

Comparison of Kinesio Tapping and Functional Bracing on the Functional Ability and Pain among Lateral Epicondylitis

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Abstract: *Introduction:* Lateral epicondylitis is one of the most common conditions affecting the upper extremity. The main complaints being the pain and decreased function, both of which affects the activities of daily living (ADL), in turn affects their quality of life. The term tennis elbow is caused by small tears in the muscles of the forearm due to overuse of the muscles or minor injury. There are many treatment modalities for tennis elbow, one of the more popular being orthotic devices such as functional elbow brace or band some advice relief might be effective after a short time period. McConnell has proposed the application of tape as a means of alleviating pain, improving muscle function and restoring functional movement patterns. **Aim:** To compare the effectiveness of functional elbow brace kinesio taping and ultra - sound in individuals with lateral epicondylitis individuals with pain and decrease functional activities. **Materials And Methodology:** Study design; Pre - test and Post - test comparative study. On the bases of Purposive sampling technique, I had chosen 30 samples with Lateral Epicondylitis individuals according to the inclusion and exclusion criteria. The samples were divided into 2 Experimental Group (A, B) and 1 Control Group (C), were as each group assigned with 10 samples for the study. The intervention for this study is Group A – Taping, Group B – Brace and Group C – Ultra - sound with 2 weeks of treatment duration. THE variables were used for pain Visual Analog Scale (VAS) and Patient Rated Tennis Elbow Evaluation (PRTEE) to identify the functional ability of the individual. The study setting will at Nehru college of Physiotherapy and Research Centre, Out Patient Department, Coimbatore. **Results:** In this study, the results of visual analogue scale for pre and post - test values of kinesio taping (group A) 6.1 & 4, brace (group B) shows 5.8 & 3.6 where as in ultra sound (group C) shows 6 & 4. In patient rated tennis elbow evaluation scale pre and post - test shows group A 33.7 & 24.1, group B shows 31.9 & 20.2 and in group C shows 33.9 & 21.9. Hence, the conclusion of this study is, in both the outcome measures shows brace had an improvement than the kinesio taping and ultra sound. In these results functional elbow brace (group B) shows the significant difference on the bases of statistical analysis then the kinesio taping (group A) and ultra sound (group C). **Conclusion:** In this study, all the three techniques kinesio taping, functional elbow brace and ultra sound shows improvement in reducing the pain and functional impairments. But functional elbow brace shows more improvement than the kinesio taping and ultra sound.

Keywords: lateral epicondylitis, functional elbow brace, kinesio taping, ultrasound treatment, pain reduction

1. Introduction

Lateral epicondylitis is one of the most common conditions affecting the upper extremity. The main complaints being the pain and decreased function, both of which affects the activities of daily living (ADL), in turn affects their quality of life. WHO classification (1980)

The lateral epicondylitis is a condition that results in pain around the outside of the elbow. It often occurs after strenuous overuse of the muscles and tendons of the forearm, near the elbow joint. As its name suggests, tennis elbow is sometimes caused by playing tennis. However, it is usually caused by a number of other physical activities.

This condition was first named by Morris (1882) who called it lawn tennis arm. The medical term of tennis elbow is lateral epicondylitis. The term tennis elbow is caused by small tears in the muscles of the forearm due to overuse of the muscles or minor injury. It can also occur as the result of a single, forceful injury. The bone of the upper arm is called the humerus. At the elbow, it plays out slightly to form a bony projection on each side. Several outer projections. Their action is to extend the wrist and fingers backwards, and rotate the forearm and palm to a facing upwards position. This is a similar movement to what happens when playing a backhand

in tennis. Excessive or repeated use of the muscles that straighten your wrist can injury the tendons in your arm and elbow and lead to tiny tears, which cause rough tissue to form near the bony lump on the outside of your elbow.

Lateral epicondylitis affects 1 - 3% of the population, only 5% of all patients seen are recreational tennis players. Although the syndrome has been identified in patients ranging from 20 to 60 years old, it predominantly occurs in the fourth and fifth decades. Male and female prevalence rates are reportedly equal. Seventy - five percent of patients are symptomatic in their dominant arms.

The success with the use of an upper forearm brace, known as a counterforce brace, in the management of tennis elbow has been documented. The authors indicated that although a forearm brace may temporarily reduce the symptomatic pain of tennis elbow, it encourages players to continue excessive use of the elbow both in playing tennis and in other activities. Haker and lundeberg state that there are many treatment modalities for tennis elbow, one of the more popular being orthotic devices such as a functional elbow brace or band some advice relief might be effective after a short time period. Counterforce braces, available from many companies, are generally simple straps worn 1 to 3 inches below the elbow. Another style is a full - elbow sleeve, with a strap to tighten

around the forearm. It is not exactly known how they work, but tendons, clinicians say. It also may “confuse” nerves into not sending pain signals.

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 minimizing the aggravation of symptoms, the use of a taping technique may facilitate the compliance to exercise rehabilitation program.

Bill vicenzino 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 epicondylgia. Kinesio taping has been designed to allow for longitudinal stretch of approximately 60% of its resting length. This degree of stretch approximates the elastic qualities of the skin. The tape is not designed to stretch horizontally. The elastic quality of the kinesio tape is effective for 3 - 5 days before the elastic polymer diminishes.

2. Need for the study

Lateral epicondylitis or tennis elbow is characterized by pain and tenderness in lateral aspect of elbow, with incidence affecting both men and women equally.

It is due to overuse syndrome, which causes micro trauma that results in collagen degeneration and adhesion formation in extensor carpi radialis longus, extensor carpi radialis brevis and extensor digitorum. Pain is usually aggravated by daily activities such as gripping or carrying bags, hence micro - trauma is repeated and results in chronic pain.

Counter force brace plays an important role in tennis players and house holding working peoples. Brace is a 2nd most commonly used by the peoples because of less expensive and easy to handle it. Some studies show's that Brace reduce the pain for short period.

Kinesio - taping was commonly used in the sports recreational activities to limit the painful range and increase the functional activities throughout the task end. It will relax the muscle and increase the flows of blood and lymphatic system. Studies show's that taping has a short - term effect in pain and functional activities.

There are several literatures and journals for comparing the tennis elbow brace, kinesio - taping, and ultra - sound with corticosteroid injection, splint, conventional therapy and manipulation techniques.

But no other studies were comparing the functional elbow brace, kinesio - taping and ultra - sound. This study is about comparing the functional elbow brace, kinesio - taping and ultra - sound to improve the pain and increase functional ability for lateral epicondylitis individuals.

3. Aim and Objective

Aim

To compare the effectiveness of functional elbow brace kinesio taping and ultra - sound in individuals with lateral epicondylitis individuals with pain and decrease functional activities.

Objective

- To find out the effect of functional elbow brace, taping and ultra - sound on level of pain in individuals with lateral epicondylitis pain.
- To find out the effect of functional elbow brace, kinesio taping and ultra - sound on functional abilities in individuals with lateral epicondylitis pain.
- To compare the effects of functional elbow brace, kinesio taping and ultra - sound in individuals with lateral epicondylitis pain and functional ability.

4. Materials and Methodology

Study Design:

Pre - test and post - test comparative study

Study Population:

Population chosen were patients with Lateral epicondylitis individuals. The patients were informed of purpose of the proposed research study and the consent was obtained for being included in the study, the following criteria for patients' selection was adapted.

Selection for Criteria

Inclusion Criteria:

Age: 20 – 40 years
Male/female subjects
Lateral epicondylitis
Cozen 's sign positive
Mill's test positive

Exclusion Criteria:

- Subjects with radiating pain
- Subject with recent history of fracture around elbow
- Subjects with neurologic condition radiating pain like radial tunnel syndrome.
- Golfer's elbow
- Rheumatoid arthritis
- Recent soft tissue injury around elbow
- Subject with structural deformities in upper limb.
- Metal implant around elbow joint
- Pathological condition around elbow joint
- Infection around elbow joint

Sample Size:

30 Patients with lateral epicondylitis individuals who met the inclusion criteria were selected for the study.

Experimental - A: 10 Taping

Experimental - B: 10 Brace

Control Group: 10 Ultra - sound

Sampling Technique:

Purposive sampling

Study Setting:

K. M. C. H college of physiotherapy department and tennis club in Coimbatore.

Study Duration:

2weeks

Hypothesis

Null Hypothesis:

- There is no significant improvement on level of pain and functional impairments in individuals with lateral epicondylitis using functional elbow brace
- There is no significant improvement on level of pain and functional impairments in individuals with lateral epicondylitis using kinesio taping technique.
- There is no significant improvement on level of pain and functional impairments in individuals with lateral epicondylitis getting conventional therapy (ultra - sound).
- There is no significant difference between functional elbow brace and kinesio taping and ultra - sound therapy in individuals with lateral epicondylitis on pain and functional impairments.

Alternative Hypothesis;

- There is significant improvement on level of pain and functional impairments in individuals with lateral epicondylitis using functional elbow brace.
- There is significant improvement on level of pain and functional impairments in individuals with lateral epicondylitis using kinesio taping technique.
- There is significant improvement on level of pain and functional abilities in individuals with lateral epicondylitis with the conventional therapy (ultra - sound).
- There is significant difference between functional elbow brace, kinesio taping and ultra - sound therapy in individuals with lateral epicondylitis on pain and functional impairments.

Outcome Measures:

Visual analogue scale

Patient - Rated tennis elbow evaluation scale.

Treatment Procedure:

30 Subjects who fulfils the inclusion criteria will be assigned into three groups of 10 each. As group A, who receive brace and group B, who receive Kinesio - Taping. Group C receives only ultra - sound therapy.

All the subjects were provide the demographic explanation and completed the several self - reported measures. In addition, the patient reported that number of hours they spend for tennis playing on a weekly basis.

Pre test and Post test scores using visual analogue scale, Patient - Rated tennis elbow evaluation scale, taken prior to the treatment protocol post test scores will be taken after 2 weeks using the same.

The primary outcome used in this study was patient rated tennis elbow evaluation scale. This patient rated tennis elbow evaluation scale has a reliable and valid tool for measuring the pain and function with the subject population with the lateral epicondylitis. The questionnaire is divided into two

parts, The first part evaluates the patients pain and it includes 5 questions that are scored form 0 (no pain) to 10 (most severe pain). The scores from the 5 pain questions are summered, and total scored out of 50 is reported. The second part entails 10 questions dealing with patients current level of function. The score for the 10 questions are summed, and divided by 2 and total score out of 50 is reported. The pain and the subscale are summed, and the total score out of 100 is reported. Lower score indicates better functions.



Functional Bracing:

A Functional Counterforce Bracing

The brace has been proposed to have immediate effects on pain intensity. By partially changing the point of force application, the brace helps to broaden the area of stress around the inflamed site. Brace were worn over the muscle bulk of the fore arm or on the pain sensitive area. Brace were advised to be worn during playing. This brace helps to reduce the load on the injured muscle to give recovery of the muscle fibres with the help of counterforce. There is no restriction for the joint play movement the individual can do the functional activities along with this brace.

Kinesio Taping

The tape used in this study was water proof, porous and adhesive. A tape with a width of 5 cm and thickness of 0.5mm were used. Single strap were used for all the participant. This is de - loading technique were the muscle healing process were starts. This strap starts from lateral epicondyle with the 50% of tension runs along with the muscle bulk upto the distal end of the radio - ulnar joint from there it has two diamond shape whole to insert the finger into it. Then the tape was continuous in the palmar aspect and ends with the palmar creases. All the participant were instructed to leave the tape after 3 to 4 days.





Ultra Sound

Position of Patient:

The patient was positioned in a chair, the arm kept on the table, with pillow under the arm & forearm. The elbow is slightly flexed, pronated & exposing the lateral epicondyle for treatment.

Treatment Procedure:

- A sufficient amount of conduction gel is applied to the target area
- Pre - warm the transducer head in the palm of your hand or in warm water.
- Increase power slowly to desired wattage.
- Move the ultra sound head slowly over the target zone in circular and long stroking motions.
- Special care is taken to avoid patient discomfort and perosteal irritation.

Ultra Sound Parameters:

Intensity: 1.5 w/cm².

Duration: 8 minutes.

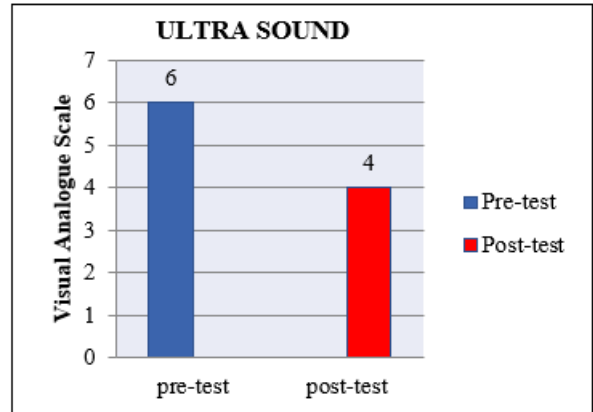
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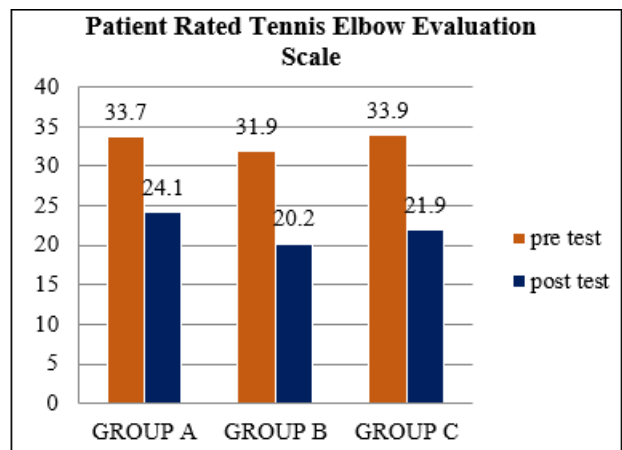
Ultrasound Machine:

Size Of Transducer Head: 3cm

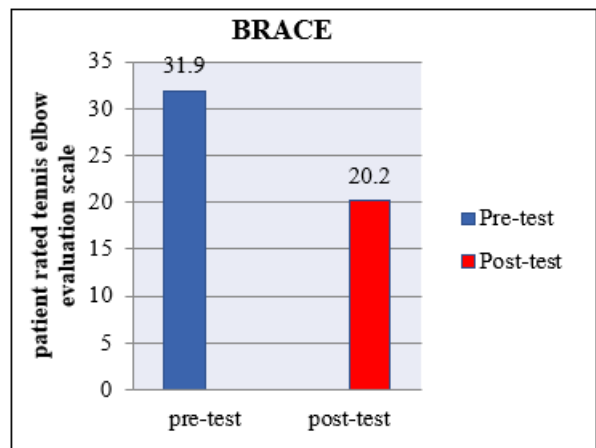
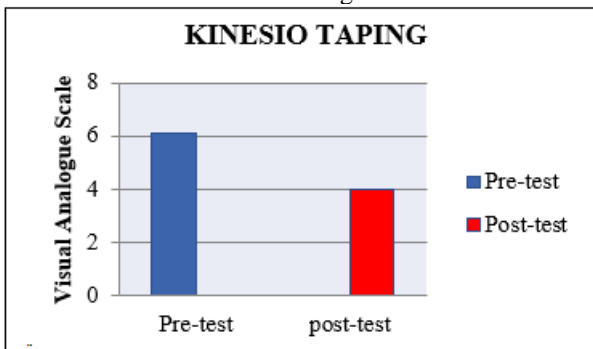
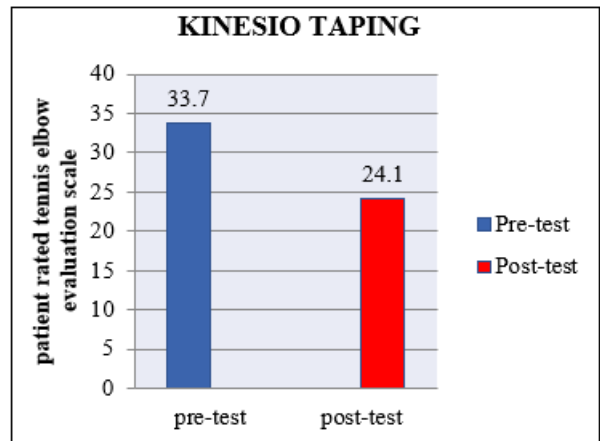
Transmission Media: Ultrasonic gel.

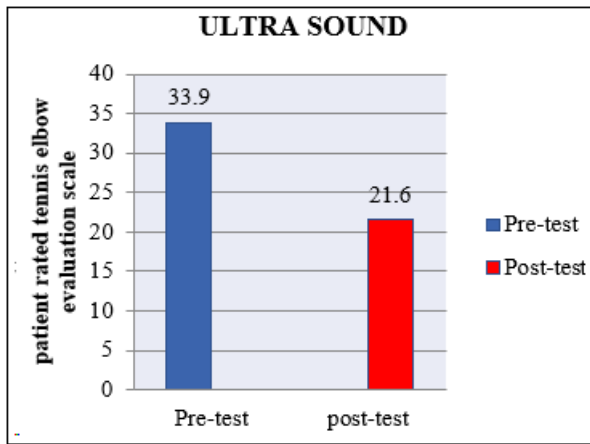


Graphical Representation Anova for Visual Analogue Scale



Patient Rated Tennis Elbow Evaluation Scale





5. Data Analysis and Results

In the total of 30 patients were enrolled for the study they were assigned into 3 groups. Each groups consists of 10 subjects with the mean age of 40 years, starts with the kinesiio taping, functional elbow brace and ultra sound till the end of 2 week. The outcome measures of visual analogue scale and patient rated tennis elbow evaluation scale were analyzed by one - way ANOVA at 5% level of significance. The patient rated tennis elbow evaluation scales were measured by 2 sub - scales each scale consists of 50 points total 100 points.

Paired ‘t’ Test:

Visual Analogue Scale:

Taping (group A):

The pre - test and post - test values of visual analogue scale group A score to analyzed the pain level using the paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.262 and the calculated t value is 3.16 since the calculated ‘t’ value was greater than the table ‘t’ value, null hypothesis is rejected.

Brace (group B):

The pre - test and post - test values of visual analogue scale for group B score to analyzed the pain level using paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.262 and the calculated value is 3.14 since the calculated ‘t’ value was greater than the table ‘t’ value, null hypothesis is rejected.

Ultra sound (group C):

The pre - test and post - test values of visual analogue scale for group C score to analyzed the pain level using paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance, the table ‘t’ value is 2.262 and the calculated value is 3.15 since the calculated ‘t’ value was greater than the table ‘t’ value, null hypothesis is rejected.

Patient rated tennis elbow evaluation scale

Taping (group A):

The pre - test and post - test values of patient rated tennis elbow evaluation scale for group A score to analyzed the functional impairments using paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance the table ‘t’ value is 2.262 and the calculated value is 3.01 since the calculated ‘t’

value was greater than the table ‘t’ value, null hypothesis is rejected.

Brace (group B):

The pre - test and post - test values of patient rated tennis elbow evaluation scale for group B score to analyzed the functional impairments using paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance the table ‘t’ value is 2.262 and the calculated value is 3.14 since the calculated ‘t’ value was greater than the table ‘t’ value, null hypothesis is rejected.

Ultra sound (group C):

The pre - test and post - test values of patient rated tennis elbow evaluation scale for group B score to analyzed the functional impairments using paired ‘t’ test. For 9 degrees of freedom and at 5% level of significance the table ‘t’ value is 2.262 and the calculated value is 3.10 since the calculated ‘t’ value was greater than the table ‘t’ value, null hypothesis is rejected.

	Group A		Group B		Group C	
	Pre	Post	Pre	Post	Pre	Post
VAS	6.1	4.0	5.8	3.6	6.0	4.0
PRTES	33.7	24.1	31.9	20.2	33.9	21.9
Calculated Value (VAS)	3.16		3.14		3.15	
PRTES	3.01		3.14		3.10	
Table Value	2.262					

One Way ANOVA

Visual Analog Scale:

While comparing pain level between and within groups the value is 1.42 the table value at 5% level of significance for 2 and 27 degree of freedom is 3.35 which is greater than calculated value so it is proved that there is no significant difference between the groups and within the groups.

Patient Rated Tennis Elbow Evaluation Scale:

While comparing the functional activities level between and within groups value is 13.77 the table value at 5% level of significance for 2 and 27 degree of freedom is 3.35 which is greater than calculated value so it is proved that there is no significant difference between the groups and within the groups.

	VAS		PRTEE	
	PRE	POST	PRE	POST
	b/t sample	b/t sample	b/t sample	b/t sample
	Within sample	Within sample	Within sample	Within sample
Sum of square	0.47	1.07	24.27	4324.37
	20.23	20.4	10.87	42373.5
df	2	27	2	27
MS	0.47	0.53	12.13	21620.68
	20.23	0.75	40.29	1569.38
F ratio	3.188	1.42	3.32	13.77

5.1 Results

In this study the results of visual analogue scale for pre and post test values of kinesiio taping (group A) 6.1 & 4, brace (group B) shows 5.8 & 3.6 where as in ultra sound (group C) shows 6 & 4. In patient rated tennis elbow evaluation scale

pre and post test shows group A 33.7 & 24.1, group B shows 31.9 & 20.2 and in group C shows 33.9 & 21.9. Hence, the conclusion of this study is, in both the outcome measures shows brace had an improvement than the kinesio taping and ultra sound.

In these results functional elbow brace (group B) shows the significant difference on the bases of statistical analysis then the kinesio taping (group A) and ultra sound (group C).

6. Discussion

This study was to compare the effect of kinesio taping, functional elbow brace and ultra sound therapy for lateral epicondylitis. In this study 30 subjects with tennis elbow were randomly assigned to the experimental group and to the control group. Among these patients, 30 patients who received kinesio taping, functional elbow brace and ultra sound. The outcome was measured by using visual analogue scale for pain intensity and patient rated tennis elbow evaluation scale for functional limitations.

Visual analogue scale is valid tool to measure the pain. It is a numerical scale 0 is no pain and 5 is moderate pain and 10 is severe pain. Visual analogue scale is standardised scale it has a validity and reliability given by a price et al. According to myles et al 1999 A study explained that Visual Analogue Scale (VAS) provide a simple technique for measuring subjective experience. They have been established as valid and reliable in a range of clinical and research applications, although there is also evidence of increased error and decreased sensitivity when used with some subjects groups decisions concerned with the choice of scoring interval, experimental design, and statistical analysis for VAS have in some instances been based on convention, assumption and convenience, highlighting the need for more comprehensive assessment of individual scales if this versatile and sensitive measurement technique is to be used to full advantage.

In this study while comparing the effect of taping, brace and ultra - sound in pain level with the tool of visual analogue scale, group A (taping) shows the resultant mean value is 4, then group B (brace) shows the resultant mean value is 3.6 and group C (ultra - sound) shows the resultant mean value is 4. According to statistical analysis brace shows significant difference rather than the taping and ultra - sound.

In this study for taping the allocated subjects were 14 within this 10 of them were participated rest of the 4 subjects were not participated within this 2 of them were discontinued within 1 week and rest of them was irregular within 2 weeks study.

Patient rated tennis elbow evaluation scale is a valid scale to measure the pain and functional impairments specially for tennis elbow condition. According to Rompe et al. (2007) evaluated the reliability, internal consistency, reproducibility, construct validity and sensitivity to change of the revised version of the PRTEE. Internal consistency is the degree that the responses to different components of the questionnaire agree which indicates that each component is measuring different aspects of the same condition in question. Construct

validity is to what extent the questionnaire correlates to other established outcome measures within the theoretical context.

In this study the functional impairments of the subjects were calculated between 3 groups through patient rated tennis elbow evaluation tool, group A shows the resultant mean value is 24.1, group B shows the resultant mean value is 20.2. And group C shows the resultant mean value is 29.1. Based on statistical analysis brace shows significant difference rather than the taping and ultra - sound.

In this study for patient rated tennis elbow evaluation scale the allocated subjects were 12 within this 2 of them were completed the questionnaire but didn't attend the 2 weeks study because of discomfort and dissatisfaction with the brace.

Subjects of present study consisted of 30 participants with in that 25 male's and 5 females. According to Alireza shamsoddini et al and few other tennis elbow is equally distributed between men & women but according to gruchow H. W et al 1979 there was fourfold increase in prevalence among men and nearly two fold increase in prevalence among women. In this study men had a marginally higher prevalence rate than women, but there was no statistically significant difference between men & women prevalence.

Shamsoddin et al (2010) conducted a study on „Initial effect of taping technique on wrist extension and grip strength and pain of Individuals with lateral epicondylitis“, to find out the initial effect of taping technique on wrist extension and grip strength and pain on Individuals with tennis elbow. included 15 patients (10 men and 5 women with 42 - 53 years) on their dominant arm, measured grip strength and pain, before and immediately after application of tape as outcome measures.

They used hand - held dynamometer and jamar dynamometer for the evaluation of wrist extension and grip strength and visual analogue scale (VAS) for pain. They concluded that Taping technique has an impressive effect on wrist extension and grip strength and pain in individuals with tennis elbow. Therefore, it is recommended for functional rehabilitation.

The possible reasoning for action of taping in reducing pain could be related to neurophysiologic effects on the nervous system. In this taping may cause alteration in pain perception, either locally at the elbow by inhibiting nociceptors, facilitating large afferent fiber input into the spinal cord and by stimulating endogenous processes of pain inhibition. In a study by Alireza Shamsoddini et al where they checked initial effect of taping technique on wrist extension and grip strength and pain of individuals with tennis elbow, and an impressive effect on wrist extension and grip strength and pain. Thus, taping was recommended in the management of tennis elbow.³⁰

had done a study that the individuals that applying a counterforce brace at the elbow improved pain free grip strength in individuals with lateral epicondylitis. Along with this they compare with the efficacy of a counterforce brace and physical therapy and the combination of both with long duration of 6 weeks and found that a “counterforce brace

alone had a greater effect on activities of daily living than physical therapy alone”.

The physiology of the counterforce brace was based on Irani's theory that counterforce orthoses have an immediate effect on pain by broadening the area of applied stress on the ECRB muscle. As a result, gentle compression of the musculo-tendinous region limits muscle expansion during muscle contraction, thereby eliciting less pain. Biomechanical studies have shown that a forearm orthosis can decrease the forces acting at the ECRB origin if the pressure pad is placed over the belly of the ECRB, but tends to be more effective if the pressure pad is positioned distal to the lateral epicondyle.

In previous studies they compares the taping with the deep friction massage shows significant improvement in deep friction massage the difference is 1.3 between this two technique was not much difference. At the same time taping was given as combination treatment like taping with conventional treatment shows significant improvement.

In previous studies the orthotic device was compared with conservative treatment, additional treatment and orthotic devices. When the orthotic device was used as an additive but not statistically significant effect of an orthotic device elbow - bandage on short - term pain - relief there were no improvement in conservative and orthotic treatment but little improvement in additional treatment stated by Cochrane collaboration.

Hence all the three techniques kinesio taping, functional elbow brace and ultra sound showed significant improvement in reducing the pain and improving functional ability.

But statistically, functional elbow brace had shown more improvement then the kinesio taping and ultra sound.

7. Summary and Conclusion

To compare the efficacy of kinesio taping, functional elbow brace and ultra - sound therapy in lateral epicondylitis, A sample of 30 subjects are randomly divided into 3 groups of 10 each. Group A 10 subjects were treated with taping technique, group B 10 subjects were treated with brace and group C 10 subjects were taken conventional treatment (ultra sound therapy).

The parameters used to assess the outcome in all the three groups were pain and the functional impairments. Pain was measured by visual analogue scale and the functional impairment was assessed by patient rated tennis elbow evaluation scale. The values of outcome measures were recorded before beginning of the treatment and at the end of the 2 weeks.

The post - test values measured at the end of 2 weeks and the pre - test values were analysed statistically using ANOVA and paired 't' test. The tests revealed that there was significant improvement in group B then the group A, C subjects in the two outcome measures.

In this study, all the three techniques kinesio taping, functional elbow brace and ultra sound shows improvement in reducing the pain and functional impairments. But,

functional elbow brace shows more improvement than the kinesio taping and ultra sound.

8. Limitations and Suggestion

8.1 Limitations:

- 1) Sample size was very small.
- 2) Only two outcome measures are present in this study
- 3) Only unilateral lateral epicondylitis was included in this study
- 4) Treatment duration was less
- 5) Only tennis players were included

8.2 Suggestions

- 1) Along with these two techniques can compare the micro current therapy for the further study
- 2) Individual technique can be selected for further study.
- 3) Different scales can be used for further studies.

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