

# THE EFFECT OF PHYSIOTHERAPY TREATMENT IN KNEE OSTEOARTHRITIS: AN EVIDENCE BASED STUDY

Bindiya S. Bhatti<sup>1</sup>, Neha N. Vasani<sup>1</sup>, Dr. Sheshna Rathod<sup>2</sup>

<sup>1</sup> - Intern student, Department of Physiotherapy, Government Physiotherapy College, Jamnagar, Gujarat

<sup>2</sup> - Tutor Cum Physiotherapist, Department of Physiotherapy, Government Physiotherapy College, Jamnagar, Gujarat

## **ABSTRACT:**

**Objective** — To determine effectiveness physiotherapy treatment in knee osteoarthritis. **Design**— The articles were searched in Google scholar, Pubmed, Elsevier, Cochrane library by using keywords TENS, SWD, US, IFT, Hot packs, LASER, knee osteoarthritis. Articles which were done during the year 2000 - 2019 were only selected. Articles were selected only if they were randomized controlled trial, includes subject with knee OA, Pain and activities of daily living were used as one of the outcome measure and Electrotherapy modality or exercise therapy was given as a treatment. **Results**— 80 to 85 articles were searched from different database out of them 13 articles were selected for the study. Two reviewers assessed study using the PEDro scale. Data were extracted by two reviewers that includes the intervention description, inclusion/exclusion criteria, baseline data, values for all outcomes at baseline, post-intervention and follow-up. **Conclusion**— Our findings indicate that exercises of knee in combination of pain relieving physical therapy modalities are more beneficial than modalities alone in physiotherapy management of knee osteoarthritis.

## **Keywords**

Knee osteoarthritis; Exercise therapy; Electrotherapy; Pain; Activities of daily living

## **INTRODUCTION:**

Knee Osteoarthritis (OA) is a degenerative type of arthritis that most commonly occurs in people of 50yrs of age & older. OA mainly affects knee joint. In OA the joint cartilage gradually wears away. Main causes of OA are age as the ability of cartilage to heal decrease as a person gets older, weight as increases pressure on weight bearing joints especially the knee joint, hereditary includes genetic mutations that might make a person more likely to develop OA. Clinical features include pain that increase during activity, but gets a little better with rest, swelling, stiffness in the knee especially in the morning, decrease in mobility of the knee making it difficult to do activities of daily living and crepitus. Diagnosis is made based on history and clinical examination. X-ray changes include joint space narrowing, subchondral cyst formation, subchondral sclerosis and osteophyte formation.<sup>1</sup>

Treatment for knee OA begins with conservative methods and progress to surgical treatment when conservative treatment fails. Conservative treatment includes patient education, lifestyle modification, weight reduction, knee bracing and medications.

Physiotherapy treatment for knee OA includes exercise therapy and electro therapy. Various exercises that are incorporated in the treatment are stretching of hamstrings and plantarflexors, strengthening of vastus medialis obliques, quadriceps drills, straight leg raising in supine, prone and side lying positions, heel raises, cycling.<sup>1</sup> Electrotherapy modalities include Ultrasound (US) using sound waves has ability to reduce pain and edema, increase the range of motion, and enhance tissue repair via thermal and non-thermal mechanisms. Low level LASER therapy used to control pain as well as it gives an analgesic effect and biomodulatory effect on microcirculation, Short wave diathermy (SWD) has a thermal effect on the tissues. Transcutaneous Electrical Nerve Stimulation (TENS), Interferential Therapy (IFT) helps to relieve pain through pain gate theory.

Evidence based study is needed to determine effective treatment and document the therapeutic effect of different modalities and techniques of various presentation. In this study we determine the effect of physiotherapy treatment in OA knee patient.

## **METHOD:**

Search strategy and study selection

The articles were searched in Google scholar, Pubmed, Elsevier, Cochrane library by using keywords TENS, SWD, US, IFT, Hot packs, LASER, knee osteoarthritis. Articles which were done during the year 2000 – 2019 were only selected. Two reviewers identified titles and abstracts relevant to using traction in patients with knee OA. Full texts of the published articles and unpublished articles were included. Articles were selected only if they were randomized controlled trial, includes subject with knee OA, Pain and activities of daily living were used as one of the outcome measure, Electrotherapy modality or exercise therapy was given as a treatment. Articles were excluded if they were Cor-relational study or Case study

Study Selection: 80 to 85 articles were searched from different database out of them 13 articles were selected for the study.

Quality measurement: Two reviewers assessed study using the PEDro scale. Data were extracted by two reviewers that includes the intervention description, inclusion/exclusion criteria, baseline data, values for all outcomes at baseline, post-intervention and follow-up

**RESULTS:**

Treatment	Title	No. of Subjects	Study Design	Duration	Outcome measures	Results	PEDRO-scale
US	Efficacy of focused low-intensity pulsed ultrasound (FLIPUS) therapy for the management of knee OA: a randomized, double blind, placebo-controlled trial <sup>2</sup>	106 patients. (Age ≥ 40yrs) Group A- FLIPUS + Diclofenac Sodium Group B-sham FLIPUS + Diclofenac Sodium	Prospective randomized placebo-controlled clinical trial	10 days	Visual Analogue Scale (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Lequesne index (LI), SF-36	Group A showed significant improvement in VAS, WOMAC, LI, ambulation speed, and most items in the SF-36 after 10 days of treatment. FLIPUS is a safe and effective treatment modality for relieving pain and improving the function and quality of life of patients with Knee OA	9/11
US	Effect of low-intensity long-duration ultrasound on the symptomatic relief of knee OA: a randomized, placebo controlled double-blind study <sup>3</sup>	84 patients 55-active deviced 29-placebo deviced	Randomized, controlled double-blind study	6 weeks	VAS, WOMAC	Long-duration low-intensity ultrasound significantly reduced pain and improved joint function in patients with moderate to severe OA knee pain.	9/11
LASER	Efficacy of low level laser therapy (LLLT) associated with exercises in knee OA: a randomized double-blind study <sup>4</sup>	40 patients (Age-50 to 75 years) 20 patients in group A received LLLT and exercises 20 patients in group B received placebo with exercises	Randomized double-blind placebo-controlled trial	22 weeks	VAS, WOMAC, Range of Motion (ROM), Muscle Strength, Lequesne questionnaire	LASER group had significant improvement, relative to baseline, on pain, ROM, functionality and activity. No significant improvement was seen in the placebo group. LLLT when associated with exercises is effective in yielding pain relief, function and activity on patients with knee OA.	9/11
LASER	Comparison of the effect of LASER therapy and therapeutic US in the management of chronic OA knee pain: a randomized controlled trial <sup>5</sup>	22 patients Age-47-83 yrs -Control -LLLT -Therapeutic (TUS)	Randomized controlled clinical trial	6 wks (3 times /wk)	VAS ROM	No significant contribution of LLLT and TUS over control (exercise) in VAS and ROM at p< 0.05. Exercise therapy should form the basis and bulk adjunct physical therapy in the management of osteoarthritis over Laser therapy and TUS.	8/11
IFT	Interferential Current Therapy in patients with Knee OA <sup>6</sup>	60 patients Group 1- 40Hz Group2-100Hz Group3-180Hz Group4-Sham IFT	Randomized and single-blind	3 wks (5 times /wk)	VAS-At rest and movement 15m walking ROM WOMAC	IFT had some advantages on pain and disability outcomes when compared with sham IFT for the management of knee OA. However, the effectiveness of different amplitude-modulated frequencies of IFT was not superior when compared with each other.	8/11
IFT	Efficacy of action potential simulation (APS) and IFT in the rehabilitation of patients with knee OA <sup>7</sup>	67 patients (Age -50 yrs) 34 patients received APS 33 patients received IFT	randomized clinical trial	4 wks	VAS WOMAC Time Up and Go test	Short term treatment with both APS & IFT could significantly reduce pain & improve physical function in patients with Knee OA.	9/11

SWD/TENS	Comparing Hot Pack, SWD, US and TENS on Isokinetic Strength, Pain, and Functional Status of Women with Osteoarthritic Knees <sup>8</sup>	100 patients Group 1 received SWD, Hotpacks, exercises Group 2 received TENS, Hot packs, exercises Group 3 received U.S., Hot packs, exercises Group 4 received Hot packs, exercises Group 5 received exercises	Single-Blind, Randomized, Controlled Trial	8 wks (3 times in wk)	Disability – index of severity for Knee OA (ISK) VAS Ambulation, predetermined distance	Using physical agents before isokinetic exercises in women with knee OA leads to augmented exercise performance, reduced pain, and improved function. Hot pack with a TENS or SWD has the best outcome.	8/11
SWD	No additional benefit of SWD over exercise program for knee OA in peri-/post-menopausal women: an equivalence trial <sup>9</sup>	104 patient (Age-50-85 years) 54 patient received sham SWD and exercises 50 patients received SWD and exercises	Double-blind randomized placebo-controlled	3 wks (3 times/wk)	WOMAC 100m walking speed Stair ascent & descent time Global assess Patient satisfaction	The addition of SWD to an exercise program for knee OA in peri-/post-menopausal women is not superior to the exercise program alone.	9/11
TENS	Comparison of the Therapeutic Efficacy of TENS Versus Intra-articular Hyaluronic Acid Injection in Patients With Knee OA: A Prospective Randomized Study <sup>10</sup>	60 patients (Age-≥45yrs) Group 1-TENS Group 2-Hylan G.F-20	Randomized controlled trial	3 wks	VAS WOMAC SF-36	Both TENS & viscosupplements with hylauronic G.F. 20 were effective in providing pain relief restoring physical function to patient with Knee OA during 1 <sup>st</sup> month and during 6month follow up period.	8/11
Exercise	Efficacy of hip strengthening exercises compared with leg strengthening exercise on knee pain, function and QOL in patients with knee OA <sup>11</sup>	72 patients 37 patients received hip strengthening exercises 35 patients received leg strengthening exercises	Single-Blinded Randomized Clinical Trial.	12 weeks	Knee injury osteoarthritis outcome score (KOOS) WOMAC 6-MWT ROM Muscle strengthening	Isolated hip and leg strengthening exercise program seem to similarly improve knee pain, function and quality of life in patient with Knee OA.	6/11
Exercise	Effect of isometric quadriceps exercise on muscle strength, pain and function in patients with knee OA: A randomized controlled study <sup>12</sup>	42 patients Age-40-65 years	Randomized Clinical Trial.	5 weeks	Numeric Rate Score-pain strength gauge device – quadriceps strength WOMAC	The 5-week isometric quadriceps exercise program showed beneficial effects on quadriceps muscle strength, pain, and functional disability in patients with knee OA.	9/11
Exercise	The effect of exercise therapy on knee OA: a randomized clinical trial <sup>13</sup>	50 patients 28 patients received exercises, NSAIDS, acupuncture and modalities 22 patients received NSAIDS, acupuncture and modalities	Single-Blinded Randomized Clinical Trial	3 months	VAS KOOS Functional Test such as 4 steps, 5 sit up, 6 MWT	Patients with knee OA in exercise group had significant improvement in pain, disability, walking, stair climbing, and sit up speed after treatment at first and second follow-up when compared with their initial status and when compared with non-exercise group.	7/11
Exercise	A physiotherapist-delivered integrated exercise and pain coping skills training (PCST) intervention for individuals with knee osteoarthritis: a randomized controlled trial protocol <sup>14</sup>	Age->=50yrs	Randomized Controlled Trial	12 weeks	VAS WOMAC QOL	Efficacy of an integrated exercise and PCST program delivered by PT in improving pain and physical function. In those with Knee OA compared with exercise on PCST alone.	7/11



**DISCUSSION:**

Total 13 articles were reviewed to determine role of physiotherapy in knee osteoarthritis. Biological effects of FLIPUS are mechanical resulting in alleviating joint symptoms, relieving joint swelling, increasing joint mobility, and reducing inflammation. Focused low intensity pulsed ultrasound with 0.6MHz and pulse repetition 300 Hz with 120 mW/cm<sup>2</sup> and duty cycle 20% given for 20 minutes one a day for 10 days was effective in reducing pain and improving function.<sup>2</sup> Low intensity, long duration ultrasound with 3 MHz continuous wave and 1.3 W power output with intensity 132 mW/cm<sup>2</sup> given for 4 hours daily for 6 weeks reduced pain.<sup>3</sup> It is stated that therapeutic ultrasound may be beneficial for patients with osteoarthritis of the knee.<sup>15</sup>

LASER along with exercises is effective in reducing pain, improving range of motion and function. LASER with 3J per point (Gallium Arsenide 904 nm) with 700Hz; 60 mW; 20W; pulsed duration of 4.3 msec; 50 sec per point.<sup>4</sup> Systemic review of LASER current evidence does not support the effectiveness of LLLT as a therapy for patients with knee OA. Effectiveness of LASER depends on several factors such as the energy density, wavelength, output, number and timing of treatment sessions as well as the optical properties of the tissue.<sup>16</sup> Our review states that LASER along with exercises is more beneficial in knee OA in comparison to LASER alone.

IFT with different amplitude modulated frequencies ranging from 40 Hz to 180 Hz was beneficial in reducing pain and improving activities of daily living.<sup>6</sup> Action potential stimulation (APS) and IFT were equally beneficial in reducing pain and improving physical function in patients with knee OA. APS was applied with frequency 151 Hz; pulse width 800 msec; constant current with maximum amplitude 1.5 mA. For IFT, isoplanar vector field with 6:6 sweep mode with carrier frequency 4 KHz; beat frequency 100Hz and sweep frequency 150 Hz was used.<sup>7</sup>

Addition of SWD to exercises for knee OA in peri-/post-menopausal women is not superior to the exercises alone.<sup>9</sup> There is a evidence that pulsed electromagnetic field therapy has little value in the management of knee osteoarthritis.<sup>17</sup> TENS with frequency of 150 Hz for 3 weeks has effective role in providing pain relief and restoring physical function to patients with knee OA.<sup>10</sup> Systemic review done for TENS in knee osteoarthritis is inconclusive.<sup>18</sup>

There is evidence that exercise and weight reduction reduce pain and improve physical function in patients with knee osteoarthritis.<sup>19</sup> Reduction in quadriceps strength is present in knee OA. Exercises including hip strengthening, quadriceps strengthening were effective for pain reduction and function improvement in patients with knee osteoarthritis.<sup>11,12</sup>

**CONCLUSION:** Exercises of knee in combination of pain relieving physical therapy modalities are more beneficial than modalities alone in physiotherapy management of knee osteoarthritis.

**REFERENCES:**

1. Kisner C, Colby LA; Therapeutic Exercise Foundations and Techniques; 2007; F A Davis company; 5<sup>th</sup> edition; 693-697
2. Jia, L. *et al.* Efficacy of focused low-intensity pulsed ultrasound therapy for the management of knee osteoarthritis: a randomized, double blind, placebo-controlled trial. *Sci. Rep.* **6**, 35453
3. Draper DO, Klyve D, Ortiz R, Best TM. Effect of low-intensity long-duration ultrasound on the symptomatic relief of knee osteoarthritis: a randomized, placebo-controlled double-blind study. *Journal of orthopaedic surgery and research.* 2018 Dec;13(1):257.
4. Alfredo PP, Bjordal JM, Dreyer SH, Meneses SR, Zaguetti G, Ovanessian V, Fukuda TY, Junior WS, Martins RÁ, Casarotto RA, Marques AP. Efficacy of low level laser therapy associated with exercises in knee osteoarthritis: a randomized double-blind study. *Clinical rehabilitation.* 2012 Jun;26(6):523-33.
5. Shmaila Hanif, A R Salim, Sikiru Lamina, Usman L Isa; Comparison of the effect of laser therapy and therapeutic ultrasound in the management of chronic osteoarthritic knee pain: a randomised controlled trail; *Nigerian Journal of Medical Rehabilitation (NJMR)*; Vol. 15, No. 1 & 2, (Issue No. 23) 2010; 1-5
6. Gundog M, Atamaz F, Kanyilmaz S, Kirazli Y, Celepoglu G. Interferential current therapy in patients with knee osteoarthritis: comparison of the effectiveness of different amplitude-modulated frequencies. *American journal of physical medicine & rehabilitation.* 2012 Feb 1;91(2):107-13.
7. Eftekharsadat B, Babaei-Ghazani A, Habibzadeh A, Kolahi B. Efficacy of action potential simulation and interferential therapy in the rehabilitation of patients with knee osteoarthritis. *Therapeutic advances in musculoskeletal disease.* 2015 Jun;7(3):67-75.
8. Cetin N, Aytar A, Atalay A, Akman MN. Comparing hot pack, short-wave diathermy, ultrasound, and TENS on isokinetic strength, pain, and functional status of women with osteoarthritic knees: a single-blind, randomized, controlled trial. *American journal of physical medicine & rehabilitation.* 2008 Jun 1;87(6):443-51.
9. Rattanachaiyanont M, Kuptniratsaikul V. No additional benefit of shortwave diathermy over exercise program for knee osteoarthritis in peri-/post-menopausal women: an equivalence trial. *Osteoarthritis and cartilage.* 2008 Jul 1;16(7):823-8.
10. Paker N, Tekdös D, Kesiktas N, Soy D. Comparison of the therapeutic efficacy of TENS versus intra-articular hyaluronic acid injection in patients with knee osteoarthritis: a prospective randomized study. *Advances in therapy.* 2006 Mar 1;23(2):342-53.
11. Lun V, Marsh A, Bray R, Lindsay D, Wiley P. Efficacy of hip strengthening exercises compared with leg strengthening exercises on knee pain, function, and quality of life in patients with knee osteoarthritis. *Clinical Journal of Sport Medicine.* 2015 Nov 1;25(6):509-17.
12. Anwer S, Alghadir A. Effect of isometric quadriceps exercise on muscle strength, pain, and function in patients with knee osteoarthritis: a randomized controlled study. *Journal of physical therapy science.* 2014;26(5):745-8.
13. Nejati P, Farzinmehr A, Moradi-Lakeh M. The effect of exercise therapy on knee osteoarthritis: a randomized clinical trial. *Medical journal of the Islamic Republic of Iran.* 2015;29:186.
14. Bennell KL, Ahamed Y, Bryant C, Jull G, Hunt MA, Kenardy J, Forbes A, Harris A, Nicholas M, Metcalf B, Egerton T. A physiotherapist-delivered integrated exercise and pain coping skills training intervention for individuals with knee osteoarthritis: a randomised controlled trial protocol. *BMC musculoskeletal disorders.* 2012 Dec;13(1):129.
15. Loyola-Sánchez A, Richardson J, MacIntyre NJ. Efficacy of ultrasound therapy for the management of knee osteoarthritis: a systematic review with meta-analysis. *Osteoarthritis and Cartilage.* 2010 Sep 1;18(9):1117-26.
16. Huang Z, Chen J, Ma J, Shen B, Pei F, Kraus VB. Effectiveness of low-level laser therapy in patients with knee osteoarthritis: a systematic review and meta-analysis. *Osteoarthritis and cartilage.* 2015 Sep 1;23(9):1437-44.
17. McCarthy CJ, Callaghan MJ, Oldham JA. Pulsed electromagnetic energy treatment offers no clinical benefit in reducing the pain of knee osteoarthritis: a systematic review. *BMC Musculoskeletal Disorders.* 2006 Dec;7(1):51.
18. Rutjes AW, Nüesch E, Sterchi R, Kalichman L, Hendriks E, Osiri M, Brosseau L, Reichenbach S, Jüni P. Transcutaneous electrostimulation for osteoarthritis of the knee. *Cochrane Database of Systematic Reviews.* 2009(4).
19. Jamtvedt G, Dahm KT, Christie A, Moe RH, Haavardsholm E, Holm I, Hagen KB. Physical therapy interventions for patients with osteoarthritis of the knee: an overview of systematic reviews. *Physical therapy.* 2008 Jan 1;88(1):123-36.