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Comparison between Sodium diclofenac phonophoresis and kinesio tape in treating postpartum de quervain's tenosynovitis

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Abstract: De Quervain's Tenosynovitis is as a painful inflammation in the tendons at the thumb base at the wrist side. Phonophoresis with local anesthetic or anti-inflammatory agents is required in the treating both the inflammation and pain in lots of musculoskeletal conditions, by way of example, tenosynovitis, epicondylitis, Hand problems and tendonitis are routine amid pregnancy along with the postpartum period. This study designed to analyze the effect of sodium diclofenac phonophoresis versus Kinesio tape in treating postnatal de quervain's tenosynovitis. Forty volunteers, women had postnatal de quervain's tenosynovitis, were randomly sent to two equal groups in the number of (A& B). Group (A) was treated by making use of sodium diclofenac phonophoresis with continuous mode for 5-10 minutes, 3 times per week for a month as the group (B) was treated through the use of Kinesio tape three times/ per week for a month changed alternate day. Assessment for all subjects in both groups (A& B) was carried out both before and after treatments program (after four weeks) throughout the Visual Analogue Scale (VAS) along with the Quick Disabilities from the Arm, Shoulder, and Hand (Q-DASH) scale. Results: Both groups exhibited a substantial reduction in both pain and level of disability after the end of treatments program, when both groups (A & B) were compared together, there is a statistical significant difference between mean values of VAS and DASH of both groups (A and B), favoring the group (A). These results indicate that using of sodium diclofenac phonophoresis and kinesio tape were effective adjunct methods in lessening pain and degree of disability in postpartum de quervain's tenosynovitis, but sodium diclofenac phonophoresis is more effectively.

Keywords: De quervain's tenosynovitis–phonophoresis–Kinesio tape.

Introduction

De Quervain syndrome moreover, referred to as gamer's thumb or radial styloid tenosynovitis or washerwoman's sprain or de Quervain disease or de Quervain's stenosing or tenosynovitis or de Quervain's tenosynovitis or mom thumb or mother's wrist, can be a tenosynovitis together with the tunnel or sheath which encompasses both tendons that regulate all movements together with the thumb¹. De Quervain tenosynovitis is instigated by inflammation of both the extensor pollicis brevis (EPB) and also the abductor pollicis longus (APL) tendons, which glance at the first dorsal compartment on the radial styloid². It is usually initiated by

repetitive activities and over usage of the wrist in ulnar deviation, thumb in extension and abduction, or could be correlated with pregnancy or arthritis rheumatoid inflammation³. Mild symptoms could be appears throughout the later months of childbearing and afterward increment uniquely as soon as the delivery. Patients with consistent symptoms have says proper care of the child activities often aggravate the trouble. Instantly these postpartum symptoms hold on in breastfeeding females and don't stop until nursing has been ended⁴. Despite the fact that this problem is viewed normally in both men and women, de quervain tenosynovitis seems, by all accounts, being substantially more regular in ladies. A number of creators, even quote a female-to-male rate all the way to very practically almost 8:1. Curiously, numerous girls face from the de quervain tenosynovitis amid maternity or even the postpartum period⁵. Phonophoresis is making use of ultrasound to improve the locally applied drugs delivery. Phonophoresis continues to be employed being an effort to improve the absorption of topically. Topical cream anti-inflammatory and analgesics providers over the corrective use of ultrasound⁶. In phonophoresis, notwithstanding serious home heating, US enable you to improve percutaneous absorption of medications. In 1954 phonophoresis was primarily utilized to treat the polyarthritis from the hand by using of hydrocortisone lotion in to the inflamed zones. From that point forward many experts have useful for the treating different musculoskeletal and dermatological issue⁷.

Diclofenac is used to cure pain, dysmenorrhea and inflammatory disorders^{8, 9}. Therapeutic ultrasound (US) required frequency between 0.75 about three MHZ, but now KHZ ultrasound is available at intensities in the range 0.1 to 3 either at pulsed or continuous mode¹⁰. The ultrasound parameters used (continuous, 1 MHz frequency, 0.5 W/cm² intensity, five minutes irradiation) have common use within the rehabilitation programs and more likely don't create any harm to the skin¹¹.

Kinesio Tape (KT) is a preferred and completely new taping strategy that was designed by Kenzo Kase, that says he will: 1) collects the fascia to modify the tissue in their desirable position, 2) lift the skin layer over zones of the inflammation, edema and pain, 3) increment incitement with the mechanoreceptors to either invigorates or restricts, 4) provides a positional boost towards the skin, and 5) diminish pressure within the lymphatic tunnels that give a way to the evacuation of discharge¹².

There are several assumptive advantages asserted for the tape. One particular helps joint motion and correcting the alignment of weak muscles therefore, as a result of the tape's rebounding features. Too, the tape is alleged to elevate the layer of skin, along creases, expanding the room below it, and expanding the lymphatic liquids and circulation. This expansion through the interstitial space is known as to prompt to lower pressure about the nociceptors from the body, which distinguish the pain, to improve general joint proprioception and also to invigorate the mechanoreceptors¹³. KT is well known by various brand names, as one example, Kinesiology or Kinesio tape or Acu Tape, or Aku tape, or Kinesio Tex, or Kinesis Orthopedic Tape, or athletic Tape, Kinesio Elastic Tape, and Neuroproprioceptive tape. KT is made by 15 to 25% prestretched as this is often could possibly be coupled to the backing paper¹².

There are numerous proposed important things about KT, including proprioceptive facilitation^{14, 15} muscle facilitation¹⁶, decreased muscle fatigue¹⁷, diminished, delayed-onset muscle soreness¹⁸, alleviation of pain¹⁹, improvement of the blood stream and lymphatic drainage and enhanced healing as lessening of edema^{20, 21, 22}. Theoretically, making use of KT determines the physiological advantages. For example, if the muscle have been damaged, first your skin is stretched manually, as well as the KT is applied unstretched²³. This application type will cause convolutions inside the skin, which results in raising on the skin¹⁹. Theories recommend that these formed convolutions empower recovery of damaged tissues²² by expanding the interstitial space and finally lightening interstitial pressures, which can happen from inflammation and swelling taking after injury¹⁶. It is also conjectured that lifting the skin layer isolates fibers, which append your skin layer to the endothelial cells of the capillary and lymphatic beds. This can be hypothesized to generate channels, which enable for lymph to empty, thus lessening the swelling²¹ and helping in an increase of the blood circulation to these area²⁰. Support with an improvement in blood flow via KT originated in the investigation conducted by²⁴ who learned that after use of the KT, the peripheral blood stream, assessed through Doppler ultrasound, expanded by 20 to 60% in poor circulation and chronic disorders patients.

Materials and Methods

Patients and methods:

Patients:

Forty women having postnatal de quervain's tenosynovitis had been selected randomly from the orthopedic outpatient clinic of Al Zahraa University Hospital, Cairo shared in this study with the following criteria: All females were clinically diagnosed with De Quervain's tenosynovitis (+ve Finkelstein's test), their ages were ranged from 20 to 40 years old. They were multiparous women, they were housewives, and all patients were in the chronic stage without any previous treatment. The exclusion criteria included the following: Patients have the first carpometacarpal joint osteoarthritis, or have wartenberg's syndrome, or have intersection syndrome (with pain will be more towards 2–3 inches below the wrist joint and at the middle of the back side of the forearm), and have cervical spondylosis or scaphoid fracture. Prior to the data collection, all participated women signed an informed consent form. The study approved by the faculty of physical therapy ethics committee (reference number: P.T.REC/012/001369).

Randomization:

An independent person randomly assigned to all participated women to either group (A) (n=20) or group (B) (n=20) by chosen numbers from closed envelopes having numbers that the number generator were chosen randomly. These randomization was restricted to different sizes permuted blocks to make sure that equal numbers were assigned to each group (A) and (B).

Design of the study: Interventional study (Pre and post design). They were divided randomly into two equal groups: Group (A) 20 women were treated by sodium diclofenac phonophoresis with continuous mode for 5 minutes, three times per week for four weeks. While the group (B) 20 women were treated with Kinesio tape with 25 % of available tension on the two stretched tendons of the first dorsal compartment (using a space correction technique) three times/week changed every other day for four weeks.

Assessment:

1. Visual analogue scale: that was used to determine the pain intensity level. It consists of 10 cm as a horizontal line with one end represented that (0= no pain) and the other end (10= worst pain)²⁵. The assessment was performed for every woman in both groups (A, B) before and after the treatment program.
2. The Disability of Arm, Shoulder, and Hand (DASH) scale: It was used for the assessment of hand functions^{26, 27}.

Treatment procedures:

A full history was taken from each woman in both groups (A) and (B) before starting this study, according to the items of the recording data sheet. Each patient was instructed carefully about the evaluation procedure. A consent form was signed by each patient before participating in the study.

Methods

1. Ultrasound with sodium diclofenac gel for treatment of group A: Twenty patients participated in this group for four weeks, 12 sessions, day after day. Continuous ultrasound with sodium diclofenac (10mg) as a coupling medium was used on the two stretched tendons of the first dorsal compartment, with a frequency of 3 MHz with an intensity of 0.5 w/cm² for five minimums²⁸.
2. Kinesio tape for treatment of group B: Twenty patients participated in this group for four weeks. Kinesio tape was designed to be changed every other day for 12 sessions in four weeks without irritation. Kinesio tape was used by 25 % of available tension on the two stretched tendons of the first dorsal compartment using. I strip from insertion to origin^{29, 30}(Fig.1).

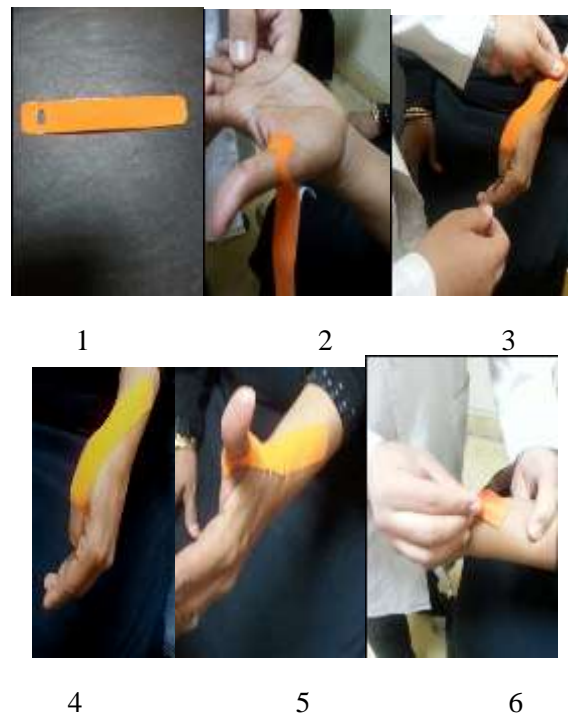


Fig. (1): Steps of Kinesio tape application & removal.

Statistical analysis:

Data were represented as means and standard deviations, median, minimum, maximum, number and percent. Chi-square test was used for comparison between categorical data. According to test of normality, either unpaired t test or Mann-Whitney test whenever it was appropriate was used for comparison between different variables in the two groups. Pairwise comparison (pre- versus post-treatment) within the same group for different variables was performed using Wilcoxon Sign Ranks test. The Statistical Package for the Social Sciences (SPSS) computer programs (version 19 windows) was used for data analysis. P value ≤ 0.05 were expressed as a significant.

Results

Demographic features of the two studied groups (A) and (B): There was no statistical significant difference in the mean values of age and parity between the two groups (A and B) at the beginning of the study as $p=0.133$ and $p=0.161$, respectively (Table1).

Table (1): Demographic features of the two studied groups (A) and (B).

	Group A (n= 20)	Group B (n= 20)	t value	P value
Age (yrs.)	29.75 \pm 4.06	27.20 \pm 6.22	1.535	0.133 (NS)
Parity	2.75 \pm 0.64	2.45 \pm 0.69	1.431	0.161 (NS)

Data are expressed as mean \pm SD.

NS= $p > 0.05$ = not significant.

P-value: Probability value

t-value: Unpaired t-value

The comparison between the mean values of VAS scores pre, post treatment in the two studied groups (A&B):

Mann-Whitney test was used to show the statistical difference in the mean value of VAS scores pre, post treatment between the two studied groups (A) and (B). Before starting the treatment program, there was no statistical significant difference between group A (5.45 \pm 1.00) and group B (5.70 \pm 0.98) with Z test=-0.747 and p value=0.455. After the end of the treatment program:

Regarding the group (A): As shows in Table 2, after the end of the treatment program, there was a highly statistically significant decrease in the mean value of VAS scores with the p-value was <0.001, z value=-3.949 with mean Difference=2.95, with percentage of improvement was 54.13%. Regarding Group (B): As shows in Table.2 after the end of the AT program, there was a statistically significant decrease in the mean value of VAS scores with the p-value was <0.001, z value=-3.985 with mean Difference=2.2, with percentage of improvement was 38.60%.

The comparison between the mean values of VAS scores after the end of the treatment program between the two studied groups (A&B) reported that, there was a statistical significant difference between group A(2.50±1.54) and group B(3.50±0.95) with Z test=-2.323 and p value=0.020, favoring the group(A).

Table (2): The comparison between the mean values of VAS scores pre, post treatment in the two studied groups (A & B).

	Group A (n= 20)	Group B (n= 20)	Z value	P value
Pre-treatment	5.45 ± 1.00	5.70 ± 0.98	-0.747	0.455 (NS)
Post-treatment	2.50 ± 1.54	3.50 ± 0.95	-2.323	0.020 *
Mean Difference	2.95	2.2		
% improvement	54.13	38.60		
Z value	-3.949	-3.985		
P value	0.001*	0.001*		

Data are expressed as mean ± SD.

Z= Mann-Whitney test.

NS= p> 0.05= not significant.

*p< 0.05= significant.

The comparison between the mean values of DASH scores pre, post treatment in the two studied groups (A&B):

Mann-Whitney test was used to show the statistical difference in the mean value of DASH scores pre, post treatment between the two studied groups (A) and (B). Before the treatment program, there was no statistical significant difference between group A (46.5 (18.0-85.0)) and group B (50.5 (16.0-80.0)) with Z test = -0.298 and p value =0.766.

After the end of the treatment program: Regarding the group (A): As shows in Table3 after the end of the treatment program, there was a highly statistically significant decrease in the mean value of DASH scores with the p-value was <0.001, z value=-3.925 with mean Difference=18, with percentage of improvement was 38.71%.

Regarding Group (B): As shows in Table.3 after the end of the treatment program, there was a highly statistically significant decrease in the mean value of DASH scores with the p-value was <0.001, z value -3.930 with Mean Difference =13, with percentage of improvement was 34.67%.

The comparison between the mean values of DASH scores after the end of the treatment program between the two studied groups (A&B) reported that, there was a statistical significant difference between group A(28.5(15.0-54.0)) and group B (37.5(15.0-77.0)) with Z test= -2.017 and p value=0.044, favoring the group(A).

Table (3): The comparison between the mean values of DASH scores pre, post treatment in the two studied groups (A&B).

	Group A (n= 20)	Group B (n= 20)	Z value	P value
Pre-treatment	46.5 (18.0-85.0)	50.5 (16.0-80.0)	-0.298	0.766
Post-treatment	28.5 (15.0-54.0)	37.5 (15.0-77.0)	-2.017	0.044 *
Difference	18	13.0		
% improvement	38.71	34.67		
Z value	-3.925	-3.930		
P value	0.001*	0.001*		

Data are expressed as median (range).

Z= Mann-Whitney test.

P> 0.05= not significant.

*P< 0.05= significant.

Discussion:

De Quervain's Tenosynovitis is considered as a pain and inflammation in the tendons at the thumb base at the wrist side³¹. Hand problems are common during gravidity or in the postpartum period. Surveys of pregnant women indicate that as many as 35 percent experience symptoms suggestive of carpal tunnel syndrome or de quervain's tenosynovitis. It considered as a common cause of wrist pain in pregnant and postpartum females³².

Phonophoresis with adding anti-inflammatory or adding the local anesthetic agents are commonly used in alleviation of both the pain and inflammation in many musculoskeletal disorders, like epicondylitis, tendonitis, tenosynovitis, bursitis and osteoarthritis (OA). This technique involves minimal danger of hepatic and renal damage and is regarded as a very well tolerated and non-invasive technique³³.

Currently, Kinesio tape is considered as a very effective method for support, reestablishment and modulating some physiologic process, it can be employed in orthopedic and sports medicine as a specialized tape which is a thin, elastic and can be stretched up to from 120% to 140% of its original length also it permits a partial to a full range of motion for the applied muscles and joints with using different pulling force to the skin³⁴.

The results of the presenting study revealed that, sodium diclofenac phonophoresis and Kinesio tape were effective adjunct methods in reducing pain, degree of disability in postpartum de quervain's tenosynovitis.

There was a highly statistically significant reduction of pain and degree of disability in both groups after the end of the treatment program, when both groups were compared together, there was a statistical significant difference in pain and degree of disability between both groups favoring the group (A) than the group (B).

The results of this study agreed with the study of Onuwe and Amadi³⁵ who compared the effect of phonophoresis, cryotherapy and combination of both modalities on different musculoskeletal injuries as de quervain's tenosynovitis, rotator cuff tendonitis, patellar tendonitis, tennis elbow, ankle sprain and muscle strain, they found that 12 from 14 patients (phonophoresis group), 7 from 19 patients (cryotherapy group) and 16 from 17 patients (combined group) were pain free after 1 to five treatment sessions. The obtained results of this study agreed with the study of Hiral and Bhakti³⁶ who compared the effect of ultrasound and phonophoresis with diclofenac gel on 30 patients with de quervain's tenosynovitis for 3 days weekly for 3 weeks. They found highly significant decline in pain in both of the groups, when two groups were compared there was a significant difference in pain in the group who treated with phonophoresis with diclofenac gel than the group who treated with ultrasound, and no significant difference in grip strength.

Our results in accordance with those recorded by Villeco³⁷ who revealed that using Kinesio tape have many beneficial effects on the drainage of lymph. According to another, two different studies, have showed that kinesio tape induced better patient compliance and quicker drainage.

The obtained results also agreed with the study of Homayouni et al.³⁸ regarding de quervain's disease patients who found in comparison between 30 patients who applied kinesio tape four times weekly for one month and 30 patients who received paraffin wax, TENS, US, friction massage every three days for 10 sessions that regarding the KT group, pretreatment VAS scores was 58 and at post treatment it have been changed to 13. But the PT group, these values were 56 and 38. The swelling was reduced in seventeen people (73%) and five people (19%) in both of the KT and PT groups, respectively. They concluded that de quervain's disease patients responded more better to KT rather than PT.

The obtained results were supported by the study of Lemos et al.³⁹ in which the patients were evaluated through using fingertip-to-floor and the Schober tests. The tape was left in place for 48 hours then the reevaluation was done after 24, 48 hours and also, 30 days after the tape have been removed. Outcomes in all three studied groups with no significant deviations were discovered during the Schober test, however this was possible to watch over the improvement of lumbar flexion after 30 days. With the fingertip-to-floor distance evaluation, the kinesio fascia correction (KFC) and kinesio without tension (KWT) groups recorded significantly improved of the flexibility after 24 and 48 hours after the tape have been taken off. Also, our results were agreed with Lim and Tay⁴⁰ who reported that in a five meta-analysis, they found that the using of kinesio taping provided significantly better pain alleviation than no treatment at all, but was not better than any other treatment approaches, this meta-analysis identified seventeen trials (416 patients in the experimental group and 406 patients in the control group), which had data for measures of pain and/or disability, four trials evaluated the

effects of application of KT on pain and /or disability in knee pain, four trials in low back pain, three trials in neck pain, two trials in shoulder pain, two trials in plantar fasciitis, one trial in de quervain's disease and one trial in myofascial pain. In our current study, there was significant reduction of DASH (disability of the arm, shoulder and hand) questionnaire in patients treated with phonophoresis and Kinesio tape, this result was supported by the work of Zaky et al⁴¹ they reported that the combinations of phonophoresis with eccentric exercise were effective on decreasing pain severity, functional disability in treatment of De Quervian's disease. Furthermore, our results were agreed with Oosting et al⁴² have approved that utilization of iontophoresis in addition to dexamethasone help in improving of the functional outcomes better than utilization of the therapeutic pulsed (20% or 50%) ultrasound (1.0-1.5w/cm²). The patients who received iontophoresis with dexamethasone demonstrated a clinically and statistically significant improvement on the Quick DASH. Both the patch applied in-clinic and wore at home for 14 hours. As well as in-clinic delivery methods with a 40mA/minimum dosage were utilized. This finding may be important for therapists treating de Quervain's tenosynovitis because of the significant improvement on the Quick DASH. The results of the study are also, supported by Shakeri *et al*⁴³. The kinesio taping brings out improvement in the disability of the shoulder, arm and hand for shoulder impingement patients. The outcomes of this study showed that after one-week of using of taping results in a substantial decrease in the disability (DASH) when it was compared with the pretreatment score in both of the control and treatment groups. Our data concluded that after the utilization of taping, the changes in DASH score, was significantly in excess in the treatment group than the placebo control group. Kaya et al.⁴⁴ compared the effectiveness of short-term use of therapeutic KT on alleviating pain and disability in 55 patients complaining of shoulder pain as result of rotator cuff disorders with using the conventional physical therapy modalities and recorded sustainably lesser DASH scale scores after the usage of taping. They established that the KT application results in enhancing function better than other physical therapy modalities from the first week, but revealed no significant difference between using of KT and other physical therapy modalities started following the second week. Frazier et al.⁴⁵ in a serious study, after applying KT and physiotherapy revealed a substantial advantages in both of DASH and pain scores in five patients complaining of various shoulder disorders. All patients were referred by the orthopedist and have been identified clinically as having the shoulder impingement syndrome. It have been reported that the applying of taping has beneficial effects on both of the sensory motor and proprioceptive feedback mechanisms⁴⁶. As utilization of taping results in a prompt sensorimotor feedback, and relieving of symptoms was recorded by the patients with enhanced the comfort degree, and improvement of the involved joint stability. Nevertheless, were cognize many limitations, one of these limitations of this study was the sample size. Although a power analysis was done for the sample size calculation, we used the data from the pain intensity (VAS) with a power set at 90%.

The results of the study are contradicted with the study of Domenico⁴⁷ who said that applying of KT, produces a suppression of the positive reflex amplitude that lasts only during putting on the process. When either the stimulus towards the mechanoreceptors or the tension inside tissue is discontinued, every aspect of the location come back to their baseline values. The outcomes of the study are also contradicted with those of Csapo and Alegre⁴⁸ who found in a 2014 meta-analysis that the elastic therapeutic tape application results in facilitation of the contraction of muscles, without effects on the muscles power.

Conclusion:

There was a statistically significant reduction of both pain and degree of disability. Accordingly, it was found that sodium diclofenac phonophoresis and Kinesio tape were effective adjunct methods in reducing pain and degree of disability in postpartum de quervain's tenosynovitis, but sodium diclofenac phonophoresis is more effective.

Consent:

All authors revealed that 'written informed consent was recorded by all the patients before starting the study.

Competing Interests

Authors have revealed that there was no competing interests exist.

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