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EFFECT OF PATELLAR TAPING VS THERAPEUTIC ULTRASOUND ON PAIN AND Q- ANGLE IN SUBJECTS WITH PATELLO FEMORAL PAIN SYNDROME

^{1,*}Anil T John, ²Dr. H. R. Rai, ³Dr. Vinod Kumar and ¹Jimshad T. U.

¹Dayananda Sagar College of Physiotherapy, Shavige Malleswara Hills, K-S lay out, Bangalore 560078, India

²Department of Orthopaedics, K. S Hegde Medical College Managalore,

³Department of Orthopedics KIMS Bangalore

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ABSTRACT

Background: Patellofemoral pain syndrome (PFPS) is a common problem among adolescents and young adults especially in soccer players, cyclists, rowers, volleyball players, ballet dancers, horseback riders, tennis players and runners as well as housewives.¹ Objective of the study was to find out whether ultrasound therapy with exercises or patellar taping with exercises is more effective on pain and muscle power, KPFPS and Q angle in patients with chondromalacia patella.

Method: A total of 120 subjects were included in the study basis of inclusion and exclusion criteria and divided into two groups. One group underwent patellar taping and exercises.(n=60) Second group underwent ultrasound and exercises.(n=60). Before and after intervention pain assessment was taken by Visual Analogue scale (VAS) everyday. Functional assessment was taken by using Kujala patellofemoral pain syndrome questionnaire and Q angle.

Result: shows both taping group and ultrasound therapy group are effective in reducing VAS score and improving Q angle. But comparing taping and ultrasound taping group had drastic improvement in reducing vas and Q angle ($p < .003$).

Conclusion: The result suggests that taping is more effective than ultrasound therapy on pain and function in subject with patella femoral pain syndrome.

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INTRODUCTION

Patellofemoral pain syndrome (PFPS) is a common problem among adolescents and young adults especially in soccer players, cyclists, rowers, volleyball players, ballet dancers, horseback riders, tennis players and runners as well as housewives (www.jgames.co.uk/title/chondromalacia_patellae). It is due to the great stress placed on the knees during the activities (www.jgames.co.uk/title/chondromalacia_patellae). The most common condition occurring in patellofemoral syndrome is chondromalacia patellae. Chondromalacia patellae is a condition which refers to the progressive erosion of the articular cartilage of the knee joint that is the cartilage underlying the kneecap (patella) that articulates with the knee joint. It is most common in females (www.healthscout.com). The possible causes includes a tight iliotibial band, bursitis, overuse, malalignment, core instability, patellar maltracking, increased Q – angle, quadriceps weakness etc.

It is characterized by retro patellar pain (behind the kneecap) or peripatellar pain (around the kneecap) when ascending or descending stairs, squatting or sitting with flexed knees (Heinties *et al.*, 2003). Persons with patellofemoral syndrome may have problem with the patella entering the trochlea of the femur, particularly in the first 30^o of knee flexion (Fulkerson *et al.*, 1990). Altered soft tissue structures are thought to result in a lateral tracking of patella (Fulkerson *et al.*, 1990 and Ahmad *et al.*, 1983). The lateral displacement of the patella may be due to inadequate medial control of vastus medialis obliquus (VMO). This inadequate control can be due to a reduction in the tension producing capacity of the VMO or a problem with the timing of VMO activity in the persons with PFPS (Voight and Weider, 1991). Various authors have suggested that hip weakness may be an impairment associated with PFPS, because poor hip control may lead to abnormal lower extremity or patellofemoral motions (Lori A. Bolgla *et al.*, 2008). Tightness of soft tissues, such as the gastrocnemius, quadriceps, and hamstring muscles and ITB/TFL, has also been suggested to influence distal fibers of the ITB/TFL complex attach to the lateral aspect of the patella via the ITB, it has been theorized that tightness of ITB/TFL may pull the

Corresponding author: Anil T John,

Dayananda Sagar College of Physiotherapy, Shavige Malleswara Hills, K-S lay out, Bangalore 560078, India.

patella laterally and increase the stress over the patellofemoral joint (Brody *et al.*, 1998). Patellar taping techniques are used to reduce the friction on the patella. It not only reduces pain but allows the individual to complete more functional quadriceps strengthening activities without anterior knee pain (Patrick J Potter *et al.*, 2009). Therapeutic ultrasound is one of the many rehabilitation interventions available for reducing pain and inflammation (Brosseau *et al.*, 2009). The ultimate goal of rehabilitation for patients with Patellofemoral pain syndrome return to the highest functional level in the most efficient manner (Rixe *et al.*, 2013).

In general, the success of conservative treatment has been acceptable during the early stages of the tendinitis and poor for the later stages. There are a number of studies on effectiveness of ultrasound with exercise and taping with exercises only on pain. Since both are extensively used in the treatment for chondromalacia patellae there has been no studies to prove as to which is better in reducing pain, improving muscle power, effect on KPFPS and Q angle This study was designed to assess the effectiveness of ultrasound with exercise and taping with exercises on pain, muscle power, effect on KPFPS and Q angle in the treatment of chondromalacia patella.

This study addressed the following question with respect to chondromalacia patella: Do patients receiving ultrasound with exercises have an effect on pain, muscle power, KPFPS and Q angle after the treatment or Does patients receiving taping with exercises show an effect on pain, muscle power, KPFPS and Q angle in patients with chondromalacia patella. And which group showed better results. Does BMI scores have any effect on chondromalacia patella. Objective of the study was to find out whether the ultrasound and exercises have any effect on Q angle in patients with Chondromalacia patellae, To find out whether the ultrasound and exercises have any bearing on KPFPS scores in patients with Chondromalacia patellae, To find out the effectiveness of patellar taping with exercises on pain in Chondromalacia patellae, To find out whether Taping and exercises have any effect on Q angle in patients with Chondromalacia patellae.,

MATERIALS AND METHODS

Study was conducted at Sagar Hospital and DSI out-patient department, Bangalore. The Ethical clearance has been obtained from the Ethical committee of institution, as per ethical guidelines research from biomedical research on human subjects, 2001, ICMR, New Delhi. The study is Experimental Design involving comparative analysis of Pre and Post test values between two groups, A total of 120 subjects was included in the study with inclusion criteria of Subjects diagnosed with chondromalacia patellae, Subjects between the age group of 18 – 45 years, Both males and females will be included and Exclusion criteria was, Any fractures in and around the hip, knee and ankle, Subjects diagnosed with osteoarthritis of knee., Subjects above 45 years of age, Subjects with any systemic diseases.

Subjects who fulfilled the inclusion and exclusion criteria were randomly divided by block randomization method into Two Groups by purposive sampling

- One group was given patellar taping and exercises.(n=60)

- Second group was given ultrasound and exercises.(n=60)
Before and after intervention pain assessment was taken by Visual Analogue scale (VAS) everyday. Functional assessment was taken by using Kujala patellofemoral pain syndrome questionnaire. Q angle, three landmarks were needed to determine the Q-angle: a) Anterior Superior Iliac Spine (ASIS)- The ASIS is the front of the pelvic bone that is felt in front of the hip at the level of your waist. b) Centre of the Patella (Kneecap)- The centre of the kneecap is best identified by locating the top, bottom and each side of the kneecap, and then drawing intersecting lines and c) Tibial Tubercle-The tibial tubercle is the bump about 5 centimetres below the kneecap on the front of the shin bone (tibia).The Q-angle is formed from a line drawn from the ASIS to the centre of the kneecap, and from the centre of the kneecap to the tibial tubercle. To find the Q-angle, measure that angle, and subtract from 180 degrees (Carolyn Kisner and Lynn Allen Colby, 2005).

Group A-Received taping and conventional therapy (exercise and stretching), Taping: Taping was done using kinesiotherapeutic tape, 3 times a week for 1 month using McConnells taping procedure. Before taping the skin was prepared well and cleaned with ether. Non-allergic under wrap (Micro Poretape) was applied followed by the Dynaplast to maintain the corrected position of the patella every alternate day. The subjects were then taught exercises for strengthening Vastus Medialis Obliques (VMO). Subjects received Mc Connell patellar taping in order to correct one/any combination of patellar orientation i.e. Glide, Tilt or Rotation. Exercise: Traditional method was followed in exercise. All the three groups were put on exercises, eccentric contraction exercises in the form of active strengthening exercises with minimum resistance (10 repetitions with 3 sets), starting from standing and asked the patient to sitting on chair slowly (90°), 6 seconds rest between each repetition and 1 minute rest between the sets. The resistance is progressed according to repetitions for the quadriceps muscles, with stretching hamstrings exercise (5 repetitions, 30 seconds in position of stretching, 30 seconds in position of relaxation) with postural instructions (avoid flexion more than 90°).

Concentric contraction exercises in the form of active strengthening exercises with minimum resistance (10 repetitions with 3 sets), from 90° to 0° sitting on chair, asked the patients to extend his knee to zero position, 6 seconds rest between each repetition and 1 minute rest between the sets. The resistance was progressed according to repetitions for the quadriceps muscles and stretching hamstrings exercise (three repetitions, 30 seconds in position of stretching, 30 seconds in position of relaxation) and postural instruction (avoid flexion more than 90°) VMO Exercises (Non-Weight bearing): Subjects were positioned in long-sitting on the plinth with the affected limb crossed over the unaffected.

This ensured that the affected limb remained in slight degree of flexion. Subjects were instructed to perform an isometric contraction of the hip adductors and knee extensors simultaneously and sustain this for 5 seconds. This was continued for 5 sets/day three times a week for four weeks, Repetitions/set for a week. VMO Exercises (Weight bearing): were encouraged for the second week. Subject was made to

stand in front a mirror with affected limb crossed over the other. An isometric contraction of the same muscles were performed and sustained for 5 seconds for three times a week for four weeks. Strengthening was done for vastus medialis muscle, quadriceps, hip abductor and hip lateral rotator muscle using DAPRE (Daily adjustable progressive resistance exercise) system. Stretching: Stretching was done for IT band, hamstrings, external rotators of hip and internal rotators of hip with 30 seconds or longer hold, repeated for several times, 3 times a week for four weeks (Carolyn Kisner and Lynn Allen Colby, 2007).

Group B-Received US and conventional therapy (exercise and stretching). Ultrasound with the output of $1\text{W}/\text{cm}^2$ for 5 minutes using a pulsed mode 1: 4 ratio with frequency of 1MHz for 3 days a week for 4 weeks. Exercise: Traditional method was followed in exercise. Strengthening was done for vastus medialis muscle, quadriceps, hip abductor and hip lateral rotator muscle using DAPRE (Daily adjustable progressive resistance exercise) system. Stretching: Stretching was done for IT band, hamstrings, external rotators of hip and internal rotators of hip with 30 seconds or longer hold, repeated for several times, 3 times a week for four weeks (Carolyn Kisner and Lynn Allen Colby, 2007 and David *et al.*, 2011).

Data analysis was performed using SPSS software (version 17). Alpha value was set at 0.05. Descriptive statistics was used to find out mean and standard deviation (SD) for demographic and outcome variables. Paired -T test was used to find out homogeneity for base line and demographic and outcome variable, Unpaired -T test was used to find out homogeneity for base line and demographic and outcome variable, Wilcoxon test was used to find out homogeneity for base line and demographic and outcome variable, Mann-Whitney test was used to find out the homogeneity for base line and demographic and outcome variable.

RESULTS

Table 1 Data are mean. In Group A the mean age is 31.47 and in the Group B the mean age is 32.57 which was not statistically significant (p value >0.211). In Group A the mean BMI is 26.08 and in the Group B the mean BMI is 27.02 which was not statistically significant (p value $>.187$). In Group A there were 21 males and 22 females, in Group B there were 24 males and 25 females which was not statistically significant (p value >0.989). In summary demographic variables were homogenous between group

Table 1. Descriptive statistics for demographic variables

Variable	GROUP A	GROUP B	p-value
Age	31.47±4.22	32.57±4.20	>0.211
BMI	26.08±3.07	27.02±3.76	$>.187$
Gender (M/F)	21/22	24/25	>0.989

Table 2 In the Group A the pre VAS score reduced from 7.12 to post VAS score of 2.39 which was statistically significant (p value .0001). In the Group A the pre Q Angle improved from 14.37 to post score of 12.81 which was statistically significant (p value .0001) Table 3 In Group B the pre VASs score

reduced from 7.44 to post VAS score of 3.24 which was statistically significant (p value $<.0001$). In Group B the pre Q angle score improved from 14.84 to post score of 13.82 which was statistically significant (p value $<.0001$).

Table 2. within comparison for Group-A

Variable	Pre	Post	p-value
VAS	7.12±1.35	2.39 ± 0.69	<0.0001
Q Angle	14.37 ± 1.83	12.81 ± 1.45	<0.0001

Table 3. Within comparison for Group B

Variable	Pre	Post	p-value
VAS	7.44±0.91	3.24 ±0.66	<0.001
Q Angle	14.84 ± 1.97	13.82 ± 1.68	<0.0001

Table 4. between comparison of group A and group B

Variable	GROUP A	GROUP B	p-value
VAS	2.40 ± 0.69	3.24±0.66	<0.0001
Q Angle	12.81±1.45	13.82±1.68	<0.003

Table 4 However when comparing between group the mean reduction in vas score for Group A was 2.40 and in the Group B score was 3.24 which was highly significant (p value less than .0001. for the Group A the mean Q Angle was 12.81 and in the Group B mean Q Angle was 13.82 which was statistically significant (p value $<.003$). In summary both group A and group B are effective in reducing vas score and improving angle. But comparing Group A with Group B, Group A is effective than Group B in reducing VAS and Q Angle.

DISCUSSION

The purpose of the study was to find out the effectiveness of taping and US along with conventional therapy on pain in chondromalacia patellae. The aim of patellar taping was to create a mechanical medial realignment of the patella, thus centralizing it within the trochlea groove and improving patellar tracking. McConnell has devised a classification to describe abnormal patellar alignment. The four main malalignments include excessive lateral glide; excessive lateral tilt; excessive posterior tilt of the inferior pole and excessive rotation (McConnell 1986; McConnell 1996). Patellar taping was designed to correct these malalignments and has four basic components, medial glide, medial tilt, anterior tilt and rotation. Further taping also unloaded painful structures (e.g. a painful fat pad) (McConnell 1996). Patellar tape provided a useful treatment technique. Clinical and research evidence supports relief of pain associated with PFPS and therefore, by including patellar tape in the treatment of PFPS, there were pain free rehabilitation programmes. The taping procedure was given along with stretching and strengthening exercises. Baseline data of demographic and outcome variable did not show any significant difference in patient population.

All the patients were able to finish the study. In the Group A the pre VAS score reduced from 7.12 post VAS score of 2.39 with sd of 0. 69 which was statistically significant (p value .0001). In the Group A the pre Q Angle improved from 14.37

to post score of 12.81 with which was statistically significant (p value .0001). Chayya Verma, Vijaya Krishnan mentioned in their study that patellar taping and the conventional method was undertaken to determine their effectiveness with respect to pain and function. Taping caused a significant reduction in for eccentric activities with a high % change in function. Thus, patellar taping appears more effective in treating PFPS. Aditya Derasari *et al*, the purpose of their study was to quantify the changes in the 6-degrees-of-freedom patellofemoral kinematics due to taping in patients with PFPS and concluded that the inferior shift in patellar displacement with taping partially explains the previously documented decrease in pain due to increases in contact area. Another study which was done by K. Crossley, S. M. Cowan, K. L. Bennell, J. McConnell, there purpose of the study was determining the mechanism of pain relief and stated that patellar tape provides a useful treatment technique and supports relief of pain associated with PFPS.

Pain reduction also enhanced patient compliance with the rehabilitation programme, and improved patients satisfaction and was used as an inexpensive adjunct to a rehabilitation programme in the management of PFPS (Aditya Derasari *et al.*, 2010; Crossley *et al.*, 2000 and Chhaya Verma *et al.*, 2012). For In Group B the pre VASs score reduced from 7.44 to post VAS score of 3.24 which was statistically significant (p value < .0001). In Group B the pre Q angle score improved from 14.84 to post score of 13.82 which was statistically significant (p value < .0001) study proved that Therapeutic ultrasound is one of the many rehabilitation interventions available for reducing pain and inflammation, Ultrasound is a form of mechanical energy consisting of high frequency vibrations". These vibrations result in acoustic streaming and radiation forces, both of which enhance the flow of particles from one side of a cell membrane to the other. Thus, ultrasound increases cell permeability. As a result of stable cavitation ultrasound also "exerts mechanical stresses on the surrounding cells or other structures. Pulsed ultrasound is generally recommended for treatment of pain and inflammation in acute stages, while the continuous ultrasound is recommended for treatment of restricted movement (David *et al.*, 2011 and Brosseau *et al.*, 2009).

However when comparing between group the mean reduction in vas score for Group A was 2.40 and in the Group B score was 3.24 which was highly significant (p value less than .0001. for the Group A the mean Q Angle was 12.81 and in the Group B mean Q Angle was 13.82 which was statistically significant (p value less than .003). In summary both Group A and Group B are effective in reducing vas score and improving angle. But comparing Group A with Group B, Group A is effective than Group B in reducing VAS and Q angle. This statement in this study hypothesized that taping can help to align the patella in the long run and also other authors states that McConnells taping can decrease the pressure on patella femoral joint thereby improving muscle strength in quadriceps muscle. Vastus medialis is assisted in its efforts to resist the pull of vastus lateralis there by stabilizing the patellae. Taping also promotes the afferent inputs and does increases stimulation of alpha motor neuron source thereby increasing muscle activity.

Conclusion

The results shows both Taping and Ultra sound therapy are effective in reducing VAS score and improving Q angle. The shows both Taping group and Ultra sound therapy group are effective in reducing VAS score and improving Q angle. But on comparison of Taping and Ultrasound therapy, Taping group showed greater improvement in reducing VAS and Q angle. Hence this study concludes that Taping is more effective than Ultrasound therapy on pain and function in subjects with Patella Femoral Pain Syndrome

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REFERENCES

- Aditya Derasari, Timothy J. Brindle, Katharine E. Alter and Frances T. Sheehan. 2010. Patients With Patellofemoral Pain: A Dynamic McConnell Taping Shifts the Patella Inferiorly in Magnetic Resonance Imaging Study. *Phys Ther.* 90:411-419.
- Ahmad, A., Burk, D., Yu, A. 1983. Invitro measurement of static pressure distribution in synovial joints, part II : Retropatellar surface. *J biomech ENG*; 105: 226 – 236.
- Brody, L.T., Thein, J.M., 1998. Nonoperative treatment for patellofemoral pain. *J Orthop Sports Phys Ther.* 28: 336-344.
- Brosseau, L., Casimiro, L., Welch, V., Miller. 2009. Therapeutic ultrasound for treating patellofemoral pain syndrome. *Cochrane collaboration*, Issue 3.
- Brosseau, L., Casimiro, L., Welch, V., Milne, S., Shea, B., Judd, M., Wells, G.A., Tugwell, P. 2009. Therapeutic ultrasound for treating patellofemoral pain syndrome (Review). *The Cochrane Library*, Issue 1.
- Carolyn Kisner, Lynn Allen Colby. *Therapeutic Exercise Foundations and Techniques*. 5th edition, 2007:p-99-690
- Chhaya Verma, Vijaya Krishnan, 2012. Comparison between Mc Connell Patellar Taping and Conventional Physiotherapy Treatment in the Management of Patellofemoral Pain Syndrome :A Randomised Controlled Trial. *JKIMSU*. 1: 2231-4261.
- Crossley, K., Cowan, S.M., Bennell, K.L., McConnell, J. 2000. Patellar taping: is clinical success supported by scientific evidence?. *Manual Therapy* ;5(3):142-150.
- David, A. Lake, Nancy, H. Wofford. 2011. Effect of Therapeutic Modalities on Patients With Patellofemoral Pain Syndrome. *Sports Health: A Multidisciplinary Approach* March/April 2011 vol. 3 no. 2 182-189.
- Fulkerson, J., Hungerford, D. Md: Williams and Vilkins Disorders of patellofemoral joint. 2nd edition. Baltimore, 1990.
- Health Encyclopedia – Diseases and Conditions. Patellofemoral syndrome. www.healthscout.com

- Heinties, E., Berger, M. Y., Bierrna, S.M.A 2003. Zienstra Exercise therapy for patellofemoral pain syndrome. *Phys Ther.* 33:671-676.
- Lori a. Bolgla, Terry r. Malone, Brian r. Umberger, Timothy, 2008. Hip Strength and Hip and Knee Kinematics During Stair Descent in Females With and Without Patellofemoral Pain Syndrome *Journal of orthopaedic and sports physical Therapy*; Nov-Jan, volume 38
- Patrick, J. Potter, Keith A J. 2009. Patellofemoral syndrome: treatment and medication. *Emedicine from Web M D*; updated, July 15.
- Rixe, J.A., Glick, J.E., Brady, J., Olympia, R.P. 2013. A review of the management of patellofemoral pain syndrome. *Phys Sportsmed.* Sep;41(3). 09.2023.
- Voight, M., Weider, D. 1991. Comparative reflex response time of the vastus medialis and vastus lateralis in normal subjects and subjects with extensor mechanism dysfunction. *Am J Sports Med.* 10 : 131-137.
- www.jgames.co.uk/title/chondromalacia_patellae. 2008;11-19.
