

## EFFECT OF POST-ISOMETRIC RELAXATION AND RECIPROCAL INHIBITION IN OSTEOARTHRITIS KNEE

SUSHMITA SINGH\*, VAISHALI JAGTAP, POOVISHNU DEVI T

Department of Musculoskeletal Sciences, Krishna College of Physiotherapy, KIMSDU, Karad - 415 110, Maharashtra, India.  
 Email: sushhhhsingh@gmail.com

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### ABSTRACT

**Objectives:** The objective is to evaluate the effect of post-isometric relaxation, reciprocal inhibition, and combined effect post-isometric relaxation and reciprocal inhibition in osteoarthritis (OA) knee.

**Methods:** Ethical clearance was obtained from the Institutional Ethical Committee, KIMSDU, Karad. A comparative study was conducted at Physiotherapy Department of Krishna Institute of Medical Sciences. A total of 30 patients were equally divided into three groups using convenient sampling with random allocation (Group A, Group B, and Group C). Baseline treatment was given to all three groups' interferential therapy and hot moist pack. Group A was given post-isometric relaxation, Group B was given reciprocal inhibition, and Group C was given a combination of post-isometric relaxation and reciprocal inhibition.

**Result:** Statistical analysis was performed using paired t-test and ANOVA test. In pre-intervention, there was no statistical significant difference seen with p values for visual analog scale (VAS) of 0.3408 and for Western Ontario and McMaster Universities Arthritis Index (WOMAC) of 0.5424. While on comparing the post-interventional values, the results between the three groups using ANOVA test revealed that there was very significant difference seen with p value for VAS of 0.0023 and for WOMAC of 0.0019.

**Conclusion:** From the study, it can be concluded that there was a significant effect of post-isometric relaxation and reciprocal inhibition in OA knee.

**Keywords:** Post-isometric relaxation, Reciprocal inhibition, Osteoarthritis, Interferential therapy.

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### INTRODUCTION

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis, and range of biochemical and morphological alterations of the synovial membrane and joint capsules [1]. The prevalence of OA of the knee in India is 22-39% [2,3]. In the age group of 55-64, the prevalence is reported to be increased dramatically to 20.3% in women. In the age group of 65, the female to male ratio ranges from 2:1 to 3:1 [4,5]. There are various reasons for the high prevalence of OA in India among which genetic is the strongest. Other factors may be squatting, sedentary lifestyle, and dietary conditions [6].

Individuals above the age of 55 years show radiographic and/or clinical evidence of OA. Knee pain is the leading symptom which gets worsened with activity and reduced with rest [7]. Advanced OA often presents with persistent pain or night pain. Diagnosis is made on the basis of physical and radiological findings which consist of findings of palpation, investigation, findings of range of motion, and special functional tests when required [8].

Key risk factors for arthritis are age, gender, obesity, previous injuries, sedentary lifestyle, and lack of physical activity [9].

### Muscle energy technique

Muscle energy technique was developed by pioneer practitioners such as Ruddy (1961) and Fred Mitchell Snr (1967) [10]. This technique is classified as an active technique in which the patient voluntarily uses his muscles from a precisely controlled position in a specific direction, against a distinctly executed counterforce. The amount of force or effort applied by the patient and the operator may vary from minimal to

maximal contractions. The duration of the contraction may vary from a few to several seconds.

### Effect of muscle energy technique

- To lengthen shortened or spastic muscles
- To strengthen weakened muscles
- To reduce localized edema
- To mobilize restricted ranges of joint [10].

### Principles used in muscle energy technique

1. Post-isometric relaxation
2. Reciprocal inhibition.

### Interferential therapy (IFT)

IFT is used to treat deeper tissues as lower pulse amplitude is required to overcome the associated skin resistance. The two medium-frequency currents interfere within the tissues and produce an amplitude-modulated beat frequency, which is calculated as the difference between the values of the two currents applied [11-13].

Physiological effects are:

- Relief of pain
- Motor stimulation
- Absorption of exudates [14-16].

The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is used to assess patients with OA of the knee [17].

### METHODS

It was a comparative study conducted in the Physiotherapy Department of Krishna Institute of Medical Sciences. 30 patients were equally divided

into three groups using convenient sampling with random allocation. Baseline treatment was given to all three groups which consisted of IFT and hot moist pack (HMP). Group A was given post-isometric relaxation, Group B was given reciprocal inhibition, and Group C was given a combination of post-isometric relaxation and reciprocal inhibition. The Patients were selected according to inclusion and exclusion criteria. Written informed consent was taken and the whole study was explained to them. Detailed musculoskeletal evaluation was done to screen the patients. Inclusion criteria were as follows: (1) Both genders, (2) age >55 years, (3) OA grade 3, and (4) unicompartmental OA. Exclusion criteria were as follows: (1) Other knee pathology such as plica syndrome and chondromalacia patella, (2) previous knee surgery, and (3) previous knee trauma.

- Group A - Treatment protocol will include post-isometric relaxation (2 sets of 5 repetitions), IFT (10 minutes), and HMP (15 minutes)
- Group B - Treatment protocol will include reciprocal inhibition (2 sets of 5 repetitions), IFT (10 minutes), and HMP (15 minutes)
- Group C - Treatment protocol will include a combination of post-isometric relaxation (1 set of 5 repetitions) and reciprocal inhibition (1 set of 5 repetitions), interferential current therapy (10 minutes), and HMP (15 minutes).

#### **Post-isometric relaxation**

The patients will be positioned in prone lying; hip will be flexed to 90°. The patient will be asked to further flex knee using 20% of his strength. Resistance will be applied to agonist muscle. The contraction will be maintained for 5 seconds, 2 sets will be performed, with 5 repetitions in each set and relaxation phase of 5 seconds in between [10].

#### **Reciprocal inhibition**

The patients will be positioned in prone lying; hip will be flexed to 90°. The patient will be asked to further extend knee using 20% of his strength. Resistance will be applied to antagonist muscle. The contraction will be maintained for 5 seconds, 2 sets will be performed, with 5 repetitions and relaxation phase of 5 seconds in between [10].

#### **Outcome measure**

##### **Visual analog scale (VAS) - intragroup comparison (within group) using paired t-test**

Table 1 also shows the comparison of mean and standard deviation of pre- and post-values of Group A, B, and C.

In the Group A, the mean VAS score on pre-intervention was  $5.74 \pm 1.41$ , which was reduced to a mean of  $4.65 \pm 1.65$  post-sessions. The p value by paired t-test was found to be 0.0002, which is extremely significant.

In Group B, the mean VAS score on pre-intervention was  $5.21 \pm 1.295$ , which was reduced to a mean of  $4.88 \pm 1.35$  post-intervention. The p value by paired t-test found to be 0.0043, which is very significant.

In Group C, the mean VAS score on pre-intervention was  $6.04 \pm 1.99$ , which was reduced to a mean of  $2.58 \pm 0.66$  post-intervention. The p value by paired t-test found to be <0.0001, which is extremely significant.

##### **WOMAC - intragroup comparison (within group) using paired t-test**

Table 2 also shows the comparison of mean and standard deviation of pre- and post-values of Group A, B, and C.

In the Group A, the mean WOMAC score on pre-intervention was  $43.2 \pm 17.61$ , which was reduced to a mean of  $29.8 \pm 16.53$  post-sessions. The p value by paired t-test was found to be <0.0001, which is extremely significant.

In Group B, the mean WOMAC score on pre-intervention was  $50.5 \pm 20.20$ , which was reduced to a mean of  $41.7 \pm 19.56$  post-intervention. The p value by paired t-test found to be 0.0051, which is very significant.

In Group C, the mean WOMAC score on pre-intervention was  $41.5 \pm 7.33$ , which was reduced to a mean of  $17.8 \pm 7.91$  post-intervention. The p value by paired t-test found to be <0.0001, which is extremely significant.

##### **VAS – intergroup (between groups) comparison using ANOVA test**

On comparing the pre-interventional values, the results between the three groups using ANOVA test revealed that there was no statistically significant difference seen with p=0.3408. While on comparing the post-session values, the results between the two groups using ANOVA test revealed that there was very significant difference seen with p=0.0019.

Table 3 shows a comparison of mean values and standard deviation of VAS scale scores in Group A, Group B, and Group C. The values were compared by applying ANOVA test. Pre-treatment shows that there is no significant difference in the VAS scores (p=0.3408), whereas post-treatment shows very significant difference (p=0.0019).

##### **WOMAC – intergroup (between groups) comparison using ANOVA test**

On comparing the pre-interventional values, the results between the three groups using ANOVA test revealed that there was no statistically significant difference seen with p=0.5424. While on comparing the post-session values, the results between the three groups using ANOVA test revealed that there was very significant difference seen with p=0.0023.

Table 4 shows a comparison of mean values and standard deviation of WOMAC scale scores in Group A, Group B, and Group C. The values were compared by applying ANOVA test. Pre-treatment shows that there is no significant difference in the WOMAC scores (p=0.5424), whereas post-treatment shows very significant difference (p=0.0023).

#### **DISCUSSION**

OA is a chronic degenerative disorder and knee OA is the most commonly affected joint in the older age group [1]. Knee OA is a leading cause of functional disability and limitations in the elder age group people. It contributes significantly to functional limitations and disability in older people [18].

Reviewing various studies, it was analyzed that the use of ultrasound, IFT, transcutaneous electrical nerve stimulation, isometric exercises, and surgical options were the lines of treatment routinely used for OA of the knee joint [19].

This study was undertaken considering all the mentioned points, and the aim of this study was to evaluate the effect of post-isometric relaxation and reciprocal inhibition in OA of the knee joint. Based on the principal of muscle energy technique, the patient voluntarily uses his muscles from a precisely controlled position in a specific direction, against a distinctly executed counterforce [10].

#### **Advantages of muscle energy technique**

The use of muscle energy technique improves both strength and endurance by increasing the flexibility of the muscles surrounding the joint. It is also beneficial in reducing localized swelling and increasing the restricted range of motion [10].

The study was carried out and the result was drawn using VAS and WOMAC score as the outcome measures. A total of 30 patients (11 male and 19 female), of which 19 were right and 11 were left side affected, diagnosed as unilateral OA knee. The age group was between 40 and 75 years. The study place was Krishna College of Physiotherapy, Outpatient Department. The patients were evaluated and were divided into three groups by convenient sampling with random allocation. Group A included 10 patients treated with HMP, IFT, and post-isometric relaxation. Group B included 10 patients treated with HMP, IFT, and reciprocal inhibition. Group C included 10 patients treated with HMP,

**Table 1: Comparison of pre- and post-VAS score within group**

Groups	Mean±SD		p value	Inference
	Pre-interventional	Post-interventional		
Group A	5.74±1.41	4.65±1.65	0.0002**	Extremely significant
Group B	5.21±1.29	4.88±1.35	0.0043*	Very significant
Group C	6.04±1.99	2.58±0.66	<0.0001**	Extremely significant

\*, \*\*, \*\*\*: 0.0043, 0.0002, <0.0001, SD: Standard deviation, VAS: Visual analog scale

**Table 2: Comparison of pre- and post-WOMAC score within group**

Groups	Mean±SD		p value	Inference
	Pre-interventional	Post-interventional		
Group A	43.2±17.61	29.8±16.53	<0.0001**	Extremely significant
Group B	50.5±20.20	41.7±19.56	0.0051*	Very significant
Group C	41.5±7.33	17.8±7.91	<0.0001**	Extremely significant

\*, \*\*, \*\*\*: 0.0051, <0.0001, <0.0001, SD: Standard deviation, WOMAC: Western Ontario and McMaster Universities Arthritis Index

**Table 3: Comparison of pre and post VAS score between groups**

Groups	Mean±SD		p value	Inference
	Pre-interventional	Post-interventional		
Group A	5.74±1.41	4.67±1.67		
Group B	5.21±1.29	4.88±1.35		
Group C	6.04±1.19	2.98±0.66		
p value	0.3408	0.0019*		
Inference	Not significant	Very significant		

\*: SD: Standard deviation, VAS: Visual analog scale

**Table 4: Comparison of pre and post WOMAC score between group**

Groups	Mean±SD		p value	Inference
	Pre-interventional	Post-interventional		
Group A	43.2±17.61	29.8±16.53		
Group B	50.5±20.20	41.7±19.56		
Group C	41.5±7.32	17.8±7.91		
p value	0.5424	0.0023*		
Inference	Not significant	Very significant		

\*: 0.0023, SD: Standard deviation, WOMAC: Western Ontario and McMaster Universities Arthritis Index

IFT, and combination of post-isometric relaxation and reciprocal inhibition.

Our study states that females are more affected with OA as compared to males which supports another study which says that in women older than age 65, the prevalence increases dramatically to 20.3%. In the age group of 65, the female to male ratio of OA prevalence in the knee ranges from 2:1 to 3:1 [4,5].

Our study states that OA is more prevalent in the age group of 55-63 years which supports previous study which states that individuals above the age of 55 years show radiographic and/or clinical evidence of OA [7].

A pre-treatment outcome measure using VAS and WOMAC scale was done. The specific treatment protocol was followed as per the group for 2 weeks, and the post-treatment outcome using VAS and WOMAC scale was documented accordingly. An exercise program was designed and a proper ergonomic advice was given.

Intragroup comparison (within group) was analyzed statistically using paired t-test for VAS and WOMAC scale scores, and intergroup comparison (between groups) was analyzed statistically using ANOVA test.

Intragroup comparison (within group) was analyzed statistically using paired t-test for VAS and WOMAC scale scores. This shows that there is an extremely significant difference of Group A VAS ( $p=0.0002$ ) and WOMAC ( $p\leq 0.0001$ ), very significant difference of Group B VAS ( $p=0.0043$ ) and WOMAC ( $p=0.0051$ ), and extremely significant difference of Group C VAS ( $p<0.0001$ ) and WOMAC ( $p<0.0001$ ).

Intergroup comparison (between groups) was analyzed statistically using ANOVA test. This shows that pre-intervention there was no statistically significant difference seen with p values for VAS was 0.3408 and for WOMAC was 0.5424. While on comparing the post-interventional values, the results between the two groups using ANOVA test revealed that there was very significant difference seen with p value for VAS was 0.0023 and for WOMAC was 0.0019.

Our study shows that post-isometric relaxation and reciprocal inhibition are both effective maneuvers in OA knee, but the combination of both the techniques has superior effects as compared to individual techniques which supports the previous study which states that post-isometric relaxation and reciprocal inhibition both are effective maneuvers [20].

In this study, an attempt was made to analyze the effect of HMP, IFT, and muscle energy technique (post-isometric relaxation and reciprocal inhibition) in reducing pain and improving functional status and strength in OA knee patients. This study was performed to investigate the reduction of symptoms after application of post-isometric relaxation and reciprocal inhibition along with conventional therapy (HMP and IFT) in OA knee patients and its post-treatment evaluation in a standardized manner using VAS and WOMAC scale. The result shows extremely significant improvement with a combination of post-isometric relaxation and reciprocal inhibition as compared to individual techniques alone.

## CONCLUSION

This study concludes that combination of post-isometric relaxation and reciprocal inhibition has an extremely significant effect over application of post-isometric relaxation or reciprocal inhibition alone in the management of OA knee joint both statistically and clinically.

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