Original Article

Initial effect of taping technique on wrist extension and grip strength and pain of Individuals with lateral epicondylitis

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Objectives: Aim of this study is to investigate the initial effect of taping technique on wrist extension and grip strength and pain of Individuals with tennis elbow.

Materials and Methods: fifteen patients (10 men and 5 women with 42.53 years) on their dominant arm participated in this study. Outcome measures were wrist extension and grip strength and pain taken before and immediately after application of tape. The unaffected arm served as a control.
Used of hand-held dynamometer and jammar dynamometer for evaluated of wrist extension and grip strength. Also, visual analog scale (VAS) used for evaluated of pain

Results: Among the variables, significant differences were found in wrist extension strength between effected and unaffected arm (P=0.006). Also, changes in grip strength shows statically significant improve in effect arm than unaffected arm (P=0.001). Changes in pain in impaired arm were positive.

Conclusion: Taping technique, as applied in this study demonstrated an impressive effect on wrist extension and grip strength and pain in individuals with tennis elbow. Therefore, it is recommended that this method may be useful in the management of this condition during exercise and functional rehabilitation.

Key words: Taping technique, Pain, Grip strength, Wrist extension strength, Lateral epicondylitis

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Introduction

Lateral epicondylitis (LE) or Tennis elbow is an extremely common injury that originally got its name after it appeared in a high proportion of tennis players. However, it commonly manifests in a vast proportion of people who don't play tennis at all. Typical examples include typists, process workers and builders, to name a few (1, 2, 3).

LE is one of the most common causes of elbow and forearm pain encountered in clinical practice that commonly associated with resisted wrist or finger extension and gripping activities (4, 5). Although pain in this area can be referred pain from the neck or shoulder region, the pain from lateral epicondylitis originates at or near the site of attachment of the common extensors to the lateral epicondyle and may radiate into the forearm and dorsum of the wrist (6, 7).

The basic pathological process in LE of the distal humerus involves the tendinous interface of the common extensor origin. This process is associated with fibrial degeneration of collagen and angiofibroblastic hyperplasia (8). It is frequently employed as a clinical model of musculoskeletal pain in the study of rehabilitation. It affects 1% to 3% of the adult population, occurs mainly as episodes in the dominant arm of patients aged 35 to 50 years, and is equally distributed between men and women (8, 9).

Recent systematic structured reviews of randomized clinical trials of a range of interventions, including friction massage, ultrasound, acupuncture, orthotic therapy, shock wave therapy, oral non steroidal anti-inflammatory medication, and surgery, have indicated that the literature does not support many of the recommended physical treatments of lateral epicondylalgia (10, 11, 12, 13, 14, 15).

McConnell has proposed the application of tape as a means of alleviating pain, improving muscle function, and restoring functional movement patterns. Clinically,

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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 (16).
Vicenzino and et al expression that taping technique that used recently, due to reduce pain on lateral epicondyle, causes facilitate rehabilitation program and improved grip strength and wrist extension muscles force in patients with lateral epicondylalgia (17). The aim of the present study was to study effect of taping technique on wrist extension and grip strength and pain of Individuals with lateral epicondylalgia immediately after application.

Materials and Methods:
Fifteen patients with lateral epicondylitis (10 men and 5 women with mean ages 42.53 years) on their dominant arm participated in this study. The patients were recruited through public advertisements and referrals from physical medicine and rehabilitation clinic of Baqiyatallah hospital and diagnosis was made by physiatrist. Subjects selected through simple non-probability sampling. Inclusion criteria were: 1) pain had to be experienced over the lateral epicondyle in at least one of the following tests: resisted static contraction of the wrist extensors or extensor carpi radialis brevis; or stretching of the extensor muscles of the forearm (18, 19). 2) One hand involved. 3) Patient reporting unilateral lateral epicondylalgia of greater than 6 weeks. Exclusion criteria were: 1) dominant hand fracture in one year ago. 2) History of rheumatoid or neurologic disease 3) limitation of range of motion in dominant hand. Ethical approval was granted for the study and informed consent statements were signed by all of patients.
In our study, outcomes were wrist extension strength and grip strength and pain. That tested both of affected and unaffected arms with and without the use of taping technique. The unaffected arm served as a control.
We used a Jamar dynamometer (model Sammons Preston, USA) with the handle in the second position to measure grip strength in kilograms of force with the upper limb in a standardized position across all trials as recommended in a study of the relationship of elbow position and grip strength (20, 21). The upper limb was positioned in a supine lying position; the palm of the hand was flat on the treatment couch and adjacent to the subject's side. That is, internal rotation of the shoulder, pronation of the forearm, 90° flexion of elbow and slight shoulder abduction to allow for the dynamometer handles to fit between the hand and body (19, 22, 23).
Wrist extension strength measured with a validated hand-held dynamometer (J TECH onsite, UK). We multiplied the output in kilograms by the lever arm distance from the third metacarpophalangeal (MP) joint to the radiolunate joint to derive a torque value (22).
Pain was measured on a visual analogue scale (VAS), where 0 (cm) was least pain imaginable and 10 (cm) was worst pain imaginable (24, 25). In this study, we used of diamond taping. The diamond taping technique consisted of 4 pieces of approximately 80- to 100-mm-long, 3.8 cm wide, non elastic, adhesive-backed sports tape (Premium quality zinc oxide tape) (26). These were laid on the skin distally to proximally in a diamond shape, while simultaneously applying a tractional force on the soft tissues towards the lateral epicondyle and perpendicular to the line of the tape (Figure 1). The strips overlapped at their ends and were secured with an additional 4 tape strips (Figure 2). This was applied in sitting with the elbow in a slightly flexed position. The shape of this taping technique (diamond) is used herein as the name of the technique so as to differentiate the technique from other taping techniques of the elbow (26).
Duration use of tape in pre treatment (baseline) and immediately post treatment (0 minutes) were evaluated. Statistical analysis: independent sample t-test used comparison of scores between affected and unaffected arms after use of counterforce forearm brace. For assessment of effect of counterforce forearm brace in pre and post intervention mean scores were analyzed using a paired-sample t-test to determine whether there were any significant differences. Statistical analysis was performed with SPSS (version 15.0), with P-values less than 0.05 considered statistically significant.

Results:
A total of 15 people based on the inclusion criteria (10 men and 5 women with mean ages 42.53 years) were enrolled in the study. 12 individuals was right dominant hand and 3 individuals were left-handed. Therefore, Eighty percent of the participants presented with their dominant arm being the affected one. Mean (±SD) duration of their tennis elbow condition was 5.1 ± 1.1 weeks.
The data from this study demonstrate positive changes in grip strength with application of taping

technique in affected arms when compared with unaffected arm. This effect was maintained for 0 minutes after taping technique was applied. In affected arm, maximum improvement in grip strength was on average 3.9 kilograms of force at the 0-minute post application measurement time. Also, the maximum improvement in wrist extension strength was on average 11.4 kilograms of force immediately after application of taping. Maximum change in reduce of pain was 1.6 (cm) and data does show positive changes after application taping technique. For the unaffected arm, a very little change in scores was demonstrated on grip strength (table 1).

Appropriate use of the t-test requires that the data fall within the typical normal distribution. Analysis by the X^2 test confirmed that the data from effected arms were not significantly different to the distribution defined by the normal or unaffected arms. The results of the student t-test showed that there was a significant main effect for grip strength between effected and unaffected arm (P =0.001). According to result, average difference wrist extension between in effected and unaffected arm was significant (P= 0.006).

Discussion and Conclusion:

This study examined the initial effect of taping technique wrist extension and grip strength and pain in lateral aspect of elbow in patients with tennis elbow. The data of our study demonstrated that the application of taping technique (diamond tape) improved grip strength immediately after application in participants with lateral epicondylalgia. Means that, effect of taping technique in grip strength in effected elbow after application than unaffected elbow tape was significant. The significant differences in grip strength are comparable with the reports by Vicenzino and et al in which the authors reported that using a diamond tape could significantly increase the grip strength in people with tennis elbow. The mean increase in grip strength in our study was not similar to reported by Vicenzino [26]. A major difference between studies was the test position used to measure grip strength. The current study and wads worth (22) and wuori (27) tested grip strength in 90° of flexion, whereas the others had the elbow in extension (26, 28).

Participations demonstrated a statistically significant increase in wrist extension strength while using diamond tape, only on the arm affected by tennis elbow. But we don't find statistically significant relationship between using of diamond tape and unaffected arm. This finding agrees with results of the experiment by Wadsworth et al (22) on the unaffected extremities of subjects wearing a forearm band. It also agrees with the experiment by Stonecipher and Catlin (29), which found that the band caused no increase in wrist extensor strength of no impaired subjects.

We postulate that the significant increase in wrist extension and grip strength of the affected arm occurred because taping technique disperses stresses generated by muscle contraction, thereby reducing painful inhibition and allowing the subject to contract more forcefully, Although not proven (22, 27).

Data of our study also showed that application of diamond tape resulted in positive changes of pain scores compared pre and post application of diamond taping. According to results, data of our study compatibility have with study by Vicenzino. In which the authors reported that application of diamond tape resulted in positive changes of pressure pain threshold scores compared to a placebo or no-tape control condition (26). For these results one explanation could be considered. A possible model of the mechanism of action for diamond taping in lateral epicondylalgia 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 (26, 30). The main results of this study demonstrated an impressive effect of a diamond tape technique on wrist extension and grip strength and pain in individuals with tennis elbow. The data suggest that this method of treatment may be a useful in the management of this condition during exercise and functional rehabilitation. Although, the treatment technique only achieved this effect when applied to the affected arm, not the unaffected arm.

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Table 1. Change in variables in effected and unaffected arm

	effected arm		unaffected arm	
	pre application	post application	Pre application	post application
Grip strength ± SD*	31.6±6.1	35.5±6.7	32.8	33.1
Wrist extension strength ± SD	43.93±13.91	55.33±10.1	61.35±12.21	62.18±13.65
Pain± SD	4.13±1.1	2.16±0.9	0	0

* Standard deviation

Table 2. Independent sample t-test analysis of the changes in grip strength and WEMF*

	Average difference in effected arm	Average difference in uneffected arm	P
Grip strength	3.9	0.31	0.001
Wrist extension muscles Force	11.4	0.83	0.006

* wrist extension muscles force

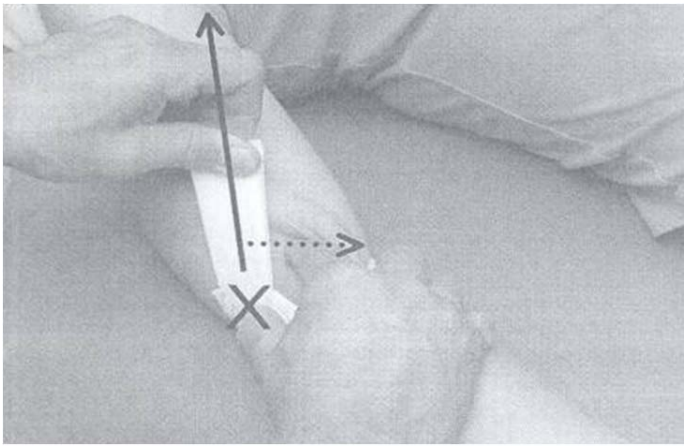

Figure 1: Diamond taping technique (Vicenzino and et al)

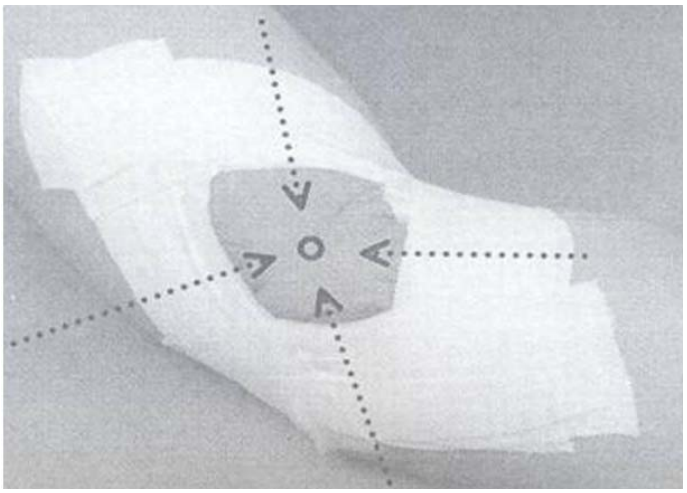

Figure 2: Overlapping ends of the tape (Vicenzino and et al)