

ORIGINAL ARTICLE

Effects of McConnell Taping Combined with Strengthening Exercises on Quadriceps Angle and Intensity of Pain in Females with Patellofemoral Pain Syndrome

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ABSTRACT

Objective: To determine the effects of McConnell taping combined with strengthening exercises on Q angle and intensity of pain in females with patellofemoral Pain Syndrome.

Study Design: Randomized control trial

Place and Duration of Study: Physical Medicine & Rehabilitation department of Fauji Foundation Hospital Rawalpindi from 1st Jan to 31st June 2018.

Materials and Methods: Females with patellofemoral pain syndrome with age 25-45 years, having anterior knee pain, limited/painful knee Range of motion and increased Q angle >18 were included in the study through non-probability convenience sampling technique. Numeric Pain Rating Scale (NPRS) and Goniometry tools were used to measure the outcomes. A total of 70 approached cases only 48 met the inclusion criteria, out of which 40 subjects completed the treatment protocol. Subjects were divided randomly into experimental and control groups. Both groups received standard treatment protocol including Trans Cutaneous Electrical Nerve (TENS) and Heating Pad for 15 minutes while Experimental group received McConnell taping in addition. Data was analyzed by using SPSS Version 21.

Results: There was significant improvement in pain intensity and Q angle in experimental group after McConnell taping p value was <0.05 for pain. Flexion ROM was significantly improved in both groups p<0.05. while extension ROM was in normal Range pre and post treatment p<0.05.

Conclusion: Results of this study shows that McConnell taping reduces pain intensity and Quadriceps Angle in patients with patellofemoral pain syndrome.

Key Words: *Patellofemoral pain syndrome, Quadriceps Angle, Range of motion, Taping technique, Visual Analogue Scale.*

Introduction

The Patellofemoral pain syndrome (PFS) is a possible cause of the anterior knee pain. It predominantly affects the female patients.^{1,2} Patellofemoral pain syndrome contributing to an estimated of 30-40% of all sports medicine visits.^{3,4} In the United States 15-45% individual reports PFPS.⁵ Typical symptoms are knee pain on anterior aspect which is exacerbated by ascending and descending stairs, squatting as well as prolonged sitting.^{6,7} An increased in Q angle >15 degree is considered the predisposing factor for patellofemoral pain syndrome. Q angle is a static

measurement which is taken in supine position without the activation of quadriceps.^{8,9} Clinically Quadriceps angle, lateral hyper mobility of patella and J sign are mostly used for the evaluation of Patellar maltracking.⁸ Structural rehabilitation Programme is implemented for management of PFPS including Rest, Patellar bracing and McConnell taping is mostly used for the treatment of patellofemoral pain syndrome which improves quadriceps function, patellar alignment and decrease Q angle.^{6,10-12}

The available research evidence, however, would suggest that either taping change the Quadriceps angle or not. In previous studies McConnell taping enhanced the activity level of Vastus Medialis Oblique relative to Vastus lateralis, and decrease pain and improved function but the direction of tape and its effects on Q angle were not targeted in this study.⁹ Some studies revealed that McConnell taping shows positive results for patellofemoral pain syndrome, but the evidence is limited on the

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outcome of the taping on Q angle.¹³ A study was conducted by Engy F et al in 2021, the result of their study significant difference between VAS and lower extremity function after McConnell tape with p value was <0.05.¹⁴

Another study was conducted by Aminaka, and Gribble examined the effects of McConnell taping on knee pain and Hip and knee kinematics in the sagittal plan during dynamic balance setting. The patients with patellofemoral pain syndrome group with McConnell tape showed a reduction in knee pain and improvement in balance compared to non-tape condition. However there were no significant differences in hip and knee angle in the sagittal plan.¹⁵ Therefore this study was planned to investigate the effects of taping on the Q angle and pain level in patients with patellofemoral pain syndrome.

Materials and Methods

This randomized control trial was conducted at Physical Medicine & Rehabilitation department of Fauji Foundation Hospital Rawalpindi from 1st Jan 2018 to 31st June 2018. Study was approved by Research Ethical Committee of Riphah International University Islamabad. The inclusion criteria of the study were known cases of Patellofemoral pain syndrome, age 25-45, having anterior knee pain, limited/painful knee ROM and Q angle >18 were included in the study. Participants having any history of knee surgery, systematic disease and other neuromuscular conditions were excluded from the study. After taking consent subjects who fulfilled the inclusion criteria were divided into group A (Experimental) and group B (Control) through convenience sampling technique. Open Epi tool was used for sample size calculation. Sample size calculated was 40 and 20 patients were assigned in each group. Study participants were assessed at base line and at the end of 2 weeks post intervention. In the control Group treatment protocol was traditional exercises including Quadriceps Isometric and Hamstring Stretching 10 repetition with 3 sets for 4 days/week, Trans cutaneous Electrical nerve stimulation (TENS) with frequency 50-100HZ, Continuous cycle time and Heating pad for 15 minutes. Total duration of each session was 45 minutes for 2 weeks. While experimental Group was given additional McConnell taping. The patient was

in supine position. Total time for taping was 2 minutes in which a cover roll tape almost 15 cm in size was first applied directly over the skin. Then 12 cm rigid tape leukotape P was applied by starting from lateral condyle of femur, anchor the patella and end on posterior aspect of the knee. For shifting of patella on medial side enough force was applied. At end of completion of taping procedure, a pouch of skin crease almost 2 cm in width was visible on medial aspect of the knee. The participants were then instructed to remove the tape before going to bed. Study Outcomes i.e., pain and Q angle were measured through Numeric pain Rating scale and by goniometry. Quadriceps Angle was statistically measured by using goniometer from three points i.e., anterior superior iliac spine, midpoint of patella and tibial tuberosity. Data was analyzed by using SPSS 21. Nonparametric test (Mann Whitney U) was applied for comparison between groups.

Results

Data of the study was stated as mean and standard deviation. Comparison of the two groups was done by using Mann Whitney U test while considering the $p < 0.05$ as statistically significant. A total of 70 approached cases 48 patients met the inclusion criteria. Only 40 subjects completed the treatment protocol 20 in each group. Treatment protocol included the application of McConnell taping with traditional exercise regimes for Group A and group B received only traditional exercise. Commonly affected population was workers (50%). Mean of the age in the Experimental Group was 36.05 ± 7.35 years while in the Control group was 37.05 ± 4.96 . Mean and SD of Q angle of participants was 18.05 ± 3.02 . Group A (Experimental) showed significant decrease in Q angle as compared to Group B (Control) $p < 0.05$. The intensity of the pain was significantly reduced in both the groups $p < 0.05$.

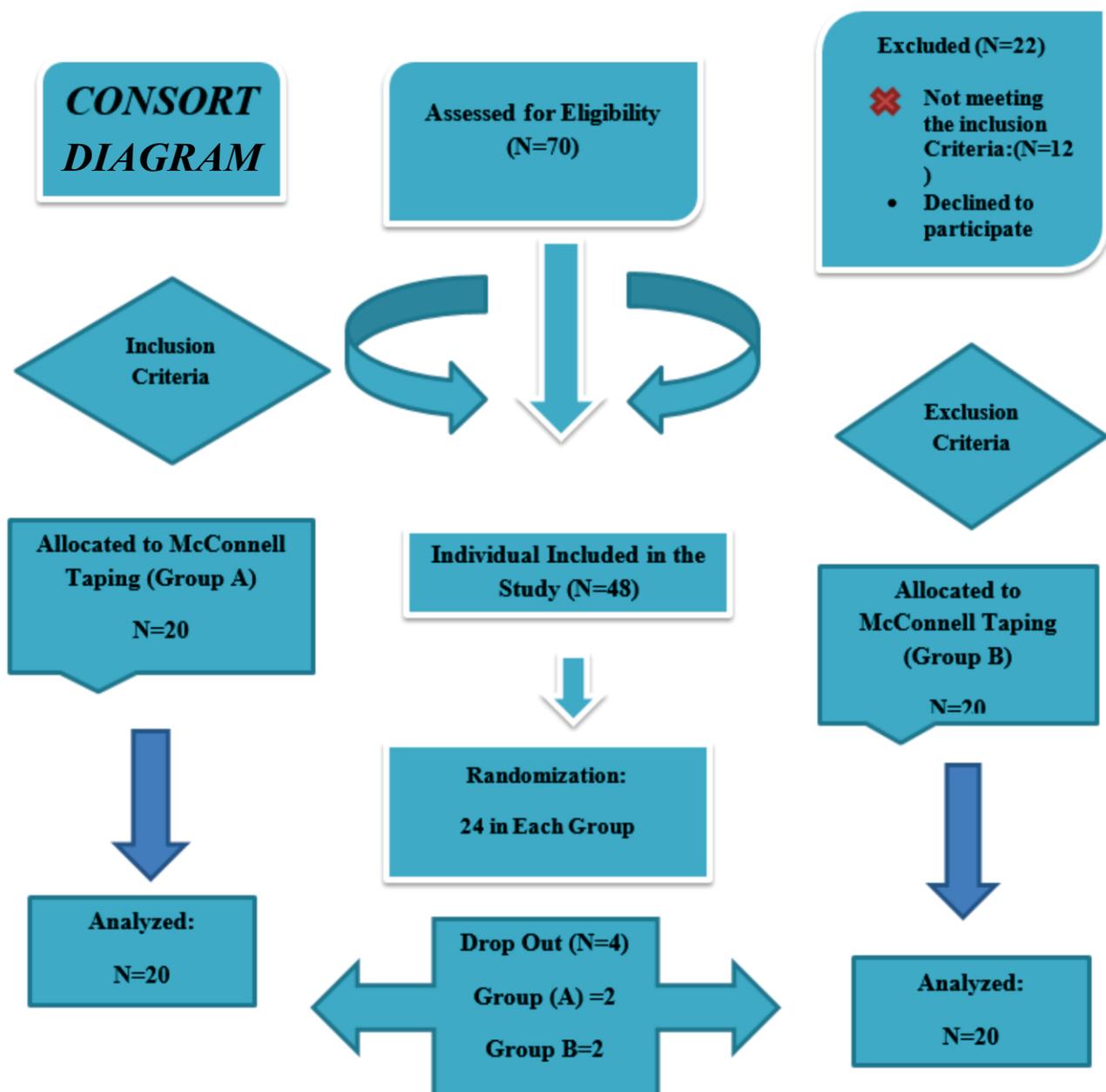
Discussion

Patellofemoral Pain Syndrome is a common cause of anterior knee pain, it mainly affects females. The present study investigated the immediate effects of McConnell taping on Q angle and knee joint pain in females with patellofemoral pain syndrome. Intensity of the pain was reduced in both groups, but its effects were noticed in experimental group as compared to control group with p value was <0.05. Overall mean Numeric pain rating scale decreased

Table I: Comparison of Q Angle, Intensity of Pain and Knee ROM between Experimental and Control Groups

Variables		Mean±SD(Experimental Group)	Mean±SD(Control Group)	P value	
Age		36.05 ±7.35	37.05±4.96	0.02	
Q Angle		Pre	19.05±3.02	19.29±1.56	0.11
		Post	14.0±2.01	18.01±1.72	0.00
NPRS		Pre	8.28±1.18	7.19±1.87	0.09
		Post	2.90±1.16	4.23± 1.60	0.05
Knee Range of motion	Flexion ROM	pre	125.06±8.87	120.09±5.97	0.06
		post	138.67±3.34	136.57±3.95	0.04
	Extension ROM	pre	0.54±1.5	0.00±0.00	0.05
		post	0.59±.67	0.00±0.09	0.00

significantly after taping from 8.28 to 2.9 in Experimental group. A previous study reported that patients with patellofemoral pain syndrome who were provided McConnell taping for two weeks reported significantly reduced pain score immediately after treatment and for 12 month follow up. Also 80% subjects achieved normal onset timing of Vastus medialis oblique and Vastus lateralis during squat and seated knee extension at 12 month follow up.^{16,17}



Another study examined the EMG activity between VL and VMO while the individual used the muscles for eccentric phase of descending stairs and concentric phase of ascending stairs. They found the peak EMG ratio of VMO and vastus lateralis in descending stairs was lower than the ascending stairs.¹⁸ A double blinded randomized control trial was conducted on 30 patients with patellofemoral pain syndrome. They treated the patients for 12 sessions for a period of 2 weeks. Significant improvement was noticed in pain intensity in both groups.¹⁸

Similarly, a study was conducted by A.M Clifford in 2020 in which they used McConnell taping as well as tibial internal rotation limitation taping for Patellofemoral pain syndrome (PFPS). The results of this study revealed that pain intensity were decreased in both taping techniques.¹⁹ The results in Current study also suggest that McConnell Taping is more effective in decreasing Q angle in patellofemoral pain syndrome. In this study the adjusted Q angle values for laterally and neutral placed patella was very close to the Centre of the reported ranges of Q angle after adjustment of lateral patellar displacement in the experimental group as compared to the control group. The present study suggests that increasing knee flexion Range of motion decrease the Q angle and patellar lateral displacement p value <0.05. The results of this study are supported by Tsung Yu-Lan in which they found the immediate effects of McConnell taping on pain and Q angle in patients with patellofemoral pain syndrome p value 0.05.³ A study was conducted by Ajlan Sac et al in which they found that higher Q angle is associated with decreased knee strength and taping decrease pain and also Q angle in patients with PFPS.²⁰

Conclusion

The result of this study shows that McConnell taping combined with strengthening exercises to decrease pain intensity and Quadriceps Angle in patients with patellofemoral pain syndrome.

Limitations

Prolonged effects of the study were not measured as time duration was limited. Data was collected from single setting of physical medicine and rehabilitation department of Fauji foundation hospital Rawalpindi, so diversity was not achieved.

Disclaimer

It was presented online in World Conference on Exercise Medicine in Malaysia on 2nd Nov 2021.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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