

Effects of McConnell taping combined with strengthening exercises of vastus medialis oblique in females with patellofemoral pain syndrome

Ruqia Begum,¹ Naureen Tassadaq,² Shakeel Ahmad,³ Wardah Ajaz Qazi,⁴ Samina Javed,⁵ Saba Murad⁶

Abstract

Objective of the study was to determine the effects of McConnell taping combined with strengthening exercises of vastus medialis oblique muscle in females with Patellofemoral Pain Syndrome. Females with Patellofemoral Pain Syndrome with an age group of 25-45 years having a less than 30/80 score on a Lower Extremity Functional Index (LEFI), anterior knee pain and painful/limited range of motion (ROM) at knee, were included in the study. A total of 51 subjects were randomly assigned into two groups. They were assigned a 30-40 minute per session for 5 days per week over a length of 2 weeks. Numeric Pain Rating Scale, Lower Extremity Functional Index and Goniometry tools were used to assess the measure of interest. These samples only comprised of females with a mean age of 36.04±7.35 years. After 2 weeks, significant improvement was recorded in the Numeric Pain Rating Scale (NPRS) ($p < 0.001$) and Lower Extremity Functional Index (LEFI) ($p < 0.001$). Flexion range of motion of the knee also improved significantly. No statistically significant difference in extension range of the knee was noted in either groups as it was normal at base line.

Keywords: Knee Biomechanics, Patellar Alignment, Patellar Tracking, Retropatellar Pain, Taping, Vastus Medialis Oblique Strengthening.

<https://doi.org/10.5455/JPMA.28469>

Introduction

Patello-femoral Pain Syndrome (PFPS) is also known as a runner's knee or a patellar overload syndrome. It has an insidious onset, presenting with retro-patellar pain or pre-patellar pain which is usually aggravated by squatting, walking, prolonged sitting (movie sign), stairs climbing, kneeling and standing from sitting^{1,2}. Patellofemoral Pain Syndrome contributes to 30% to 40% of all the visits made to the sports medicine department. Smith et al reported a 15%-45% visit rate to the doctor's office made

.....
^{1,2,4,6}Institute of Rehabilitation Sciences, Foundation University Islamabad, Pakistan; ³JOUF University Sakaka, Saudi Arabia; ⁵Al Syed Hospital Kidney Center Rawalpindi, Pakistan.

Correspondence: Ruqia Begum. Email: rr.ruqia544@gmail.com

by the residents of the United States³. A study conducted by freedman in the navel academy of the United States showed that females are 2.3 times more likely to develop Patellofemoral dysfunction than their male counterparts⁴.

Patellofemoral Pain Syndrome is multifactorial in origin; static, dynamic, local and distant factors are responsible for stability of the patellofemoral joint. Dynamic and static stability of the patellofemoral joint is maintained by quadriceps tendon, lateral and medial retinaculum, vastus medialis and vastus lateralis^{5,6}. Lateral tilting of the patella occurs if the dynamic stabilizer vastus medialis Oblique (VMO) is weak or when the medial static stabilizer is stretched. For pain free function of the patella, balance of the lateral and medial dynamic and static stabilizer is necessary. If the lateral retinaculum becomes shortened, there will be more lateral translatory force on the patella causing a lateral shift^{6,7}.

McConnell taping is widely used to treat Patellofemoral Pain Syndrome through an improvement of the quadriceps function and an alignment of the patella. Misalignments of the patella can be treated through four different ways i.e. medial tilt, rotation, medial glide and an anterior tilt. Medial gliding technique is mostly used for Patellofemoral Pain Syndrome. This current study was planned to compare the effects of a McConnell taping combined with the strengthening of vastus medialis oblique versus the traditional exercises for strengthening of vastus medialis oblique in females with Patellofemoral Pain Syndrome.⁸

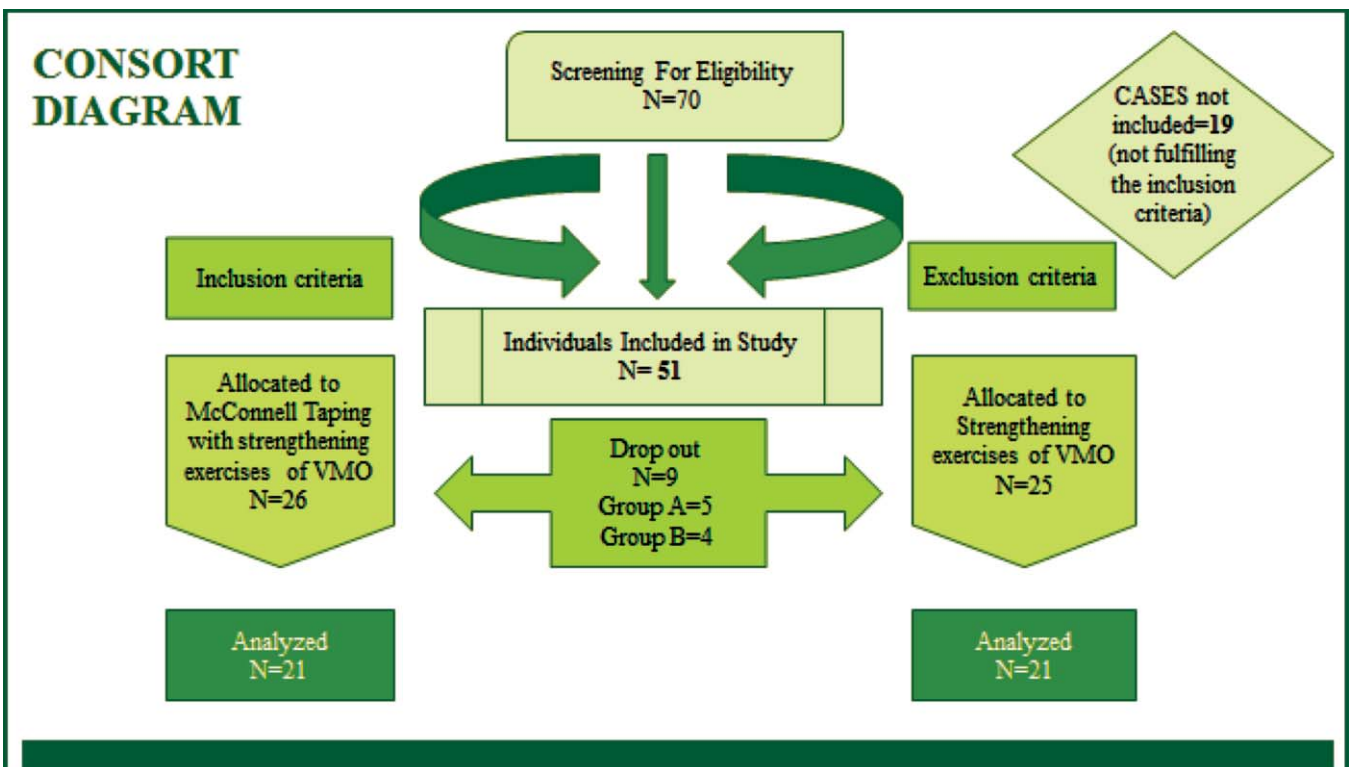
Methods and Results

A Study was conducted at the Fauji Foundation Hospital Rawalpindi (FFH), from 1st of January to 31st of June, 2018. Study protocol was approved by the research ethical committee, Riphah International University, Islamabad.

Standard treatment was provided to both the groups while the interventional group had a McConnell taping. Subjects were assessed at the baseline through blind assessors and 2 weeks of intervention was then provided. After intervention, subjects were analysed again by a blind assessors.

Table: Mann Whitney U test Comparison of Lower Extremity Functional index(LEFI), Numeric Pain Rating Scale(NPRS) & Range of Motion Between Groups.

Variable		Experimental group(A) Mean±SD	Control group (B) Mean±SD	P value	Z value
NPRS	Pre	7.28±1.18	7.19±.872	0.989	-0.013
	Post	0.904±1.13	3.23± 1.64	0.001	-4.110
LEFI	pre	19.38±8.04	17.66±5.092	0.418	-0.810
	post	140.09±4.41	136.57±3.95	0.001	-5.036
Knee flexion	pre	132.047±7.78	131.90±6.22	1.00	0.000
	post	140.09±4.41	136.57±3.95	0.029	-2.186
Knee extension	pre	0.52±1.5	0.000±0.000	0.076	-1.775
	post	0.95±.43	0.000±0.000	0.317	-1.00

**Figure:** Consort diagram.⁹

The sample size was finalized by using an open epi tool after reviewing a study conducted by Kim *et al* ⁸.

A total 70 patients with knee pain duration up to 1 year were assessed for Patellofemoral Pain syndrome, out of which 51 participants met the inclusion criteria. They were divided into two groups. Group 'A' received McConnell Taping combined with strengthening exercises of VMO (N=26) while group 'B' underwent strengthening exercises of VMO (N=25). Treatment duration was 2 weeks. A total 9 patients dropped out, 5 from Group A and 4 from Group B. Forty two patients were analysed, 21 in each group.

Informed consent was taken in the written form. Data was

collected using a valid standardized assessment tool, Lower extremity Functional index (LEFI) for functional status of the patients, Numeric Pain rating scale (NPRS) for pain and Goniometry for Range of motion assessment. Measurements were taken at the baseline and after 2 weeks post intervention as shown in Table 1. Mean age of the participants was 36.04±7.35 years. Most commonly affected population included workers (50%). In the experimental group, 57.1% were worker and in the control group, 42.9% were worker. There was a significant improvement in the pain and lower extremity functional index as well as the range of motion in experimental group A) as compared to the control group (B).

Numeric Pain Rating Scale (NPRS) and Lower Extremity Functional Index (LEFI) were used as study tools.

SPSS version 20 was used for statistical analysis and Mann Whitney U test was used for the inferential analysis to compare the results.

Treatment protocol: In the traditional groups, patients were given exercises for 4 -5 days per week, 30-45 minutes of session for 2 weeks. McConnell group participants received traditional exercises for 4-5 days per week, 30-40 minutes of sessions for 2 weeks along with the McConnell taping.

Discussion

An immediate reduction in the pain level as quantified by Visual Analogue Scale with an application of a patellar taping is consistent with previous findings. Current study suggests McConnell taping to be effective in improving the performance during functional tasks such as stairs climbing and walking in a symptomatic individual. A similar study by Ferrerira et al showed McConnell taping in Patellofemoral Pain Syndrome to be effective in pain control as well as in the dynamic and static postural control^{10,11}. A study conducted by Salsich et al depicted significant improvement in pain (92.6%) with an increase in knee flexion range and extensor moment of the knee after the application of McConnell tape during functional activities¹². A study conducted by Lee et al found quadriceps activity to be affected by McConnell taping which changes the position of the patella, vastus medialis activity (23.33+12.08%) and vastus lateralis activity (18.02+7.34%), when the activity of vastus medialis and the vastus lateralis was compared, it was significantly reduced ($p<0.05$) in the McConnell tape¹³. Results of this study also suggest that the range of motion improvement in flexion range was significant but there was no change in the extension range of motion as it was normal at baseline. Score for LEFI after 2 weeks was improved markedly with a significant p-value.

Limitations

Prolonged effects was not measured as follow up could not be carried out because of the non-feasibility for the patients. Data was collected from single setting and diversity was not achieved.

Conclusion

The current study concluded that McConnell taping

combined with strengthening exercises of vastus medialis is more effective in reducing pain and improved lower extremity functional activities when compared to strengthening exercises of vastus medialis oblique alone in females with Patellofemoral Pain Syndrome.

Disclaimer: None.

Funding Sources: None.

Conflict of Interest: None.

References

1. Aminaka N, Gribble PA. A systematic review of the effects of therapeutic taping on patellofemoral pain syndrome. *J Athl Train.* 2005; 40:341-51.
2. Kader D, Matar H, Caplan N. Patellofemoral joint instability: a review of current concepts. *J Ortho Trauma.* 2016; 6:1-8.
3. Smith BE, Selfe J, Thacker D, Hendrick P, Bateman M, Moffatt F, et al. Incidence and prevalence of patellofemoral pain: A systematic review and meta-analysis. *PLoS one.* 2018; 13:e0190892.
4. Freedman SR, Brody LT, Rosenthal M, Wise JC. Short-term effects of patellar kinesio taping on pain and hop function in patients with patellofemoral pain syndrome. *Sports Health.* 2014; 6:294-300.
5. Vora M, Curry E, Chipman A, Matzkin E, Li X. Patellofemoral pain syndrome in female athletes: A review of diagnoses, etiology and treatment options. *Orthop Rev (Pavia).* 2018; 9:7281.
6. Leibbrandt DC, Louw QA. The use of McConnell taping to correct abnormal biomechanics and muscle activation patterns in subjects with anterior knee pain: a systematic review. *J Phys Ther Sci.* 2015; 27:2395-404.
7. Boling M, Padua D, Marshall S, Guskiewicz K, Pyne S, Beutler A. Gender differences in the incidence and prevalence of patellofemoral pain syndrome. *Scand J Med Sci Sports.* 2010; 20:725-30.
8. Kim KM, Davis B, Hertel J, Hart J. Effects of Kinesio taping in patients with quadriceps inhibition: A randomized, single-blinded study. *Phys Ther Sport.* 2017; 24:67-73.
9. <http://www.equator-network.org/reporting-guidelines/conosort> accessed on January 8, 2020.
10. Ferrari D, Briani RV, de Oliveira Silva D, Pazzinatto MF, Ferreira AS, Alves N, et al. Higher pain level and lower functional capacity are associated with the number of altered kinematics in women with patellofemoral pain. *Gait & posture.* 2018; 60:268-72.
11. Ghourbanpour A, Talebi GA, Hosseinzadeh S, Janmohammadi N, Taghipour M. Effects of patellar taping on knee pain, functional disability, and patellar alignments in patients with patellofemoral pain syndrome: A randomized clinical trial. *J Bodyw Mov Ther.* 2018; 22:493-7.
12. Salsich GB, Brechter JH, Farwell D, Powers CM. The effects of patellar taping on knee kinetics, kinematics, and vastus lateralis muscle activity during stair ambulation in individuals with patellofemoral pain. *J Orthop Sports Phys Ther.* 2002; 32:3-10.
13. Lee SE, Cho SH. The effect of McConnell taping on vastus medialis and lateralis activity during squatting in adults with patellofemoral pain syndrome. *J Exerc Rehabil.* 2013; 9:326-30.