

“TO EVALUATE THE EFFECTIVENESS OF ULTRASOUND AND DIAMOND TAPING TECHNIQUE VERSUS ULTRASOUND AND DEEP FRICTION MASSAGE IN PATIENTS WITH TENNIS ELBOW”

LIST OF ABBREVIATIONS

TE = Tennis elbow

LE = Lateral epicondylitis

DT = Diamond taping

DTFM = Deep transverse friction massage

ECRB = Extensor carpi radialis brevis

ECRL = Extensor carpi radialis longus

VAS = Visual analogue scale

ROM = Range of motion

et al = and others



ABSTRACT

Background and purpose :

- Lateral epicondylitis (Tennis elbow) is a common entity.

The aim of the study is **“TO EVALUATE THE EFFECTIVENESS OF ULTRASOUND AND DIAMOND TAPING TECHNIQUE VERSUS ULTRASOUND AND DEEP FRICTION MASSAGE IN PATIENTS WITH TENNIS ELBOW”**

Methods :

- A group of 30 subjects were taken for the study and randomly assigned into two groups (Group A and Group B).
- Group A (15) Diamond taping technique and ultrasound.
- Group B (15) Deep transverse friction massage and ultrasound.

Results :

- Both groups A and B, the outcome measures are VAS and ROM with goniometer.
- The baseline measurements are compared to the data at the end of 10 sessions and after three weeks.

Key words : lateral epicondylitis, Diamond taping technique, Deep friction massage, Visual Analogue Scale (VAS) for pain, Range of Motion.

INTRODUCTION

- Tennis elbow or lateral epicondylitis is one of the most common lesions of the forearm. It is a lesion affecting the origin of the tendons of the muscles that extend the wrist joint mainly Extensor Carpi Radialis Brevis (ECRB).
- The dominant arm is commonly affected among both men and women with prevalence of 1-3% and in the age group of 30-60 years as per the epidemiological evidences state.
- It was first distinguished from writer's cramp by Runge in 1873; it was named as "lawn tennis arm" by Morris and therefore recommended that it is a new and more appropriate term, as epicondylalgia.
- Typical signs and symptoms include pain and tenderness over the lateral epicondyle, exacerbated by resisted wrist extension and passive wrist flexion, and impaired grip strength. As a result, the term now most widely used is lateral epicondylitis.
- This pathology inflammation and mucinoid degeneration of the extensor origin as subsequent changes within the inelastic tendon such as thickening of the tendon's sheath, nodule formation and adhesions with a reduction in vascularity, fraying and splitting of collagen fibres and which further weakens the tendon causing more micro tears.
- It also prevents the contractile element pathology of the common extensor bundle so that strengthening the forearm muscles can be done without painful symptoms. Therefore, treatment is directed towards complete severance of the tendon from its attachment and firm fixation of tendon origin at the musculotendinous junction.
- Biomechanical factors includes that the commonest causative factor is present at elbow over-use or repetitive concentric and eccentric contractions of the extensor muscles (mainly ECRB) which stabilizes the wrist.
- These repetitive stresses in tennis players with backhand stroke and inadequate forearm extensor power and endurance produces chronic overload due to biomechanical positional fault resulting in micro tearing and fibrosis of the common wrist extensor origin.
- This presents as pain on gripping activities, decreased grip strength and tenderness over the outer edge of the elbow.
- **Cyriax Deep Transverse Friction Massage (DTF) :** it is a specific type of connective tissue massage applied precisely to the soft tissue structures such as tendons, muscles, and ligaments. It is vital that DTF be performed only at the exact site of the lesion, with the depth of friction tolerable to the patient.
- The patient experiences a numbing effect during the session and immediate reassessment shows reduction in pain and increase in strength and mobility.
- Deep Transverse Friction leads to immediate pain relief due to traumatic hyperaemia, increases tissue perfusion and stimulation of mechanoreceptors and reduces abnormal fibrous adhesions and make scar

tissue more mobile in sub-acute and chronic inflammatory conditions by realigning the normal soft tissue fibres (Schwellnus 1992, Walker 1984).

- **Diamond tape** :it is one of the McConnell deloading procedures in which the soft tissues are drawn in towards the area of pain at the lateral epicondyle. McConnell has proposed the application of tape as a means of alleviating pain, improving muscle function, and restoring functional movement patterns.
- Clinically, in musculoskeletal conditions, by minimising the aggravation of symptoms during the performance of therapeutic exercise, the use of a taping technique may facilitate the compliance to exercise rehabilitation programs.
- Taping is a cost effective treatment alternative for many common injuries and overuse syndromes. Tape is applied across the joint in several layers and is positioned to provide outside support and restrict forces that would apply stress on an injured part.
- McConnell taping mainly aims to reduce pain, improve function and biomechanics. Taping aim is to control the fascia directly, establish proper structural alignment, improve muscular recruitment and also increase proprioception stimulating static and dynamic neuro-muscular retraining by balancing the tissue length/tension relationship and motor control.

Clinical stages :

Acute stage/severe condition :

- Physical examination findings (key impairments)
- Severe impairments of muscle power
- Swelling in the lateral epicondyle region
- Increased temperature in the lateral epicondyle region
- Active wrist extension limited by pain
- Pain with passive wrist flexion, finger flexion, forearm pronation and elbow extension
- Pain and weakness with resisted wrist extension and 3rd MCP joint extension
- Tender (symptoms reproduced) with provocative palpation of the superior-lateral part of elbow.

Settled stage / Mild condition :

- Physical examination findings (key impairments)
- Mild impairments of muscle power
- Mild to no pain with palpation of the lateral epicondyle
- Full and pain-free active wrist extension although mild discomfort may occur at end range
- Pain-free or mild discomfort with full passive wrist flexion, forearm pronation, and finger flexion.
- Mild pain with resisted wrist extension combined with ulna deviation and forearm.

OBJECTIVES OF STUDY

- To study the efficacy of diamond taping in the treatment of lateral epicondylitis.
- To study the efficacy of Deep transverse friction massage in the treatment of lateral epicondylitis.
- To compare the efficacy of diamond taping and deep transverse friction massage in the treatment of lateral epicondylitis.

HYPOTHESIS

NULL HYPOTHESIS :

- It states that there will be no significant difference in the effectiveness of Diamond taping with ultrasound and Deep Transverse Friction Massage with ultrasound in the treatment of tennis elbow.

ALTERNATIVE HYPOTHESIS :

- It states that there will be a significant difference in the effectiveness of Diamond taping with ultrasound and Deep Transverse Friction Massage with ultrasound in the treatment of tennis elbow.

REVIEW OF LITERATURE

- **Mary Dyson (1987)** which increases the rate of tissues repair after injury and reduces pain. She concludes that the standard treatment of lateral epicondylitis is therapeutic ultrasound which is a form of acoustic vibration when treated with a normal frequencies of 1MHZ and 3MHZ states that treatment with ultrasound can induce physiological changes.
- **Holmes et al (1991)** did a study on clinical trials of ultrasound treatment in soft tissue injury and concluded that pulsed ultrasound is an electrotherapeutic modality typically used to relieve pain and increase rate of healing in conditions like soft tissue injuries, musculoskeletal pains.
- **Young (1996)** suggested that non-thermal effect may be preferable for soft tissue repair and stimulation of blood flow. Therefore, ultrasound was selected as treatment modality. **Sim and Waterfield (1997)** argued that continuous scale of intensity like visual analogue scale is potentially more sensitive to small degrees of change in intensity.
- **Stratford and colleagues (Stratford et al 1987)** studied on individuals with lateral epicondylitis, maximum pain-free movements and functional ability was achieved. Thus the outcome measures proved the effects of treatment on lateral epicondylitis.
- **McConnell 2000** has proposed the application of tape as a means of alleviating pain, improving muscle function, and restoring functional movement patterns. Clinically, in musculoskeletal conditions, by minimizing the aggravation of symptoms during the performance of therapeutic exercise, the use of a taping technique may facilitate the compliance to exercise rehabilitation programs.

- **Vicenzino B, Wright A, et al 2001**, conducted a study on specific manipulative therapy treatment for chronic lateral epicondylalgia produces uniquely characteristic hypoalgesia in randomized double-blind study with 24 patients suffering unilateral chronic lateral epicondylalgia.
- **Brosseau L, Casimiro L, et al 2002** in a randomized clinical trials of 17 patients showed no statistical difference in the three types of pain relief measured after four consecutive sessions of deep tendon friction massage combined with other physiotherapy modalities. Brosseau L proposed his intervention on deep transverse friction massage for treating tendinitis and conducted that deep transverse friction massage is helpful in rehabilitation of tennis elbow via mobilization of soft tissue and release or stretch and scar tissue impairing normal movement.
- **Brooks Banks J 2003** conducted an experimental study to determine the initial effects of taping on pain and grip strength in individuals lateral epicondylitis. The result is significantly improved in reduction of pain and pain-free grip strength.
- **ManTher 2003** proposed the evidence of clinical efficacy of the myriad of treatment approaches. The manipulated therapy and taping treatment proved the clinical best practice management of lateral epicondylitis.
- **Boisauvert B, Brousse C, et al 2004** in a randomized clinical trial on 46 subjects proved the beneficial effects persisted only for a short time, and the long-term outcome could be poor. For the long term, physiotherapy (pulsed ultrasound, deep friction massage and exercise programme) was the best option but was not significantly different from the “wait-and-see” approach.
- **Bisset L, Paungmali A, et al 2005** in a controlled trial identified 76 subjects and the effectiveness of physical intervention for lateral epicondylitis was carried out. The further research with long term follow up into manipulative and exercise as treated is indicated.
- **Stasinopoulos D, Stasinopoulos I 2006** a research study was carried out with 75 patients who suffered lateral epicondylitis to compare the effect of Cyriax, physiotherapy supervised exercise program. The study produced the largest effect in reduction of pain and improved mobility and function.
- **Bill Vicenzino 2007 et al** did a study on initial effects of elbow taping on pain-free grip strength and pressure pain threshold and found effectiveness of diamond taping technique on pain-free grip strength in individuals with chronic lateral epicondylalgia.
- **Joshua A. Cleland, PT 2007** experimented on joint manipulation in the management of lateral epicondylalgia. Evidence exists demonstrating that joint manipulation directed at the elbow and wrist. He proposed that this information will be useful for the physical therapists in making clinical decisions regarding the selection of treatment technique for the management of patients with lateral epicondylalgia.

- **Mulligan 2008** a total of 38 patients in the experimental design study investigated the effect of a combination of Mulligan techniques and traditional treatment compared with that of traditional treatment alone in patients with lateral epicondylitis. The applied Mulligan techniques included mobilization with movement and taping, and were aimed to reduce pain and improve activities of daily living.
- **Kohia M, et al 2008** studied and evaluated the effectiveness of physical therapy treatments on lateral epicondylitis. The research has examined the effectiveness of various physical therapy interventions on lateral epicondylitis.
- **Nagrle AV, et al 2009** advocated the use of deep transverse friction massage in combination with Mill's manipulation in treating lateral epicondylalgia. A random trial with 60 patients was conducted to compare the effectiveness of deep transverse friction massage with Mill's manipulation versus phonophoresis with supervised exercise in managing lateral epicondylalgia.
- **Viswas R, et al 2012** conducted a study with 20 patients, who had tennis elbow (lateral epicondylitis). To compare the effectiveness of supervised exercise program and Cyriax physiotherapy in the treatment of tennis elbow (lateral epicondylitis). Both the supervised exercise program and Cyriax physiotherapy were found to be significantly effective in reduction of pain and in the improvement of functional status. The supervised exercise programme resulted in greater improvement in comparison to those who received Cyriax physiotherapy.

METHODOLOGY

Study design :

The research approach for the study is experimental study.

Selection of sample :

Lateral epicondylitis subjects, those fulfilled the inclusion criteria were taken from MGM hospital, Warangal, and the out-patients department of Vaagdevi College of Physiotherapy.

Sampling method :

Stratified random sampling method in which 30 subjects were clinically diagnosed as lateral epicondylitis and were referred for physiotherapy.

Materials :

- Sports tape

- Scissors
- Therapeutic ultrasound machine (chitinog, 3mhz)
- Visual analogue scale
- Ultrasound gel

Inclusion criteria :

- Age group 20-40 years of both genders
- VAS > 7
- Positive mills test and cozens test
- Local tenderness on palpation over lateral epicondyle of the humerus
- From sub-acute to chronic pain more than 2 months

Exclusion criteria :

- Trauma
- Fracture
- Dislocation
- Bony abnormalities around elbow
- Corticosteroid injection in the preceding 3 months
- Systemic illness like metabolic, metastatic, infective disorders
- Other neurological abnormalities
- Skin allergies to adhesive tape

Special tests :

Cozen's test :

- To perform the Cozen's test, the therapist stabilizes the patient's elbow with one hand while the patients is asked to pronate the forearm and extend and radially deviate the wrist against manual resistance of the clinician.
- The test is considered positive if it produces pain or reproduction of other symptoms in the area of the lateral epicondyle.

Mill's test :

- While palpating the lateral epicondyle, the examiner pronates the patient's forearm, and flexes the wrist fully and extends the elbow. A positive test is indicated by pain over the lateral epicondyle of humerus.

Maudsley's test :

- The examiner resists extension of the 3rd digit of the hand, stressing the extensor digitorum muscle and tendon. A positive test is indicated by pain over the lateral epicondyle of the humerus.

Outcome measures:

- Pain scale (VAS)
- Range of motion (ROM)
- Patient rated tennis elbow evaluation

PROCEDURE

- Individually informed consent will be taken from all the 30 subjects selected for the study on the basis of inclusion and exclusion criteria. The subjects will be divided into two groups i.e., Group-A and Group-B. Each group consists of 15 subjects.
- Group-A receives treatment of Diamond taping with ultrasound.
- Group-B receives treatment of Deep Friction Massage with ultrasound.

Intervention carried on participants :**Treatment procedure :**

- The subjects were diagnosed as lateral epicondylitis after satisfying the initial screening and selection criteria were instituted with treatment procedure.
- The treatment protocol includes Diamond taping along with ultrasound therapy to Group-1 subjects and Deep friction massage along with ultrasound therapy to Group-2 subjects
- Specific evaluation for the range of motion of elbow flexion, extension is done with a goniometer using the procedure.

Experimental Group-A Diamond taping with ultrasound :**Application of diamond taping :**

- The elbow region (from lower end of humerus till mid forearm) has to be shaved and the part should be dry. Now a skin toughener spray is sprayed on the skin to avoid the direct contact with the tape. Then a pro wrap tape is applied all over the region with minimal stress.
- The diamond taping technique consisted of 4 pieces of approximately 80-100mm long, 38mm wide, non-elastic, sports tape. These were laid on skin distally to proximally in a diamond shape, applying a tractional force on soft tissues towards lateral epicondyle and perpendicular to line of the tape.
- The strips overlapped at their ends were secured with an additional 4 tape strips giving the bulging tissue a orange peel appearance.
- The tape will be removed after 24 hours of application.

- This leads to inflammation and mucinoid degeneration of the extensor origin and subsequent changes within the inelastic tendon such as thickening of the tendon's sheath, nodule formation and adhesions.
- This leads to reduction in vascularity, fraying and splitting of collagen fibres and which further weakens the tendon causing more micro tears and prolong the degeneration process.
- The anchor point x from which the tape is tensioned longitudinally along the solid lined arrow and laid onto the skin while skin is pulled in towards the site of pain.
- The overlapping ends of the tape and the orange peel effect on the skin with the diamond tape, resulting from the translation of skin away from the tape towards the site of pain.

Experiment Group-B Deep friction massage with ultrasound

Application of deep friction massage :

- Cyriax technique comprises of deep transverse friction in combination with Mill's manipulation which must be performed immediately after deep transverse friction. Deep transverse friction for lateral epicondylitis will be applied.
- The patient is positioned comfortably with the elbow fully supinated and in 90 degrees of flexion. The anterolateral aspect of the lateral epicondyle is located and the area of tenderness is identified.
- Deep transverse friction with the side of the thumb tip is applied, applying the pressure in a posterior direction on the teno-periosteal junction of extensor carpi radialis brevis.
- The therapist maintains this pressure while imparting deep transverse friction in a direction towards his fingers, which should be positioned on the other side of the elbow for counter pressure.
- This study also showed that application of diamond tape resulted in positive changes of pressure pain threshold scores compared to a placebo or no-tape control condition.
- The diamond tape in this study has influenced pain perception to a sufficient degree to allow the participants to produce higher mobility.

Application of ultrasound :

Position of the patient :

- The subject will be positioned in back rest chair with arm adducted and internal rotated and ultrasound, along with the coupling medium over the transducer, is given on the lateral epicondyle.
- Both the groups will be given therapeutic ultrasound with intensity of 0.8 W/cm².
- The subjects will be treated for 4-8 mins as duration. The treatment will be given continuously for 10 sessions. The follow up would be after 2 weeks.
- At the end, re-evaluation will be done for elbow mobility and functional ability by goniometer and patient rated elbow evaluation questionnaire respectively, the pain status will be measured by visual analogue scale.

Calibration of the instrument :

- Frequency – 1MHz
- Intensity – 0.8 W/cm²
- Mode – pulsed mode
- Mark space ratio – 1:1

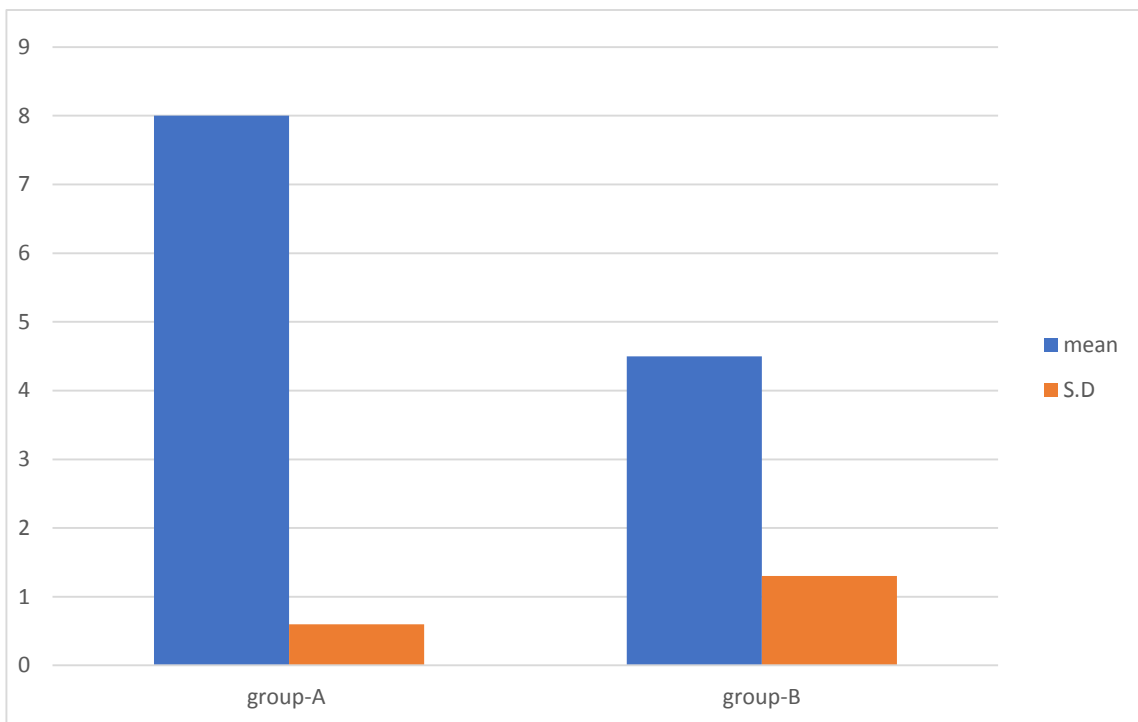
RESULTS

Dependent ‘t’ test performed with pre and post test values of pain intensity for significance within Group A

Table I shows pre Rx and post Rx values of Group-A VAS

	Pre-Rx Data	Post-Rx test
Mean	8.066	4.4
S.D	0.799	1.242
t-value	30.23	
p-value	0.05	
Result	Significant	

Interpretation : As the ‘t’ value (30.23) is greater than the tabulated value (2.145), it shows there is a significance within the group where $p < 0.05$

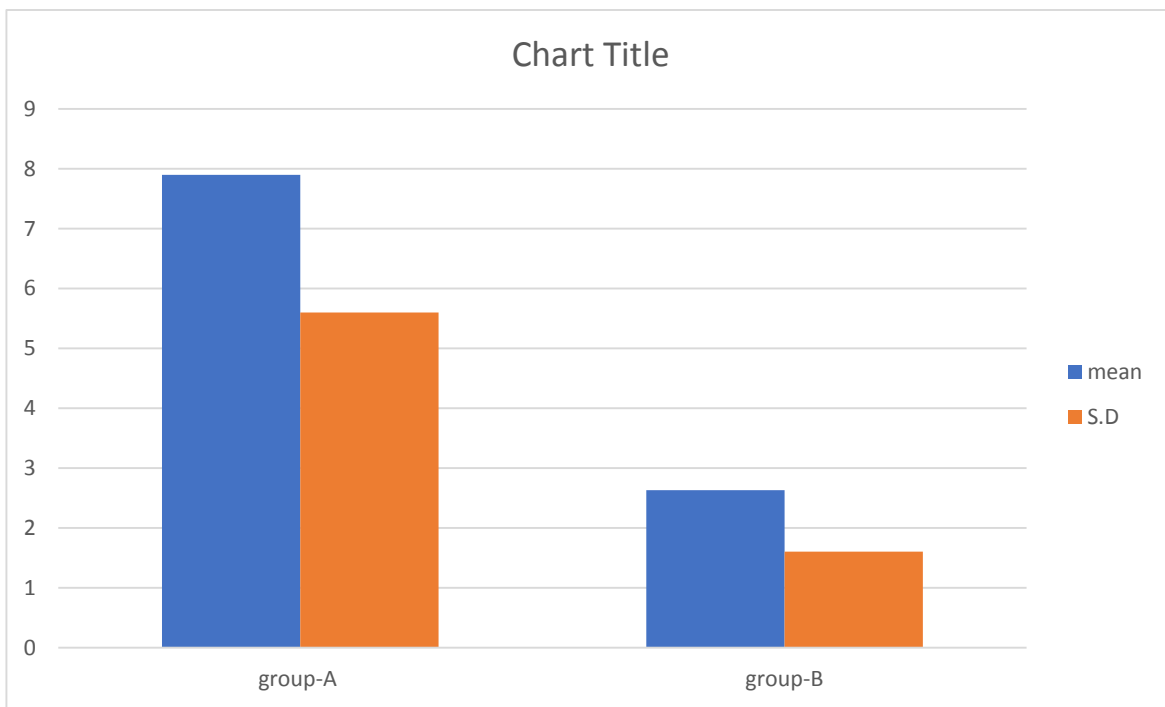


Dependent ‘t’ test performed with pre and post test values of pain intensity for significance within Group B

Table II shows pre Rx and post Rx values of Group-B VAS

	Pre-Rx Data	Post-Rx test
Mean	7.93	5.6
S.D	2.633	1.604
t-value	18.97	
p-value	0.05	
Result	Significant	

Interpretation :As the ‘t’ value (8.97) is greater than the tabulated value (2.145), it shows there is a significance within the group where $p < 0.05$.

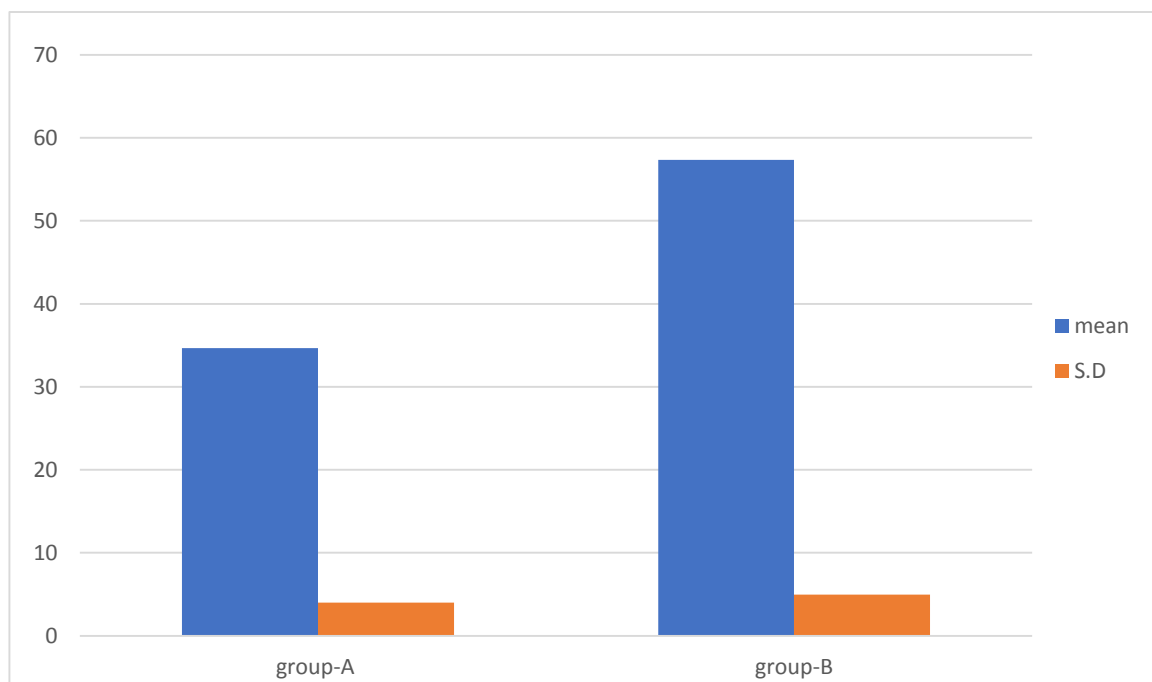


Dependent ‘t’ test performed with pre Rx and post Rx values of joint motion (ROM) for significance within Group A

Table III shows pre Rx and post Rx values of group A (ROM)

	Pre-Rx Data	Post-Rx test
Mean	34.66	57.33
S.D	3.994	4.952
t-value	24.44	
p-value	0.05	
Result	Significant	

Interpretation : As the ‘t’ value (24.44) is greater than the tabulated value (2.145), it shows there is a significance within the group

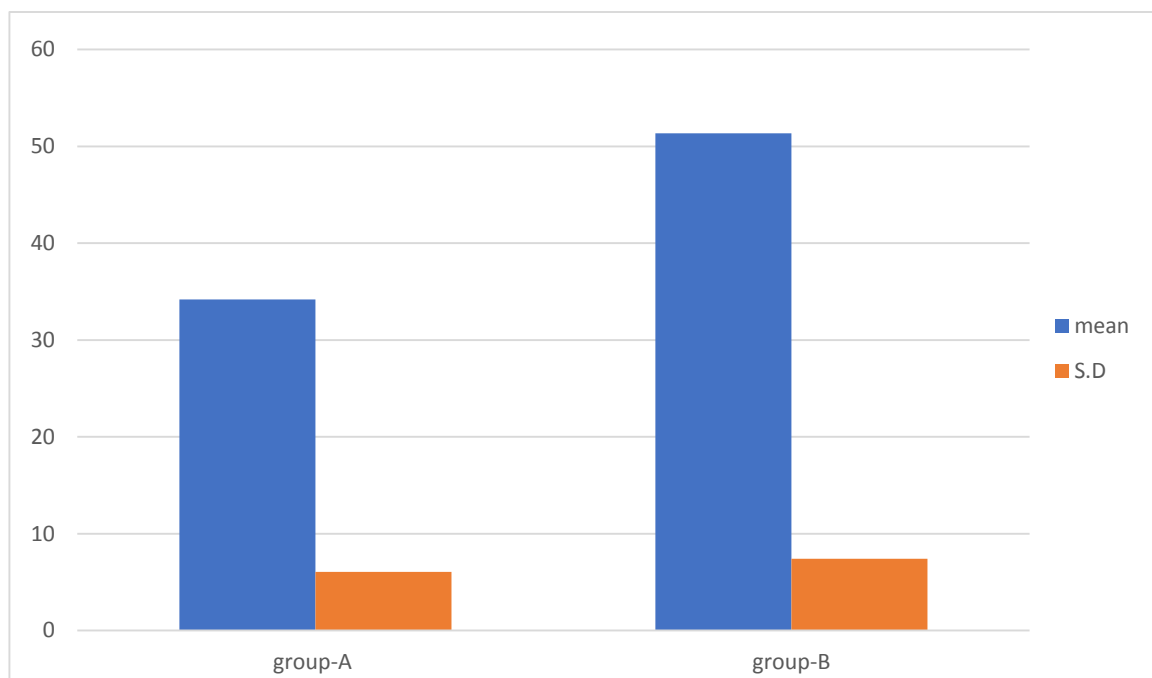


Dependent ‘t’ test performed with pre and post-test values of joint motion (ROM) for significance within Group B

Table IV shows pre Rx and post Rx values of group B (ROM)

	Pre-Rx Data	Post-Rx test
Mean	8.066	4.4
S.D	0.799	1.242
t-value	30.23	
p-value	0.05	
Result	Significant	

Interpretation : As the ‘t’ value (28.693) is greater than the tabulated value (2.145), it shows there is a significance within the group where $p < 0.05$.

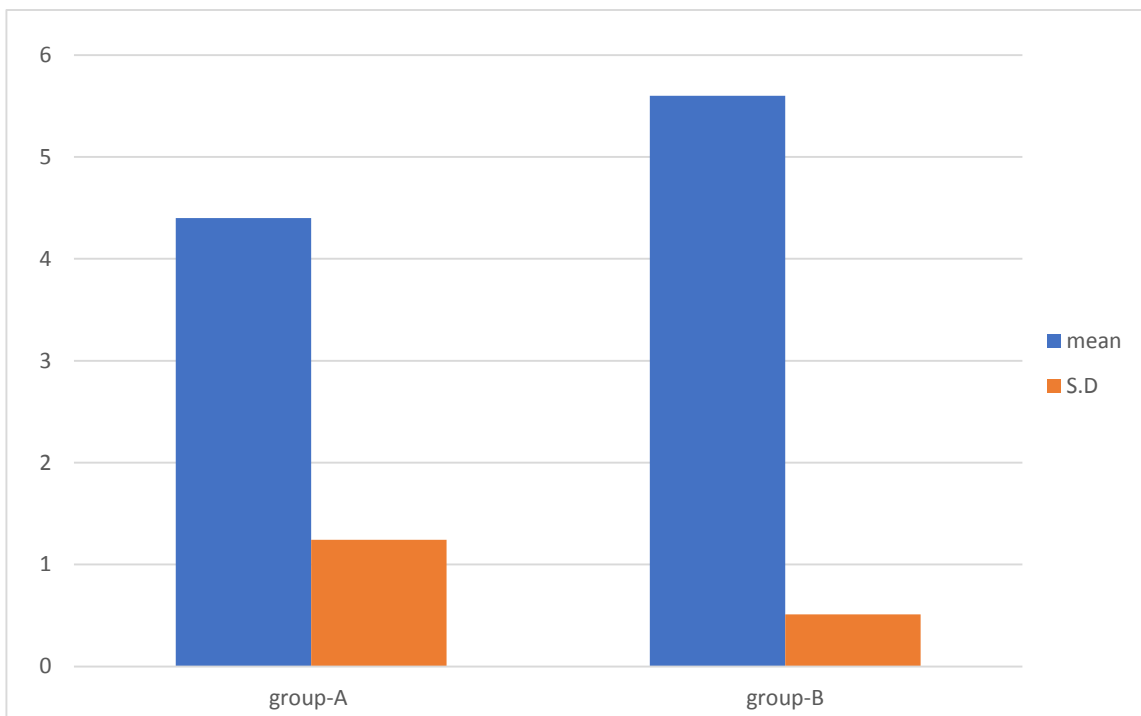


Independent ‘t’ test performed with post test values of Group A and Group B compared for pain intensity for significance between the groups

Table V shows comparison of VAS for Group A and Group B

	Group-A(post Rx)	Group-B(post Rx)
Mean	4.4	5.6
S.D	1.242	0.511
t-value	10.474	
p-value	0.05	
Result	Significant	

Interpretation :As the ‘t’ value (10.474) is greater than the tabulated value (2.048), it shows there is a significance within the group where $p < 0.05$.

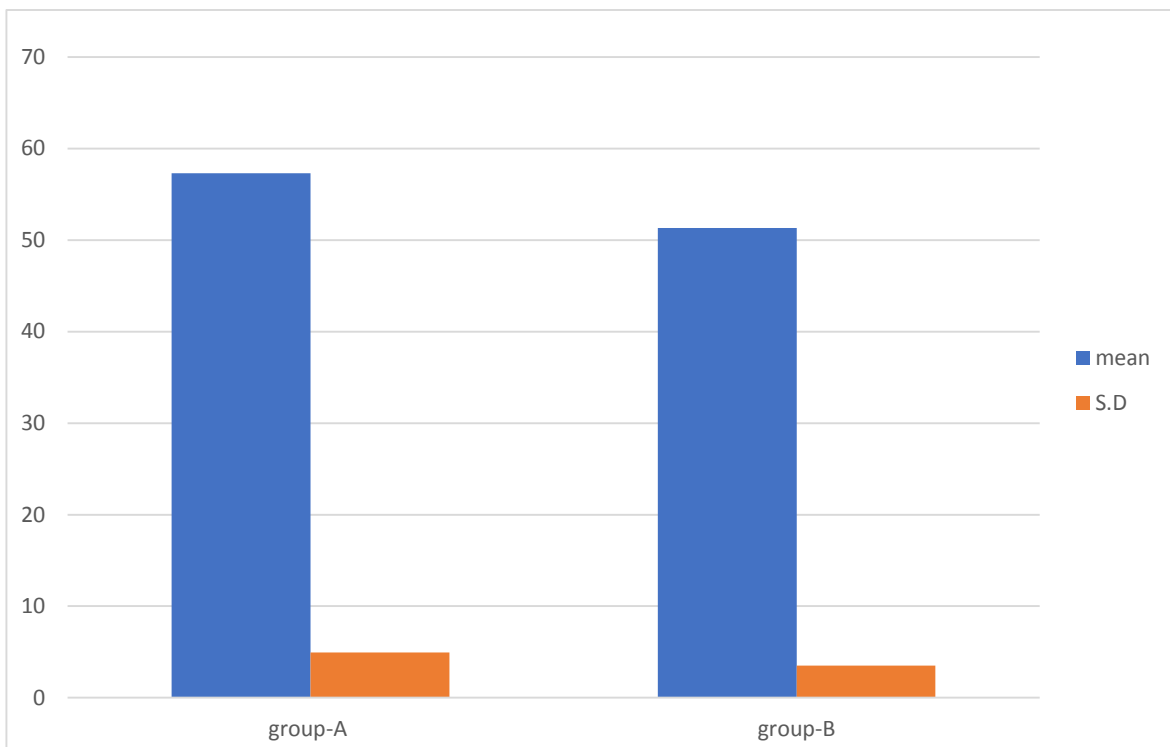


Independent ‘t’ test performed with post-test values of Group A and Group B joint motion for significance between the groups

Table VI shows comparison of ROM for Group A and Group B

	Group-A(post-Rx)	Group-B(Post-Rx)
Mean	57.33	51.33
S.D	4.952	3.519
t-value	3.8258	
p-value	0.05	
Result	Significant	

Interpretation : As the ‘t’ value (3.8258) is greater than the tabulated value (2.048), it shows there is a significance within the group where $p < 0.05$.

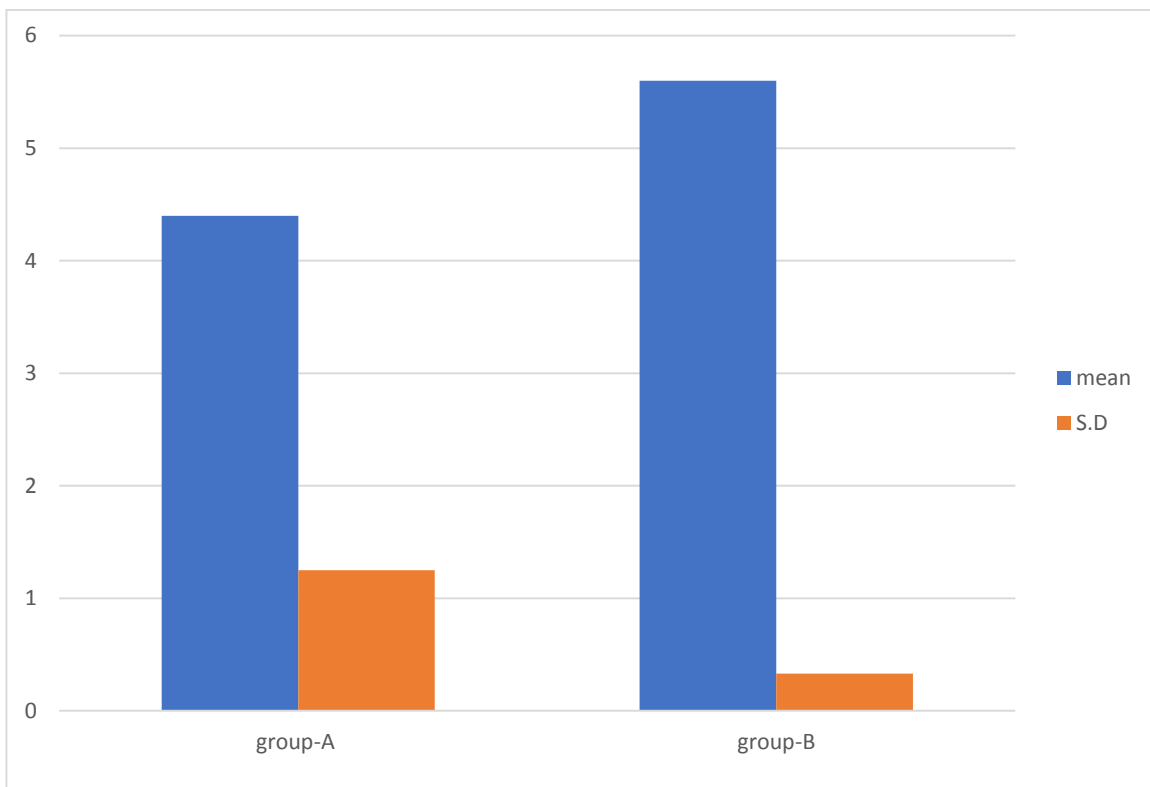


Comparison of post test values of Group A and Group B pain intensity (VAS) with Mann Whitney 'U' test

MANN WHITNEY 'U' TEST (VAS) :

	Group-A(post Rx)	Group-B(Post-Rx)
Mean	4.4	5.6
S.D	1.25	0.33
Mann Whitney U test	52.5	
p-value	0.05	

Interpretation :the table shows the test value (52.5) when compared with the post test values of both groups assessed for pain intensity. When compared to the tabulated value (64), the test value is smaller at $p < 0.05$.

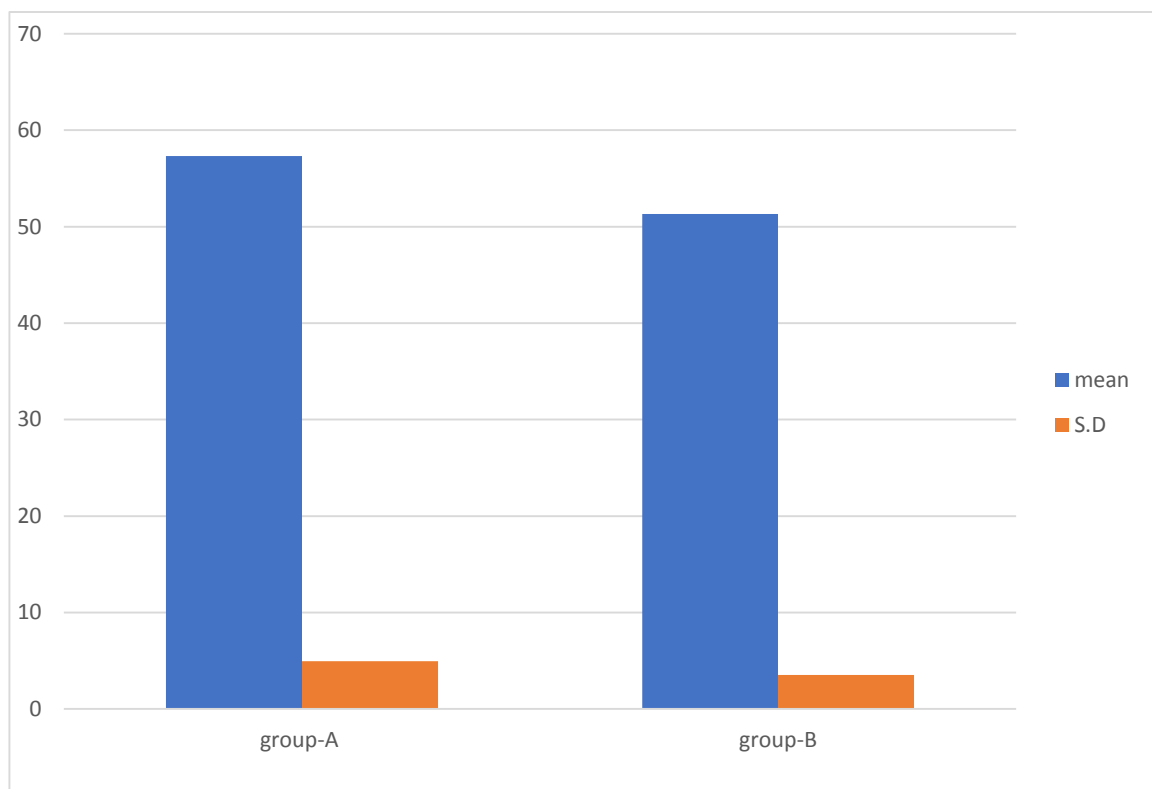


Comparison of post test values of Group A and Group B for joint motion (ROM) with Mann Whitney ‘U’ test

MANN WHITNEY ‘U’ TEST (ROM)

	Group-A(post Rx)	Group-B(Post-Rx)
Mean	57.33	51.33
S.D	4.952	3.518
Mann Whitney U test	40.5	
p-value	0.05	

Interpretation :The table shows the test value as 40.5 when compared with the post test values of both groups assessed for joint motion (ROM). When compared to the tabulated value (64), the test value is smaller at $p < 0.05$.



Statistical analysis:

Data analysis:

The following statistical methods were applied in this research for the data analysis.

1. Descriptive statistics:

- a) **Mean:** The mean of the values were calculated using the formula

$$x = \frac{\sum x}{n}$$

Where, x is arithmetic mean

$\sum x$ is sum of all variables

N is number of all variables

- b) **Standard Deviation (SD):** It is calculated by using the formula

$$SD = \frac{\sqrt{\sum (x - x_1)^2}}{\sqrt{n}}$$

Where, x_1 = arithmetic mean

x = sum of all variables

n = number of all variables

- a) Dependent t'test

$$t = \left| \frac{d}{s/\sqrt{n}} \right|$$

Where, d is difference between the values i.e.,

$$d = x_1 - y_1$$

$$d \text{ is } \frac{1}{n} \sum d_1$$

n =sample size

s =sample variants

$$S = \sqrt{\frac{1}{n-1} \sum (d - \bar{d})^2}$$

b) Independent 't'test

$$t = \frac{x - y}{\sqrt{s^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

Where $x = 1^{\text{st}}$ sample mean

$$x = \frac{1}{n} \sum x_1$$

$y = 2^{\text{nd}}$ sample mean

$$y = \frac{1}{n_2} \sum y_1$$

$s^2 =$ pool variants (group variants)

$$s^2 = \frac{1}{n_1 + n_2 - 2} \left[\sum (x_1 - x_2)^2 + \sum (y_1 - y_2)^2 \right]$$

$n_1 = 1^{\text{st}}$ sample size

$n_2 = 2^{\text{nd}}$ sample size

Mann Whitney'U'test:

The test is done by comparing the post treatment values of both Group A and Group B and the results were interpreted. The formula used is

$$U = n_1 n_2 + n_x \frac{(n_x t_1)}{2} - T_x$$

Where $n_1 = 1^{\text{st}}$ sample size

$n_2 = 2^{\text{nd}}$ sample size

$n_x =$ size of large ranks total

$T_x =$ sum of large ranks total

Interpretation of Statistical Results:

- The experimental study was conducted with 30 subjects suffering with tennis elbow (Lateral Epicondylitis) and were randomly divided into two groups namely Group A & Group B consisting of 15 each to know the effectiveness of ultrasound and Diamond taping technique over ultrasound and Deep Transverse friction in the subject.
- The parameters used were pain which is measured by using Visual Analogue Scale (VAS) and the Range of Motion (ROM) measured with the use of Universal Goniometer. The Patient Rated Elbow Evaluation chart is used as a Questionnaire to measure the scales and to know the extent of pain persistence and to grade the severity.
- The values were recorded pre-treatment and post treatment. The results were recorded as the treatment was given continuously for 10 sessions follow up after 3 weeks.
- The data were analysed using dependent 't' test to find the significance of the interventions used within the groups and an independent 't' test was used to find out the significance between the groups.
- The dependent 't' test showed for both the groups stating that diamond taping with ultrasound is effective in reducing pain and improve the range of motion.
- The results were found to be significant with independent 't' test at $p < 0.05$ with calculated 't' values being more than table values for pain and motion stating that there is a significant effect diamond taping with ultrasound over deep friction massage with ultrasound in Group A when compared Group B patients.
- Ultrasound is used as a common treatment programme in reducing pain and improving friction.



DISCUSSION

- The data of this preliminary study demonstrated that the application of a diamond tape technique decreased pain in participants with chronic lateral epicondylalgia.
- This is the first study to our knowledge that has shown such an effect with a taping technique applied to the elbow and deep friction massage improved ROM and functional ability.
- A possible clinical ramification of this finding is that the diamond tape could be used to facilitate the pain-free implementation of an exercise rehabilitation program for chronic lateral epicondylalgia.

CONCLUSION

- This study concludes that physical therapy intervention of diamond taping technique and deep friction massage. Ultrasound therapy was given for both the groups. Conclusions are based on statistical significance.
- This study compared Diamond taping technique and deep friction massage. Subjects received pain free treatment and strength gain during the intervention.
- Thus the results suggest Diamond taping techniques with ultrasound therapy is effective in reduction of pain on improving mobility and functional ability of patients with lateral epicondylitis.
- This study demonstrated an ameliorative effect of a diamond tape technique on pain-free grip strength in individuals with chronic lateral epicondylalgia.
- The data suggest that this treatment modality may be a useful adjunct in the management of this condition where it would serve to optimize the imposed loads on the forearm muscles during exercise and functional rehabilitation.

SUMMARY

- The study was aimed to determine the effectiveness of Diamond taping technique and deep friction massage for the treatment of lateral epicondylitis to reduce pain and improve mobility.
- A total of 30 patients with lateral epicondylitis of elbow satisfying the Inclusion criteria were included in the study. They are divided into 2 groups Group A and Group B using simple random sampling method.
- The outcomes were measured using VAS score and ROM with goniometer with elbow evaluation questionnaire. Statistically using "t"-test the results showed improvements in post treatment group and obtained successful outcomes in reduction of VAS scale scores and improvement in joint range of motion and functional ability of the subjects.
- This result suggests that intervention consisting of diamond taping techniques was more effective than ultrasound therapy for decreasing pain after follow up 3 weeks period.
- Treatment was given continuously for 10 sessions follow up after 3 weeks. During this 3 weeks period both group subjects also received treatment and the baseline measurements are compared to the data at the end of this study. There was a tremendous improvement among the patients that lacked pain and profound joint movement.

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MASTER CHARTS

Group-A master chart – Pre Rx and Post Rx Data (VAS)

S. No	Gender	Age	Pre Rx Data	Post Rx Test
1	M	26	8	4
2	M	25	8	4
3	F	30	9	6
4	M	32	9	6
5	F	35	7	3
6	M	28	8	4
7	M	24	7	3
8	M	31	8	4
9	F	27	9	6
10	M	23	8	4

11	M	22	7	3
12	M	27	7	3
13	F	32	9	6
14	F	36	8	4
15	M	30	9	6

Group-B master chart – Pre Rx and Post Rx Data (VAS)

S. No	Gender	Age	Pre Rx Data	Post Rx Test
1	M	28	8	6
2	M	24	7	5
3	M	23	7	5
4	F	30	8	5
5	M	32	9	6
6	F	34	9	6
7	M	36	8	6
8	M	28	7	5
9	M	26	8	6
10	F	29	9	6
11	F	33	8	5
12	M	32	8	6
13	F	34	7	5

14	F	27	8	6
15	M	28	8	6

Group-A master chart – Pre Rx and Post Rx Data (ROM)

S. No	Gender	Age	Pre Rx Data	Post Rx Test
1	M	26	35°	60°
2	M	25	35°	60°
3	F	30	30°	55°
4	M	32	35°	50°
5	F	35	30°	55°
6	M	28	40°	60°
7	M	24	35°	60°
8	M	31	30°	55°
9	F	27	40°	60°
10	M	23	40°	65°
11	M	22	40°	65°
12	M	27	35°	60°
13	F	32	30°	55°
14	F	36	30°	50°
15	M	30	35°	50°

Group-B master chart – Pre Rx and Post Rx Data (ROM)

S. No	Gender	Age	Pre Rx Data	Post Rx Test
1	M	28	35°	55°
2	M	24	40°	55°
3	M	23	40°	55°
4	F	30	30°	50°
5	M	32	30°	45°
6	F	34	30°	45°
7	M	36	32°	50°
8	M	28	40°	55°
9	F	26	34°	50°
10	F	29	30°	50°
11	F	33	32°	50°
12	F	32	30°	50°
13	F	34	30°	50°
14	F	27	40°	55°
15	M	28	40°	55°