



Effect of Eccentric Exercise in Treatment of De-Quervian's Disease

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Abstract

Objective: *This study was carried to determine the effect of eccentric exercises in treatment of De Quervian's disease*

Methods: *Thirty female patients diagnosed as De Quervian's tenosynovitis was randomly distributed into two equal experimental groups. Each patient was treated for twelve sessions each other day for a total period of four weeks. Patients in the experimental group (A) received phonophoresis, while patients in the experimental group (B) received a combined program of phonophoresis identical to those applied to group (A) in addition to eccentric exercises then visual analogue scale (VAS) was used to assess pain severity. The disability of arm, shoulder and hand outcome questionnaire (DASH) was used to assess hand functions. Jamar's dynamometer and pinch gauge were used to assess hand grip and pinch strength.*

Results: *Patients of both groups showed significant improvement in all the measured variables. In between group difference, the second group showed a significant improvement than the first group in all the measured variables.*

Conclusion: *Both of phonophoresis and the combination of phonophoresis with eccentric exercise were effective on decreasing pain severity, functional disability as well as improving grip and pinch strength. However, the combination of phonophoresis with eccentric exercise was more effective than phonophoresis alone in treatment of De Quervian's disease.*

Keywords: *De Quervian's disease, Phonophoresis, Eccentric exercises.*

Introduction

De Quervain's syndrome or De Quervain's disease named after the Swiss surgeon Fritz De 'Quervain, who identified it in 1895 ^[1], [2]. De Quervain's disease (DQ) is described as painful stenosing tenosynovitis of the first dorsal compartment of the hand ^{[3],[4]}. It is usually caused by overuse or repetitive gliding of tendons of the first dorsal compartment abductor pollicis longus (APL) and extensor pollicis brevis (EPB) beneath the sheath over the styloid process of the radius ^[4], ^[5]. Patients typically report with pain over the radial styloid process accompanied by first dorsal compartment tenderness and marked wrist swelling also it is associated with painful abduction of the thumb, decreased grip strength (GS) and pinch strength (PS) of affected hand, in addition to a positive Finkelstein's test ^[6]. (DQST) is diagnosed by the clinical symptoms and by positive Finkelstein test. Radiographs are not usually required for diagnosis ^[7]. One study showed the histopathological appearances of the tendon sheath and synovium in De quervain's disease. The condition was not characterized by inflammation, but by thickening of the tendon sheath and most notably by the accumulation of mucopolysaccharide, which is an indicator of myxoid degeneration. ^[8] The Concept of eccentric exercises as treatment for tendinopathy has been described by Stanish and coworkers and is based upon the belief that tendon injuries often occur during the eccentric phase of muscle work. They also proposed that in eccentric exercises, the tendon was subjected to greater forces than in concentric exercises and hence to more remodeling stimulus ^{[9], [10]}. Furthermore other study postulated that the mechanism by which eccentric loading is effective the pattern of tendon loading, with its force fluctuations, rather than the magnitude of the force. They observed a pattern of sinusoidal loading and unloading in eccentric loading, these fluctuations in force may provide an important stimulus for the re-modelling of tendon ^[11]. Eccentric training has demonstrated

some application in the treatment of De Quervain's disease ^{[12], [13]}.

Subjects and Methods

Patients

Thirty female patients diagnosed as De Quervain's disease. They were randomly distributed into two equal experimental groups. The first experimental group consisted of 15 females with mean age of 34.47 (± 7.08) years and mean duration of illness of 4.83 (± 1.08) months; the second experimental group consisted of 15 females with mean age of 34.60 (± 7.008) years and mean duration of illness of 4.93 (± 1.17) months. They were referred from the orthopedic outpatient clinic of the faculty of medicine, Misr University for science and technology, Egypt. Exclusion criteria included conditions associated intercarpal instabilities, scaphoid fracture, superficial radial neuritis (Wartenberg's syndrome) and osteoarthritis of the 1st CMJ, patients with any previous hand surgery or any rheumatic diseases or receiving corticosteroid or analgesic drugs.

Instrumentations and Materials

In this study the severity of De Quervain's disease was assessed by using visual analogue scale (VAS). The disability of arm, shoulder and hand outcome questionnaire (DASH) was used for the assessment of hand functions. The hand grip and pinch strength were evaluated by using Jamar's dynamometer and pinch gauge. Pretreatment assessment was done within 48 hours before the first session while post treatment assessment was done within 48 hours after the last treatment session.

Study protocol

They were randomly distributed into two equal experimental groups. Each patient was treated for twelve sessions each other day for a total period of four weeks at the out-patient clinic of faculty of Physical Therapy, Misr University for Science and Technology. Both experimental groups (A, B)

received phonophoresis with diclofenac gel 4 g of Aquasonic gel containing 0.4% Dex-P was applied over the wrist chin, and pulsed (20%) ultrasound waves (ITO models ES-420 with 5-cm2 probe) were used with an intensity of 1.0 W/cm2 at a 1MHz frequency for 5 minutes to transfer the medication, and that was 3x/wk for 4weeks. Patients in the second experimental group (B) received eccentric training protocol.

Ethical consideration

All patients were informed of the purpose, tools, procedures, and duration of the study and signed a written consent.

Statistical analysis

Paired t-test was conducted to detect within group difference pretreatment and post treatment for pain severity, grip strength, pinch strength and functional disability. The level of significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through SPSS (statistical package for social sciences, version 19).

Results

Subject characteristics:

Thirty female patients participated in this study, Table 1 showed the mean \pm SD age, duration of illness of the study group.

Table (1): Mean age and duration of illness of both experimental groups:

Variable	First experimental group	Second experimental group	t-value	p-value
Age(year)	34.6 \pm 7.01	34.47 \pm 7.08	0.052	0.959 (NS)
Duration of illness (MO.)	4.93 \pm 1.18	4.83 \pm 1.08	0.242	0.810 (NS)

Comparison between groups before treatment

Unpaired t test was used to detect difference between groups before treatment. There was no significant difference between groups regarding pain severity ($t=0.237$, $P=0.815$), grip strength ($t=0.196$, $P=0.846$), pinch strength ($t=0.417$

, $P=0.680$) and functional disability ($t=0.277$, $P=0.784$) as shown in table (2)

Table 2: comparison between groups before treatment

Variable	Group (1) Mean (SD)	Group (2) Mean (SD)	t-value	P-value
Pain severity	7.467(\pm 1.2459)	7.367(\pm 1.0601)	0.237	0.815 (N.S)
Grip strength	12.933(\pm 1.5337)	12.833(\pm 1.2488)	0.196	0.846 (N.S)
Pinch strength	2.500(\pm .5000)	2.400(\pm .7838)	0.417	0.680 (N.S)
Functional disability	90.67(\pm 14.281)	89.27(\pm 13.430)	0.277	0.784 (N.S)

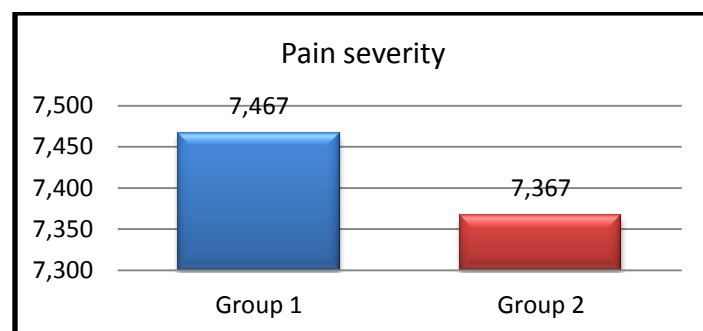


Figure (1): pain severity between groups

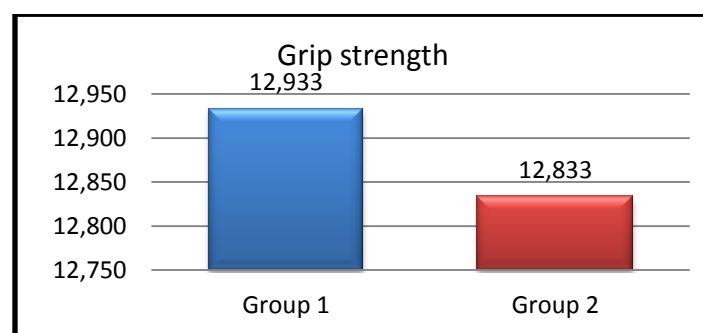


Figure (2): Grip strength between groups

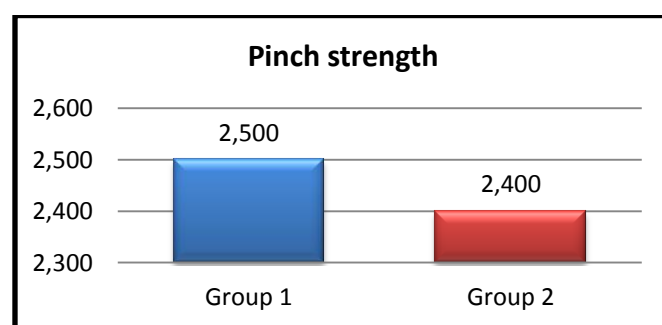


Figure (3): Pinch strength between groups

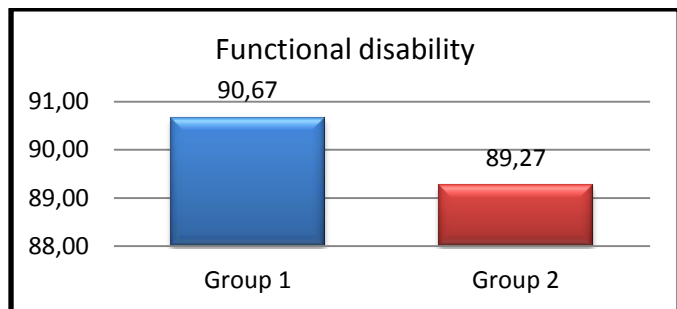


Figure (4): DASH between groups

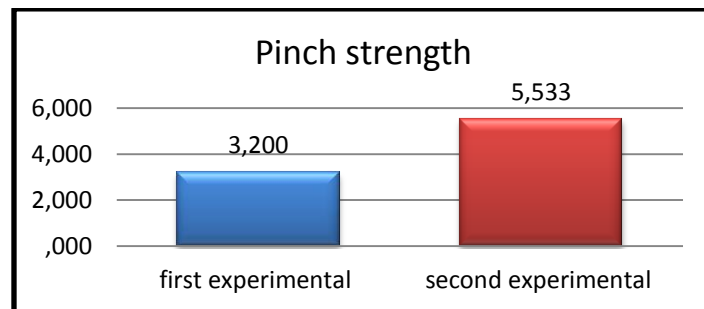


Fig (7): Between group difference for pinch strength

Comparison between pre and post treatment conditions:

The VAS scale and DASH questionnaire consecutively of the first experimental group decreased post treatment by 4.90 (± 1.105) and 61.73 (± 61.73). However, the GS and PS consecutively of the first experimental group increased post treatment by 15.0 (± 2.20) and 3.20 (± 0.774).

The VAS scale and DASH questionnaire consecutively of the second experimental group decreased post treatment by 3.967 (± 1.329) and 52.67 (± 7.613). However, the GS and PS consecutively of the second experimental group increased post treatment by 18.67 (± 0.4880) and 5.53 (± 0.2289).

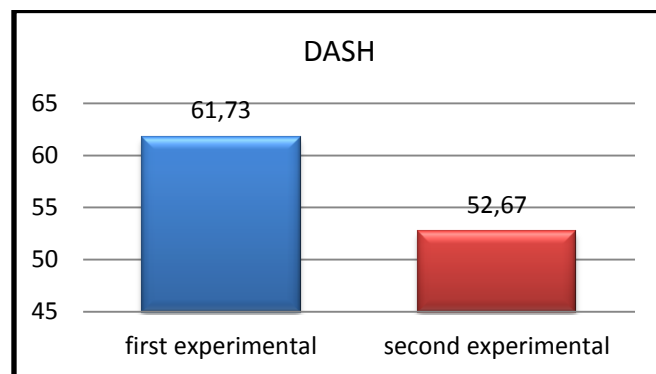


Fig (8): Between group difference for functional disability

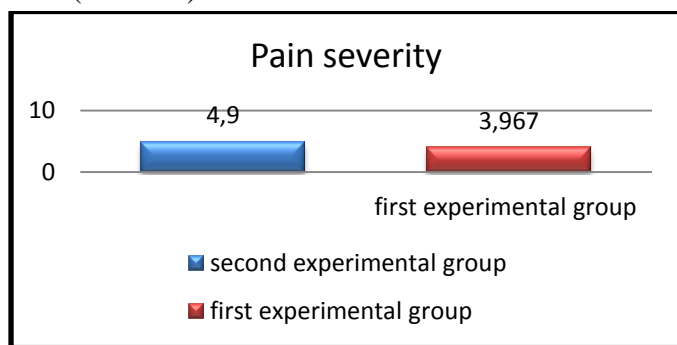


Fig (5): Between group difference for pain severity

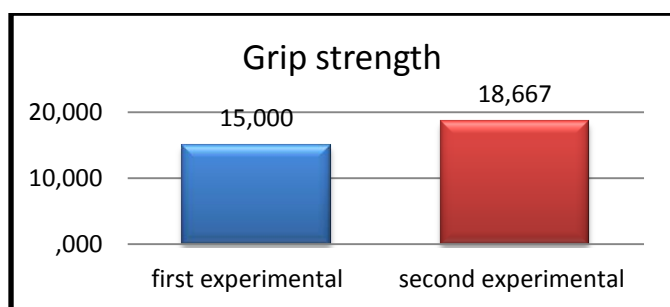


Fig (6): Between group difference for grip strength

Discussion

In our current study, there was a significant decrease in pain severity in both groups, our result was in agreement with numerous previous researches which proved that ketoprofen phonophoresis coupled with a supervised exercise regime and stretching exercise leads to considerable improvement in De Quervain's tenosynovitis [14], [15], [9], [11], [12], [13].

Results of this study showed a significant increase in grip and pinch strength in patients treated with phonophoresis followed by eccentric exercises. This has been supported by researches postulating that eccentric training led to encouraging results in terms of pain reduction and functional improvement [12], [13]. In addition to that, there was a significant increase in this variable in patients treated with phonophoresis, this finding was in agreement on the work of Hiral et al. who found that there is highly significant improvement in pain and grip strength in patients with De Quervain's diseases. They concluded that phonophoresis with diclofenac gel has a

significant effect on pain and grip strength in patients with De Quervain's diseases ^[14].

In our current study, there was a significant increase in grip and pinch strength in both groups; however, the combination of phonophoresis followed by eccentric exercises was more effective in increasing grip and pinch strength rather than phonophoresis alone in treatment of De Quervian disease.

In our current study, there was significant reduction of DASH (disability of the arm, shoulder and hand) questionnaire in patients treated with phonophoresis, this result was supported by the work of Hiral et al. and Tabinda et al ^{[14], [15]}. In addition to that, there was a significant decrease in this variable within the patients treated with phonophoresis followed by eccentric exercises, As Knobloch et al. ^[12] and Rabin et al. ^[16] reported that there was a reduction of DASH score following the eccentric training program in patients with De Quervian's disease.

Furthermore, there was significant reduction of DASH (disability of the arm, shoulder and hand) questionnaire in patients treated with phonophoresis followed by eccentric exercises rather than in patients treated with phonophoresis. Quick DASH (disability of the arm, shoulder and hand) questionnaire also was used in evaluation of disability in patients with De Quervian's disease, numerous studies reported that there was a reduction of QDASH score following the eccentric training program in patients with De Quervian's disease ^{[13], [17], [18], [19]}.

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Conclusion

Both of phonophoresis and the combination of phonophoresis with eccentric exercise were effective on decreasing pain severity, functional disability as well as improving grip and pinch strength. However, the combination of

phonophoresis with eccentric exercise was more effective than phonophoresis alone in treatment of De Quervian's disease.

References

1. Huang TH., Feng CK., Gung YW., Tsai, MW., Chen, CS., Liu, CL.: Optimization design of thumb spica splint using finite element method. *Med Bio Eng Comput.* 2006; 44(12):1105–1111.
2. Pagonis T., Ditsios K., Toli P., Givissis P., Christodoulou A.: Improved Corticosteroid treatment of Recalcitrant de Quervain Tenosynovitis With a Novel 4-Point Injection Technique. *The American journal of sports medicine.* 2011;39(2): 398-403.
3. Avci S., Yilmaz C., Sayli U.: Comparison of nonsurgical treatment measures for de Quervain's disease of pregnancy and lactation. *Journal of Hand Surgery.* 2002; 27(2):322–324.
4. Retig AC.: Athletic injuries of the wrist and hand. Part II: overuse injuries of the wrist and traumatic injuries to the hand. *American Journal of Sports Medicine.* 2004; 32(1): 262–273.
5. Dawson C and Mudgal CS.: Staged description of the Finkelstein test. *Journal of hand surgery.* 2010; 35(9):1513–1515.
6. El-Hadidy S., Badran D., Yousef S., Ababneh M., El-Hadidy M., Doar H.: De Quervain's Tendovaginitis Stenosans in Jordanians. *JMJ.* 2010; 40(3).
7. Suresh SS., Zaki H., Ali A.: Does Radial Styloid Abnormality in de Quervain's Disease Affect the Outcome of Management? *American Association for Hand Surgery.* 2010; 5:374–377.
8. Clarke MT., Lyall HA., Grant JW., Matthewson MH.: The histopathology of de Quervain's disease. *J H S Br.* 1998; 23(6):732–742.

9. Stanish WD., Rubinovich RM., Curwin S.: Eccentric exercise in chronic tendinitis. *Clin Orthop*. 1986; 208: 65–68.
10. Stanish WD., Curwin S., Mandel S.: *Tendinitis: Its Etiology and Treatment*. Oxford: Oxford University Press. 2000.
11. Rees J.D., Lichtwark G.A., Wolman R.L., Wilson A.M.: The mechanism for efficacy of eccentric loading in Achilles tendon injury; An in vivo study in humans. *Rheumatology*. 2008; 47(10):1493–1497.
12. Knobloch K., Gohritz A., Spies M., Peter M.: Neovascularisation in de Quervain's disease of the wrist: novel combined therapy using sclerosing therapy with polidocanol and eccentric training of the forearms and wrists—a pilot report: *Knee Surg Sports Traumatol Arthrosc*. 2008; 16:803–805.
13. Papa J.A, FCCPOR(C):. Conservative management of De Quervain's stenosing tenosynovitis: a case report *J Can Chiropr Assoc*. 2012; 56(2): 112-120.
14. Hiral S., Bhakti D.: A Study to determine the effect of Ultrasound and Phonophoresis in De Quervain's Diseases. *Indian Journal of Physiotherapy and Occupational Therapy - An International Journal*. 2014; 8(2):224-229.
15. Tabinda H and Mahmood F.: De Quervain's Tenosynovitis and Phonophoresis: A Randomised Control Trial in Pregnant Females De Quervain. *journal of Orthopaedics, Trauma and Rehabilitation*. 2014; 19(1), 2-6.
16. Rabin A., Israeli T., Kozol Z.: Physiotherapy Management of People Diagnosed with de Quervain's Disease: A Case Series. *Physiotherapy Canada*. 2015; 67(3): 263-267.
17. Shah, F. A., Khan H., Kifayatullah W. A., Khan Z., Durrani Z. A., Alam W.: Efficacy of local corticosteroid injections in de Quervain's tenosynovitis. *Pak J Surg*. 2012; 28(2): 118-121.
18. Hadianfard M., Ashraf A., Fakheri M., Nasiri A.: Efficacy of acupuncture versus local methylprednisolone acetate injection in de Quervain's tenosynovitis: a randomized controlled trial. *Journal of acupuncture and meridian studies*. 2014; 7(3): 115-121.
19. Rowland P., Phelan N., Gardiner S., Linton K. N., Galvin R.: The Effectiveness of Corticosteroid Injection for De Quervain's Stenosing Tenosynovitis (DQST): A Systematic Review and Meta-Analysis. *O O J I*. 2015; 9: 437-444.