

To Study the Effect of Quadriceps Strengthening Versus Hamstring Strengthening in Patients with Osteoarthritis of Knee

Shrushti P Jachak^a, Tamanna Nurai^b, Subrat Samal^c, Ashish W. Bele^d, Shiril Nagarkar^e

^aStudent, Ravi Nair Physiotherapy College, Sawangi (M), Wardha 442001, Maharashtra, India.

^bStudent, Ravi Nair Physiotherapy College, Sawangi (M), Wardha 442001, Maharashtra, India.

^cAssociate Professor, Ravi Nair Physiotherapy College, Sawangi (M), Wardha 442001, Maharashtra, India.

^dAssociate Professor, Ravi Nair Physiotherapy College, Sawangi (M), Wardha 442001, Maharashtra, India.

^eAssociate Professor, Ravi Nair Physiotherapy College, Sawangi (M), Wardha 442001, Maharashtra, India.

Abstract

Background: Osteoarthritis (OA) is a chronic degenerative disease affecting major joints of the body specially weight bearing joints. Quadriceps and Hamstrings are the major group of muscles which are affected by OA knee. **Aim & Objective:** To compare the Quadriceps strengthening versus Hamstrings strengthening. **Methodology:** A total of 100 subjects was screened as per inclusion criteria and exclusion criteria and were taken for the study. The subjects were divided into 2 groups, Group A-Quadriceps received Quadriceps strengthening exercises and Group B-Hamstring received Hamstring strengthening exercises along with conventional treatment respectively. Treatment session was done 5 days a week for 6 weeks for 30-45 minutes. Pre and post evaluation was done on the basis of NPRS scale, MMT grading. **Results:** Subject shows improvement in pain and in strength for 6 weeks of exercise. Post intervention, the NPRS and MMT score of both groups improved but Group A improved more significantly than Group B. The level of significance was set at $P < 0.05$. **Conclusion:** Quadriceps strengthening is more effective than Hamstring Strengthening.

KEYWORDS- Osteoarthritis, Quadriceps strengthening, Hamstring Strengthening.

INTRODUCTION:

Osteoarthritis (OA) is a chronic degenerative disease affecting major joints of the body specially weight bearing joints for example knee, one third of adults and presenting a tendency to increase with age. OA knee can be associated with symptoms of pain, instability, reduction of range of motion (ROM) and consequently, deterioration in quality of life and function. This functional limitation results in an increase of the risk of increase in disability which leads to impairment of day-to-day ability.

Various studies reported that patients with knee OA present less quadriceps muscle strength. As the quadriceps muscle plays the role of shock absorber, a weakness of this muscle decreases the joint protection, resulting in greater stress and

overload on the knee. Quadriceps strengthening exercises performed over eight weeks proved just as effective in function improvement as the use of non-hormonal anti-inflammatory drugs in patients with OA of the knee. Moreover, moderate-intensity exercises showed themselves to be a good form of treatment not only for the improvement of symptoms, but also in the increase of the glycosaminoglycan content.

The researchers verified that these have a beneficial effect on pain and function. However, there was accentuated variability in terms of the type of exercise evaluated and particularly in relation to the methodological aspects. Besides the physical benefits, the exercises also had a beneficial effect on the mental health of patients with knee OA.

In normal gait agonist and antagonist muscle pairs at each lower extremity joint contract in an alternating pattern with low levels of concurrent activity between the main activation bursts. In the intact knee joint, activation of the agonist quadriceps muscle generates an anterior shear force on the tibia relative to the femur and activation of the antagonistic hamstring muscle group counteracts this force, producing joint stability. When the quadriceps is activated to generate power in activities of daily living (ADLs), central command concurrently also activates the hamstrings and spinal reflexes, including reciprocal inhibition, modulate the amount of coactivity.

Knee OA is usually managed in primary care with analgesics and non-pharmacological options, such as exercise. Exercise has been shown to improve function, strength, walking speed, and self-efficacy and to reduce pain and the risk of other chronic conditions. Progression of the disease is also prevented or retarded by physical and occupational therapy and exercise programs.

OBJECTIVES/RATIONAL:

The Need of the study/rational is to evaluate balance in Elderly population.

OBJECTIVE: -

- To study the effect of quadriceps strengthening and hamstring strengthening in patients with osteoarthritis of knee.
- To test the efficacy of hamstring strengthening in patients with osteoarthritis of knee.
- To compare the effect of quadriceps strengthening and hamstrings strengthening versus quadriceps strengthening in patients with osteoarthritis of knee.

METHODOLOGY:

The institution ethics committee clearance will be obtained. 100 participants will be selected randomly from Ravi Nair physiotherapy college, AVBRH as per the inclusion and exclusion criteria. The informed consent will be obtained. The participants will be explained about the type of study in their own language. They will be explained about the exercises. Understanding of the exercises is essential as this may affect the outcome. They will be provided with Numerical pain rating scale.

Sampling technique: Simple random sampling technique.

Study setting: Physiotherapy, Out Patient Department (OPD), Ravi Nair

Physiotherapy College (RNPC), Acharya VinobaBhave Rural Hospital (AVBRH) Sawangi (M) Wardha.

Sample size: 100

Study duration: One Year

Inclusion Criteria:

- Patients who willing to participate in the study
- Patients with unilateral and bilateral involvement.
- Patients with pain in and around knee.
- Age of subject is 40-70yr.
- Both males/females are included.

Exclusion Criteria:

- Patients with any deformity of knee, hip and back.
- Patients who had any central or peripheral nervous system involvement.
- Patients who had received steroids injections 5 months previous.

Materials:

- Numerical pain rating scale
- Data analysis was done by using descriptive and inferential statistics using chi-square test and software used in the analysis were SPSS 22.0 version and GraphPad Prism 6.0 version and $p < 0.05$ is considered as level of sig

RESULTS:

- Comparison of NPRS score at pre and posttest for quadriceps- Mean NPRS score at pretest was 6.40 ± 1.14 and at posttest it was 2.90 ± 0.67 . By using student's paired t test statistically significant improvement was found in NPRS score at pre and posttest for quadriceps ($t=27.92, p=0.0001$).

- Comparison of NPRS score at pre and posttest for hamstring- Mean NPRS score at pretest was 6.18 ± 1.18 and at posttest it was 3.22 ± 0.78 . By using student's paired t test statistically significant improvement was found in NPRS score at pre and posttest for hamstring ($t=23.79, p=0.0001$).

- Comparison of MMT score at pre and posttest for quadriceps- Maximum 3 MMT score was found at pretest in 36% of the patients and at posttest maximum in 32% of the patients MMT score of 4- was present. By using chi-square test statistically significant difference was found in MMT score between pre and posttest (χ^2 -value=103.10, $p=0.0001$).

- Comparison of MMT score at pre and posttest for hamstring- Maximum 3 MMT score was found at pretest in 28% of the patients and at posttest maximum in 40% of the patients MMT score of 3+ was present. By using chi-square test statistically significant difference was found in MMT score between pre and posttest (χ^2 -value=38.33, $p=0.0001$).

DISCUSSION:

Results shows decrease in pain after treatment within group A and Group B after treatment as compared to pre-treatment. Wen-Dien Chang Hungr review article shows that although quadriceps exercises are more effective in OA knee but hamstring strengthening also plays important role in treating patients with OA knee and it is also a challenging task for the physiotherapist. In our study we have found that both of these

exercises are effective in reducing pain and improving functional activity but quadriceps strengthening is more effective in improving the quality of life reducing pain in patients with OA knee and they have an drastic result in reducing pain on VAS and disability.. Lederman in his study stated that lower extremity strength training program has an positive effect on reducing knee pain. Hkim studied 33 patients and found that quadriceps exercise along with core muscle exercise had a positive effect on Degenerative disc disease patients in reducing pain and disability, preventing atrophy of lower extremity muscles.

The main finding in this study was that hamstring muscle coactivity during ADLs was greater in OA subjects compared with age- and gender-matched healthy adults and young adults. We also found that subjects with knee OA performed ADLs with a substantially higher relative EMG activation of the quadriceps muscle than control subjects. Thus, a new finding was that subjects with knee OA execute ADLs with an altered muscle activation pattern compared with healthy adults.

Muscle plays a major role in the structure and function of joints as evidenced by disuse atrophy of the quadriceps femoris muscle that accompanies knee joint pain. Weakness of the quadriceps muscle has been noted by the American Academy of Orthopaedic Surgeons as a risk factor of structural damage to the knee joint.

Quadriceps weakness is associated with disability in subjects with knee pain. As the quadriceps mechanism is of key importance in walking, standing, and using stairs, muscle weakness may be direct cause of impaired function. It may also explain the large increase in odds of disability for those with particularly weak muscles. The association of quadriceps strength with pain and disability in the community has been confirmed.

OA knee affects the hamstring muscle more than the quadriceps muscle. Therefore, there is a need for physiotherapists who have hitherto concentrated almost exclusively on quadriceps strengthening in OA patients to include hamstring strengthening in their management protocol. The ratio of quadriceps to hamstring muscle strength is important for the stability of the knee and for protection from excessive stress.

In the present study, we found that there were significance differences between pre and post intervention measures in both groups. In pain assessed by VAS, muscle strengths.

Conclusion:

In our study it has been found that both treatment protocols has been proved effective in reducing pain and thus improving functional activity and quality life but quadriceps strength training program is more effective as compared to hamstring group.

Reference:

1. Guccione AA, Felson DT, Anderson JJ, et al. : The effects of specific medical conditions on the functional limitations of elders in the Framingham Study. *Am J Public Health*, 1994, 84: 351
2. Burckhardt CS: Chronic pain. *NursClin North Am*, 1990, 25: 863–870
3. Sharma MK, Swami HM, Bhatia V, et al. : An epidemiological study of correlates osteoarthritis in geriatric population of UT Chandigarh. *Indian J Community Med*,

2007, 32: 77–78

4. Murray CJ, Lopez AD: The global burden of disease. Geneva: World Health Organization, 1997
5. Slemenda C, Brandt KD, Heilman DK, et al. : Quadriceps weakness and osteoarthritis of the knee. *Ann Intern Med*, 1997, 127: 97–104
6. Hurley MV, Scott DL, Rees J, et al. : Sensorimotor changes and functional performance in patients with knee osteoarthritis. *Ann Rheum Dis*, 1997, 56: 641–648
7. McAlindon TE, Cooper C, Kirwan JR, et al. : Determinants of disability in osteoarthritis of the knee. *Ann Rheum Dis*, 1993, 52: 258–262 [8. Minor MA: Exercise in the treatment of osteoarthritis. *Rheum Dis Clin North Am*, 1999, 25: 397–415,]
8. Hassan BS, Mockett S, Doherty M: Static postural sway, proprioception, and maximal voluntary quadriceps contraction in patients with knee osteoarthritis and normal control subjects. *Ann Rheum Dis*, 2001, 60: 612–618[
9. Jayson MI, Dixon AS: Intra-articular pressure in rheumatoid arthritis of the knee. 3. Pressure changes during joint use. *Ann Rheum Dis*, 1970, 29: 401–408. [Medline] [CrossRef]
10. Norden DK, Leventhal A, Schumacher RH: Prescribing exercise for OA of the knee. *J Musculoskelet Med*, 1994, 11: 14–21.
11. Zhang W, Moskowitz RW, Nuki G, et al. : OARSI recommendations for the management of hip and knee osteoarthritis, part I: critical appraisal of existing treatment guidelines and systematic review of current research evidence. *Osteoarthritis Cartilage*, 2007, 15: 981–1000
12. Scott DL, Shiple M, Dawson A, et al.: The clinical management of rheumatoid arthritis and osteoarthritis: strategies for improving clinical effectiveness. *Br J Rheumatol*, 1998, 37: 546–554. [Medline] [CrossRef]
13. Lane NE, Thompson JM: Management of osteoarthritis in the primary care setting: an evidence-based approach to treatment. *Am J Med*, 1997, 103: 25S–30S. [Medline] [CrossRef]
14. Foster NE, Thomas E, Barlas P, et al.: Acupuncture as an adjunct to exercise based physiotherapy for osteoarthritis of the knee: randomised controlled trial. *BMJ*, 2007, 335: 436. [Medline] [CrossRef]
15. Holden MA, Nicholls EE, Hay EM, et al.: Physical therapists' use of therapeutic exercise for patients with clinical knee osteoarthritis in the United Kingdom: in line with current recommendations? *Phys Ther*, 2008, 88: 1109–1121. [Medline] [CrossRef]
16. Van Baar ME, Assendelft WJ, Dekker J, et al.: Effectiveness of exercise therapy in patients with osteoarthritis of the hip or knee: a systematic review of randomized clinical trials. *Arthritis Rheum*, 1999, 42: 1361–1369. [Medline] [CrossRef]

17. Iorio R, Healy WL: Unicompartmental arthritis of the knee. *J Bone Joint Surg Am*, 2003, 85-A: 1351–1364. [Medline]
18. Zhang W, Moskowitz RW, Nuki G, et al. : OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis Cartilage*, 2008, 16: 137–162]
19. Jayson MI, Dixon AS: Intra-articular pressure in rheumatoid arthritis of the knee. 3. Pressure changes during joint use. *Ann Rheum Dis*, 1970, 29: 401–13. Norden DK, Leventhal A, Schumacher RH: Prescribing exercise for OA of the knee. *J Musculoskelet Med*, 1994, 11: 14–21
20. Gallasch CH, Alexandre NM: The measurement of musculoskeletal pain intensity: a comparison of four methods. *Rev Gaucha Enferm*, 2007, 28: 260–265.