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A Study to Compare the Effectiveness of K taping with wall squats and K taping with standard exercise program in reducing pain and improving running performance in 100 m female runners with patellofemoral pain syndrome

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ABSTRACT

INTRODUCTION: Patellofemoral pain syndrome [PFPS] is a condition of peripatellar pain resulting from physical and bio mechanical changes in the patellofemoral joint, generally affecting young active individuals. It occurs more commonly in female athletes who involve more in running and jumping sports and soldiers. This study compares the effect of wall squats and standard exercise program in adjunct with kinesio taping in reducing pain and running performance. **METHODOLOGY:** Thirty female subjects between the age of 18-25yrs were randomly allocated into Group-A and Group-B. The anterior knee pain scale, the numerical pain rating scale and 20 m sprint test were used as outcome measures. They were given the treatment program for a period of 6 weeks. **RESULT:** The difference between the efficacy of “Wall Squats + k-Taping (WSKT)” and “Standard Ex Program + k-Taping (SEPTK)” in terms of reduction in ST20M score is not statistically significant 5% level ($t(28) = -1.203, p\text{-value} = 0.239 > 0.05$). The mean reduction in ST20M by WSKT (Mean = 0.36, SD = 0.20) is greater than the mean reduction in ST20M by SEPTK (Mean = 0.29, SD = 0.09). **CONCLUSION:** This clearly indicates that “Wall Squats + k-Taping” is slightly more effective than “Standard Ex Program + k-Taping” in reducing in female runners with Patellofemoral Pain Syndrome.

KEY WORDS:

Patellofemoral pain syndrome, Anterior knee pain scale, 20 m sprint, kinesiotaping.

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INTRODUCTION: Patellofemoral pain syndrome [PFPS] is a commonly occurring knee problems in young active individuals and it accounts to almost 10-40% of all musculoskeletal complaints. The prevalence rate of PFPS in female athletes was 16.3 per 100 athletes¹. This reduces the running performance of the athlete and the participation to compete in sports². In this condition, the patellofemoral compression forces increase with increasing knee angles upto 90deg of knee flexion and can reach upto 8times body weight³. The Q angle, is the acute angle formed by the vector for the combined pull of the quadriceps femoris muscle and the patellar tendon and is important because of the lateral pull it exerts on the patella⁴. This reduces the running performance of the athlete and the participation to compete in sports. This study concentrates on 100 m runners with anterior knee pain. The athlete must continue a cycle of movement throughout the 100 meters in the fastest possible way. The gait cycle is the basic unit of measurement in gait analysis. Phases of running are the same as the phases of gait. The quadriceps and rectus femoris both fire from late swing to midstance to prepare the limb for ground contact and to absorb the shock of that impact during stance phase absorption. It is during this phase, the patellofemoral joint reaction forces are more to the joint⁵. To evaluate the efficacy of wall squats and kinesiotaping versus standard exercise program in reducing pain and improving running performance in 100 m female runners in patellofemoral pain syndrome.

METHODOLOGY: In this experimental design, the thirty subjects are allotted into two groups through simple random sampling methods. After the institutional ethical committee approval and the subjects were given intervention after getting their informed consent for this 6weeks of study duration. The female runners with age group of 17-25 yrs old 100m runners with patellofemoral pain syndrome are included and subjects with subluxation, meniscal injury and other knee problems are excluded from this study. Allocated one group of subjects are trained with the specific knee extension training program with the Kinesiotaping and the other group are trained with the standard exercise intervention and kinesiotaping for the 6 weeks of study duration. Pre and Post- test of each group subjects were assessed using the numerical pain rating scale, anterior knee pain scale and 20m sprint test as an outcome measures.

PROCEDURE: A comparative study is done among the female 100 m runners to determine the effect of kinesio taping with wall squats and kinesio taping with standard exercise programme in reducing pain and improving running performance. 48 subjects from 7 different colleges participated in the study who were between the ages of 17-25 yrs and were 100 m runners. After the completion of the general assessment 32 subjects fit into the inclusion criteria. An informed consent was received and the subjects are given the anterior knee pain questionnaire and the numerical pain rating scale for indicating their pain intensity. These scores were recorded as pretest values. 20 m sprint test is done to assess the running performance. This was done in the field, where 20 m is marked and a straight line is drawn using a measuring tape. Two cones were placed, one at the starting of the line and the other at the end of the line. Their routine warm up is done before the test. The subject is asked to run at the start of the whistle upto the 20 m length as fast as they can. A trial run is done and after thorough understanding by the runners, the test is conducted. On the blow of the whistle, the athlete runs the 20 m distance and the time taken to complete the 20 m

run is noted using a stopwatch. The time is noted in seconds as the pre test value. Then the subjects were randomly divided into group A and group B with 15 subjects allocated in each group. The subjects were explained about the kinesio tape and kinesiotaping technique, wall squats, quadriceps sets, terminal knee extension and straight leg raise and their effects and the possible outcomes of the study. Group A received wall squats and kinesiotaping for a duration of 4 weeks. Wall squats were performed with the subject in standing with the back supported to the wall and the feet at a foot distance from the wall. Then the subject is asked to flex the shoulders upto 90 degrees with forearm pronated and asked to squat upto 60 degrees of knee flexion and come back to starting position. The subjects are taken to the outpatient department and wall squats of 6 repetitions of 3 sets with adequate rest of 30 secs between each set were performed. Then kinesio taping (Fig -1) is applied after the wall squats by placing knee in 90 deg flexion in high sitting. Split the tape 3-4" from the end. Anchor the tape at mid thigh and wrap around the sides of the patella. No stretch is required. The tape was removed every day before the exercise and applied again after the exercise. The tape remained throughout the day. The subject is asked to remove the kinesiotape in case of any irritation or discomfort.

Fig-1 KINESIOTAPING OF THE PATELLA.



Group-B received a standard exercise program with kinesiotaping. The standard exercise program consists of a set of three exercises, namely, static quadriceps / quadriceps sets, terminal knee extension and straight leg raise. Quadriceps sets is performed with the subject in supine lying and a small towel rolled under the popliteal fossa of the knee. It is to be noted that the knee is in slight degrees of flexion. The subject is then asked to press the towel with knee by contracting the quadriceps muscle. The contraction has to be held for 10 counts and then released. During the contraction of the knee the knee has to extend. Straight leg raise is also done in lying position and the subject is asked to flex the unaffected leg. Then the subject is asked to raise the affected leg at the hip slowly without bending the knee upto 60-70 deg. This position is held for 10 counts and then return to starting position. Terminal knee extension is also done in lying. Place a pillow under the knee so that the knee is partially flexed to about 15 deg and ask the subject to extend the knee. Ask the patient to feel the contraction in the quadriceps and hold for 10 counts. Then release and return back to the starting position. These exercises are performed as 3 sets of 10 repetitions each and with an adequate rest of 30 secs between each set. This procedure is done for both the groups for duration of 6 weeks and post- test values are noted. These values are then given for statistical analysis. **DATA ANALYSIS & Annals of Tropical Medicine & Public Health** <http://doi.org/10.36295/ASRO.2020.231316>

STATISTICS: In this study, Paired Samples t-test, and Independent Samples t-test are performed at 5% level of significance (p value < 0.05). In order to compare the effectiveness of two treatments, the difference between Pre-test and Post-test scores would be calculated and then the mean of these differences would be calculated separately for Group A (Table 1) and Group B (Table 2). These mean of the differences for two Group (A and B) would be considered as the sample means of two groups respectively.

Table 1: Pre and Post-test outcome measures in group A (Wall squat exercise and K taping)

Outcome measures	Pre-test values (Mean \pm SD)	Post-test values (Mean \pm SD)	P value (0.005)
AKPS	78 \pm 9.98	95 \pm 5.91	0.000***
NPRS	4.06 \pm 1.16	0.9 \pm 0.88	0.000***
20m sprint test	3.75 \pm 0.30	3.39 \pm 0.15	0.000***

*** highly significant

Table 2: Pre and Post-test outcome measures in group B (Standard exercise program and K taping)

Outcome measures	Pre-test values (Mean \pm SD)	Post-test values (Mean \pm SD)	P value (0.005)
AKPS	68 \pm 14.48	90 \pm 8.89	0.000***
NPRS	5.06 \pm 1.16	1.40 \pm 0.98	0.000***
20m sprint test	3.89 \pm 0.20	3.60 \pm 0.20	0.000***

*** highly significant

The difference between the efficacy of “**Wall Squats + k-Taping (WSKT)**” and “**Standard Ex Prog + k-Taping (SEPTK)**” in terms of reduction in ST20M score is not statistically significant 5% level ($t(28) = -1.203$, p -value = $0.239 > 0.05$). The mean reduction in ST20M by WSKT (Mean = 0.36, SD = 0.20) is greater than the mean reduction in ST20M by SEPTK (Mean = 0.29, SD = 0.09). This clearly indicates that “**Wall Squats + k-Taping**” is slightly more effective than “**Standard Ex Prog + k-Taping**” in reducing “20m Sprint Test Score” in female runners with Patellofemoral Pain Syndrome.

DISCUSSION: Patellofemoral pain syndrome is one of the most common disorders of the lower extremity with its greatest incidence in young physically active female athletes. Patellofemoral pain limits participation in recreational and sports activities and more importantly may be a precursor to long term patellofemoral osteoarthritis⁶. The symptoms usually prohibited the students from participating in school physical activities and competitive sports². This study investigated the effect of an exercise program in conjunction to kinesio taping of the patella and effect of wall squats in conjunction with kinesio taping of the patella on pain and running performance. The reason for the reduction in pain could be due to the kinesio taping that was used as an adjunct to wall squats⁷. Hence, Kinesiotaping checks the lateral tracking of patella during the squat descent and reducing patellofemoral joint stress, thereby leading to reduction in pain. It is proposed that the tapes lift the skin and increase the spaces between the

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skin and muscle, hence reducing the localized pressure and helping to promote circulation and lymphatic drainage. Kinesiotape induced increase in VMO activation or decrease in VL activation. The taping technique is based on the theory that proper alignment of the patella in the patellofemoral groove will decrease pain with activity, allowing the patient to train or facilitate the recruitment of the VMO. Herrington et al⁸ reported that the pain modulation effect of taping could be due to the mechanical positioning of the patella by the tape and cutaneous stimulation of the nervous systems. The present study involved wall squats with kinesio taping given for a duration of six weeks with the same outcome measure. The reason for the reduction in pain could be due to the bio mechanics behind wall squats which says that patellofemoral joint forces are minimal during 60-70deg of knee flexion where the distance between the patella and the intertubercular sulcus of the femur is more , thereby reducing the friction between the surfaces. During wall squats, the feet are placed farther away from the, which reduces the anterior translation of the patella, thereby reducing the patellofemoral joint stress. Since wall squats are weight bearing exercises the vastus medialis obliquus is also strengthened. Since it is primary stabilizer of the patella medially, it allows normal tracking of patella. D kaya et al⁹ conducted a study using rehabilitation protocol with k-taping for a period of three months out of which wall squats were given for one week, where the subjects shown good improvement in the NPRS rating scale.

CONCLUSION: Comparing the above values between the groups, it is evident that wall squats with kinesiotaping and standard exercise program with kinesiotaping show significant reduction in pain and improvement in running performance. However, the values of standard exercise program are slightly more than wall squats with k-taping. Hence, standard exercise programme can be used as a treatment protocol for reducing pain and improving running performance in female runners with patellofemoral pain syndrome.

Ethical clearance- Taken from Institutional Human ethical committee.

Source of funding- Self

Conflict of Interest - Nil.

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