $p < 0.001$ which shows both taping techniques were effective for improving functional control (Table-I).

Table-I: Mean, standard deviation & p-values of SEBT and LEFS

Wilcoxon Sign Test					
Outcome measures		Mean±SD (pre-treatment)	Mean±SD (post-treatment)	Mean difference	P-value
SEBT	SEBT (anterior)	56.82±6.23	73.50±2.69	16.68±3.54	<0.001
	SEBT (post-medial)	57.86±4.14	73.79±4.68	15.93±0.54	<0.001
	SEBT (post-lateral)	57.89±4.80	73.61±3.91	15.72±0.89	<0.001
LEFT		16.00±2.86	28.96±4.20	12.96±1.34	<0.001

Discussion

Results of the current study revealed that the McConnell taping was effective in improving dynamic postural control and functional activity using SEBT and LEFS, both show a significant difference.

Chang WD *et al.* conducted a review and performed a meta-analysis about the comparison of Kinesio versus McConnell taping in patients of PFPS with 11 controlled studies included. It concludes that Kinesio taping method and McConnell taping techniques both are effective for reducing pain, increasing muscle flexibility, and helping correct the alignment of the patella when managing patients with PFPS.⁷ The current study is experimental and it involved only McConnell taping, variables used were SEBT and LEFS.

Another study conducted by Mange MN *et al.* worked on a patient with PF knee osteoarthritis (OA). It was a randomized controlled trial performed to check the effects of Kinesio and McConnell taping in subjects of knee OA at the patellofemoral joint during flexion and extension ROM, pain was assessed through a numeric pain rating scale in squatting and stairs descending in OA patients at the patellofemoral joint. In group 1, patients were treated with

Kinesio taping and patients in group 2 were treated with McConnell taping. Goniometer and pain scale was used as an assessing tool for ROM and pain. Mann Whitney U test was used to analyze the data. The results revealed that Kinesio taping showed a significant difference for reducing pain ($p < 0.04$) and gaining ROM ($p < 0.03$) so Kinesio taping showed more significant results statistically and clinically as compared to McConnell taping.²⁴ The present study incorporated one group assessing variables re and post-treatment, significant results were found with using McConnell taping.

Conclusion

McConnell taping is effective for athletes suffering from anterior knee pain is patellofemoral pain syndrome for enhancing functional activity and improving postural control dynamically.

Declarations

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding

author will submit all dataset files.

Competing interests: None.

Funding: No funding source was involved.

Authors' contributions: All authors read and approved the final manuscript.

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