



PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION - AN INNOVATIVE APPROACH TO TREAT OSTEOARTHRITIS KNEE PATIENTS.

Anatomy

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ABSTRACT

Aim: Osteoarthritis (OA) knee is one of the major cause of mobility impairment, particularly among people of age group 40 years and above. Though there are many treatments available for OA both Pharmacological and Non pharmacological, explore of PNF technique in OA knee is still in lacunae. To fillup the gap, the aim of this study is to find out the immediate effect of Proprioceptive Neuromuscular Facilitation (PNF) stretching in osteoarthritis knee patients.

Methods: A prospective study was conducted at National Institute of Medical Science Superspeciality Hospital, Jaipur. This study included 100 patients and they were divided into Group A (n=50), which was control group and Group B (n=50) was experimental group. Group A and B underwent out come measuring tools like pain measured using Numeric Pain Rating Scale (NPRS), Range of Motion (ROM) of knee joint measured using Universal goniometer and Functional activities of knee joint measured using short form Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC) before and after treatment. Group A patients received Moist Hot Pack (MHP) in knee joint for 5 minutes, where as Group B patients received MHP for 5 minutes and PNF stretching (Contract Relax - Antagonist Contract) for 3 minutes. The pre and post treatment data were recorded in Microsoft Excel and Student T- Test was used to evaluate clinical significance between groups.

Results: It was found that Group B patients treated by PNF stretching improved a lot in OA knee symptoms with negligible effects in Group A patients treated by Moist hot pack.

Conclusion: It was concluded from the study that PNF stretching may be a treatment option for patients with OA knee.

KEYWORDS

PNF, Proprioceptors, Osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) knee is one of the major cause of mobility impairment, particularly among people of age group 40 years and above¹. Prevalence of Osteoarthritis knee in India is 28.7%². Due to improvement of human life expectancy prevalence of OA is going to increase in future. Osteoarthritis of knee causes pain and disability which adversely affects life style and quality of life of patients.

There are plethora of treatment options available to clinicians for OA but there is still scope for treatments which improves symptoms with minimal or negligible side effects. OA treatment can be broadly classified into pharmacological and non pharmacological treatment. Pharmacological treatment includes acetaminophen, Non steroidal anti inflammatory drugs (NSAIDs), Opioids, Intra articular injections, Glucosamine sulfate and chondroitin sulfate. Non pharmacological treatment includes hydrotherapy, massage therapy, thermotherapy, electrotherapy, Manual therapy and surgery³. These days pharmacological interventions plays major role in the treatment of Osteoarthritis knees. Pharmacological interventions do improve symptoms but they are not benign and does have side effects and also required to be taken for long duration. Non-pharmacological intervention like Proprioceptive Neuromuscular Facilitation (PNF) stretching is safe and can improve symptoms in OA knees with negligible side effects. There has been little research on PNF in treatment of OA knees. Considering the above, this study was aimed to explore the immediate effects of PNF stretching in terms of pain, range of motion and functional activities in osteoarthritis knee patients.

SUBJECTS AND METHODS

A prospective study was conducted after getting ethical committee approval from period of July 2017 to December 2017 at National Institute of Medical Science Superspeciality Hospital, Jaipur. This study included 100 patients. Inclusion criteria was patients with age

group 40 years and above with Grade 1 or Grade 2 osteoarthritis of knee joint on radiographs according to criteria of Kellgren and Lawrence. Patients of Grade 3 and 4 osteoarthritis of knee joint and with history of major Knee injury, Neuromuscular disorder of the knee joint, Inflammatory arthritis, history of steroid injection in knee joint and any congenital disorder or previous trauma were excluded from the study.

After explaining the procedure and getting consent, 100 patients were enrolled in the study and were divided into Group A and B by lottery method. Group A (n=50) control group and Group B (n=50) was experimental group. Group A and B underwent out come measuring tools like pain measured using Numeric Pain Rating Scale (NPRS), Range of Motion (ROM) of knee joint measured using Universal goniometer and Functional activities of knee joint measured using short form Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) before and after treatment. Group A patients received Moist Hot Pack (MHP) in knee joint for 5 minutes, where as Group B patients received MHP for 5 minutes and PNF stretching (Contract Relax - Antagonist Contract) for 3 minutes. Patient was made to lie comfortably over treatment table and his/her hamstring muscle was stretched until a mild stretch sensation was felt, this position was maintained for 7 seconds. Next, the patient was asked to push his/her leg down against the resistance of the researcher for 3 seconds (Isometric contraction). After this, the patient was asked to relax for 5 seconds. Then patient was asked to concentrically contract the quadriceps femoris muscle, by attempting to further raise the leg, for 7 seconds. This sequence was repeated 5 times with each sequence separated from each by a 20 seconds interval. The pre and post treatment data were recorded in Microsoft Excel and Student T- Test was used to evaluate clinical significance between groups.

RESULTS

Table 1: Average and P value for Pre and Post treatment NPRS, ROM and Short form WOMAC scores of Group A and B.

Gro up	Age (Range)	Gender (Male/Female)	Pre treatment NPRS score (Average)	Post treatment NPRS score (Average)	Pre treatment ROM score (Average)	Post treatment ROM score (Average)	Pre treatment short form WOMAC score (Average)	Post treatment short form WOMAC score (Average)	NPRS P value	ROM P value	Short form WOMAC P value
A	42-65	Male-18 Female-32	5.64	5.32	117	118.2	16.1	15.38	0.10	0.46	0.19
B	42-65	Male-18 Female-32	5.66	4.16	117	123.6	15.76	12.9	< 0.0005	< 0.0005	< 0.0005

In Group A (Control group) patients age of range 42-65 years, average score for Pre and Post NPRS score was 5.64 and 5.32, Pre and Post ROM average score was 117 and 118.2 and Pre and post Short form WOMAC score was 16.1 and 15.38. P value of NPRS, ROM and Short form WOMAC score was 0.10, 0.46 and 0.19 respectively. In Group B (Experimental group) patients age of range 42-65 years, average score for Pre and Post NPRS score was 5.66 and 4.16, Pre and Post ROM average score was 117 and 123.6 and Pre and post Short form WOMAC score was 15.76 and 12.9. P value of NPRS, ROM and Short form WOMAC score was < 0.0005. On comparing the average and P value of Pre and Post test scores in both Control and Experimental groups it was noted that Group A had negligible effects in OA knee patients with respect to Pain, ROM and Functional activity. Where as Group B patient respond well to PNF stretching treatment and results were highly significant statistically (P < 0.0005). None of our patients in both control and experimental group reported any local skin or general complications with the treatment.

DISCUSSION

There are various treatment options available to treat OA, where people has options to choose one among it. They are aware of pharmacological treatment which yields only symptomatic relief, relief also dosage dependent, long duration treatment and not cost effective. Clinicians are looking for alternate treatment options which is safe, effective and has minimal side effects. Among various non pharmacological treatment following are most commonly utilized methods. Thermotherapy, where heat, cold and combination of two (contract bath) are used, which yielded negligible effects in OA knee patients⁴. Exercise is utilized as supportive treatment in OA knee patients. Exercise can course some symptomatic improvement but it can't alter biomechanical nor structural disease progression in Osteoarthritis knee patients. The effect of exercise also declines over time^{5,7}. Electrical modalities like Transcutaneous Electrical Nerve Stimulator (TENS), Interferential current (IFT), Ultrasound therapy and Short wave diathermy showed improvement in OA symptoms but for short terms, but it is not cost effective⁸⁻¹¹. Hydrotherapy improves symptoms of Osteoarthritis, but muscle cramps, fall and contact dermatitis were noticed with this modality. Massage therapy which is an conventional method to treat OA is time consuming procedure and yielded negligible effects¹²⁻¹⁵.

Due to adverse, negligible effects and burden of cost of treatments mentioned above, there evolved new innovative treatment for Osteoarthritis which can ease symptoms without major side effects. Using the body's own biological mechanism i.e stimulation of mechanoreceptors in muscle may relieves pain, increase Active Range of Motion (AROM) and functional activities of Osteoarthritis knee patients. Mechanical forces which evoke response from Mechanoreceptors are present in muscle. PNF stretching technique is one of the technique used to stimulate the muscle receptors. PNF stretching is currently used to treat tighten muscles around the joint but not in arthritis of joint. Findings of previous empirical evidence which applied PNF stretching to shortened hamstring muscle noted increased muscle flexibility^{16,17}. Similarly modified hold relax technique produced better hamstring flexibility in tighten hamstring muscle¹⁸⁻²⁰. So it created a lacunae to focus on availing the PNF stretching in Osteoarthritis (OA) knee. In OA knee, patients have symptoms like pain, Restricted ROM and difficulty in functional activities like walking, stair climbing, squatting etc. So once the pain gets better, patients become functionally active. To ease pain muscle receptors (Mechanoreceptors) was stimulated with PNF stretching (Pain gate theory). In this study it was observed that PNF stretching when applied to osteoarthritis knee patients of grade 1 and 2 yielded marked reduction in pain, increased ROM and functional activities. Our study was limited by its short follow and we only saw the results of PNF immediately after the treatment. We believe that if repeats sessions of

PNF then it would lead to improvement in patients symptoms for longer term and we recommend a study with longer follow up is required to see if this true.

CONCLUSION

Moist hot pack treatment on its own has negligible effects in improving symptoms of OA knee patients. PNF showed significant beneficial effects in patients with early arthritis. It showed improvement in pain, range of motion and improvement in WOMAC score. PNF stretching seems like good alternative treatment option in OA knee patients without significant side effects. Authors would recommend that patients with early knee arthritis should be routinely sent for PNF treatment.

REFERENCES

- Lutzner J et al 2009 Surgical options for patients with osteoarthritis of the knee 5, 309-316(2009)
- Chandra Prakash Pal, Pulkesh Singh, Sanjay Chaturvedi et al. Epidemiology of knee osteoarthritis in India and related factors. Indian J Orthop, 2016;50(5): 518-522.
- Erlangga Yusuf MD, PhD, Pharmacologic and Non-Pharmacologic Treatment of Osteoarthritis. Curr Treat Options in Rheum 2016; 2:111-125.
- Amal E. Shehata and Manal E. Fareed. Effect of cold, warm or contrast therapy on controlling knee osteoarthritis associated problems. International Scholarly and Scientific Research and Innovation 7(9) 2013.
- Kim Bennell, Rana S. Hinman, Tim V. Wrigley et al. Exercise and Osteoarthritis: Cause and Effects. Compr Physio 2011. 1:1943-2008
- Kim L. Bennell, Fiona Dobson, Rana S. Hinman. Exercise in osteoarthritis: Moving from prescription to adherence. Best Practice & Research Clinical Rheumatology 28 (2014); 93-117
- Lucy Beumer, Jennie Wong, Stuart J Warden et al. Effects of exercise and manual therapy on pain associated with hip osteoarthritis: a systematic review and meta-analysis. Br J Sports Med 2015;0:1-7
- Funda C. Atamaz, MD, Berrin Durmaz, MD, Meltem Baydar, MD et al Comparison of the efficacy of transcutaneous electrical nerve stimulation, interferential currents, and shortwave diathermy in knee osteoarthritis: a double-blind randomized controlled multicenter study. Arch Phys Med Rehabil 2012;93:748-56.
- Shea Palmer, Melissa Domaille, Fiona Cramp et al. Transcutaneous electrical nerve stimulation as an adjunct to education and exercise for knee osteoarthritis: a randomized controlled trial. Arthritis Care & Research Vol. 66, No. 3, March 2014, pp 387-394.
- Yasemin Ulus, Berna Tander, Yesim Akyol et al. Therapeutic ultrasound versus sham ultrasound for the management of patients with knee osteoarthritis: a randomized double-blind controlled clinical study. International Journal of Rheumatic Diseases 2012; 15: 197-206
- Cakir S, Hepguler S, Ozturk C et al. Efficacy of Therapeutic Ultrasound for the Management of Knee Osteoarthritis- A Randomized, Controlled, and Double-Blind Study. Am. J. Phys. Med. Rehabil, Vol. 93, No. 5, May 2014
- Benjamin Waller, Anna Ogonowska-Slodownik, Manuel Vitor et al. Effect of therapeutic aquatic exercise on symptoms and function associated with lower limb osteoarthritis: systematic review with meta-analysis. Phys Ther. 2014; 94:1383-1395.
- Dorothea V. Atkins PhD, David A. Eichler, PhD. The Effects of Self-Massage on Osteoarthritis of the Knee: a Randomized, Controlled Trial. International Journal of Therapeutic Massage and Bodywork- Volume 6, Number 1, March 2013.
- Virginia Cortes Godoy, Tomas Gallego Izquierdo, Irene Lazaro Navas et al Effectiveness of massage therapy as co-adjutant treatment to exercise in osteoarthritis of the knee: A randomized control trial. Journal of Back and Musculoskeletal Rehabilitation 27 (2014); 521-529
- Diederik C Bervoets, Pim AJ Luijsterburg, Jeroen JN Alessie et al Massage therapy has short-term benefits for people with common musculoskeletal disorders compared to no treatment: A systematic review. Journal of Physiotherapy 61 (2015); 106-116.
- Kyoung Lim, PT, MSc, Hyung-Chun Nam, PT, PhD, Kyoung-Sim Jung, PT, PhD Effects on Hamstring Muscle Extensibility, Muscle Activity, and Balance of Different Stretching Techniques J. Phys. Ther. Sci. 26: 209-213, 2014.
- Mandeep Kaur, Rajesh Paul, Sandeep Kumar et al. A Randomized Controlled Trial to Compare the Effectiveness of Static Stretching Versus PNF Stretching of Hamstring Muscles Following Superficial Heat in Athletes International Journal of Scientific and Research Publications, Volume 4, Issue 7, July 2014.
- Gopi S. Mistry, Neeta J. Vyas, Megha S. Sheth. Comparison Of The Effect Of Active Release Technique Versus Proprioceptive Neuromuscular Facilitation Stretching (Modified Hold-Relax) On Hamstring Flexibility In Patients Having Chronic Low Back Pain. NJIRM 2015; Vol. 6(5) Sept-Oct.
- Amit Kumar Singh, Sibbala Nagaraj, Rakesh Man Palikhe et al. Neurodynamic sliding versus PNF stretching on hamstring flexibility in collegiate students: A comparative study International Journal of Physical Education, Sports and Health 2017; 4(1): 29-33.
- Laura Deguzman The Immediate Effects Of Self-Administered Proprioceptive Neuromuscular Facilitation, Myofascial Release, And Dynamic Stretching On Range Of Motion 2016.