

Effect of Phonophoresis on Carpal Tunnel Syndrome during Pregnancy: A Randomized Clinical Trial

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Abstract

Background: Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy in the upper extremities. Phonophoresis is a localized, non-invasive, convenient and rapid method of delivering low molecular weight drugs as well as macromolecules into the skin.

Aim of Study: To investigate the effect of phonophoresis on carpal tunnel syndrome in pregnancy period.

Subjects and Methods: This study was carried upon 30 pregnant females suffering from carpal tunnel syndrome. Their age ranged from 22 to 35 years and their BMI was less than 30 kg/m². They were selected from Tiba Hospital Al-Gharbia. The participants were randomly distributed in two groups equal in number. Control group (A) consisted of 15 females, each patient will receive phonophoresis for 10 mins, 3 times per week for (4 weeks) additionally to this, each patient will be asked to perform 30 mins of exercises for her affected hand and wrist. Also, each patient will be asked to wear a night cook up splint throughout the treatment course (4 weeks).

Study group (B) consisted of 15 females, each patient will be asked to perform 30 mins of exercises for her affected hand and wrist. Also, each patient will be asked to wear a night cook up splint throughout the treatment course (4 weeks).

All females in both groups (A and B) were assessed pre and post treatment by using, visual analogue scale and EMG apparatus.

Results: The results of the current study revealed that, both groups showed a significant ($p < 0.05$) decrease in pain sensation after treatment, group (A) achieved 78.55% while group (B) achieved 24.29% but the percentage of decrease in VAS was more pronounced and more noticeable in group (A) when compared with group (B). Also, both groups showed a significant ($p < 0.05$) decrease in distal latency and increase of conduction velocity of median nerve after treatment, group (A) achieved 64.02% while group (B) achieved 16.46% but the percentage of decrease in distal latency and increase of conduction velocity of median nerve was more pronounced and more noticeable in group (A) when compared with group (B).

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Conclusion: Phonophoresis has beneficial effects in alleviating pain in women suffering from carpal tunnel syndrome in pregnancy.

Key Words: Carpal tunnel syndrome – Phonophoresis – Visual analogue scale – EMG.

Introduction

CARPAL tunnel syndrome or median neuropathy at the wrist is a medical condition in which the median nerve is compressed at the wrist, leading to pain, parathesia and muscle weakness in the hand and forearm [1].

People with CTS experience numbness, tingling, or burning sensations in the thumb and fingers, in particular the index and middle fingers and radial half of the ring finger, because these receive their sensory and motor function (muscle control) from the median nerve [2].

Carpal tunnel syndrome (CTS) is a frequent complication of pregnancy, with a prevalence reported as high as 62%. CTS commonly presents during the third trimester, but can occur during the first trimester [3].

During pregnancy, the body goes through a lot of physical and hormonal changes that can lead to swelling in the body. When extra fluid causes swelling in the wrist, it puts pressure on the median nerve and causes the symptoms of carpal tunnel syndrome [4].

There are several therapeutic options for patients with CTS depending on various factors, including the stage of the disease, the severity of the symptoms, and patients' preferences. Non-surgical intervention is recommended as the first-line treatment in cases of mild to moderate CTS. They are indicated in patients with no muscle weakness,

atrophy, or denervation and with only a mild abnormality on nerve conduction studies [5].

Phonophoresis is a localized, non-invasive, convenient and rapid method of delivering low molecular weight drugs as well as macromolecules into the skin [6].

Phonophoresis was proved to have the upper hand over ultrasound alone in decreasing pain in knee osteoarthritis and many other cases [7].

The transdermal drug delivery system presents several advantages compared to injections, although skin is the major barrier for the application of transcutaneous drugs. Phonophoresis is an available technique for the enhancement of transdermal absorption of NSAIDs into tissues by the application of ultrasound. There are several studies of phonophoresis with various parameters, including intensity, frequency, duration, and continuous or pulsating mode [8].

Consequently, the purpose of this randomized-controlled study was to investigate the effect of phonophoresis on carpal tunnel syndrome.

Subjects, Material and Methods

Subjects:

This study was carried out on thirty patients. After ethical approval, They were selected randomly from the outpatient clinic of Neurology and Orthopedic of Tiba Specialized Hospital, Tanta, Egypt. The study was conducted from 26 December 2018 to 7 February 2019.

Their ages were ranged from 22-35 years old, their body mass index didn't exceed $30\text{kg}/\text{m}^2$.

Patients with diabetes mellitus, hypertension, vascular diseases, heart diseases, renal diseases, hormonal disturbance, cervical spondylosis, rheumatoid arthritis, leukemia, benign tumors, double crush syndrome, carpal bone fractures, joint injuries deformities in their hands or forearms, cognitive or psychiatric disorders, burns in their hands and Skin diseases were excluded.

The patients were divided randomly in to two equal groups (A&B):

Group (A): It was consisted of 15 patients. They treated by phonophoresis that was adjusted at: (a) Frequency (3MHz), (b) Intensity (1.5-2w/M2) Until patient feel tingling sensation. A sufficient amount of ketoprofen gel will be placed over the transducer head. The ultrasonic device will be switched on and the physiotherapist starts

to move the transducer head on the treated area in a circular motion for 10mins. Also, each patient was asked to the patient starts the exercises for her affected hand and wrist for 30mins. Also, each patient was asked to wear cock up splint throughout the treatment course which was adjusted at neutral angle at night time (4 weeks).

Group (B): It was Consisted of 15 patients, each patient was asked to the patient starts the exercises for her affected hand and wrist for 30mins. Also, each patient was asked to wear cock up splint throughout the treatment course which was adjusted at neutral angle at night time (4 weeks).

Material:

- 1- Recording data sheet: It was used to record all data of each patient in both groups (A and B) in it before starting treatment course. It included: Name, age, address, occupation, number of parity, diagnosis and chief complain.
 - 2- Consent form: Each patient in both groups (A and B) was asked to sign on the consent form before participating in this study.
 - 3- Weight and height scale: It was used to measure weight and height of each patient in both groups (A and B) to calculate body mass index (BMI) before participating in this study through this equation: $\text{BMI} = \text{weight (kg)} / \text{square of body height (m}^2) = (\text{Kg}/\text{m}^2)$.
 - 4- Ultrasonic device and ketoprofen gel.
- EMG apparatus:* To measure nerve conduction velocity and distal latency of median nerve.
- 5- Visual analogue scale.
 - 6- Pillows, cushions and sheets: Pillows and cushions was used to support the women body parts in a comfortable relaxed position. Also, sheets will be used to cover each patient.
 - 7- Plinth: Will be used to apply phonophoresis during evaluation sessions.
 - 8- Cotton and alcohol to clean any tools or apparatus that are used in treatment procedure.
 - 9- Stop watch: Will be used for adjusting the duration of phonophoresis application.

Procedures:

1- Evaluative procedures:

- Weight and height was measured for each patient in both groups (A & B), body mass index was calculated before participation in this study through this equation: $\text{BMI} = \text{Weight}/\text{height}^2$ (Kg/m^2).

- Each patient in both groups was asked to make EMG to measure distal latency as well as sensory and motor conduction velocity of the median nerve before and after the treatment course.

- Each patient in both groups (A&B) was asked to put a mark on visual analogue scale to estimate her level of pain before and after the treatment.

- The visual analogue scale: Is a graphic rating scale with numerical values (0-4) placed equidistantly along a line of 10cm long prone horizontally. The descriptors and numbers will help all participants of any 2 groups (A&B) to estimate their level of pain before and after the treatment course.

II- Treatment procedures:

- Study group (A): Each patient in this group will be asked to sit comfortably on arm chair and rested her hand on the treatment table, the physiotherapist will be sit on a chair near the other edge of the plinth (treatment table). At first, the treated area will be cleaned with a piece of cotton immersed in alcohol. Then, the ultrasonic device will be adjusted on the following parameters: Frequency: 3 MH Intensity: -1.5-2w/M2 and Mode: Continous, After that, a condom will be placed over the transducer head to prevent transmission of infection and a sufficient amount of ketoprofen gel will be placed over the transducer head. The ultrasonic device will be switched on and the physiotherapist starts to move the transducer head on the treated area in a circular motion for 10mins. After finishing the session, the ultrasonic device will be switched off and the transducer head is cleaned with a piece of cotton and the patient starts the exercises for her affected hand and wrist for 30mins. Also, each patient will be asked to wear a night cook up splint throughout the treatment course (4 weeks).

- Control group (B): Each patient in this group will be asked to perform 30mins of exercises for her affected hand and wrist as in group (A), 3 times per week for (4 weeks). Also, each patient will be asked to wear a night cook up splint throughout the treatment course (4 weeks).

Results

Table (1): Demographic characteristics of all patients in two groups (A&B).

	Group A (n=15)	Group B (n=15)	t- value	p- value
Age (yrs.)	30.90±2.72	31.47±2.36	-0.610	0.547 (NS)
Weight (kg.)	82.30±2.64	83.04±2.17	-0.839	0.409 (NS)
Height (cm)	169.27±2.46	170.07±3.65	-0.703	0.488 (NS)
BMI (kg/m ²)	28.73±0.95	28.74±1.13	-0.011	0.991 (NS)

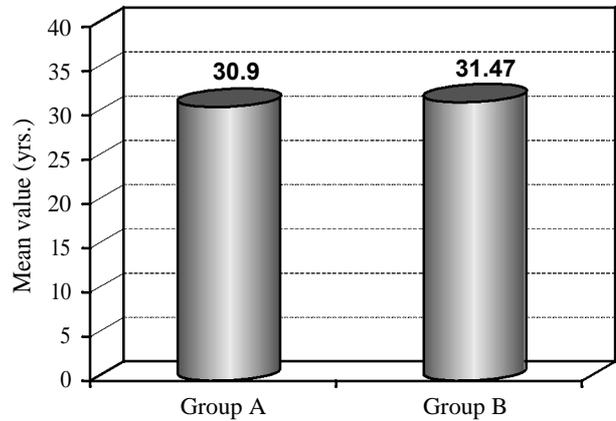


Fig. (1): Mean values of age in both groups (A&B).

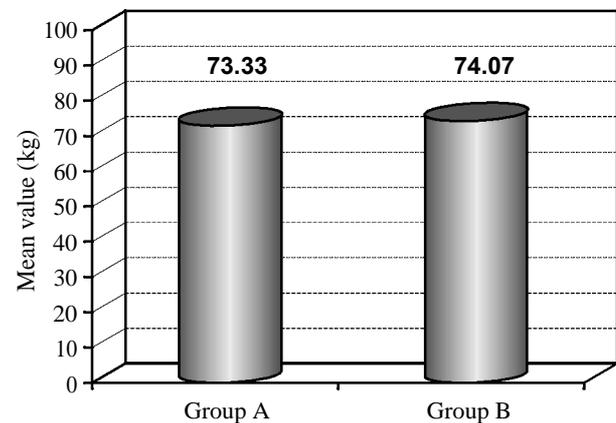


Fig. (2): Mean values of weight in both groups (A&B).

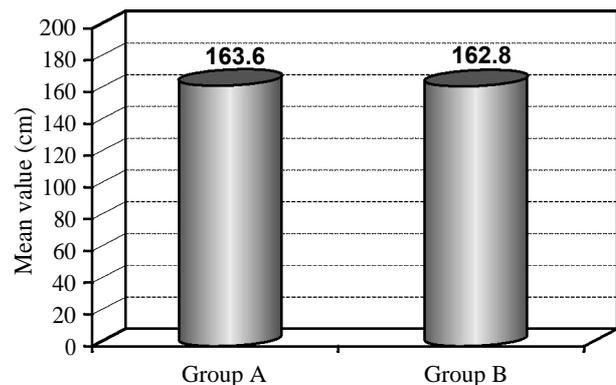


Fig. (3): Mean values of height in both groups (A&B).

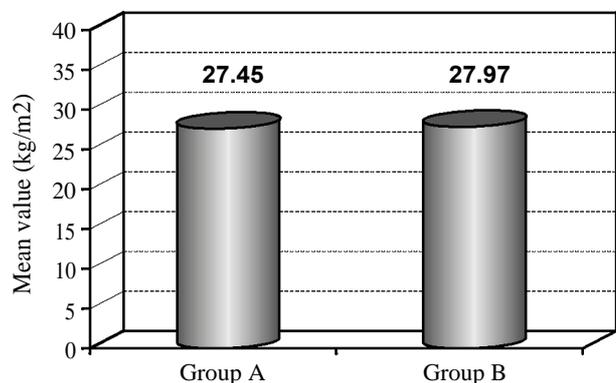


Fig. (4): Mean values of height in both groups (A&B).

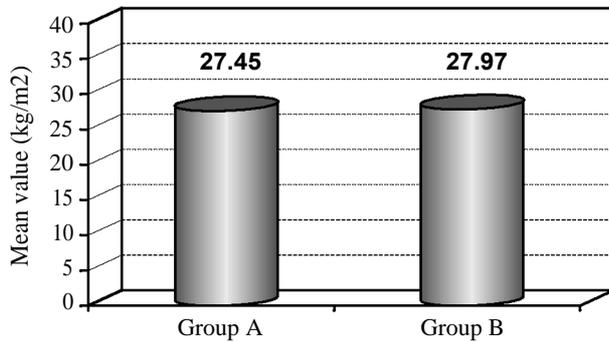


Fig. (5): Mean values of BMI in both groups (A&B).

Table (2): Illustrate mean \pm SD for VAS scores before and after treatment for both groups (A&B).

Variable	Group A		Group B	
	Before treatment	After treatment	Before treatment	After treatment
Mean \pm SD	3.73 \pm 0.46	0.80 \pm 0.77	3.87 \pm 0.35	2.93 \pm 0.88
MD		2.93		0.94
# value		19.138		4.525
p-value		0.001		0.001
% of $\downarrow\downarrow$ in VAS		78.55		24.29
Significance	Highly significant		Highly significant	

Table (3): Illustrate comparison between the two groups (A & B) after treatment only regarding to VAS score.

	Group A	Group B
Mean \pm SD	0.80 \pm 0.77	2.93 \pm 0.88
Mean difference		-2.13
# value		-7.031
p-value		0.001
% of $\downarrow\downarrow$ in VAS		54.26
Significance	Highly significant	

By comparing the two groups (A & B) after treatment regarding to VAS scores, it was found that, both groups showed a decrease in pain sensation after treatment, group (A) achieved 78.55% while group (B) achieved 24.29% but the percentage of decrease in VAS was more pronounced and more noticeable in group (A) when compared with group (B), this means that phonophoresis was very effective in decreasing pain in CTS.

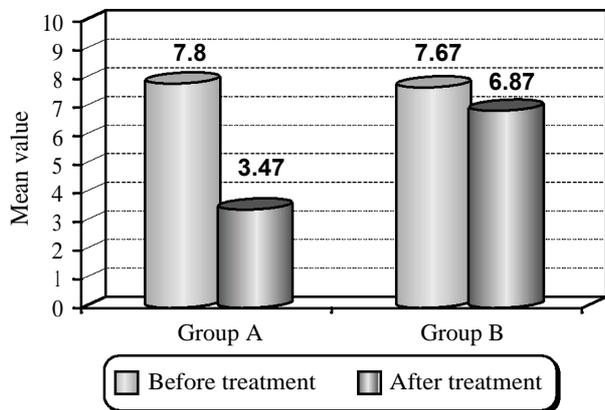


Fig. (6): Illustrates mean values of VAS measured before and after treatment in the two studied groups (A & B).

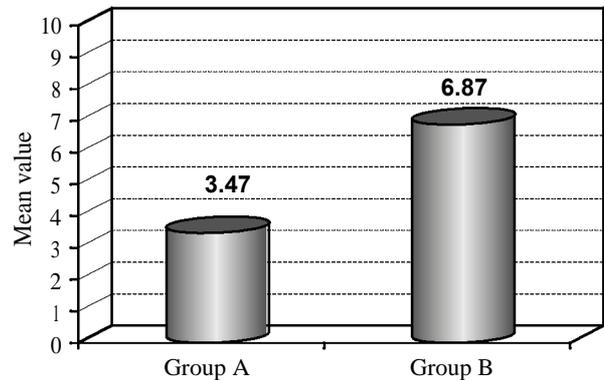


Fig. (7): Mean values of VAS measured after treatment in the two groups.

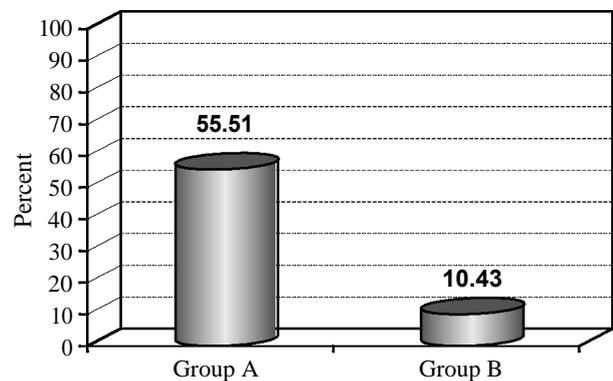


Fig. (8): Percent of decrease in VAS after treatment in both groups (A & B).

Table (4): Illustrates mean value \pm SD of distal latency (median.n) before and after treatment for patients in group (A&B).

Variable	Group A		Group B	
	Before treatment	After treatment	Before treatment	After treatment
Mean \pm SD	4.22 \pm 0.25	3.71 \pm 0.30	4.45 \pm 0.37	4.35 \pm 0.35
MD		0.51		0.10
# value		13.201		4.298
p-value		0.001		0.001
% of $\downarrow\downarrow$ in distal latency (median.n)		12.09		2.25
Significance	Highly significant		Highly significant	

Table (5): Illustrates comparison between the two groups (A & B) after treatment only regarding to distal latency (median.n).

	Group A	Group B
Mean \pm SD	3.71 \pm 0.30	4.35 \pm 0.35
Mean difference		-0.64
# value		-5.376
p-value		0.001
% of $\downarrow\downarrow$ in distal latency (median.n)		9.84
Significance	Highly significant	

By comparing the two groups (A & B) after treatment regarding o distal latency (median.n), it was found that, both groups showed a decrease in distal latency (median.n) after treatment, group (A) achieved 12.09% while group (B) achieved 2.25% but the percentage of decrease in distal latency (median.n) was more pronounced and more notable in group (A) when compared with group (B), this means that phonophoresis plus exercise and cockup splint was more effective than exercise and cock up splint in decreasing distal latency (median.n).

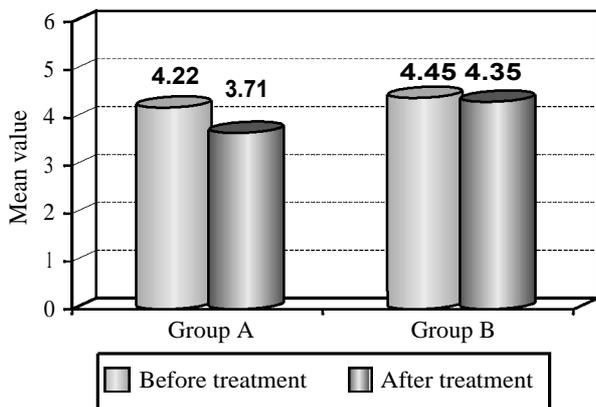


Fig. (9): Illustrates mean values of distal latency (median.n) measured before and after treatment in the two studied groups (A & B).

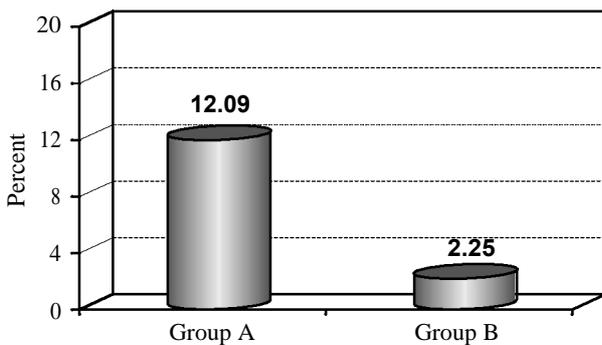


Fig. (10): Illustrates mean values of distal latency (median.n) measured after treatment in the two studied groups (A & B).

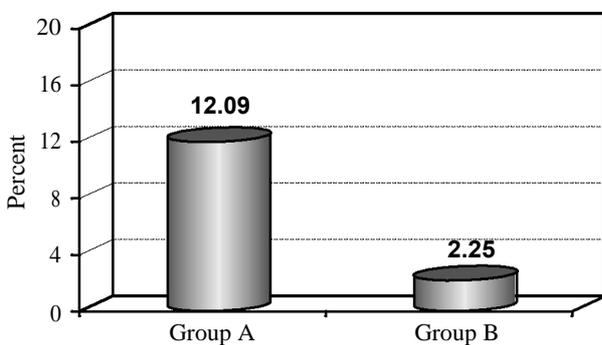


Fig. (11): Percent of decrease in distal latency (median.n) level after treatment in both groups (A & B).

Table (6): Illustrates mean \pm SD for conduction velocity (median.n) before and after treatment for both groups (A & B).

Variable	Group A		Group B	
	Before treatment	After treatment	Before treatment	After treatment
Mean \pm SD	40.73 \pm 2.28	45.47 \pm 2.20	40.20 \pm 2.37	40.67 \pm 2.58
MD		-4.74		-0.47
# value		-12.752		-1.825
p-value		0.001		0.089
% of increase		11.64		1.17
Significance		Highly significant		Highly significant

Table (7): Illustrates comparison between the two groups (A & B) after treatment only regarding to conduction velocity (median.n).

	Group A	Group B
Mean \pm SD	45.47 \pm 2.20	40.67 \pm 2.58
Mean difference		4.8
# value		5.481
p-value		0.001
% of increase		10.47
Significance		Highly significant

By comparing the two groups (A & B) after treatment regarding o conduction velocity (median.n), it was found that, both groups showed an increase in conduction velocity (median.n) after treatment, group (A) achieved 11.64% while group (B) achieved 1.17% but the percentage of increase in conduction velocity (median.n) was more pronounced and more notable in group (A) when compared with group (B), this means that phonophoresis plus exercise and cock up splint was more effective than exercise and cock up splint in increasing conduction velocity (median.n).

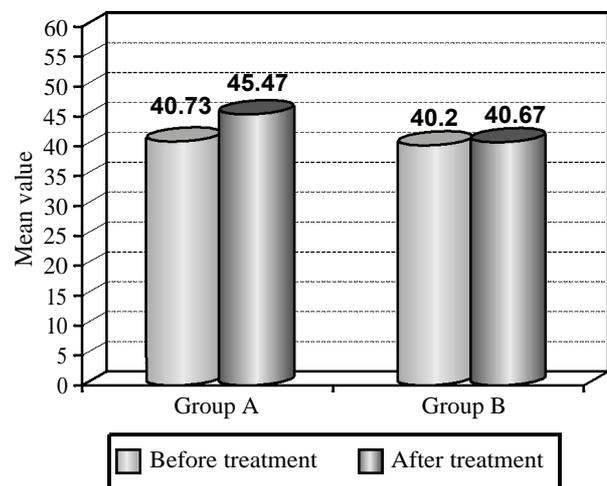


Fig. (12): Illustrates mean values of conduction velocity (median.n) measured before and after treatment in the two studied groups (A & B).

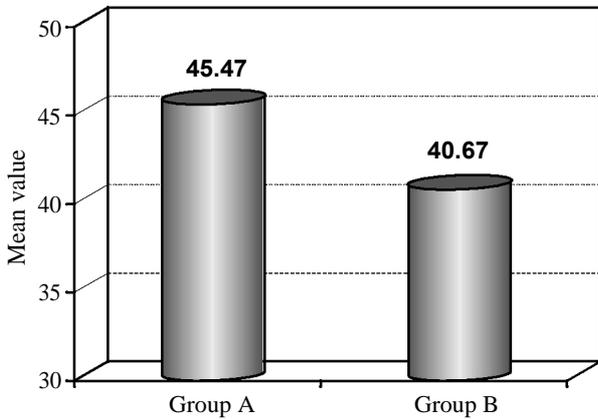


Fig. (13): Mean values of conduction velocity (median.n) level measured after treatment in the two group.

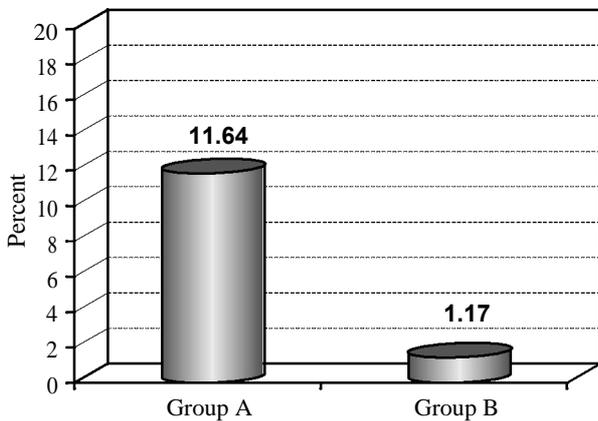


Fig. (14): Percent of increase in conduction velocity (median.n) level after treatment in both groups (A & B).

Discussion

The results of this study come in agreement with the results of mense et al., [9] who had conducted a study to investigate the effect of phonophoresis on CTS in pregnant women. His study was carried out on 30 patients suffering from idiopathic CTS in pregnancy period. All patients were divided randomly into two equal groups. One group received phonophoresis with nerve and tendon gliding exercises and cock up splint for the wrist, three times per week for four weeks. The other group received the same wrist exercises and cock up splint. Pain level, sensory and motor distal latencies and conduction velocities of the median nerve, functional status scale and hand grip strength were assessed pre and post treatment. The results of his study showed that “There was a significant decrease ($p < 0.05$) in pain level, sensory and motor distal latencies of the median nerve, and a significant increase ($p < 0.05$) in sensory and motor conduction velocities of the median nerve and hand grip strength in both groups after treatment but the percentage of improvement was much higher in

favor of phonophoresis treatment”. He concluded that “phonophoresis effect was found in the reduction of pain, improvement in the electrophysiological studies and increasing hand grip strength. Thereby, phonophoresis has the ability to alleviate pain and reduce inflammation at the site of injury and this is usually done through increasing vascularization and stimulating the release of endorphin”.

The results of the present study confirm the results of Norvell et al., [10] who had conducted a study to investigate the efficacy of phonophoresis versus surgical intervention in case of mild to moderate carpal tunnel syndrome (CTS). In a randomized placebo-controlled, double-blinded study. Forty five female patients diagnosed as mild to moderate CTS were included in this study. Patients were divided randomly into three equal groups. Placebo group received sham exposure, and group II received phonophoresis at a frequency of 3M Hz, and the III group received surgical interference. The outcome measurements were median nerve sensory distal latency (SDL), motor distal latency (MDL) and Boston carpal tunnel questionnaire (BCTQ). Measurements were carried out at baseline and three months later. The results of this study showed that “There were significant decrease of all measurements of both Phonophoresis and surgical groups than placebo group and significant decrease of all measurements of phonophoresis group than surgical group”. These results suggested that “PEMF was beneficial in improving median nerve electrophysiological function and improving hand functional abilities. Also, phonophoresis was more efficient than surgical interference in case of mild to moderate CTS, which appeared in enhancing the median nerve function and decreasing pain, numbness, paresthesia as well as improving hand functional abilities”.

Phonophoresis therapy is a safe, and non-invasive way to reduce pain and inflammation. Phonophoresis works by altering the structure of stratum corneum lipids, using ultrasound in phonophoresis cause mechanical disturbance in an absorbing medium. US improves the rate of solution of the drug into the stratum corneum lipids, perhaps even permitting supersaturation. This would provide a greater thermodynamic driving force across the stratum corneum (Mitragoti et al., [8]).

The results of the present study agree with the results of who stated that Neuropathic pain (numbness, tingling and burning pain) of CTS usually arises from ectopic firing of nociceptive unmyelinated C-fiber afferent axons that are undergoing degeneration. Microneurography has confirmed

that dysregulated expression of sodium and calcium channels which accumulate at the site of injury are responsible for ectopic depolarization. Phonophoresis generates extremely low frequency quasi-rectangular electrical current within the tissues which influence biological activity (it can depolarize, repolarize, and hyperpolarize neurons). It was hypothesized that “Directing this energy into carpal tunnel region could influence neural firing patterns and lower visual analogue scale scores of neuropathic pain”.

Cagnie et al., [11] added that “phonophoresis therapy is a safe and non-invasive tool to improve health. It confirmed by biopsy of knee synovial and adipose tissue that ketoprofen phonophoresis achieved higher local tissue concentration of the medication by using continuous or pulsed ultrasound with negligible systemic plasma levels. The most important benefits of phonophoresis are increased energy and circulation, reduced muscle spasms, improved sleep, enhanced healing of bone fractures, and reduction of pain and inflammation. It has been used successfully in the management of CTS, low back pain, pelvic pain, cancer pain, lumbar radiculopathy, osteoarthritis of the knee and the treatment of chronic wounds to accelerate the healing process”. This agrees with the results of the current study.

Singh and Maibach [12] reported that phonophoresis can relieve pain, reduce inflammation and promote healing in damaged tissues through increasing vascularization and stimulating collagen synthesis.

Oskouei et al., [13] confirmed that “using ketoprofen phonophoresis (100mg/g of ointment) on patients with OA, tendinitis, or bursitis, there was improvement (marked decrease in pain and a substantial gain in active ROM) in 68% of patients and partial improvement (decrease in pain but some pain remaining, and a gain in active ROM with limitations still present) in 18% of patients as compared with 27% improvement and 16% partial improvement when treated with US alone 90”. This agrees with the results of the current study.

The results of this study agree with the results of Yildiz et al., [14] who stated that “Now phonophoresis is considered as the most efficient procedure that can be used to alleviate pain, reduce inflammation and swelling associated with CTS in pregnancy period. It is safe and has no side effects like medications. It is usually recommended to treat so many other pathological conditions such

as acute and chronic low back pain, de quervain tenosynovitis, primary dysmenorrhea, fibromyalgia, coccydynia, planter fasciitis, shoulder pain and tennis elbow”.

The results of the current study come in agreement with the results of Burke et al., [15] who studied the effect of phonophoresis on diabetic patients with peripheral neuropathy. The results of his study showed that “low frequency phonophoresis can be used for retarding the progression of peripheral neuropathy in a short time”.

Bradon et al., [16] demonstrated that “phonophoresis therapy can reduce subjective neuropathic pain and influence objective electrophysiological parameters of patients with CTS”. He added that “This therapy has anti-inflammatory action and anti-edematous effect. It is a solution to soothe pain in CTS with no need to additional medicaments”. This comes in agreement with the results of the current study.

The results of the present study agree with the results of Michelsen et al., [17].

O'Connor et al., [18] who explained that “phonophoresis therapy can increase capillary blood flow at the injured area which may help to flush lactic acid, debris and all other inflammatory agents that build up in tissues as a result of inflammatory phase and injury. This in turn reduces inflammation & swelling and once inflammations decreased, the pain is relieved”.

It could be concluded that phonophoresis was more effective on CTS in pregnant period.

References

- 1- MORASKA S., AVIDON I. and BAKER F.C.: What we know about primary dysmenorrhea today: A critical review. *Hum. Reprod Update*, 21 (6): 762-778, 2015.
- 2- ATROSHI I., GUMMESSON C., JOHNSON R., ORNSTEIN E., RANSTAM J. and ROSEN I.: Prevalence of carpal tunnel syndrome in a general population. *JAMA*, 282 (2): 153-8, 2020.
- 3- ATISOOKNCI, TOZUN M., ARSLAN G. and CALIK E.: Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. *Ups J. Med. Sci.*, 115 (2): 138-145, 2014.
- 4- MASSEY E.W.: Carpal tunnel syndrome in pregnancy. *Obstet. Gynecol. Surv.*, 33: 145-148, 2013.
- 5- HASHEMPOUR, TUULARI J.J., MERISAARI H., LIDAUER K., LUUKKONEN I., SAUNAVAARA J., PARKKOLA R., LAHDESMÄKI T., LEHTOLA S.J., KESKINEN M., LEWIS J.D., SCHEININ N.M., KARLSSON L. and KARLSSON H.: A novel approach for manual segmentation of the Amygdala and Hippocampus in Neonate MRI *Front Neurosci.*, 13: p. 1025, 2019.

- 6- LEIGHTON T.G.: "What is ultrasound?" Prog. Biophys. Mol. Biol., 93 (1-3): 3-83, 2017 Jones, L. and M.I. Johnson. Transcutaneous electrical nerve Stimulation. Continuing Education in Anaesthesia, Critical Care & Pain, 9 (4): 130-135, 2017.
- 7- HASSAN F. and ELGENDY M.: "Diclofenacphonophoresis efficacy in knee osteoarthritis". Master thesis Faculty of Physical Therapy, Cairo University, 2017.
- 8- MITRAGOTRI S., FARRELL J., TANG H., et al.: Determination of threshold energy dose for ultrasound-induced transdermal drug transport. J. Control Release, 63: 41, 2020.
- 9- MENSE S., SIMONS D.G. and RUSSELL I.J.: Muscle Pain: Understanding Its Nature, Diagnosis, and Treatment, 1st ed. San Antonio, Texas: Lippincott Williams & Wilkins, 111-128, 2014.
- 10- NORVELL, JEFFREY G. and STEELE, MARK: "Carpal Tunnel Syndrome". eMedicine. Archived from the original on August 3, 2010 ive tissue manipulation in women with primary dysmenorrhea: A randomized controlled trial. Complementary therapies in clinical practice, September 10, 33: 1-6, 2019.
- 11- CAGNIE S.T., KULUNOGLU B.A., YASA M.E., PIR-INCCI C.S., YILDIRIM N.U., KUCUKSAHIN O., UGURLU F.G. and AKKUS S.: A comparison of the effects of exercises plus connective tissue massage to exercises alone in women with fibromyalgia syndrome: A randomized controlled trial. Rheumatology international, 37 (11): 2019-806, 2017.
- 12- SINGH P. and MAIBACH H.I.: Iontophoresis in drug delivery: Basic principles and applications. Crit Rev. Ther. Drug Carrier Syst, 11: 161-213, 2015.
- 13- OSKOU EI A.E., TALEBI G.A., SHAKOURI S.K. and GHABILI K.: Effects of Neuromobilization Maneuver on Clinical and Electrophysiological Measures of Patients with Carpal Tunnel Syndrome. Journal of physical therapy science. Jul, 26 (7): 1017-22, 2016.
- 14- YILDIZ N., ATALAY N.S., GUNGEN G.O., SANAL E., AKKAYA N. and TOPUZ O.: Comparison of ultrasound and ketoprofenphonophoresis in the treatment of carpal tunnel syndrome. J. Back Musculoskelet Rehabil, 24 (1): 39-47, 2019.
- 15- BURKE F.D., ELLIS J., MCKENNA H. and BRADLEY M.J.: Primary care management of carpal tunnel syndrome. Postgraduate medical journal. Aug., 79 (934): 433, 2018.
- 16- BRADON J. WILHELMI, RYAN NAFFZIGER and MICHAEL NEUMEISTER: Hand, nerve compression syndrome, J. Hand Surg., 34 (2): 252-S, 2017.
- 17- MICHELSEN H. and POSNER M.A.: Medical history of carpal tunnel syndrome. Hand Clinics. May 1; 18 (2): 257-68, 2019.
- 18- O'CONNOR D., MARSHALL S.C., MASSY-WESTROPP N. and PITT V.: Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome (Review). The Cochrane database of systematic reviews, Volume (7): 1-106, 2012.

تأثير مادة الكيتوبروفين المدخلة بواسطة الموجات الصوتية لمتلازمة اختناق العصب الاوسط عند الرسغ للسيدات أثناء الحمل

أجريت هذه الدراسة لمعرفة تأثير مادة الكيتوبروفين المدخلة بواسطة الموجات الصوتية لمتلازمة أختناق العصب الأوسط عند: الرسغ للسيدات أثناء الحمل.

العينات والأساليب: أجريت هذه الدراسة على ٣٠ مريضة. تم اختيارهن بشكل عشوائي من العيادة الخارجية لأمراض الأعصاب وجراحة العظام بمستشفى طبية التخصصى بطنطا. تراوحت أعمارهن بين (٢٢-٣٥) عاماً، لم يتعدى مؤشر كتلة الجسم لديهن أقل من ٣٠ كجم/م^٢. تم تقسيم جميع المرضى بشكل عشوائي إلى مجموعتين متساويتين فى العدد (أ، ب): المجموعة (أ) تتكون من ١٥ مريضة تلقت كل مريضة فى هذه المجموعة الموجات المغناطيسية بتردد ٣ ميغا هرتز وشدة ١.٥-٢ واط لكل متر مربع لمدة ١٠ دقيقة، ٣ مرات/أسبوعياً لمدة ٤ أسابيع. أيضاً، طلب من كل مريضة ارتداء ساند رسغ طوال فترة العلاج الذى تم ضبطه بزواوية محايدة فى الليل مع عمل تمارين لعضلات اليد. المجموعة (ب) تتكون من ١٥ مريضة. طلب من كل مريضة ارتداء ساند رسغ طوال فترة العلاج الذى تم ضبطه بزواوية محايدة فى الليل مع عمل تمارين لعضلات اليد. تم تقييم كل الحالات فى كلا المجموعتين قبل وبعد العلاج باستخدام المقياس التناظرى البصرى وجهاز رسم العصب لقياس سرعة توصيل العصب.

النتائج: أظهرت النتائج إنه بمقارنة المجموعتين (أ، ب) بعد العلاج بالنسبة للمقياس النظير البصرى، وقياس سرعة توصيل العصب، تبين أن كلا المجموعتين أظهرت إنخفاضاً فى الإحساس بالألم بعد العلاج ولكن نسبة الانخفاض كانت أكثر وضوحاً فى المجموعة (أ) بالمقارنة مع المجموعة (ب).