A Comparative Study to Evaluate the Effect of Blood Flow Restriction Therapy and Retro Walking on Pain, Strength of Muscles and WOMAC Score in Patients of Osteoarthritis of Knee

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Abstract

Background - Osteoarthritis of knee being one of the major causes for disability in older population. Due to sedentary lifestyle this disease is becoming common in younger population as well. As prevalence of the disease is increasing it is a need of the hour to come up with a highly reliable exercise protocol which will be beneficial for the patients. This research aims to establish a beneficial and reliable exercise protocol which can be well tolerated by the patients suffering from osteoarthritis of knee.

Methods – 150 subjects will be selected. Randomly they will be assigned to two groups that is Group A and Group B using chit method. Group A will receive Blood Flow Restriction Training and Group B will receive retro walking training. Training will continue for 15 days. After 15 days patient will be reassessed for pain, strength and WOMAC score.

Result – Studies have proved that Blood Flow Restriction Therapy and retro walking both the intervention are beneficial in patients of osteoarthritis to reduce pain, improve strength and WOMAC score. This study will provide us an intervention which is beneficial in treating osteoarthritis and is well tolerated by the patients. We may get a result where blood flow restriction would have a better impact on few outcome measures while retro walking may fetch better impact on other outcome measures. We may also conclude that combination of both the interventions is a better option for the treatment of osteoarthritis patients.

Keywords – Knee osteoarthritis, Blood Flow Restriction Therapy, Retro walking, WOMAC score

Introduction

Osteoarthritis is a degenerative disease of joints. It causes wear and tear of joints as one ages. The structures which are affected are the bones, the cartilage and the synovium. Knee and hip being the weight bearing joints are susceptible to degenerative changes that interfere with physical activities and quality of life. Knee OA is the major source of pain and impairment in elderly population. Thirty three percent of individuals aged between 63 and 94 years suffer from knee OA which restricts their ability to stand, walk and climb stairs. In the population aged 60 years and above the occurrence rate of knee OA is 10% in males and 13% in females among.¹

Osteoarthritis is a degenerative disease which is progressive in nature. This disease occurs mostly in weight bearing joints of lower limb. Pain is the earliest symptom which may be dull aching initially but may
become worse and consistent in later stages of the disease. Swelling is also a common complaint associated with the disease. Pain and muscle spasm initially cause stiffness but later capsular contracture and incongruity of joint surface sets in. Decreased flexibility of muscles reduces the joint range of motion and thus contributes to increase in the stiffness of the joint. Physiotherapy is very beneficial treatment and provides symptomatic relief to patients of osteoarthritis of knee. Research also prove that some recent advances like blood flow restriction therapy and retro walking may be beneficial to the patients if added to their rehabilitation protocol.1

Blood flow restriction (BFR) exercise requires only mildly regulating arterial inflow and allowing relaxing (or “slowing”) of venous outflow at the top of the arms or legs while training either very low-weight arm, leg or core muscles with good reproducibility to failure. Venous blood flow restraint is accomplished by applying an inflatable collar or brace to the extremity being exercised. The band must be tight enough to minimize normal venous transfer to the heart whereas remaining loose enough to facilitate arterial passage. BFR enables you dramatically improve muscle and strength by using as little as 20 to 30 percent of your maximum weight in one repetition (1 RM) as opposed to traditional strength training using 70 to 85 percent of your 1 RM. Alternatively one may contract the muscles with the BFR bands and move them very steadily on for those who can’t or don’t want to use weights.2

BFR makes use of lighter weight than Traditional strength training, and continuing to make it much widely available to variety of individuals including the elderly and disabled or injured patients. This intervention is indeed a vigorous training, as during the first set type I moderate jerk muscle fiber become exhausted, Therefore Type II moderate muscle jerk fibers are used as the exercise progresses, which is certainly known for many of the BFR ‘s physiological benefits.2

Retro-walking is protected shut dynamic chain practice as it decreases the compressive powers at the patellofemoral joint. During Retro-walking quadriceps flighty capacity is diminished, while the isometric and concentric quadriceps quality is protected. Retro-strolling preparing programs are known to expand quadriceps quality. Additionally, during retro walking cardiopulmonary interest is higher when contrasted with forward-walking. Henceforth, such advantages make backward walking a protected and viable segment of recovery schedule for patients of knee osteoarthritis.3

Methods/Design

Aim- To assess the impact of blood flow restriction and retro walking in knee osteoarthritis subjects.

Study Design

This study will be conducted in musculoskeletal sciences division, RNPC Sawangi, Wardha after endorsement from institutional ethic advisory group of DMIMS, deemed to be university. Before including all the participants will be told about the aim and procedure of the research. All the participants who meet inclusion criteria must give written consent. All the 150 participants diagnosed with osteoarthritis will be allocated to group A or Group B randomly by chit method and will be enrolled for the study for two weeks.

Participants

Inclusion Criteria

150 men and women of the age group 50 to 70 years will participate in the study. All the participants should be diagnosed patients of OA knee depending on the American College of Rheumatology criteria (unilateral or bilateral).3 They must have symptomatic knee OA and must be graded from 1 -3 on Kellengren and Lawrence scale.3,4

Exclusion Criteria

Participants undergone any knee surgery to either knee inside recent months,3 any sort of foundational ligament condition, some other solid, joint or neurological condition influencing capacity of lower appendage, experienced active recuperation treatment or taken intra-articular joint injections for knee joint for last previous three months will be excluded.3 Also participants with fringe vascular illness, systolic pulse more prominent than 160 or under 100 mm Hg, diastolic circulatory strain more noteworthy than 100 mm Hg, profound vein apoplexy, previous myocardial localized necrosis, paralysis in the earlier year, or previous malignant growth which created confinements for work out will be excluded to avoid further complications.4,5
**SAMPLE SIZE CONSIDERATION**

Total 150 participants will be included in the study. Formula which was used to calculate the sample size was simple sample size calculation formula. Article of reference used was osteoarthritis in India: an epidemiologic aspect which was published in International journal of resent scientific research in October 2017. Participants will be randomly classified into two groups by chit method.

**INTERVENTION DESIGN**

**Group A – Blood flow restriction therapy**

All the participants will undergo 5 mins of warm up session followed by conventional physiotherapy exercises. Then patient will undergo strength training using blood flow restriction therapy, followed by a 5 mins of cool down session.\(^4\)

- Warm up session - 1. Ankle toe movements
  2. Heel slides

- Conventional physiotherapy exercises - 3. Static quadriceps (10 sec holds with 10 repetitions)
  4. Active hip movements (10 repetitions of each)

- Strength training session - In the blood flow restriction therapy, resistance exercises will be done at twenty per cent of 1RM with external pressure on each leg’s upper thigh. \(^4\)

  Exercises which will be performed\(^5\) – 1. Dynamic quads

  2. Hamstring curls

  In each set counts of reps will be as follows \(^2\)

  In first sitting = 30 reps with rest of 20 seconds
  In second sitting = 20-30 reps with rest of 20 seconds
  In third sitting = 10-20 reps with rest of 20 seconds

  Pressure of the cuff is set according to \([\text{pressure} = 0.5 \text{ (systolic blood pressure)} + 2 (\text{thigh circumference}) + 5]^{6}\)

  Cool down session – 1. Hamstring stretching
  2. Calf stretching
  3. Heel raises

**Group B – Retro walking**

All the participants will undergo 5 mins of warm up session followed by conventional physiotherapy exercises. Then patient will undergo 10 mins of retro walking session, followed by a 5 mins of cool down session. \(^3\)

- Warm up session – 1. Ankle toe movements
  2. Heel slides

- Conventional physiotherapy exercises - 3. Static quadriceps (10 sec holds with 10 repetitions)
  4. Active hip movement (10 repetitions of each)

- Strength training session -1. 10 mins of retro walking \(^3\)

  Cool down session - 1. Hamstring stretching
  2. Calf stretch
  3. Heel raises

**Outcome Measures**

1) **Numerical pain rating scale** – it is a 10-point scale which is used to measure pain where 0 signifies no pain and 10 signifies maximum pain. This scale has Excellent test-reliability with interclass association element of 0.95.\(^7\)

2) **Modified sphygmomanometer to measure strength of muscles** – it will be used for calculating knee muscle strength. The Modified Sphygmomanometer Scale (MST) is an effective tool for intensity calculation, because it is inexpensive and provides objective values to measure the strength of knee muscles.\(^8\)

3) **WOMAC scale for functional activities** – it is a 24-point scale which is used to rate day to day activities of person. Score out of 96 points will be calculated and depending on that the disability will be judged. One of the most commonly employed tests to test clinically
significant improvements in KOA patients is the Western Ontario McMaster Universities Osteoarthritis Index (WOMAC). This contains three subscales that assess rigidity, pain and work. Substantial pain problems reflect a specific mechanical joint load and by recognizing behaviors with early signs, this can suggest when organized pain happens first and therefore whose operation is correlated with the initiation of pain.9

**Statistical Analysis**

Data will be coded and entered in MS excel worksheet and analyzed using appropriate statistical software.

**Discussion**

The study is aimed at assessing the impact of blood flow restriction and retro walking in subjects of osteoarthritis of knee. A recent study proved that retro walking plays a big role in increasing extension moment, improvising strength in functional range with improving physical function10. A study conducted in 2017 proved that as compared with normal quadriceps strengthening, low load with BFR produced pain reduction to a greater extend with improvement in daily living activities at 8 weeks in people with patella femoral Pain11. Hence we can see that earlier studies have proved that both these interventions are beneficial in pain reduction and improvement of strength and WOMAC score. But amongst the two which one is better and well tolerated by the patients is not known. Hence aim of this research is to find out that which intervention amongst the two will be beneficial for the patients of osteoarthritis of knee.

To conclude we aim to find out effect of Blood Flow Restriction Therapy and Retro Walking on pain, strength and WOMAC score. Hence which intervention is more beneficial on these outcome measures is to be analyzed.

**Result**

This study will help us to find a better intervention amongst the two intervention. We may come to result where we may find that for some outcome measures blood flow therapy may provide better results and for others retro walking may be a better option.

**Research Ethics Approval:**

The trial will be performed in accordance with the Declaration of Helsinki.

**Confidentiality:**

Specific patient’s information will be kept separate from the central dataset, and will not be exchanged. All personal data will be stored securely before, during and after the court to preserve the confidentiality.

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