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The Effect of Mobilization with Movement versus Conventional Treatment on Range of Motion in Patients with Post-Traumatic Stiffness of Knee Joint: A Randomized Clinical Trial

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ABSTRACT

Introduction: Stiffness or restricted ROM of the knee joint is a term used commonly to describe any traumatic condition occurring within or around the knee joint. It can result from direct and indirect below and is experienced as pain with activity, local tenderness to palpation, and decreased ability to tolerate tension, which results in decreased movement and functional strength. Knee joint is one of the most susceptible joint to trauma in lower limb. Treatment begins with avoidance of aggravating signs and symptoms. Other means of treatment include hot therapy and icing the injured knee and around the knee joint, ultrasound therapy, CPM (continuous passive motion) and range of motion exercises of the joint. Movement with mobilization has become an important therapeutic regimen and broadly used in case of restricted range of motion of the joint or stiffness of the joint.

Material and Method: The study was of a double blind, randomized clinical trial with 30 subjects, 7 were female, 23 were male and all subjects were assigned according to criteria (inclusion & exclusion) and carried out at physiotherapy OPD of CSS Hospital, Meerut. Range of motion of the knee joint & pain were assessed by using the goniometry & VAS score respectively. The subjects were reassessed after completion of 4 weeks of intervention. The collected data were of mean and standard deviation of goniometry and VAS score and has been analyzed using SPSS software. The study was done to find out the comparative effect of mobilization with movement versus conventional treatment on patients with post traumatic knee joint stiffness.

Results: The results showed that there was significant difference in pain and range of motion with their VAS and goniometry score (p=0.001) respectively.

Conclusion: Study concluded that the difference from 1st to 28th day in VAS & goniometry score which shows that MWM is more effective than conventional treatment (CPM) to decrease pain and improve range of motion in post traumatic knee joint stiffness.

Key Words: MWM (Mobilization with Movement), CPM (Continuous Passive Motion), VAS (Visual Analogue Scale), Goniometry, ROM (Range of Motion), knee joint stiffness.

INTRODUCTION

Immobilization of human knees for several weeks or more can result in stiffness and diminished range of motion in the joints. This can lead to contracture of muscles and knee instability. [1] Post traumatic stiffness of knee joint is common after knee arthroplasties, cruciate ligament repairs and trauma. [2] Post-traumatic knee stiffness and loss of range of motion is a common complication of injuries to the knee area. The causes of post-traumatic knee stiffness can be divided into flexion contractures, extension contractures, and combined contractures. Post-traumatic stiffness can be due to the presence of dense intra-articular adhesions and/or fibrotic transformation of peri-articular structures. [3]

Limitation of joint movement, both flexion and extension, suggests intra-articular pathology. Sometimes, there may be extra-articular block to flexion (due to bony mass behind the knee) or due to tight quadriceps muscle holding the knee on the front (as occurs in quadriceps fibrosis). [4]

Knee stiffness, or more accurately, a limitation in range of motion, is a potential complication after any intra-articular or extra-articular injury. It can be caused by a flexion contracture, an extension contracture or a combined contracture (affecting both flexion and extension) relative to the contra lateral side (if healthy). This stiffness has two components: intra-articular: tissue remodelling leading to intra-articular adhesions, excessive proliferation of fibrous scar tissue, retraction of peri-articular soft tissues and bone impingement due to intra-articular malunion; and extra-articular: quadriceps adhesions to a femoral callus, femoral aponeurosis and inter muscular septum, retraction of the muscle due to scar tissue and skin adhesions in the deeper layers. [5]

In cases of limited flexion, one must look for posterior impingement (femoral malunion), anterior adhesions or retractions (joint capsule, quadriceps bursa, patellar retinaculum, quadriceps), and patella baja/infera. Recent knee radiographs are essential: A/P and lateral weight bearing, view of patellofemoral joint. Radiographs of the femur are also needed if it was fractured, along with long-leg standing views. CT arthrography and/or MRI can be useful in characterizing the reasons for stiffness. These can help determine the presence of intra-articular malunion, the capsule volume, and the presence of meniscus, cartilage and ligament injuries. [6]

In cases of limited extension (flexion deformity), one must look for anterior impingement (e.g. malunion of the intercondylar eminence), contracture of anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) (retraction of the PCL, which is taut during flexion, primarily limits flexion, unless the PCL insertions were brought closer together due to malunion, in which case, the PCL will also limit extension) and contracture of the posterior joint capsule over the condyles. [7]

Patient faces a complication named as stiff knee gait in knee stiffness. Normally, the knee goes in flexion during the early stage of swing phase to clear the foot from the ground. But if the knee is stiff during the swing phase, the patient has to raise the affected side pelvis to clear the foot from the ground and swing sideways with circumduction of the limb to propel it forward to reach the heel strike. [8]

There are various regimens to overcome joint stiffness or increase the range of motion of the joint. Previously there were studies done for post traumatic stiffness using conventional therapy such as, continuous passive motion (CPM) is used in overcoming joint stiffness or increasing range of motion of the joint and static progressive stretch using orthosis given to treat contractures of elbow, ankle and knee. [9] Repeated prolonged loading exercises for increasing knee flexion range, active range of movement exercises, isometric quadriceps femoris exercises and knee flexion stretching exercises.

On the other aspect, Physiotherapist's use many mobilization techniques from time immemorial for effectively improving the range of motion of several joints. One such mobilization technique is what Mobilization is with movement (MWM) which is a combination of Mobilizations and movement as advocated by Mulligan.

Mobilization with movement is always at right angles to the plane of the movement taking place and will only work in ONE direction - when correct MWM is repeated with three sets of ten repetitions, the joint's option to stay on track seems to return. [10]

Exelby L (1996) says, as per mulligan, mobilization is applied parallel or at right angles to the restricted joint movement. If the applied mobilization achieves immediate improvement in the functional movement and abolishes the pain, the treatment involves sustaining the mobilization while the patient performs the active movement repetitively. On reassessment of the joint function, the movement should remain improved without the mobilization. [11]

MWM may be applied to increase ROM and/ or decrease the pain associated with movement by improving joint tracking. Mulligan stated that MWM is more effective with loss of flexion than extension. [12]

OBJECTIVES

1. To find out the effect of MWM and conventional treatment on range of motion in patients with post traumatic knee stiffness.
2. To find out the comparative effect between MWM and conventional treatment on range of motion in patients with post traumatic knee stiffness.

MATERIALS AND METHODS

OUTCOME MEASURES

Visual Analogue Scale (Vas)

The visual analog scale is one of the most basic pain measurement tools. It consists of a 10 cm line. The clinician can measure the place on the line and convert into it a score between 0 to 10 where 0 is no pain and 10 is bad as it could be. [13]

Goniometry

It is a technique in which using an instrument named as goniometer purports to measure accurately the movements present in a simple or composite joint. Actually a goniometer is used not so much to measure the exact number of degrees of the movement in a joint as to find out whether there is an increase or a decrease of such movements. In order to do this, it is desirable that a goniometry should provide an easy method of reference to the joint or joints being examined and also provide a fixed base- line point from which to measure any increase or decrease of movement. [14]

TEST PROCEDURE

Visual analogue scale (VAS)

VAS attempt to represent measurement quantities in terms of a straight line placed horizontally or vertically on paper. The endpoints of the line are labelled with descriptive or numeric terms to anchor the extremes of the scale and provide a frame of reference for any point in the continuum between intervals between the endpoints to assists the individual in grading responses. Commonly the entire visual analog line is 10 cm long. The patient is asked to bisect the line at a point representing self-reported position on the scale. The patient score is then obtained by measuring from the zero mark to the mark bisecting the scale.

Range of motion

Active flexion range of motion of affected knee joint was assessed using a universal goniometer (in degrees). Flexion was measured in prone lying position. In flexion, lateral condyle of the femur or the lateral aspect of mid joint line of knee was used as axis of motion. The hip joint was stabilized during flexion and extension by the research assistant in order to avoid movements of the hip joint. The movement was stopped when the first resistance was felt.

LIMITATION OF STUDY

Research is done only among particular age group

Only range of motion and pain are measured.

It is short duration study.

VARIABLES

Dependent Variables: Pain, Range of Motion (ROM).

STUDY DESIGN

This is a randomized clinical trial.

Sample selection: According to the inclusion and exclusion criteria, the convenient sample of 30 subjects had randomly assigned in the study. All subjects were equally allocated in two groups, group A and group B. This study was conducted in physiotherapy OPD of CSS Hospital, Subharti University Meerut.

INCLUSION CRITERIA

- Age 22-35 yrs.
- Both Male and female

- Fracture of unilateral knee joint and around the knee managed with conservative treatment only.
- Subjects with post traumatic stiffness of knee joint having a minimum of 70º knee flexion

EXCLUSION CRITERIA

- Any deformity of hip and knee
- Fracture or dislocation of the knee or in adjacent joints which managed with ORIIF.
- Recent injuries on knee or on adjacent areas.
- Implant at fracture and around fracture site
- Neurological problems
- Subject having polyarthritis, bleeding disorders, tumors, local infection, peripheral vascular disease, leg-length discrepancy of more than one-half inch.

INSTRUMENTATION

- Couch
- Chair with Back rest
- Stationary (Pen, Pencil)
- Goniometer (Universal type full circle goniometer)
- Consent Form
- Mulligan Belt

PROCEDURE

After getting their informed consent the subjects were randomly assigned and allocated in three groups. Subjects for research purpose were selected according to inclusion and exclusion criteria. According to VAS score and goniometry score, the data of pain and range of motion was collected and table of selected variants was prepared and sorting of data was done. The patients in the both experimental groups, group A and B subjects followed paraffin wax bath (PWB), mobilization with movement (MWM), continuous passive motion (CPM) and range of motion (ROM) exercises of the knee joint. Group 'A' received PWB and MWM and group 'B' received PWB, CPM and ROM exercises of the knee joint respectively.

In group A, the mobilization with movement (MWM) technique was implemented with three sets of ten repetitions on each treatment occasion for a period of 6 days/ week. In this group, the adjustable couch was used to treat the patients effectively. During MWM, position of the patients was prone lying and high sitting position with swinging bilateral leg out of the couch at available various range of motion of affected knee joint. In prone lying position, the therapist was stand just behind the patient towards the affected knee joint. The mulligan belt placed at proximal tibial ends which already wrapped with the lower back of the therapist. In high or couch sitting position, the therapist was sitting on rest chair. The method using of mulligan belt was same as in prone lying position. After stabilization, the mobilization with movement (MWM) started in order with the therapist mobilized the knee joint followed by active movement of knee joint performed by the patients.

In group B, the continuous passive motion (CPM) in mechanical form was given to the patients. In this group, the duration of CPM was 40 minutes for improving flexion range of motion of the knee joint. These protocols were used to accommodate the tolerance level of patients with various degrees of motion. Patients were also instructed to perform home exercises program in three sets of 15 repetitions, twice daily.

The exercise program consisting of isometric exercises and stretching exercises was taught to the patients. The isometric exercises consisted of three exercises using a towel roll. The participants were instructed to perform a total of 10 repetitions. Each repetition lasted6 seconds with an interval of approximately 3 seconds.

In the first exercise using the towel roll, the patients were placed in a supine position with knees flexed. The towel roll was positioned between the patient's knees, and the patient was instructed to press the knees against the roll to perform a maximal contraction. This exercise aimed to strengthen the hip adductor muscles.

In the second exercise, the patients were placed in a supine position with legs straight. With the towel roll placed under the ankle of the affected limb, the patients performed maximal contractions. This exercise strengthened the hamstrings muscle.

In the third exercise, patients were in supine position with legs straight. With the towel roll placed under the knee, patients were asked to press the knee on the roll. This exercise aimed to strengthen quadriceps muscle.

The stretching exercises were performed actively and included the following muscles and in order: quadriceps (standing knee bent), knee flexion in prone lying position and the hamstring muscles the calf muscle (standing and long sitting with both the knees extended, ankle dorsiflexion with the help of towel) the patients were instructed to perform these exercise twice/day for 28 days.

All data were seen in three consecutive visits: initial evaluation on 1st day, second on 14th day and third or last on 28th day respectively but were instructed to follow the home exercise program for a total of 4 weeks. The home exercise program consisted of hot fomentation along with range of motion exercises of knee joint.

The data was analyzed by using SPSS and the value of independent t-test was collected and the significance of p-value was checked and results were prepared. The post measurements were taken for the same variables.

DATA ANALYSIS

All analysis was obtained using SPSS version 19.0. Demo graphic data of the patients including range of motion and pain were summarized. The dependent variables for the statistical analysis were VAS and goniometry score. A base line data was taken and analyze. The independent t-test was used. A level of significance 5%was used to determine the statistical significance.

Table-1: DIFFERENCE IN VAS (PAIN) SCORE- 1st to 14th Day

GROUPS	TIME PERIODS	PAIRED DIFFERENCES				
		MEAN	S.D	S.E.M	t-value	p-value
GROUP A	At 1st day	4.37	.799	.266	8.411	.000
	At 14th day	3.13	.745	.192		
GROUP B	At 1st day	4.80	.775	.200	12.435	.000
	At 14th day	3.00	.845	.218		

Table-2: DIFFERENCE IN VAS (PAIN) SCORE- 1st to 28th Day

GROUPS	TIME PERIODS	PAIRED DIFFERENCES				
		MEAN	S.D	S.E.M	t-value	p-value
GROUP A	At 1st day	4.37	.799	.266	8.411	.000
	At 28th day	1.20	.775	.200		
GROUP B	At 1st Day	4.80	.775	.200	13.440	.000
	At 28th Day	1.73	.704	.182		

Table-3: DIFFERENCE IN GONIOMETRY (ROM) SCORE- 1st to 14th Day

GROUPS	TIME PERIODS	PAIRED DIFFERENCES				
		MEAN	S.D	S.E.M	t-value	p-value
GROUP A	At 1st day	73.67	14.075	3.634	-17.838	.000
	At 14th day	87.33	14.864	3.838		
GROUP B	At 1st day	70.67	11.318	2.922	-15.199	.000
	At 14th day	81.67	10.801	2.789		

Table-4: DIFFERENCE IN GONIOMETRY (ROM) SCORE- 1st to 28th Day

GROUPS	TIME PERIODS	PAIRED DIFFERENCES				
		MEAN	S.D	S.E.M	t-value	p-value
GROUP A	At 1st day	73.67	14.075	3.634	-27.358	.000
	At 28th day	106.00	10.556	2.726		
GROUP B	At 1st day	70.67	11.318	2.922	-19.000	.000
	At 28th day	96.00	8.701	2.247		

RESULT

A sample of size 30 was studied individually for VAS and goniometry score at base line.

Table-1 presents the paired difference of VAS score between group A and B at 1st to 14th day. There was significant reduction in pain between 1st to 14thday.

Table-2, presents the paired difference of ROM score between group A and B at 1st to 14th day. There was significant improvement and increasing ROM between 1st to 14thday

Table-3 presents the paired difference of VAS score between group A and B at 1st to 28th day. There was significant reduction in pain between 1st to 28thday

Table-4 presents the paired difference of ROM score between group A and B at 1st to 28th day. There was significant improvement and increasing ROM between 1st to 28thday

The Paired 't' test was applied to find out the significant difference in VAS and goniometry score at 1st to 14th day and 1st to 28th day respectively which shows a significant difference at 5% level of significance (P<0.005).

DISCUSSION

This study provides data for pain and range of motion of persons who had post traumatic knee joint stiffness. The data is sparse in between 22-35 age groups since it was convenient to find people in this age group who could fit the inclusion criteria in this study.

In this study, data shows there is decreasing in VAS score and increasing goniometry score in patients with post traumatic knee joint stiffness. Both treatment MWM and conventional program i.e. CPM along with PWB are effective in reducing pain and improving range of motion of the knee joint. But MWM is more effective than CPM in reducing pain and joint stiffness. In previous studies, the effect of CPM was less effective to overcome joint stiffness and pain.

Cynthia M. Chiarello et al 1997 did a study on the effect of CPM duration and increment on range of motion in total knee arthroplasty patients. In this study Forty-five total knee arthroplasty patients were randomly assigned to either a control group, a short CPM duration (3-5 hours per day) group with CPM ROM increased 5" twice daily, a short CPM duration group with CPM ROM increased daily to patient tolerance, a long CPM duration (10-12 hours per day) group with CPM ROM increased 5" twice daily, or a long CPM duration group with CPM ROM increased daily to patient tolerance. Active and passive flexion and extension were measured goniometrically on each postoperative day that the patient was treated by physical therapy. No statistically significant differences between groups were found for baseline and final postoperative ROM. The CPM groups did not maintain the parameters assigned and were combined, revealing an enhanced rate of change of flexion. [13]

Based on the results of this study, CPM does not increase flexion or extension ROM in primary total knee arthroplasty patients with degenerative joint disease compared with a control group not using CPM.

Arun Prasad Balasundaram et al 2017 conducted a study to know the short - term effects of the MWM in patients with post-traumatic stiffness of the knee joint. In this study, twenty consecutive patients with post-traumatic stiffness of the knee joint with a minimum available 80° knee flexion range of motion were included. One group pre-to-post-test study design was employed, in which the active knee flexion range of motion was used as an outcome measure. The mobilisation with movement treatment techniques was implemented with three sets of ten repetitions on each treatment occasion for a period of 3 days.

Their study stated that mobilisation with movement treatment techniques significantly improved the active knee flexion range of motion ($p = 0.000$) from

pre-treatment to post-treatment. The findings from this study demonstrated immediate benefits in outcomes following mobilisation with movement treatment techniques in a cohort of patients with post-traumatic stiffness of the knee joint. [14]

The hypothesis states that the MWM along with PWB would be effective in the treatment of post traumatic knee joint stiffness was supported by this research. This study found that patients with post traumatic knee joint stiffness experienced significant improvements with MWM as compared to conventional physical therapy.

CONCLUSION

The study states that both treatment program decrease pain and improving range of motion in patients with post traumatic knee joint stiffness. It is concluded that the both program i.e. conventional therapy and MWM along with PWB is effective in reduction of pain and improving range of motion in patients with post traumatic knee joint stiffness. On the basis of statistical analysis then study conclude that the significant difference from 1st to 14thday and 1st to 28th day in VAS and goniometry score which is shown in (Table1,2,3and 4). It shows that MWM is comparative effective in decreasing pain and improving range of motion. This Study supports experimental hypothesis H_1.

REFERENCES

1. Richard W. Bohannan, Debbie Charis, Patricia Larkin, Cynthia Lieber and Lynnette Riddick Effectiveness of repeated prolonged loading for increasing flexion in knees demonstrating post-operative stiffness: A clinical report. American Journal of Physical Therapy 1985 April; 65(4): 494-496.
2. P. Bountti, M Mcgrath, S. Ulrich, S. Mckenzie, T Seyler, M mont. Static progressive stretch for the treatment of knee stiffness. The Knee 2008 June; 15(4) 272-276
3. N.Pujol, P.Boisrenoult, P.Beoufils; post-traumatic knee stiffness: surgical techniques:Orthopaedics& Traumatology Surgery & Research · January 2015.
4. J. Maheshwari; examination of knee joint: Essential orthopaedics, page 313, 3rd edition
5. Mariani P P, Santon N, Roveve P, Della Rocca C, Adriani E; Histological and structural study of the adhesive tissue in knee fibroartrosis: A clinical-Pathological correlation. Arthroscopy 1997; 13(3) 313-8 [E pub 1997/06/01]
6. N.Pujol, P.Boisrenoult, P.Beoufils; post-traumatic knee stiffness: surgical techniques: Orthopaedics& Traumatology Surgery & Research · January 2015
7. N.Pujol, P.Boisrenoult, P.Beoufils; post-traumatic knee stiffness: surgical techniques: Orthopaedics& Traumatology Surgery & Research · January 2015
8. SureshwarPandey, Anil Kumar Pandey, clinical orthopaedic diagnosis, page 216, 3rd edition.
9. Cynthia M. Chiarello, PhD, PT, Linda Gundersen, MS, PT,Terrance O'Halloran, MS, PT; The effect of continuous passive motion duration and increment on range of motion in total knee arthroplasty patients.
10. Brian R Mulligan. Manual therapy: "NAGs", "SNAGs", "MWMs" etc. 5th edition Wellington, New Zealand: Plane view services Ltd; 2004, page 87-88, 115-120
11. Linda Exelby: Peripheral mobilization with movement; Manual Therapy 1(3), page 118-126
12. Carolyn Kisner, Lynn Allen colbey; The knee: therapeutic exercise 5th edition, page 696
13. Susan B O'Sullivan & Thomas J Schmitz: physical rehabilitation, chapter 11, 5th edition, published by Jaypee brothers' medical publishers' ltd,page no. 381.

14. Bryan O. Scott. A universal goniometer Rheumatology (Oxford) 1965;8(4):138-141.

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