

Effect of Interferential Therapy versus Shortwave Diathermy on Pain and Function in Mechanical Neck Pain - A Comparative Study

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ABSTRACT

Background: Mechanical neck pain is defined as generalized neck pain provoked by sustained neck postures, neck movement and pain on palpation of cervical musculature without pathologies. Mechanical neck pain is experienced by 30 % to 50 % of the general population. [1] 11 % to 14 % of working population experience activity limitation due to neck pain.

The causative factors may include everyday activities. Such as bending over a desk for hours, having poor posture while watching TV or reading, placing your computer monitor too high or too low, sleeping in an uncomfortable position, or twisting and turning the neck in a jarring manner while exercising. Physical therapy interventions used in mechanical neck pain include exercise therapy and electrotherapeutic modalities.

Shortwave diathermy is a high frequency modality working on mechanism of pain relief by producing heating effects in the deeper tissues resulting in vasodilatation.

Interferential therapy on the other hand, works on the principle of interference of two medium frequency currents in the deeper tissues, to produce the effect of low frequency current which primarily works by acting on the Pain gate mechanism.

The purpose of this study is to compare the efficacy of a medium frequency current and a high frequency current in relieving pain and improving function in patients with mechanical neck pain.

Methodology: Ethical clearance was obtained from institutional ethical committee prior to study 34 patients referred from the Orthopedic

OPD were screened. From that 30 patients who fulfilled inclusion & exclusion criteria were included in the study after taking written informed consent. Patients were divided into 2 groups by Convenient Sequential sampling. There were 6 drop out from the study. Total 24 Patients were divided into 2 groups. Each group contained 12 patients.

Group- A [SWD + conventional therapeutic exercise group]

Group- B [IFT + conventional therapeutic exercise group]

The procedure was explained to the patient and they were assessed as per the proforma and there was no any adverse event occurred during the study duration.

Data was collected between the duration of 3 months from August-2016 to October-2016

Results: The results of the study shows statistically significant difference between Shortwave Diathermy and Interferential Therapy, in terms of pain relief and improvement in function of mechanical neck pain patients, thus supporting to use of both the modalities in the management of mechanical neck pain, But as an adjunct to therapeutic exercises for the greater benefit of the patient, Interferential Therapy use More recommendable.

Conclusion: From the present study, it can be concluded that either of Shortwave Diathermy or Interferential Therapy can be used as an adjunct to therapeutic exercise to improve pain and function in patients with Mechanical Neck pain. But for greater improvement in pain and function, Use of Interferential Therapy can be considered more effective.

Key words: Mechanical Neck Pain, Interferential Therapy, Shortwave diathermy

INTRODUCTION

Neck pain is common, bothersome and potentially debilitating problem and a widespread disorder. The overall prevalence of neck pain in the general population is 23.1%. [1] Prevalence is generally higher in high-income, urban countries compared with low- and middle income, rural countries. [1] Neck pain peaks in the middle age and is higher in woman than in man. Most neck pain results from problems affecting the structures of cervical spine which includes 7 cervical vertebrae, the intervertebral discs and the other joints between the vertebrae and nerves and blood vessels.

Mechanical neck pain is defined as generalized neck pain provoked by sustained neck postures & neck movements, pain on palpation of cervical musculature without pathologies occurs. The pain is felt in the region between superior nuchal line to the first thoracic vertebra. [2] Mechanical neck pain affected by 30 % to 50 % of the general population annually. 11 % to 14% of working population experience activity limitation due to neck pain.

The causes of neck pain mainly include following: [3][6]

- Anomalies of bones and joints
- Trauma
- Poor posture
- Degenerative joint disease
- Tumor/neoplasm
- Neck musculature strain
- Psychological stress
- Others or ideological

The gross management of mechanical neck pain consists of conservative management that includes cognitive behavioral therapy, supervised exercise therapy, brief educational interventions like Neck schools and multidisciplinary treatment while the other one is surgical treatment. [4][5] Many

treatment forms are prescribed for mechanical neck pain including oral nonsteroidal anti-inflammatory drugs, acupuncture, manipulation, massage, electrotherapy and therapeutic exercises. [5] Various physical therapy modalities used are thermotherapy, cryotherapy, cervical traction, shortwave diathermy, interferential therapy, transcutaneous electrical nerve stimulation massage; manipulation and collar etc. are used. Integrating modalities into therapy can foster much needed relief in patients affected by neck pain. There is wide range of modalities that serves to reduce pain and thereby improve function in patients with mechanical neck pain. These modalities also plays very important role in active rehabilitation of patient with long term positive outcomes. [6]

Shortwave diathermy is a high frequency current that is obtained by a discharging condenser through inductance of low ohmic resistance. When this high frequency current passes into the tissues, it produces heat into the tissues. Continuous SWD can be delivered through either inductive or capacitive method. [7][8] Various direct and indirect mechanisms of pain relief through SWD are explained. Direct mechanisms are strong superficial heating activating the pain gate mechanism, removal of noxious chemical substance and waste products through vasodilatation. Indirectly it relieves pain by resolving inflammation, reducing swelling, increasing compliance of connective tissues, decreasing joint stiffness and placebo effect. [8]

Interferential therapy, on the other hand, is characterized by the interference of two medium frequency currents [1-10kHz] which combine to produce low frequency [1kHz]. Interference therapy is applied transcutaneously via electrode pads, either by bipolar or by quadripolar application. Although the exact mechanism of action of IFT on pain modulation is unknown. Selective stimulation of large or small diametric afferent fibers and by using different doses of amplitude modulated frequency [AMF] has been proposed as

possible mechanism of for activating analgesic effect. The other theoretical mechanism is descending pain suppression system [DPSS], physiological block of nerve conduction, increased circulation and placebo mechanism. [7][8]

The indications, contraindications and dangers of both the modalities were reviewed and taken into consideration for selection of patients. [9,10]

Many studies have compared the effectiveness of shortwave diathermy and placebo or exercise alone and interferential therapy versus TENS or placebo or exercise alone which showed significant reduction in pain and improvement in function with use of these modalities. But very few studies have been published for comparing the effectiveness of high frequency modality versus low frequency modality in mechanical neck pain. Thus, this study has been designed to compare the effectiveness of shortwave diathermy and interferential therapy on pain in mechanical neck pain. [7][8]

MATERIAL AND METHODS

Pen, Scale, Plinth, Table, Chair, Consent form, Proforma, Towel, Aqueous gel, Tape, Pad electrodes, Stabilizer, Camera, Cotton, Bed sheet and Pillow
Patients with Mechanical neck pain were diagnosed and referred by a medical practitioner were screened as per the inclusion and exclusion criteria.

➤ FLOW CHART:

INCLUSION CRITERIA:

- 1-Patients diagnosed with mechanical neck pain by the medical practitioner and referred from the orthopedic OPD of the hospital.
- 2- Patients willing to participate
- 3-Gender-Both male and female

EXCLUSION CRITERIA:

- 1-Patients with cervical Radiculopathy
 - 2-Cervicogenic headache
 - 3-Trauma to neck
 - 4-Vertebro-basillary artery insufficiency
 - 5- Thoracic Outlet Syndrome
 - 6- Any traumatic or non-traumatic shoulder disorders
- Red flags for short wave diathermy and interferential therapy. [1]

The patients were included in the study after taking the informed written consent. They were then divided into two groups.

Group- A [SWD + conventional therapeutic exercise group]

Group- B [IFT + conventional therapeutic exercise group]

The procedure was explained to the patient and they were assessed as per the proforma.

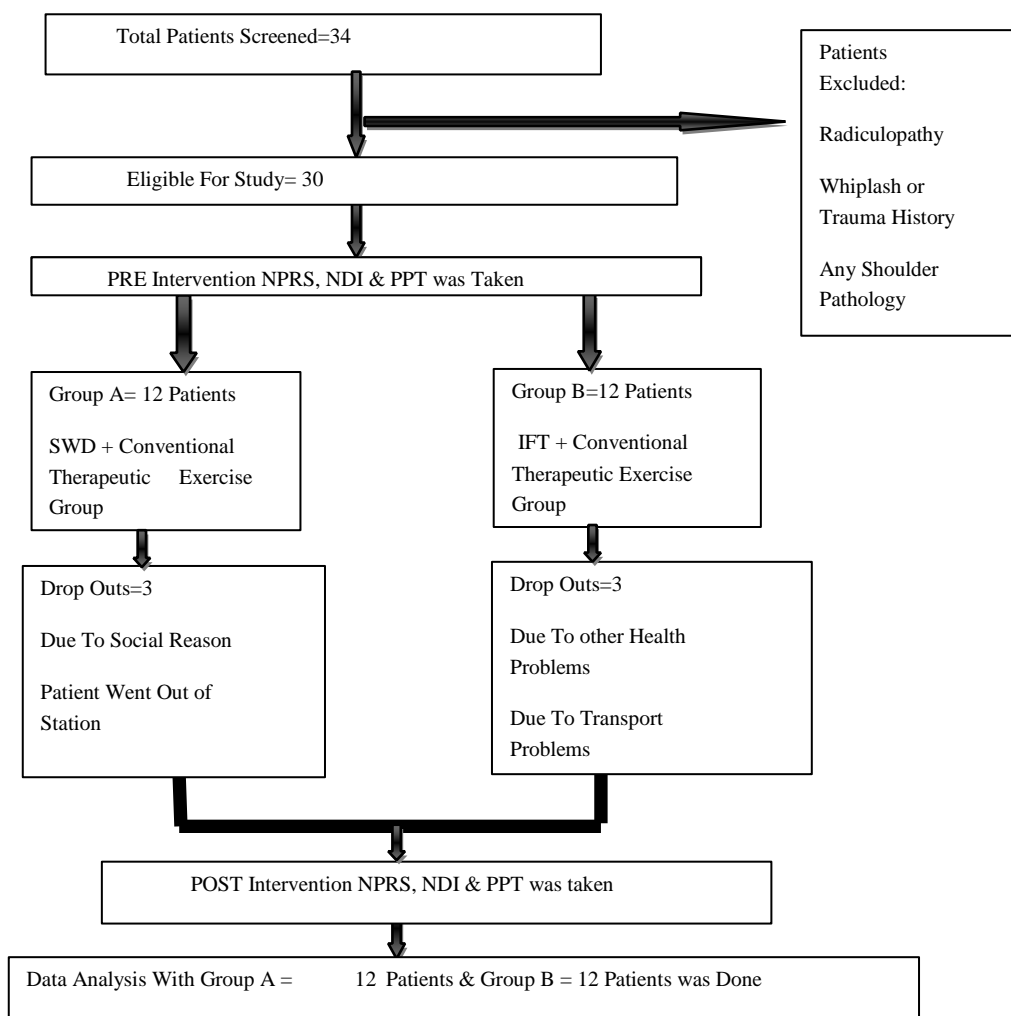
Group- A

Patients in the group 1 were administered Short wave diathermy along with conventional therapeutic exercise group for mechanical neck pain.

Group- B

Patients in the group 2 were administered interferential therapy along with conventional therapeutic exercise group for mechanical neck pain.

Patients in both the groups were advised for follow ergonomic advices and apply hot water fomentation if required.



Shortwave diathermy: [13-15]

Patients were checked for all the contraindications for SWD before starting the treatment.

Patient was made to lie in prone position.

Electrodes were placed in the Neck Region in the Co-Planar Method.

Proper Spacing was done For the Electrodes & Proper Distance was kept Between Two Electrodes.

The Parameters for the SWD were set As Follows:

Time: 20 Minutes [11]

Intensity: As per Patient's Tolerance [Comfortable warmth]. A Proper Check was kept throughout the treatment.

Type of Electrode: Capacitor Electrode.

Method of Application: Co-Planar

Interferential Therapy: [12-14]

Patients were checked for all the contraindications for SWD before starting the treatment.

Four carbon rubber Electrodes were placed in the Neck Region+ in Quadripolar Method.

The Parameters for the SWD were set As Follows:

Time: 20 Minutes [11]

Intensity: As per Patient's Tolerance. A Proper Check was kept throughout the treatment.

Frequency: 90-120 Hz [Rhythmic]

Wave form: Triangular/Trapezoid / Rectangular [15]

Postural Education & Core Stability For The Cervical Spine: [16][18]

On the initial treatment visit, patient will be educated about the importance of correct postural alignment of the cervical spine during daily activities and at work place.

- Keep your neck straight & chin tucked in.
- Avoid neck flexion and extension position for prolonged periods of time.

- Take regular intervals from your work and do active range of motion exercises of cervical spine.
- Sleep with neck adequately supported on pillow so that it fully supports the neck curvature while lying on the back as well as during side lying position.
- Avoid any heavy weight lifting on the Head. INE was done twice in a day. Once in the department and for the second time, patients were taught to do exercises at home. [22]

Dynamic Neck Exercises: [23-25]

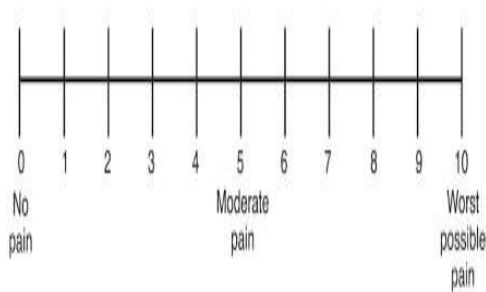
Dynamic neck exercises included lifting head up with the chin tucked in from supine lying for neck flexion, lifting head backwards in prone lying for neck extension, lifting head sideways from pillow in side lying position for neck side flexion. [22] The same is repeated also for the other side and finally lifting head off from the bed and rotating to one side for neck rotation,

repeating both ways. These exercises were performed for 8-10 repetitions twice a day.

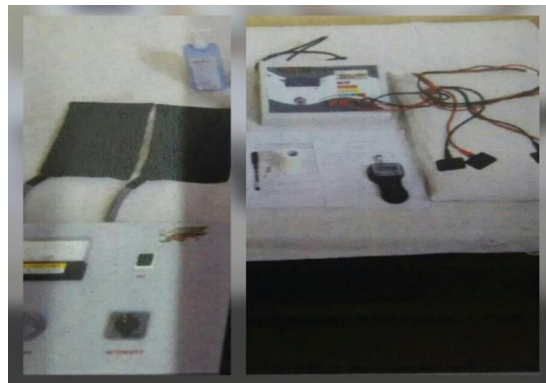
Ergonomic Advices: Ergonomic Advices and Postural Re-Education were given to the patients to prevent neck strain as well as prevent further recurrence of symptoms and were asked to follow the same. [21]

APPARATUS USED IN THE STUDY

- Shortwave Diathermy
Input:230 VAC ; 50 Hz ; Input Power:1000W Model no.:955
Serial No.:1010310
- Interferential Therapy
Input:230 VAC ; 50 Hz ; Input Power:20W
Model no.:203
Serial No.:980314
- Pressure Algometer
Model FDX; Accuracy:+/- 0.3% of full scale.
Area of Flat Rubber Tip is 1cm²



Photograph-1



Photograph -2



Photograph-3



Photograph-4



Photograph-5

RESULTS

Data of 24 patients were analyzed using statistical package of social sciences version 16. [SPSS v.16 & Microsoft Excel 2010]

Thirty patients, after screening were divided into two groups. 15 patients in Group A were administered Shortwave Diathermy with Conventional therapeutic Exercises and 15 patients in Group A were administered Interferential Therapy with Conventional therapeutic Exercises.

Three patients from Group A and Three Patients from Group B discontinued the treatment. Hence a total of 24 patients, 12 patients from Group A and 12 patients from Group B completed the study and Data Analysis was performed on the following outcome measures.

- Numerical Pain Rating Scale [NPRS] Score
- Neck Disability Index [NDI] Score
- Pain Pressure Threshold [PPT] Score
- Wilcoxon Signed rank test was applied for the analysis of Pre and Post Outcome Measures within Group Analysis, whereas. Mann- Whitney U test was applied for between Group Analysis of the above mentioned outcome measures.

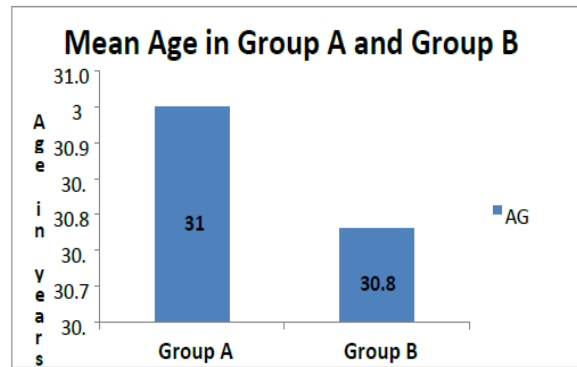
Mann- Whitney U test was applied for comparing Baseline Characteristics of the patients in both groups.

The following Table shows The Comparison of Baseline Characteristics Between Groups:

Table 1:

Outcome Measures	U Value	P Value
Pre NPRS	50.50	0.181
Pre NDI	60	0.485
Pre PPT	62	0.563

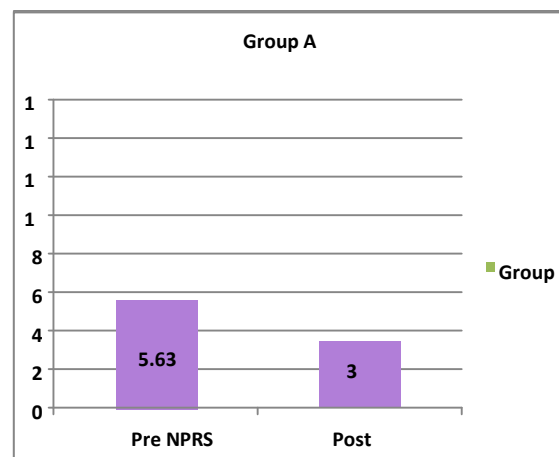
There was No significant Difference between the Baseline characteristics of both the groups.



Graph 1: The following Graph shows the Mean Age in both Groups.

Table 2: PRE AND POST MEAN OF NPRS SCORES IN GROUP A:

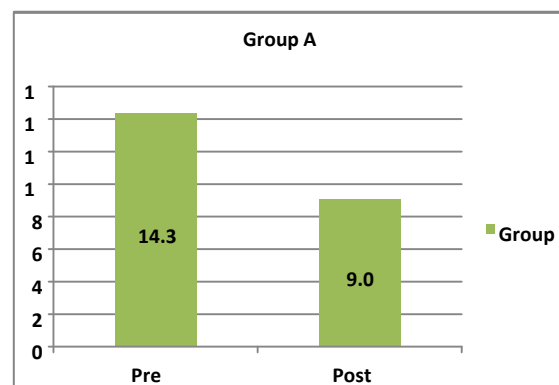
OUTCOME MEASURE	PRE [Mean ±SD]	POST [Mean ±SD]	Z value	P value
NPRS	5.63±0.63	3±0.6	-3.17	0.001



Graph 2:

Table 3: PRE AND POST MEAN OF NDI SCORES IN GROUP A:

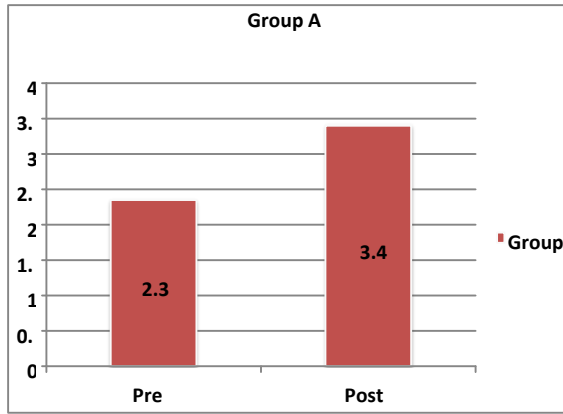
OUTCOME MEASURE	PRE [MEAN±SD]	POST [MEAN±SD]	Z value	P value
NDI	14.36±4.03	9.09±3.31	-3.08	0.002



Graph 3:

TABLE 4: PRE AND POST MEAN OF PPT SCORES IN GROUP A:

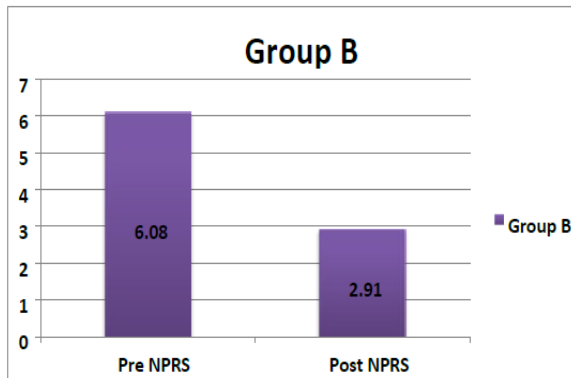
OUTCOME MEASURE	PRE [MEAN±SD]	POST [MEAN±SD]	Z value	P value
PPT	2.35±0.87	3.40±0.94	-3.06	0.02



GRAPH 4:

TABLE 5 PRE AND POST MEANS OF NPRS SCORES IN GROUP B:

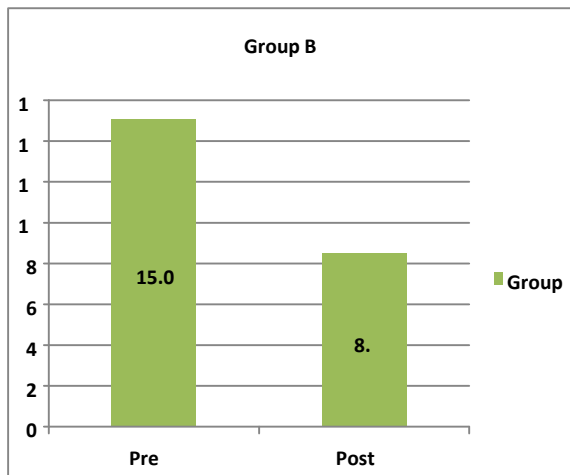
OUTCOME MEASURE	PRE [Mean±SD]	POST [Mean±SD]	Z value	P value
NPRS	6.08 ± 0.79	2.91 ± 0.79	-3.11	0.02



GRAPH 5:

TABLE 6: PRE AND POST MEAN OF NDI SCORES IN GROUP B:

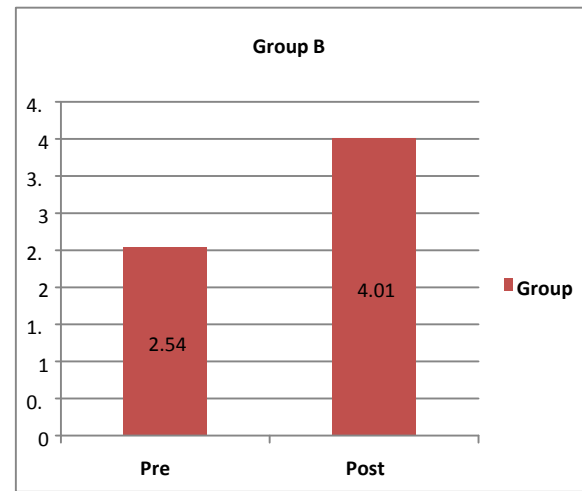
OUTCOME MEASURE	PRE [MEAN±SD]	POST [MEAN±SD]	Z value	P value
NDI	15.08±3.67	8.5±11.9	-3.07	0.02



GRAPH 6:

TABLE 7: PRE AND POST MEAN OF PPT SCORES IN GROUP B:

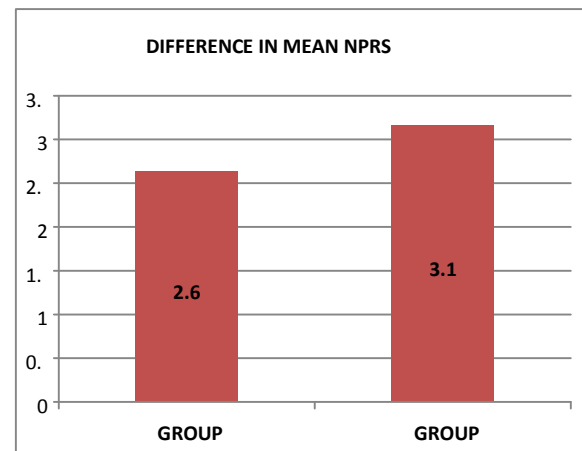
OUTCOME MEASURE	PRE [Mean±SD]	POST [Mean ±SD]	Z value	P value
PPT	2.54±0.67	4.0±0.54	-3.06	0.02



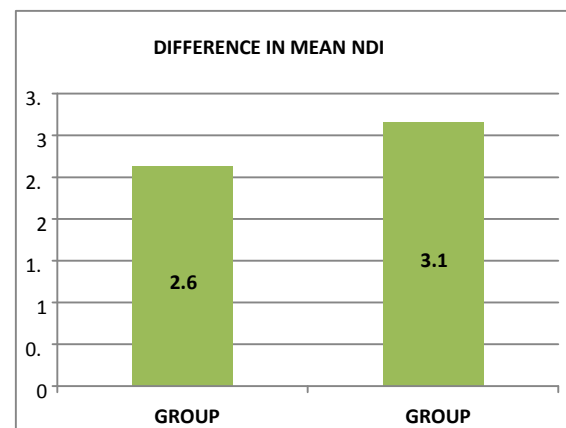
GRAPH 7:

TABLE 8: The following Table shows Difference in the Means of All 3 outcome Measures:

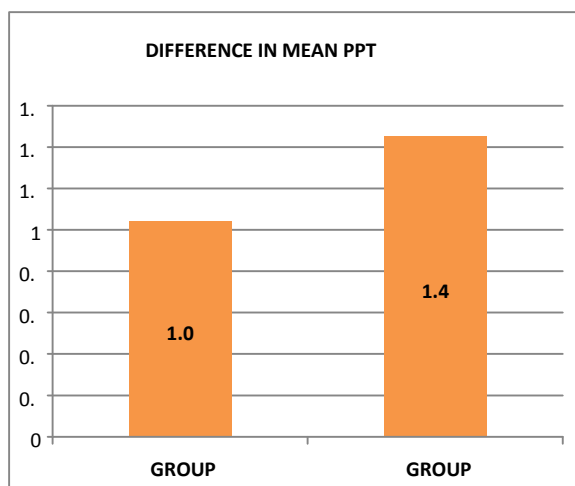
OUTCOME	GROUP A	GROUP B	U value	P value
NPRS	2.63	3.16	20	0.01
NDI	5.27	6.58	38	0.045
PPT	1.04	1.45	27	0.009



GRAPH 8 :



GRAPH 9:



GRAPH 10:

Thus, The Difference in Outcome Measure of Both Groups was statistically significant. So, The Study suggests that Both SWD & IFT are effective in improving Pain and Function and both can be used in the treatment of Mechanical Neck Pain, but for more beneficial improvement in pain and Function, Interferential Therapy use is More Recommendable.

DISCUSSION

The current study focused to compare the effectiveness of Shortwave Diathermy and Interferential Therapy on pain and function in patients with mechanical neck pain. Total 30 patients of mechanical neck pain were divided into two groups. 12 patients in Group 1 were administered shortwave diathermy along with conventional therapeutic exercise. Whereas in Group 2, Patients were administered Interferential Therapy along with conventional therapeutic exercise. There were 3 dropouts from each group. The treatment was administered for 15 days and NPRS, NDI and PPT were taken as outcome measures before & after the study in both the groups. Results showed statistical significant improvement in NPRS, NDI and PPT [$p < 0.05$], in both the groups, after 15 days. Whereas, There was significant improvement found [$p < 0.05$] in all above mentioned outcomes.

Patients in Group A, treated with SWD showed statistical significant

improvement in NPRS, NDI and PPT post treatment. This can be because of the unique ability of the shortwave diathermy to alter the cell membrane permeability which opens the sodium channel and congest the area & thereby inhibiting sodium potassium pump, which, in turn, slows rate of depolarization, thus increasing the pain threshold. Increased blood flow in the muscles, capillary filtration, capillary pressure and increased oxygen perfusion thus producing relief in pain caused by ischemia and hypoxia. Primary pain relief immediately after application of shortwave diathermy is often thought to be associated with decreased muscle spasm, reduction of adhesion and contracture and increased blood flow. [20] This improvement in pain may have led to improvement in function and PPT in patients with mechanical neck pain.

There was a statistical significant difference in the NPRS score of the patients in Group B treated with IFT, after 15 days. The proposed mechanism behind this is can be Wedensky inhibition of type C fibres. [19] Another can be the activation of pain gate mechanism at the frequency of 80-100 Hz. Decreased pain might thus have showed improvement in function and PPT in patients with mechanical neck pain treated within interferential therapy.

The results of the present study shows statistically significant difference between these two modalities, in terms of pain relief and improvement in function of mechanical neck pain patients, thus supporting to use of both, Shortwave Diathermy & Interferential Therapy in the management of mechanical neck pain, But as an adjunct to therapeutic exercises for the greater benefit of the patient, Interferential Therapy use More recommendable.

CONCLUSION

From the present study, it can be concluded that either of Shortwave Diathermy or Interferential Therapy can be used as an adjunct to therapeutic exercise to improve pain and function in patients with

Mechanical Neck pain. But for greater improvement in pain and function, Use of Interferential Therapy can be considered more effective.

Ethical approval: B.J. Medical College, Civil Hospital, Ahmedabad ethics committee approved this study. All participants gave written informed consent before data collection began. No conflict of interest and No financial burden on patients.

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