



## A STUDY ON ANKLE TRACTION AND INTERFERENTIAL THERAPY FOR THE TREATMENT OF OSTEOARTHRITIS OF KNEE JOINT

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### ABSTRACT

Osteoarthritis 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 capsule. 59 subjects, suffering from unilateral Osteoarthritis of knee joint participated in this experimental study. After considering inclusion and exclusion criteria, subjects were divided into 3 groups. Group A received Ankle Traction, Group B received Interferential Therapy and Group C received a combination of Ankle Traction and Interferential Therapy. All three groups were given exercises in common. The subjects were assessed on a modified Indian Version of WOMAC Index (CRD Pune Version) in English and Marathi languages. The subjects were assessed prior to the 1<sup>st</sup> day of the treatment session. Similar assessments were taken by the end of 1<sup>st</sup> week and 2<sup>nd</sup> week and scores were taken. With 't' test, there was a significant improvement in the total WOMAC Score and its sub parameters of pain, stiffness and functional score in all 3 groups ( Gr. A- score 29.55 reduced to 12.95 , in Gr. B - score 31.3 reduced to 14.4 and in Gr. C – score 32.11 reduced to 13.79 ). Whereas ANOVA did not show significant difference in the pain, stiffness and functional score of WOMAC Index between all 3 groups. It was concluded that all three methods of treatment i.e Ankle Traction with exercises, Interferential Therapy with exercises and a combination of Ankle Traction and Interferential Therapy along with exercises are equally effective in the management of Osteoarthritis of knee joint.

**KEY WORDS:** *Osteoarthritis, Ankle Traction, Interferential Therapy, WOMAC.*



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## INTRODUCTION

The American Rheumatism Association defined Osteoarthritis as a heterogeneous group of conditions that lead to joint symptoms and signs which are associated with defective integrity of the articular cartilage and changes in the underlying bone and at the joint margins.<sup>1</sup> It is the most common Rheumatologic disease, affecting 80% of those aged 65 years or older. It is the eighth leading cause of disability globally, with the knee joint most frequently associated with disability.<sup>2</sup> Many countries in Asia are aging rapidly. It has been estimated that the percentage of people aged 65 years and over, in Asia will be more than double in the next two decades, from 6.8% in 2008 to 16.2% in 2040.<sup>3</sup> Prevalence of Osteoarthritis ranges from 22% to 39% in India.<sup>2</sup> Evidence indicates that prevalence of Osteoarthritis increases with age and generally affects women more frequently than men.<sup>3</sup> The main symptoms of Osteoarthritis of knee joint are pain, stiffness and altered functions. Initially it tends to be worse with weight bearing and Ambulation. Eventually, it can progress to pain day and night once cartilage loss leads to bone-on-bone contact.<sup>4</sup> Treatment goals include management of painful symptoms and improvement of functional capacity. These goals can be achieved by combining non-pharmacological modalities and Pharmacological interventions including Paracetamol, Opioids and NSAIDS. Interferential Therapy is a form of electroanalgesia based on the gate control theory of pain perception by Melzack and Wall. It delivers currents to deep tissues through the use of Kilofertz –carrier frequency pulsed or sinusoidal currents to overcome the impedance offered by the skin. The basic concept behind Interferential therapy is that skin impedance (resistance) is inversely proportional to the frequency of an applied current. 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. Review of literature supports the evidence of Interferential Therapy in the management of Osteoarthritis of knee joint.<sup>5</sup> Since Traction is traditionally used for the treatment of Cervical Spondylosis<sup>6</sup> and Lumbar Spondylosis<sup>7</sup> for relief of pain and muscle relaxation, traction can also be given in the treatment of Osteoarthritis of knee joint. As some studies have been conducted states that traction can be given for Ankle Joint<sup>8</sup> and that so it can also be given for Osteoarthritis of knee joint.<sup>9</sup> Evidence indicates that Quadriceps weakness may be present in patients who have Osteoarthritis of knee joint. There is a possibility that Quadriceps weakness is a primary risk factor for knee pain, disability and progression of joint damage in persons with Osteoarthritis of the knee.<sup>10</sup> Encouraging regular exercises may reduce the physical impairments and thus improve the Osteoarthritis patient's quality of life.<sup>11</sup> The primary purpose of this study is to determine the effectiveness of Ankle Traction and Interferential Therapy along with Exercises in the management of Osteoarthritis of knee joint. Though it is known that Ankle Traction and Interferential Therapy are effective individually, however combination therapy may help in faster recovery.

## MATERIALS AND METHODS

This experimental study design was conducted at Dr. D. Y. Patil Physiotherapy OPD, Pimpri, Pune. after the approval from Institutional Ethical Committee. The sampling method used was Purposive sampling. Initially, sixty subjects participated in the study, but one subject discontinued the treatment because of personal reasons. Hence 59 subjects, suffering from Unilateral Osteoarthritis of knee joint participated in the study. Prior to the participation, they were explained about the treatment and the experimental procedures and were requested to sign a consent form for their voluntary participation in the study. The inclusion criteria consisted of (1) Patients who were diagnosed as Tibio - femoral type of Osteoarthritis of knee joint by Orthopaedicians (2) Unilateral Osteoarthritis of knee joint (3) Age 40 to 60 years (4) Knee pain for most days of prior month. Exclusion criteria consisted of (1) Deformities following fractures around the joints of the lower extremities (2) Patients with Rheumatoid Arthritis (3) Infective conditions around the knee joint (4) Neurological conditions (5) metal implants in and around the knee joint (6) Intra- articular corticosteroid injection into the knee joint within previous 3 months (7) Radiating pain from other areas like low back pain, sciatica. After considering about the inclusion and exclusion criteria, the subjects were divided into 3 groups. Group A consisted of 20 subjects (Male=6, Female=14) with a mean age of 50.1 years and were treated with Ankle Traction. Group B consisted of 20 subjects (Male=6, Female=14) with a mean age of 48.5 years and were treated with Interferential Therapy. Group C consisted of 19 subjects (Male=8, Female=11) with a mean age of 50.7 years and were treated with combination of Ankle Traction and Interferential Therapy. All three groups were given straight leg raising and free active flexion exercises in common. In this study, Group A patients received Ankle Traction in supine position, with the help of visco strap placed around the Ankle joint. This in turn is attached to the spreader bar of the mechanical traction machine. The spreader bar to which the traction cords are attached lies 4-6 inches beyond the Ankle to allow movements of the foot. Counter traction is given by raising Foot end of the bed by means of wooden blocks, so that the body tends to slide in opposite direction to that of the traction force. Traction weight of 3 kgs<sup>12</sup> with Intermittent traction (30 seconds on and 30 seconds off)<sup>13</sup> was given for 30 minutes for a duration of 2 weeks.<sup>14</sup> Group B patients were treated with Interferential Therapy, given in supine lying position and skin resistance was reduced with the help of normal saline. Mode of delivery was by Quadripolar method with an electrode fixation by Velcro straps or Adhesive tapes. Carbon impregnated electrodes were used with an electro conductive gel, as it involves in transcutaneous delivery of an electric current at skin level. Beat frequency range (sweep between 80-150 bps) was used for management of pain with an intensity as tolerated by the patient. Treatment was given for 10 minutes<sup>15</sup> for a duration of 2 weeks. Group C patients were treated with a combination of Ankle Traction and Interferential Therapy. All three groups were given an exercise regime, consisted of straight leg raising up to 10 times with a 10 seconds hold, within the limits of pain. Subjects were instructed to perform these exercises twice per day. In addition, free active knee flexion exercises were performed up to 10 times at each exercise session.<sup>16</sup> The application of the

WOMAC (Western Ontario and McMaster Universities) Index is used to assess patients of Osteoarthritis of Knee joint womac Index in countries with a vast degree of socio cultural diversity such as India requires certain modifications and adaptation. So the modified Indian version of WOMAC by Arvind Chopra was used and for the convenience of patients, a translated scale was used in English and Marathi languages.<sup>17</sup> The patients were assessed with these instruments on the 1<sup>st</sup> day of the treatment session and scores were taken. Similar assessments were taken by the end of the 1<sup>st</sup> week and by the end of 2<sup>nd</sup> week and scores were taken.

## RESULTS

Statistical analysis was done using primer software and confidence interval was kept at 95%. Intra Group comparison (within group) using paired t test was done. The table 2 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 of WOMAC score on pretreatment was 29.55 which was reduced to a mean of 19.55 after 1 week of treatment on 6<sup>th</sup> day and which was further reduced to a mean of 12.95 after 2 weeks of treatment on 12<sup>th</sup> day. The p value by paired 't' test was found to be <0.001(table 3) which is statistically significant. In Group B, the mean WOMAC score on pretreatment was 31.3 which was reduced to a mean of 21.3 post 1 week on 6<sup>th</sup> day and that it was further reduced to 14.4 post 2 weeks of treatment on 12<sup>th</sup> day. The p value by paired 't' test was found to be <0.001(table 3) which is statistically significant. In Group C, the mean WOMAC score on pretreatment was 32.11 which was reduced to a mean of 21.05 post 1 week on 6<sup>th</sup> day and that it was further reduced to 13.79 post 2 weeks of treatment on 12<sup>th</sup> day. The p value by paired 't' test was found to be <0.001(table 3) which is statistically significant.

**Table 1**  
**Baseline characteristics of the participants**

Variable	Group A (20)	Group B (20)	Group C (19)
sex	M= 6 & F=14	M= 6 & F=14	M= 8 & F=11
Age(years)	50.1	48.5	50.7

**Table 2**  
**WOMAC Score at 3 levels among 3 groups**

GROUPS		PAIN		STIFFNESS		FUNCTIONAL SCORE		TOTAL	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Group A	Pre Treatment	5.95	1.731	1.9	0.9679	21.7	3.868	29.55	5.615
	Post I week	3.65	1.461	1.1	0.7182	14.8	3.665	19.55	4.947
	Post II WEEKS	1.9	0.9199	0.55	0.5104	11	3.728	12.95	3.9
Group B	Pre Treatment	6.4	1.465	2.0	0.9177	22.9	3.768	31.3	5.079
	Post I week	3.85	0.9881	1.3	0.8013	16.15	3.048	21.3	4.092
	Post II WEEKS	2.1	0.9119	0.6	0.5026	11.7	2.296	14.4	3.202
Group C	Pre Treatment	6.526	1.645	2.368	1.0650	23.21	4.328	32.11	5.772
	Post I week	4.105	1.15	1.263	0.8057	15.68	3.367	21.05	4.378
	Post II WEEKS	2.316	0.7493	0.5789	0.5073	10.89	2.726	13.79	3.376

**Table 3**  
**Statistical significance in all subscores of WOMAC among 3 groups**

Sub Parameters of WOMAC	Groups	Pre Treatment& post I week	Pretreatment & post II week	Post I week & post II weeks
Pain	Group A	t= 11.898, p<0.001	t= 13.354, p<0.001	t= 7.676, p<0.001
	Group B	t= 11.419, p<0.001	t= 14.333, p<0.001	t= 9.200, p<0.001
	Group C	t= 9.857, p<0.001	t= 11.587, p<0.001	t= 8.500, p<0.001
Stiffness	Group A	t= 4.292, p<0.001	t= 6.469, p<0.001	t= 3.240, p<0.001
	Group B	t= 4.765, p<0.001	t= 8.304, p<0.001	t= 4.765, p<0.001
	Group C	t= 5.953, p<0.001	t= 10.936, p<0.001	t= 4.444, p<0.001
Functional Score	Group A	t= 15.249, p<0.001	t= 19.061, p<0.001	t= 6.962, p<0.001
	Group B	t= 20.870, p<0.001	t= 22.615, p<0.001	t=12.399, p<0.001
	Group C	t= 10.911, p<0.001	t= 15.015, p<0.001	t= 9.955, p<0.001

**Table -4**  
**Analysis of variance for pain, stiffness and functional score**

Groups	PAIN		STIFFNESS		FUNCTIONAL SCORE	
	f. value	p. value	f. value	p. value	f. value	p. value
GROUP A						
GROUP B	1.10	0.339	0.46	0.636	0.81	0.452
GROUP C						

**But all three treatment groups showed a rapid decline in the mean value of total WOMAC Index in the 1<sup>st</sup> week of treatment as compared to the 2<sup>nd</sup> week of treatment.**

## DISCUSSION

Overall the results of the study demonstrated that all three groups provided significantly greater pain relief, decreased stiffness and improved functional ability using modified Indian version of WOMAC Index in the management of Osteoarthritis of knee joint. In this study, Group A showed significant improvement in pain, stiffness and functional score with a total pretreatment mean of 29.55 and post treatment mean of 12.95 with p value of <0.001. The possible explanation for the finding could be because mechanoreceptors are stimulated which may block the transmission of the nociceptive stimuli at the spinal cord or brain stem level and inhibition of reflex muscle guarding will decrease the discomfort from the contracting muscles.<sup>7</sup> When the ligament is loaded and unloaded in successive manner, the load formation curve will shift to the right with loading and unloading cycle instead of following the same path. This phenomenon, i.e Hysteresis, is an important therapeutic application during traction.<sup>13</sup> As based on the above phenomenon, the study showed significant improvement in pain, stiffness and functional ability. Group B showed a significant improvement in pain, stiffness and functional score with a total pretreatment mean score of 31.3 and post treatment of 14.4 and p value of <0.001. The pain relief by Interferential Therapy is due to pain gate theory by Melzack and Wall (1965) who proposed that action potentials in the form of impulses, traveling along the large diameter fibers compete for access into the central ascending sensory tracts in the dorsal horn of spinal cord with nociceptive impulses travelling along the smaller diameter nociceptive fibers. The former fibers conduct faster, therefore their action potentials gain precedence over the nociceptive impulses, closing gates against the action potentials which therefore fail to reach at conscious level.<sup>1</sup> The previous study on the effect of Interferential Therapy in modulating Osteoarthritis knee pain by Rufus Adesoji (2002), revealed a significant difference in pain modulation in Black African patients with Osteoarthritis using Interferential Therapy and placebo condition.<sup>1</sup> Goats (1990) proposed that an increase in motor stimulation promotes an efflux of pain inducing chemicals from the site of damage. The descending pain suppression mechanism mediated by endogenous opiates is also thought to modulate the experience of pain (Belanger 1985).<sup>1</sup> Group C was given the combination of Ankle Traction, Interferential Therapy along with exercises, which showed significant improvement in pain, stiffness and functional score with pre-treatment mean value of 32.11 and post-treatment of 13.79 and p< 0.001. The improvement is due to the combination of the effect of Hysteresis and Pain gate mechanism. In conclusion, the present study shows that all three methods of treatment i.e. Ankle Traction with exercises, Interferential Therapy with exercises and combination of Ankle Traction and Interferential Therapy with exercises are equally effective in the management of Osteoarthritis of knee joint.

### Future Scope

Further studies can be done with large sample size. Radiographs and MRI can also be used to compare pre and post treatment efficacy. Long term follow up may prove the efficacy of the treatment.

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## CONFLICT OF INTEREST

Conflict of interest declared none.

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