

# Effectiveness of Diamond Taping as an Adjunct to Conventional Physiotherapy on Pain Free Grip Strength in Subjects with Tennis Elbow

K. Venkata Sai<sup>1</sup>, Syed Roshni Shanavas<sup>2</sup>

<sup>1</sup>Assistant professor SIMS College of Physiotherapy, Guntur, Andhra Pradesh, India

<sup>2</sup>Under Graduate, SIMS College of physiotherapy, Guntur, Andhra Pradesh, India

**Abstract:** Background: Tennis elbow is often thought to develop from excessive stress on common extensor origin. McConnell Taping is a treatment technique, which protects the tissue from excess external force and provide pain relief that allows for improved performance during exercise. This study aims at investigating the effects of McConnell taping on pain during gripping and grip strength using a simple and cost effective Modified Sphygmomanometer Test (MST). Materials and methods: This study was done on sixty subjects with unilateral tennis elbow of age group 30- 64 years. Random allotment was done into either taping along with conventional physiotherapy or conventional physiotherapy alone groups. Both groups were assessed for pain intensity and grip strength at baseline and at the end of 4-week treatment. Results: Pre-post comparison showed reduced pain intensity and improved grip strength in both groups. However, this was not significant. Between-groups analysis showed significant reduction of pain in taping group 20.6 (95% CI = -26.95 to -14.36) than conventional physiotherapy alone group. Improvement of grip strength in taping group was 57.5 (95% CI = 31.23 to 83.30) greater than in conventional physiotherapy group. Conclusion: McConnell taping provided better outcomes when administered along with conventional physiotherapy in short term when compared to conventional physiotherapy alone in tennis elbow patients.

**Keywords:** Tennis elbow, McConnell Taping, Modified Sphygmomanometer Test, Grip.

## 1. Introduction

Tennis elbow is a condition, in which the outer part of the elbow becomes sore and tender. The forearm extensor muscles and tendons become damaged from overuse and repetitive motions. Dr.F.Runge a German physician is usually credited for the first description of the condition in 1873 [1, 2]. Pain around the lateral epicondyle is known by a variety of names which include but are not limited to lateral epicondyle periostitis, extensor carpi radialis brevis tendinosis, lateral epicondylagia[3]. The most commonly used names are Tennis elbow and lateral epicondylitis. The prevalence of tennis elbow in people within age group of 30-64 is 1.3%. Women (36%) are seen to be more affected than men (24%).The common symptoms include pain and weakness during gripping [4]. The pain occurs at the outside of the elbow, which is the site of common extensor origin, which may sometimes radiate to forearm and dorsum of the wrist. In particular tennis elbow mostly affects those in professions that require repetitive, forceful, heavy manual tasks, non-neutral wrist positions (like twisting), and repetitive gripping [5].The treatment of tennis elbow aims at reducing pain, increasing strength and improving the quality of life of the patient, while minimizing the possible side effects of treatment.Common conservative treatments for tennis elbow include cross friction massage, electrical and thermal modalities, bracing, and therapeutic exercise [6-8]. McConnell has proposed the tape application for tennis elbow as a means of alleviating pain,improving muscle function, and restoring functional movement patterns. In clinical scenario for treatment of musculoskeletal conditions, taping techniques are useful to minimize the aggravation of symptoms during the performance of therapeutic exercise program and gripping activities [9].The measurement of grip strength is usually done using a dynamometer, which is

accurate, valid, reliable, and sensitive. However, its relative high cost has hindered its use in most clinical settings, including those in which there are insufficient financial resources. An interesting alternative for this is Modified Sphygmomanometer Test (MST) a device that is portable, easily obtained, and commonly acquired by healthcare professionals for the measurement of blood pressure. This is a quick and easy test, which follows procedures similar to those used with dynamometer [10, 11]

The aim of the present work is to study effect of diamond taping technique along with conventional physiotherapy on pain and grip strength using modified sphygmomanometer test, which is a cost effective tool in individuals with tennis elbow.

## 2. Materials and Methods

The selection of the subjects was done with convenience sampling method utilizing eligibility criteria. The inclusion criteria were (1) pain over the lateral epicondyle (2) pain on grip strength testing (3) pain with any one of the following tests: resisted middle-finger extension, resisted wrist extension, or passive stretch of the wrist extensors (4) age between 30 and 64 years. The exclusion criteria were (1) allergies to adhesive tape,(2) six weeks prior steroid injection (3) any neurological abnormalities of upper limb (4) other associated upper limb orthopaedic condition (5) refusal to participate in the study.

Sixty participants who met the eligibility criteria were assigned randomly to either taping along with conventional physiotherapy group or conventional physiotherapy alone group. All participants were informed about the purpose and proper explanation was given regarding the procedures used

in the study. Verbal and written consents were obtained. The diamond taping technique was applied in sitting position with the slightly flexed elbow [9]. Non elastic, adhesive tape was cut into four pieces of approximately 80 to 100 mm long and were applied on the skin distally to proximally in a diamond shape, while simultaneously applying a traction force on soft tissues towards the lateral epicondyle giving the bulging tissues a characteristic “orange peel” appearance (Fig 1).



**Figure 1**

Therapeutic exercise program included stretching followed by eccentric strengthening of the wrist extensors. Stretching was performed in the seated position with elbow extended, forearm pronated, and wrist flexed with ulnar deviation. This stretch position was held for duration of 30–45 seconds and was performed 3 times before and 3 times after the eccentric exercise portion of the treatment. There was a 30-second rest interval between each bouts of stretching. Eccentric strengthening exercise was performed in the seated position with full elbow extended, forearm pronated, and wrist extended. From this position, the patient slowly lowered wrist into flexion for a count of 30 and using the contralateral hand to return the wrist to extension. Patients were instructed to continue the exercise even when they experience mild discomfort and to stop the exercise if the pain worsens and becomes disabling. For whom the eccentric exercise could be performed without minor discomfort or pain, the load was increased using free weights based on the patients 10 RM (Repetition Maximum). Three sets of ten repetitions were performed during each treatment, with a one-minute rest interval between each set [12]. In taping along with conventional physiotherapy, group subjects were made to do exercises with application of tape.

For all the participants pain during gripping and grip strength was measured using MST. Pain was evaluated by using Visual Analogue Scale (VAS) and grip strength using mercury reading of sphygmomanometer. For testing the cuff is folded into three equal parts and rolled up with the plaster. The sphygmomanometer is inflated to 20mm Hg, and the valve closed to prevent leakage. Patient was then asked to compress the cuff while seated on a chair with the feet and trunk supported, shoulder adducted, elbow flexed at 90 degrees, forearm in neutral position, wrist 0-30 degrees extension [11]. These outcome were assessed at baseline before treatment and at 4 weeks duration at the end of treatment sessions. The data was analyzed using student's unpaired t-test at 5% level to detect the significance of differences between the two groups. The data entry and statistical analysis was done utilizing MS-Excel and SPSS software.

### 3. Results

Baseline demographic and clinical characteristics of participants in both the groups were given in Table 1. Both the groups were homogenous at baseline.

Between the groups, analysis showed reduction of pain during gripping and improvement in grip strength in both groups (Table 2). However, the reduction in pain during gripping of taping group was 20.6 (95% CI = -26.95 to -14.36) greater than

**Table 1:** Comparison of subjects' characteristics at baseline by group

Subject characteristics	Taping along with conventional physiotherapy group	Conventional physiotherapy alone group	P value†
AGE (Yrs)‡	37.13 ± 7.29	41.33 ± 6.21	.10
Gender (F/M)	17/13	18/12	.79
VAS score(mm) ‡	7.40 ± 0.99	7.27 ± 1.03	.72
Grip strength (mm of Hg)‡	127.47 ± 11.71	133.33 ± 15.94	.26

‡Values expressed as Mean ± SD

† The level of significance was set at p< 0.05

conventional physiotherapy group. Improvement in grip strength in taping group was 57.5 (95% CI = 31.23 to 83.30) greater than conventional physiotherapy group. No adverse effects of treatment were reported.

**Table 2:** Comparison of outcome values in both groups at Pre and Post Experimental Evaluations

Outcome/Evaluation	Taping along with conventional physiotherapy group	Conventional physiotherapy alone group	95% CI of difference	pvalue†
Grip strength (Pre) ‡	127.47 ± 11.71	133.33 ± 15.94	-16.33 to 4.59	.26
Grip strength (Post)‡	226.40±44.25	169.13±21.56	31.23 to 83.30	0.0001
VAS (Pre) ‡	72.67 ± 10.33	74.0 ± 9.86	-8.88 to 6.22	.72
VAS (Post) ‡	32.67 ± 13.06	53.33 ± 11.25	-26.95 to -14.36	< 0.0001

‡Values expressed as Mean ± SD

† The level of significance was set at p< 0.05

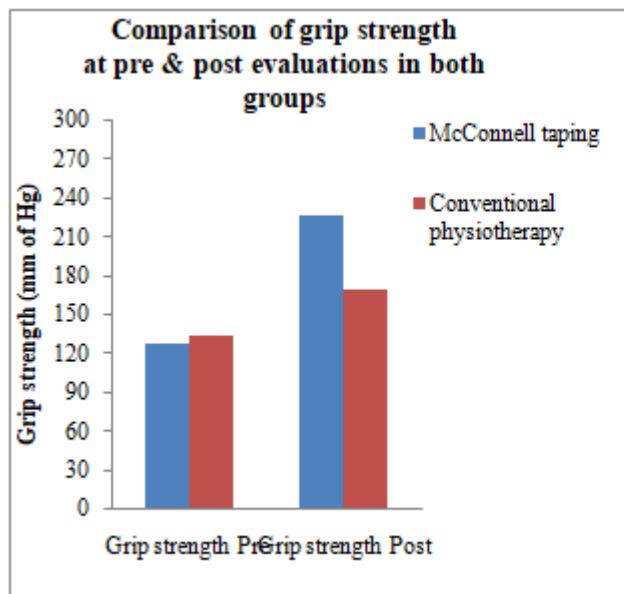


Figure 2

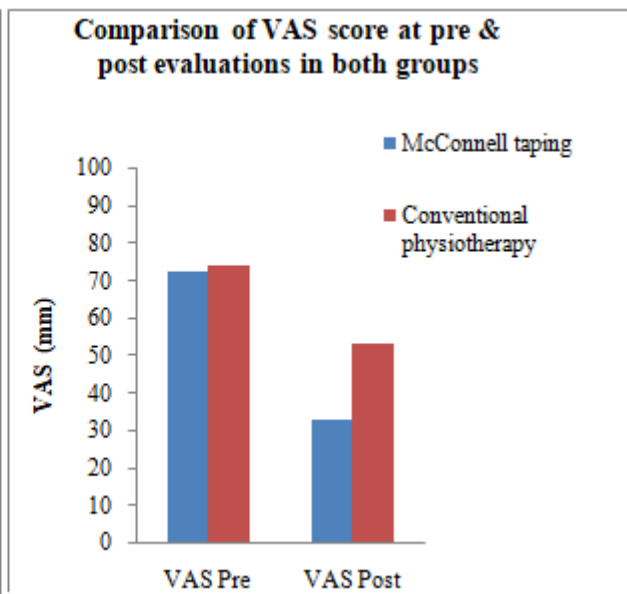


Figure 3

#### 4. Discussion

The results obtained in this study show that at the end of four weeks diamond taping when administered along with conventional physiotherapy has greater beneficial effect on reduction of pain and improvement in grip strength in tennis elbow subjects than who received conventional physiotherapy alone. Our results are consistent with those of a previous study, which demonstrated a significant increase in wrist extension strength immediately after diamond taping in tennis elbow patients [13]

A possible clinical explanation of this finding is that the diamond tape facilitates the pain-free implementation of an exercise program for tennis elbow patients [14]. McConnell the originator of this mode of taping has speculated that the main mechanism of action of this treatment is to provide pain relief that allows for improved movement and function. One mechanism relates the benefit of taping to be a direct mechanical effect on the muscles of the forearm by improving internal muscle mechanics and/or by protecting the damaged tissue from excess force and, as a result, improving grip strength [15]. Another model of the mechanism of action for diamond taping in tennis elbow relates to its neurophysiologic effects on the nervous system, particularly the nociceptive system. In this neurophysiological model, the tape may exert an effect on grip strength by primarily altering pain perception, either locally at the elbow by inhibiting nociceptors, facilitating large afferent fiber input into the spinal cord and/or possibly by stimulating endogenous processes of pain inhibition. There are various limitations for this study, firstly the duration of the patients symptoms were not taken into consideration, so the effect of chronicity was not considered. Another factor of concern is that the grip strength was measured with a cost effective and easily available modified sphygmomanometer test whose reliability was not compared with that of the standard dynamometer in tennis elbow patients though its accuracy was tested in various other upper limb conditions. Therefore, studies looking at the reliability and validity of testing grip strength with modified

sphygmomanometer test are required. To get better accuracy, studies should take chronicity as compulsory inclusion criteria for selection of subjects.

#### 5. Conclusion

This study concluded that McConnell taping provided betterment in symptoms of tennis elbow subjects by improving internal muscle mechanics and/or by protecting the damaged tissue from excess force during exercise. Hence, it is suggested that McConnell taping may be used as an adjunct in management of tennis elbow patients for better outcomes.

#### 6. Conflict of interest

None

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