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To Compare the Effects of VMO Strengthening Exercise wth Quadriceps Isometric Exercise versus VMO Strengthening with Gluteus Medius Strengthening Exercise to Normalize Q Angle in Patients with Knee Osteoarthritis

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ABSTRACT

Introduction: Trapezitis is defined as the 'inflammation of trapezius muscle'. The upper trapezius muscle designed as postural muscle and its highly susceptible to overuse. people who use their arms for extended periods of time that requires holding their arms out in front, like operating mobile, computer, bike riding, car driving or an assembly line worker will recognize a burning pain between the shoulder blades. Myofascial release which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. Hence this technique is proposed to act as a catalyst in cupping therapy (CT) a traditional chinese medicine therapy, has used for >2000 years and uses a negative pressure mechanism the resolution of trapezius spasm.

Aim: The aim of study is to compare the effectiveness of cupping therapy vs. myofascial release technique in trapezitis caused by digitalization.

Method: Total 30 patients were included in the study by simple random sampling method. Subjects were divided into two groups with 15 patients in each group. Group A was receive UST with myofascial release technique, Group B was receive UST with cupping therapy. The patient was assessed pre and post intervention through visual analog scale (VAS), neck disability index (NDI), and cervical range of motion (CROM).

Result: Data was analyzed by using paired t-test. Pre and post score were taken via VAS, NDI, CROM. P value <0.05.

Conclusion: The study concluded that both the groups has shown significant improvement in reduction of pain and improve functional limitation and range of motion. However MFR with UST has shown a better improvement than cupping therapy with UST when the subjects in both the groups are compared.

Keywords: Trapizitis, Mfr, Cupping Therapy, Vas, Ndi, Crom.

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INTRODUCTION

Osteoarthritis (OA) is a common disease associated with significant morbidity. This is particularly apparent at the knee joint, one of the commonest sites to be affected. As prevalence of OA increases with age and aging is associated with decreasing physiological function, the combination has major health implications. Symptoms cannot, however, be predicted merely by the degree of

structural damage. The quadriceps weakness commonly associated with osteoarthritis of the knee is widely believed to result from disuse atrophy secondary to pain in the involved joint.[1] Osteoarthritis is degenerative joint disease. Commonly it is thought to be wear and tear of joints as one ages. Two types of OA are recognized-primary and secondary.

1. ***Primary OA:*** It occurs in old age mainly in the weight bearing joints.
2. ***Secondary OA:*** In this type, t here is an underlying primary disease of the joint which leads to degeneration of the joint.[2]

A high Quadriceps angle increases the chance of developing the various knee problems. One of the most common problems associated with increased Quadriceps angle is patellofemoral tracking syndrome. A high Quadriceps angle interferes with the smooth gliding movement between the patella & the knee. Overtime, especially with repetitive activities, this type of microtrauma causes non specific pain to the front of the knee. As this abnormal tracking continues, various knee muscles like hamstrings, quadriceps & calf muscle become imbalanced, and the cartilage on the underside of the patella begins to wear & thin, Eventually knee becomes degenerative & develops osteoarthritis.[3]

Isometric quadriceps exercise program showed beneficial effects on quadriceps muscle strength, pain, and functional disability in patients with osteoarthritis of the knee.[4] The Q angle have shown to be increased in the OA knee, possibly as the degeneration progresses and more pain and immobility could be aggravating factor. The Q angle of knee is measurement of the angle between quadriceps muscle and Patella tendon and it provides useful information about the alignment of knee joint. It is likely to be influenced by the muscle strength of varying group of muscles that alter the mechanics of knee other that Quadriceps alone. Gluteus Medius weakness is very common among people above age 50 and more evident with obesity indicating the mechanics change in the knee joint too.[5] Both Quadriceps isometric and VMO strengthening are effective in decreasing qangle.[6]

Knee osteoarthritis (OA), also known as degenerative joint disease of the knee, is typically the result of wear and tear and progressive loss of articular cartilage. It is most common in elderly women and men. Knee osteoarthritis can be divided into two types, primary and secondary. Primary osteoarthritis is articular degeneration without any apparent underlying reason. Secondary osteoarthritis is the consequence of either an abnormal concentration of force across the joint as with post-traumatic causes or abnormal articular cartilage, such as rheumatoid arthritis (RA). Osteoarthritis is typically a progressive disease that may eventually lead to disability. The intensity of the clinical symptoms may vary from each individual. However, they typically become more severe, more frequent, and more debilitating over time. The rate of progression also varies for each individual. Common clinical symptoms include knee pain that is gradual in onset and worse with activity, knee stiffness and swelling, pain after prolonged sitting or resting, and pain that worsens over time. Treatment for knee osteoarthritis begins with conservative methods and progresses to surgical treatment options when conservative treatment fails.[7]

Q-angle: The Q angle of knee is measurement of the angle between quadriceps muscle and Patella tendon and it provides useful information about the alignment of knee joint.[8]

Q angle is likely influenced by muscle strength of varying group of muscles that alterthe mechanics of knee other that quadriceps muscle alone. Strengthening exercise is widely recommended for the condition.[9]

Osteoarthritis is the second most common rheumatological problem and it is the most frequent joint disease with a prevalence of 22 to 39% in India.

AIM OF STUDY

To Compare the effect of VMO strengthening with Quadriceps Isometric Exercise Versus VMO strengthening with Gluteus Medius Strengthening Exercise to Normalize Q Angle in Patients with Knee Osteoarthritis.

NEED OF STUDY

A high Q angle increase the chance of knee osteoarthritis. This affects the biomechanics of knee joint. The muscle strength affects Q angle variation of osteoarthritis of knee. Some studies have shown that vastus medialis oblique strengthening exercise combined with quadriceps isometric exercise is effective in normalizing Q anglein in Patients with knee osteoarthritis. The weakness of hip gluteus medius (hip abductor) can be attributed to gender and obesity. Gluteus Medius (hip abductor) strengthening exercise combined with vastus medialis obique strengthening exercise helps in

reducing pain and can normalize q anglein knee osteoarthritis.

PURPOSE OF STUDY

The purpose of present study is to normalize Q angle in patients with knee osteoarthritis by strengthening the weak muscles.

The importance of muscle strengthening is to treat Q angle in patients with knee osteoarthritis.This will help in correcting the alignment of the knee joint. This will alter the mechanics of the knee joint.

Muscle strength of varying group of muscles alter the mechanics of the knee joint.

Experimental Hypothesis

There may be significant difference between effects of VMO strengthening exercise combined with Quadriceps isometric exercise versus VMO strengthening exercise combined with hip abductors to normalize Q angle in patients with knee osteoarthritis.

Null Hypothesis

There may or may not be no significant difference between effects of VMO strengthening exercise combined with quadriceps isometric exercise versus VMO strengthening exercise combined with hip abductors to normalize Q angle in patients with knee osteoarthritis.

REVIEW OF LITERATURE

Santhi Venkatapathy et al. did a study on the effect of Isometric Quadricep Activation and Vastus Medialis Obliqus Strengthening in Decreasing Q-Angle amongYoung Females and concluded that both isometrics quadriceps activation and VMO strengthening reduced Q angle significantly and there was no difference between the two procedures. [33]

Ayşe Aydemir EKİM et al. 2017did a study on Relationship Between Q-Angle and Articular Cartilage in Female Patients with Symptomatic Knee Osteoarthritis: Ultrasonographic and Radiologic Evaluation and concluded that HQ-angle was associated with cartilage thickness measurements of the medial femoral condyle and cartilage grading by ultrasonography and the Kellgren-Lawrence grading system in patients with knee OA.[34]

Ved Prakash et al. did a study on Correlation between body mass index, waist hip ratio & quadriceps angle in subjects with primary osteoarthritic knee and concluded that these 3 independent parameters as risk factors for primary oa were alsoa risk factors for the same interdependently.[35]

Sudhan 2018 did a study on Relationship of Muscle Strength and 'Q' Angle in Knee Osteoarthritis and concluded that there is positive relationship betweenmuscle strength, Q angle and Osteoarthritis knee and negative relation between musclestrength OA knees.[36]

Laura H. Lathinghouse et al 2000 did a study on Effect of Isometric Quadriceps Activation on q angle in Women Before and after Quadriceps Exercise and concludedthat Q angle decreases with IQA.[38]

Varah Yuenyongviwat et al 2020 did a study on Effect of hip abductor strengthening exercises in knee osteoarthritis: a randomized controlled trial and concluded that either hip abductor exercises combined with quadriceps exercises or quadriceps exercises alone could lessen patient pain and improve function. Adding quadriceps exercises could expedite improvement of less pain, symptoms, activity in daily living and quality of life faster than quadriceps exercises alone; however, this onlyappeared to be over a 2–4 weeks period with small effect size, after which there was there were no differences. Hence, considering to add hip abductor exercises in the treatment protocol should be based on the patients and doctors perspective.[39]

Elizabeth A. Sled et aldid a study on Hip Abductor Muscle Strengthening In Persons with Knee OA: Effect on Knee Joint Loading During Gait and concluded that8 week home program of hip abductor muscle strengthening did not reduce knee joint loading, but improved function , in a group of participants with medial knee OA.[40]

METHODOLOGY AND METHODS

Sample Size: 30 osteoarthritis patient between 50 to 65 years of age group participate in thestudy. They will randomly divided into 2 groups. Group A (Experimental Group) and Group B (Experimental Group) with each group having 15. The confidence level 95% and confidence interval 5% will be used to calculate the sample size. Dehradun Census (Uttarakhand) population (6797970 in 2018) was included (census and sample survey, Dehradun 2018). This formula will beused in this study. Simple random sampling technique will be used. Study

will be conducted at Department of Physiotherapy, Shri Mahant Indiresh Hospital Patel Nagar.

Study will be completed in 8 weeks. Sample selection: Consist of inclusion and exclusion criteria: Inclusion Criteria Age Group 60-65 years. Both sex, Experienced symptoms for atleast 4 weeks or more. Exclusion Criteria-Recent Traumatic Injury, Recent Knee Fracture, Recent injury to hip, Past surgery, Lower Limb Deformity, Scoliosis. Variables of the study: The independent variables areQuadriceps Isometric, Vastus Medialis Oblique Strengthening, Gluteus Medius Strengthening Quadriceps Isometric Vastus Medialis Oblique Strengthening Hip Abductor Gluteus Medius Strengthening Dependent Variables are Pain, Incorrect Q angleMuscle Srength. Outcome Measurement womac. Materials Used Goniometer Towel, roll, Pen, PillowSocks, Data Collection sheet.

PROCEDURE

30 patients between the age group of 50-65 years were included in the study after taking a written consent from either the patient or their relative. Patient were made aware of the research and the procedure to be followed. Patient were divided into two groups. Each group consist of patients of both the gender. Group A received VMO strengthening with Quadriceps Isometric Exercise and Group B received VMO strengthening with Gluteus strengthening exercise. Both groups had received the rehabilitative exercise program to normalize Q-angle in Knee Osteoarthritis. The study was 8 weeks 6 days per week at department of Ortho in Shri Mahant ndresh Hospital, physiotherapy OPD. Examination included assessment which was performed on first and last day of treatment and data was recorded Group A-VMO strengthening exercise with quadriceps isometric exercise VMO strengthening Exercise.

Patients were instructed to lie in supine position with extended knee. Patients were instructed to rotate their leg laterally. Maintain the position for 10 seconds and then slowly lower the leg down. Relax and repeat the procedure for 10 times. Quadriceps Isometric Exercise: Patient is in supine position with extended knee. Arolled towel was placed under the knee. Next the patient was instructed to press thetowel hold iot for about 10 seconds and then relax. The procedure was repeated 10 times (Fig. 1)

Fig. 1: Patient Performing Quadriceps Isometric Exe

Group B: VMO strengthening Exercise with Gluteus Medius Strengthening Exercise VMO Strengthening Exercise. VMO strengthening exercise through squat with isometric hip adduction. (Fig. 2)

Fig. 2: Patient Performing VMO strengthening Exercise

Gluteus Medius Strengthening Exercise - Lie on one side with with bottom leg bent to 45 degree and the top leg straight. Stack the hips and shoulders directly on top of one another. There is a strong tendency to roll the hips forward or back here engage the gluteus medius to lift the upper leg to wards the ceiling: squeeze and hold the top position and then slowly lower the leg (Fig. 3).

Fig. 3: Patient Performing Gluteus Medius Strengthening

RESULT

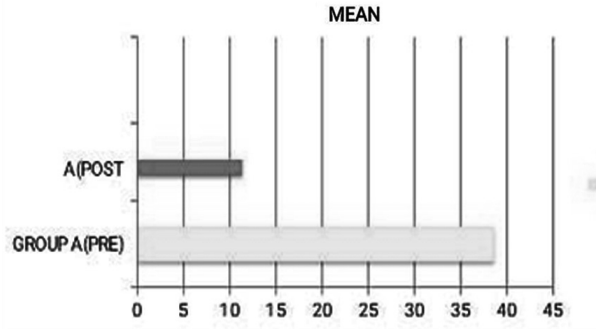
The chapter deals with result of data analysis of data ofone outcome measure that is WOMAC within

group A and Group B. The score were analyzed and interpreted and interpreted to determine which intervention is more effective in normalizing Q-angle in patiernts with knee osteoarthritis.

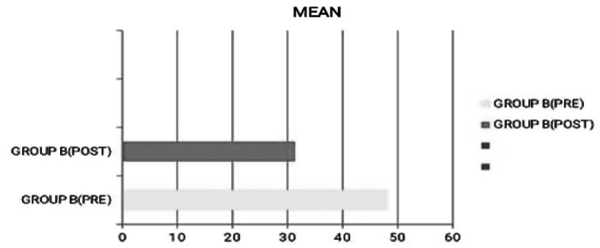
The data were analyzed using statistical software SPSS 15 version. To analyze the difference in the Womac scale between Group-A and Group-B, paired t-test was used. The p values <0.0001 in both the groups showing extremely significant but the Womac score in Group A is more effective as compared to Group B .(Table1)

Table 1: Mean Difference in Womac Score between Group A & Group B

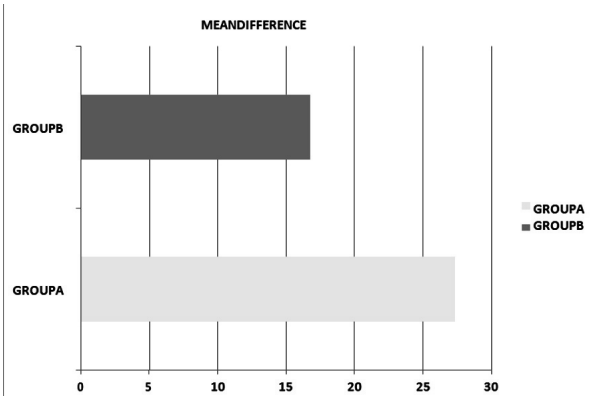
Difference in Womac Score	Group A	Group B
Mean	27.66	16.73
SD	2.79	5.81
t value	37.86	11.15
P value	<o.ooo1	<0.0001



Graph 1: Comparing mean pre and post of Group A



Graph 2: Comparingmean pre and post of



Graph 3: Comparingme and ifference of Group A and Group B

Osteoarthritis (OA) is a common disease associated with significant morbidity. This is particularly apparent at the knee joint, one of the commonest sites to be affected. As prevalence of OA increases with age and aging is associated with decreasing physiological function, the combination has major health implications. Symptoms cannot, however, be predicted merely by the degree of structural damage. The quadriceps weakness commonly associated with osteoarthritis of the knee is widely believed to result from disuse atrophy secondary to pain in the involved joint. Osteoarthritis is degenerative joint disease. Commonly it is thought to be wear and tearof joints as one ages. Two types of OA are recognized primary and secondary.

Primary OA: It occurs in old age mainly in the weight bearing joints.

Secondary OA: In this type ,there is an underlying primary disease of the joint which leads to degeneration of the joint.

The Q angle have shown to be increased in the OA knee, possibly as the degeneration progresses and more pain and immobility could be aggravating factor. The Q angle of knee is measurement of the angle between quadriceps muscle and Patella tendon and it provides useful information about the alignment of knee joint. It is likely to be influenced by the muscle strength of varying group of muscles that alter the mechanics of knee other that Quadriceps alone. Gluteus Medius weakness is very common among people above age 50 and more evident with obesity indicating the mechanics change inthe knee joint too.

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is widely used in the evaluation of Hip and Knee Osteoarthritis. It is a self-administered questionnaire consisting of 24 items divided into 3 subscales.

Pain (5 items): During walking, using stairs, in bed, sitting or lying, and standingupright.

Stiffness (2 items): After first waking and later in the day

Physical Function (17 items): Using stairs, rising from sitting, standing, bending,walking, getting in / out of a car, shopping, putting on / taking off socks, risingfrom bed, lying in bed, getting in / out of bath, sitting, getting on / off toilet, heavy domestic duties, light domestic duties WOMAC Index was developed in 1982 at Western Ontario and McMaster Universities.

Area of assessment of WOMAC are activities of daily living, functional mobility, gaitgeneral health,

quality of life.

The WOMAC takes approximately 12 minutes to complete.

The test questions are scored on a scale of 0-4 , which correspond to:

None (0), Mild (1), Moderate (2), Severe (3), and Extreme (4) The scores for each subscale are summed up, with a possible score range of 0-20 for Pain, 0-8 for Stiffness, and 0-68 for physical function High scores on the WOMAC indicate worse pain, stiffness, and functional limitations. The WOMAC Index has been used extensively in clinical trials.

WOMAC Index can be a useful screening tool for people at risk for Osteoarthritis andwill help in identifying the disease early.

Isometrics quadriceps exercise strengthen the quads by contracting the muscle.

Vastus Medialis Oblique Strengthening is important in knee rehabilitation as it helpscontrol the position of patella Gluteus Medius weakness cause knee pain. Gluteus Medius is weak in patients with knee osteoarthritis. Gluteus Medius weakness is very common among people above age 50 and more evident with obesity indicating the mechanics change in the knee joint too.

Strengthening gluteus medius helps in reducing knee pain in patients with knee osteoarthritis.

VMO strengthening with quadriceps isometrics along with stretching is more effective according to WOMAC.

Supported by Santhi Venkatapathy et al there is significant change in post interventionin group a p value is less than less than 0.05 which approved that VMO strengthening with quadriceps isometrics along with stretching is more effective according to WOMAC.

The improvement was seen after 8 weeks but continued improvement was not found. The group B show non significant result of $P > 0.05$. In this group VMO with gluteus medius strengthening was given to the patient and shows non significant result after 8 weeks when compared to pre-intervention score this states that VMO strengthening with gluteus medius strengthening are not sufficient outcome clinically this study demonstrated that VMO strengthening with Quadriceps isometrics with stretching as treatment tool improvement was seen in normalizing Qangle in Ostearthritis.

Limitation of Study

The duration of study was only 8 weeks so further progressive long term benefit couldnot be recorded whom exercise was prescribed to the patient.

Proper follow up would not be done due to Covid-19

Future of Study

Study can be done on larger population. Further study can be done to check to comparethe effect of VMO strengthening with quadriceps isometric exercise versus VMO strengthening with Gluteus Medius strengthening exercise to normalize Q-angle in patients with knee osteoarthritis.

The exact mechanism of incorrect Q - angle in knee osteoarthritis and the muscle weakness affecting Q - angle in knee osteoarthritis can be studied in more detail.

The duration of the study can be increased further studies are recommended to minimize these limitation in search way that larger sample size that included various age group of people are studied. Various outcome measure can be used to record the pain.

CONCLUSION

The study provided evidence to support the use of VMO strengthening exercise with quadriceps isometric and VMO strengthening with gluteus medius strengthening exercise to normalize Q-angle in patients with knee osteoarthritis.

In conclusionVMO strengthening exercise with quadriceps isometrics was found to beeffective in normalizing Q-angle in patients with knee osteoarthritis.

When VMO strengthening exercise and quadriceps isometrics exercise is administered to patients suffering from knee osteoarthritis with affected Q-angle over a period of 8weeks it result in normalizing Q-angle in patients with knee Osteoarthritis.

REFERENCES

1. Kelgren JH, Lawrence JS, Osteoarthrosis and disk degeneration in an urban population. Ann Rheum Dis 1958 ; 388-96
2. Anna Latwice et al Epidemiology and Burden of Osteoarthritis.
3. Dr.Dany Tong, October 23 2010 Higher Q-angle in women increases chances of having knee pain.
4. Shahnaz Anwar Ahmed 2014 26:745-748 A