



Effect of Contrast application with exercises on Early OA in middle aged population

“Hot and cold therapies with progressive exercises as Preventive measure “

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Abstract

Knee joint is the most important weight bearing joint of human body and most prevalent to undergo daily wear and tear with uneven lifestyle and as normal ageing process . Physiotherapy department witnesses on an average of 20% of knee Arthritis patients on an average among total Out patient department patients. Osteoarthritis being the commonest cause of discomfort in knee joint (25).

Aim of study : This study aims to design an easy and budget friendly approach as part of Preventive and curative measure of Knee Osteoarthritis which should be affordable and approachable to maximum population at ease.

Methodology: Total 70 participants were shortlisted between age group of 40-60 years with acute knee pain of less than 6 months with treatment strategy including use of Contrast technique (Cold pack and hot pack) followed by series of Range of motion exercises, Knee stretching exercises and knee strengthening exercises over a period of 6 weeks under observation . WOMAC index was used to measure level of pain, stiffness and quality of movement at interval of 2 , 4 and 6 weeks.

Results: Contrast techniques helped in relieving pain and stiffness while Series of guided exercises helped in gaining knee strength which resulted in improved performance and reduced complaints . Spss software was used to analyze data which gave $p < 0.001$ which significantly supported study where as $F = 579.620$ which again gave strong support to study parameters.

Key words: Knee Osteoarthritis, Contrast techniques, Physiotherapy management of knee pain, Knee joint Exercises.

Introduction

Knee joint is important weight bearing joint of human body . It is a complex joint structure comprised of three different compartments viz patellofemoral joint , medial femorotibial compartment and lateral femorotibial compartment made of combination of four bones being strong Femur, firm tibia, sleek fibula and cute little patella hence known as knee joint complex.

It is also most commonly affected joint with pain and stiffness with uncountable reasons ranging from injury to ageing issues starting at any age. Aging related changes being common between 40-60 years and more prevailing in females as compared to males(7)

Osteoarthritis may be defined as a condition of synovial joints characterized by focal loss of articular hyaline cartilage with proliferation of new bone and remodelling of joint contour. Commonest feature being inflammation of associated tissues preferentially targets the weight bearing joint mainly knee & hip. There is no single cause of OA; it results from a disparity between the stress applied to the articular cartilage and the ability of the cartilage to withstand that stress. The initial or early OA treatment aimed at relieve of pain, restoration of joint movement and rest of the joint with the support of various different treatment strategies starting from medication to surgeries. For long term management full explanation of the nature of OA and advice and instruction on appropriate exercise program is essential. Reduction of any adverse mechanical factors – these includes weight loss if obese,

increasing joint space using traction, shock-absorbing footwear, use of walking stick or walker are suggested. (6) People usually experience pain after long periods of rest, during walk, during stair climbing which progresses gradually towards stiffness and limited mobility with age from early to chronic Osteoarthritis changes(1). Osteoarthritis physiologically includes change in joint surface with minor to major Bony spikes and damage to cartilage resulting in reduction of joint space and wearing and tearing of joint(25). Pain during mobility becomes the trigger which Forces Patients to visit Expert. Underlying pathophysiology behind this Pain Presentation includes reduction in joint space due to osteophytes and damaged cartilage one at a time or both.

Decreasing walking speed has been suggested as a mechanism used by individuals with knee pathologies to reduce loading and pain in the medial compartment of the knee(11)

Many studies have focused on understanding the pathophysiological mechanisms of OA in humans by histological examination of retrieved joint tissues from patients with OA or by employing cells, including chondrocytes or synovitis, isolated from tissues obtained from patients undergoing joint replacement, or by studying whole joint tissue in explant cultures.(24)

Physiotherapy finds various techniques aiming to relieve pain and discomfort. Physiotherapist works with Rest, various electrotherapeutic modalities, manipulation techniques, mobilization protocols and different exercise regimes which helps every patients differently. Few gets relief in few sittings whereas few lefts with pain for long duration that means there was no specific plan to help Osteoarthritis patients get quick and long lasting relief. This gap in Physiotherapy practices drives the urge to design a solution of this ongoing problem.

While dealing with such patients we tried to innovate some techniques which can help in reducing pain as soon as possible and at same time reduce chances of further joint damage with increasing joint space and strengthening of muscles. We focused on three different areas muscle spasm, reduced joint space and weakness and tightness of soft tissues supporting knee joint complex.

Contrast technique includes Alternate application of hot pack and cold pack in sequence to relieve muscle spasm and sequentially relieving pain which is main complaint of patients presenting in department (5). In order to relieve spasm and pain we applied hot pack and cold pack for specific duration within comfort of patient.

Later muscular rehabilitation was plan for prolonged benefits and it included stretching and strengthening techniques maintaining Range of motion of knee joint.

WOMAC index (Western Ontario and McMaster university Osteoarthritis assessment scale) was used to evaluate Level of pain, stiffness and mobility. Higher the score suggests worse situation and reduction in scores suggests reduction of symptoms and improvement in patients condition. Measurement were recorded in day 0, after 2 weeks, after 4 weeks and at end of 6 weeks to ensure efficacy of this innovative technique. Study was conducted on 70 patients and after 6 weeks of specific duration with regular intervention there was marked difference in level of pain and stiffness. It helped many patients in regaining pain free daily routine work starting from getting up in the morning, performing daily chores till getting back to bed with No or minimum pain and independence.

Physical therapy can help reduce the pain, swelling and stiffness of knee osteoarthritis and it can help improve knee joint function. The present review aimed at understanding various aspects of Knee Osteoarthritis and various physiotherapeutic treatments available for knee osteoarthritis. Study concluded that daily exercises are important in knee OA patients and beneficial for the improvement. Studies have shown that Skeletal joint traction improves the effectiveness of the treatment program in treating symptoms of knee OA and improves function in elderly people with knee OA whereas few studies are of the view that combined treatment Contrast techniques along with skeletal traction and regular exercises gives better results in Knee OA patients.(10)

Keywords: Osteoarthritis of knee, knee joint pain, skeletal traction of knee, strengthening exercises of knee, knee joint Rehabilitation, Contrast techniques in knee joint pain, stretching of knee joint

Review of literature:

Porth . C , M characterized knee OA with focal and progressive loss of joint cartilage along with underlying bony changes.

Md Moniruzzaman Khan et al emphasized on use of regular exercise for prolonged relief from symptoms of osteoarthritis.

Vincent .K, R et al told about associated vascular disturbances with other cartilage and bony changes in osteoarthritis.

Kumar.V, et al discussed about more pain and stiffness at knee joint in morning or after rest hours.

Buckland – Wright .C, told about instability and poor function of knee joint secondary to damage of soft tissues and bony tissues associated in and around knee joint.

Pallavi bhagat, Vaishali jagtap and Poovishnu devi T studied about significance of exercises of knee joint in their study on effect of circuit training in OA knee.

Abul kalam azad , Golam nabi et al told about improved fitness of Knee joint with strengthening exercises in osteoarthritis.

Taesung Ko , Sukmin Lee, Dongjin lee studied about increased muscle strength, improved functional performance and Proprioception with Exercises in OA knee

Otero M, Favero M, Dragomir C, et al studied about various trigger factors responsible for osteoarthritic changes in individuals.

Dr Manoj shukla and Dr Mukesh Goyal supported role of Physiotherapy in Knee Osteoarthritis treatment.

Favero M, Ramonda R, Goldring MB, et al. Studied about Early Osteoarthritis symptoms and explained two stages of pain One is related to activity and becomes more constant over time, which later becomes 'background pain' interspersed with unpredictable intense pain. Also they claimed radiographic evidence of OA as a late marker for the structural evolution of the disease.

Roddy E, Zhang W, Doherty, M, Arden NK, Barlow J, Birrell F, Carr A, et. Found Exercise is an effective and commonly prescribed intervention for lower limb osteoarthritis .

Jayanta nath studied about role of Physiotherapy in knee osteoarthritis focusing on strengthening of quadriceps muscle with various stimulation techniques

Shahnaz hasan researched about Quadriceps Femoris Strength Training emphasizing on effect of Neuromuscular Electrical Stimulation Vs Isometric Exercise in Osteoarthritis. She evaluated the effectiveness of the Neuromuscular Electrical stimulation as an add-on therapy with maximum voluntary isometric contraction exercise on the quantitative changes of the quadriceps strength, pain and functional outcomes in patients with Osteoarthritis.

Parisa nejati et al studied benefits of exercise on knee osteoarthritis in pain, disability, walking, stair climbing, and sit up speed after treatment and follow-ups with home programs when compared with their initial status and when compared with non-exercise group.

Objectives

1. To design cost effective Conservative and Easy-to-use treatment strategy for Early Osteoarthritis symptoms
2. To make Knee Arthritis rehabilitation Efficacious with Physiotherapy
3. To ensure long-term Pain free mobility of Patients diagnosed with Osteoarthritis at early stage.
4. To provide Patients with strong knee muscles so as to ensure prolonged Knee fitness.

Hypothesis:

- i. Whether contrast (cold packs and hot packs) reduces pain and stiffness in early osteoarthritis knee.
- ii. Whether strengthening exercises of knee help in reducing pain and stiffness in early osteoarthritis.

Methodology

This Experimental mixed type of research was conducted at Jyoti Physiotherapy clinic Guna . Patients who presented with problem of knee pain and stiffness were assessed properly to assure if they have symptoms of Early Osteoarthritis . There were explained about the procedure to ensure active participation and Monitoring done for 6 weeks to record the outcomes.

Assessment

WOMAC scale is used for assessment of pain , stiffness and physical function. Scores were recorded on day 0 (date of initial assessment) and repeated at planned intervals.

Sample selection :

Inclusion criteria:

1. Pain at knee joint with less than 6 months
2. Stiffness of knee joint with less than 6 months
3. Age between 40-60 years
4. Pain during walk
5. Pain after rest hours
6. Positive X-ray changes Suggestive of early OA changes

Exclusion criteria:

1. Pain at knee joint for more than 6 months
2. Stiffness of knee joint for more than 6 months
3. Any history of trauma
4. Any congenital anomalies (related to knee joint)
5. Any soft tissue injuries in and around knee joint
6. Rheumatoid arthritis
7. Other types of arthritis

8. Any associated neurological complaints
9. Osteoporosis
10. Vascular anomalies

Sample size:

A total of 70 patients are Selected as per Inclusion criteria including both male and female individuals during rehabilitation .

Area of study

This Experimental research was conducted in out patient department of Jyoti Physiotherapy clinic and Rehabilitation centre Guna MP as an independent study.

Selection criteria of techniques:

1. Contrast technique – Combination of hot pack and cold pack is know as Contrast technique. Cold pack was applied for 10 minutes – Duration of cold pack was kept as per comfort of patient and weather outside. Average duration was 10 minutes to allow vasoconstriction at local knee joint .Hot pack was applied for 15 minutes – For heating of knee joint followed by Cold pack moist heat packs were used for duration comfortable to patient. An average duration of 15 minutes was selected.
2. Exercises of knee joint
 - ROM exercises
 - Stretching exercises
 - Strengthening exercises

Material required:

1. Hot packs
2. Cold packs
3. WOMAC scale in print form
4. 1 kg weight cuffs
5. Couch

WOMAC scale:

WOMAC (Western Ontario and McMaster Universities Arthritis Index) scale is an easy and commonly used, self-administered questionnaire to assess pain, stiffness, and physical function in patients with hip or knee osteoarthritis. It uses 24 questions with score range from 0 (none) to 4 (extreme), where higher scores reflects more pain and discomfort and vice versa. It is effective and easy to understand among patients with ongoing treatment. It has questions / conditions for pain (5 items), stiffness (2 items), and physical function (17 items) with activities including walking, stairs, and bending. Total score being 96 which means worse pain . It is one of the most reliable and user friendly assessment tool used in epidemiologic and clinical research to measure the intensity or frequency of various symptoms. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective, it is self reported, easy to understand , apply and measure at same time . From various categories suggesting of none, mild, moderate and severe . It is used to record patients' pain progression, or compare pain severity between patients with similar conditions. WOMAC has been widely used in diverse adult populations for different conditions like Osteoarthritis, Rheumatoid arthritis, Post chemo and variety of medical and other conditions.

Procedure:

Patient was taken in department and counselled about technique. WOMAC test format was used to evaluate pain and stiffness before starting treatment to understand level of discomfort arthritis is causing. Patient was positioned comfortably and contrast technique was applied to provide relaxation and pain relief. Cold pack (ice pack) is applied at first for average of 7-10 minutes depending on patients acceptance and weather condition followed by application of hot packs (moist heat packs) for 12-15 minutes depending upon patients acceptance and weather conditions.

As part of treatment strategy selected Exercises will be introduced in following sequence

- I. General ROM exercise: for first two week progressing from one set of 10 repetition at first week to two set of 10 repetition in second week with each of following exercises:
 1. Toe flexion extension
 2. Ankle flexion extension
 3. knee flexion - extension in supine lying.
 4. Hip flexion (straight Leg raises) in supine lying
 5. Hip abduction adduction (leg In out) in supine lying
 6. Knee flexion- extension in sitting position at end of couch
 7. Knee flexion- extension in standing position.

8. Hip flexion extension in standing
9. Hip abduction in standing
10. Knee flexion extension in prone lying position.

At end of second week WOMAC scale rating is repeated to check level of pain, stiffness and physical function and recorded.

II. Stretching exercises to maintain muscle length for 2 weeks . One set of five repetition of each stretch with hold for 10 seconds each for third week gradually progressing to two set of five repetition of each stretch for 10 seconds hold. Stretching exercises includes:

1. Stretching of calf muscles in standing position
Technique: patient is asked to stand on toes with support and raise ankle for 10 counts and relax.
2. Stretching of Knee flexors (hamstring Stretch)
Technique : Patient is asked to straight up legs with support of wall to stretch hamstring .
3. Stretching of Knee extensors (quadriceps stretch)
Technique: Patient is asked to go on side lying and bend knee on top and take hip in extension to stretch quadriceps.
4. Stretching of hip flexors (Ilio psoas stretch)
Technique: This is done simultaneously with quadriceps stretch.
5. Stretching of hip extensors (Gluteus stretch)
Technique: Patient is asked to hold knee to tummy in supine lying to stretch Gluteus muscles.
6. Stretching of hip adductors
Technique: Patient is asked to bend knees in supine lying and gradually open knees to stretch knee adductors .

At end of fourth week WOMAC scale rating is repeated to check level of pain, stiffness and physical function and recorded

2. Strengthening exercises of knee musculature will start for last two weeks that includes 1 kg weight cuffs for all exercises done in first two weeks.

At end of 6th week WOMAC scale rating is repeated to check level of pain, stiffness and physical function and recorded Note: All techniques will be applied in sequence at comfort of patient within limits.

DATA ANALYSIS:

Statistics were performed by using SPSS 16. Results were calculated by using 0.05 level of significance.

Table 4: Mean and SD of Womac Score at 0 day, 2 weeks, 4 weeks & 6 weeks for the subjects included in the study

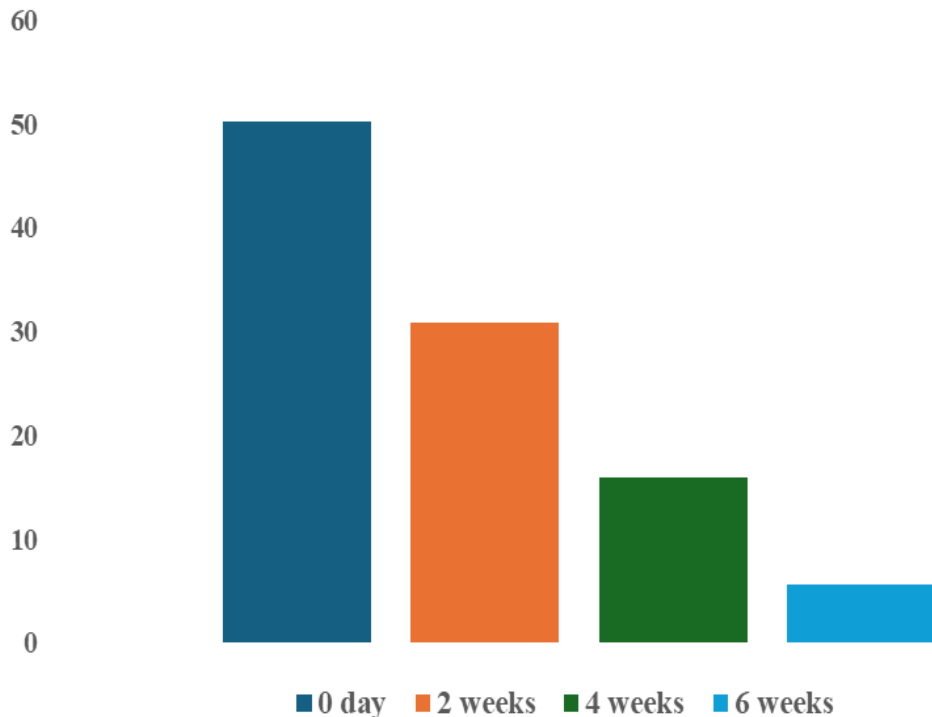
Womac Score	GROUP	
	Mean	SD
0 day	50.30	10.05
2 weeks	30.87	7.35
4 weeks	15.94	4.35
6 weeks	5.64	2.75
MD (0 day – 6 weeks)	44.65	9.16

Table 5: Comparison of mean value for Womac Score at 0 day, 2 weeks, 4 weeks & 6 weeks for the subjects included in the study

Womac Score	GROUP	
	t value	P value
DAY 0 & WEEK 2	36.465	< 0.001
DAY 0 & WEEK 4	39.840	< 0.001
DAY 0 & WEEK 6	40.788	< 0.001
WEEK 2 & WEEK 4	30.883	< 0.001
WEEK 2 & WEEK 6	34.058	< 0.001
WEEK 4 & WEEK 6	24.866	< 0.001

Womac Score	GROUP	
	F value	P value
DAY 0 & WEEK 2 Vs WEEK 4 Vs WEEK 6	579.620	< 0.001

Comparison of mean value for Womac Score at 0 day, 2 weeks, 4 weeks & 6 weeks for the subjects included in the study



Based on the statistical values provided ($F=579.620$), ($p<0.001$) for a repeated measures analysis comparing WOMAC scores across time points (Day 0, Week 2, Week 4, Week 6), the interpretation is that there is an extremely significant, time-dependent change in patient outcomes.

Interpretation: The treatment or intervention applied has a major effect on pain, stiffness, and physical function over the 6-week period.

Strength of Effect (The F -Value $F=579.620$): An F -value of this magnitude is very high, indicating that the variation between the time points (treatment effect) is massive compared to the variation within the groups (individual patient differences).

Interpretation: The change over time is consistent across the subjects, showing a strong, clear, and dramatic trend.

The data indicates that the intervention produced a statistically powerful and highly significant improvement in knee osteoarthritis symptoms (pain, stiffness, and function) from baseline through week 6.

Result and interpretation

After applying contrast and exercises for 6 weeks the change in Womac score indicates success of intervention. The value of P and F marks the efficacy of techin managing pain and stiffness in due period of time.

Significance

According to data it is analyzed that this Experimental research founds Significant result in relieving symptoms of early Osteoarthritis in middle aged patients which includes No or minimum pain, reduced or nil joint stiffness and improved mobility. Also it has proved as an important milestone in Rehabilitation of knee Arthritis from Physiotherapeutic approach. This approach is easy to understand and implement with patients limits and affordable. This helps in preventing arthritis at early age and relieve symptoms at initial stage without letting it get complicated.

Limitation

The time duration invested in Treatment daily was approximately 1 hour which is higher than usual time general people expects to give for treatment . Also the duration of total treatment was 6 weeks which was again a limitation for this technique to be applicable globally.

More work need to be done in the field to make it more user friendly and long lasting.

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WOMAC SCALE

Name /code/ age/ sex

**The Western Ontario and McMaster Universities Osteoarthritis Index
(WOMAC)**

Name: _____ Date: _____

Instructions: Please rate the activities in each category according to the following scale of difficulty: 0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely

Circle **one number** for each activity

		Day 0	wk 2	wk 4	wk 6	
Pain	1. Walking	0	1	2	3	4
	2. Stair Climbing	0	1	2	3	4
	3. Nocturnal	0	1	2	3	4
	4. Rest	0	1	2	3	4
	5. Weight bearing	0	1	2	3	4
Stiffness	1. Morning stiffness	0	1	2	3	4
	2. Stiffness occurring later in the day	0	1	2	3	4
Physical Function	1. Descending stairs	0	1	2	3	4
	2. Ascending stairs	0	1	2	3	4
	3. Rising from sitting	0	1	2	3	4
	4. Standing	0	1	2	3	4
	5. Bending to floor	0	1	2	3	4
	6. Walking on flat surface	0	1	2	3	4
	7. Getting in / out of car	0	1	2	3	4
	8. Going shopping	0	1	2	3	4
	9. Putting on socks	0	1	2	3	4
	10. Lying in bed	0	1	2	3	4
	11. Taking off socks	0	1	2	3	4
	12. Rising from bed	0	1	2	3	4
	13. Getting in/out of bath	0	1	2	3	4
	14. Sitting	0	1	2	3	4
	15. Getting on/off toilet	0	1	2	3	4
	16. Heavy domestic duties	0	1	2	3	4
	17. Light domestic duties	0	1	2	3	4

Total Score: _____ / 96 = _____%

Comments / Interpretation (to be completed by therapist only):