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Power and Precision Grip in Patients with De Quervain's Disease

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Author`s Contribution

[1] Substantial contributions to the conception or design of the work for the acquisition, analysis or interpretation of data for the work, [2] Drafting the work or reviewing it critically for important intellectual content, [3] Final approval of the version to be published, [2] Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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A B S T R A C T

Background: De Quervain's disease, characterized by inflammation of thumb tendons, is a common cause of wrist pain. This study emphasizes the crucial role of power and precision grip in De Quervain's patients, highlighting its significance for medical assessments.

Objective: To determine power and precision grip in patients with De Quervain's disease.

Methodology: Over the course of six months, 86 participants from the Ghurki Trust and Teaching Hospital, GTTH, Lahore, Pakistan, participated in a descriptive cross-sectional study (June 2023 - Dec 2023) The study was collected from participants who fulfilled the inclusion criteria. They were selected through non-probability convenient sampling technique. Finkelstein test was used to collect data. Data was entered and analyzed by using SPSS version 16. Descriptive statistics including affected and un-affected side of power and precision grip and demographic characteristics of the participant was collected.

Results: The study involved 86 participants from Ghurki trust and teaching hospital, revealed gender distribution of 61% females and 38% males with an age range of 20-39 years. The results showed weight of phone had mean ± SD of 1.88 ± 24.97.Power grip results showed that males on affected side had mean ± SD of 1.18 ± 0.68 and on un-affected side had mean ± SD of 1.78 ± 0.113 and in females, the affected side had mean ± SD of 1.20 ± 0.40 and on un-affected side had mean ± SD of 1.32 ± 0.54. Precision grip results showed that males on affected side had mean± SD of 25.06±2.90 and on un-affected side had mean ± SD of 23.51±3.05 and in females; the affected side had mean± SD of 25.49 ± 2.93 and on un-affected side had mean ± SD of 23.58 ± 2.27.

Conclusion: The study concluded that by comparing affected and un-affected side of male and female. There is a significant difference in male power grip however female power grip didn't show any difference. Also in precision grip females showed a significant difference and males didn't show any difference.

Key Words: Cross Sectional study, De Quervain's Disease, Mobile phone users, Power Grip, Precision Grip

Introduction

The wrist's first extensor compartment is frequent site of stenosing tenosynovitis, also known as De Quervain's disease (DQD).[1] De Quervain's disease affects the hand and wrist area. Movement of thumb becomes difficult.[2] De Quervain's disease is an inflammatory disease of tendons.[3] The tendons that control the mobility of the thumb, specifically the abductor pollicis longus and extensor pollicis brevis, are affected by De Quervain's disease.[4] De Quervain's disease, which is characterized by inflammation and thickening of the synovial sheath and tendons of the abductor pollicis longus and extensor pollicis brevis muscles, is a common cause of wrist pain.[5] A substantial correlation was found between de Quervain's tenosynovitis and work-related factors.[6] Finkelstein's sign used as a diagnostic test for De Quervain's disease.[7]

De Quervain's disease is thought to affect 0.5% of men and 1.3% of women, peaking in prevalence in people in their forties and fifties. Individuals with a history of medial or lateral epicondylitis may experience it more frequently. Inexperienced parents or child care workers who have

experienced bilateral involvement frequently describe spontaneous resolution after lifting the child is less common.[8] DQD is a straining condition that affects more women who routinely perform manual tasks.[9]

Micro trauma to the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons at the extensor retinaculum overlying the radial styloid is linked to the gradual onset of symptoms. Chronic thumb use (such as pinching, wringing out a cloth, knitting, or crocheting) combined with repetitive wrist radial and ulnar deviation might exacerbate symptoms.[10] DQD is a musculoskeletal condition that impairs a person's hand function.[11] Problematic smartphone use also leads to De Quervain's disease.[12] Physical therapy, ice, rest, and splinting are all non-surgical ways to treat DQD. Surgery should only be considered if symptoms worsen or persist after nonsurgical therapy has been attempted.[13]

The reported outcome measures included the Visual Analogue Scale (VAS) for pain, the Patient-Rated Wrist/Hand Examination for Function and Power, and accurate grip strength using a pinch gauge and hand-held dynamometer.[14] Dynamometer used for handgrip strength.[15]

Numerous risk factors for DQ tenosynovitis have been proposed over time, such as being female, being Black, and being older than 40. Pregnancy is known to significantly increase the likelihood of receiving a DQ diagnosis. From a mechanical perspective, mothers are predisposed to this condition because caregiving for the newborn causes flexion and ulnar deviation, which puts stress on the surrounding tendons and causes inflammation of the tendons and tendon sheaths.[16] Women had significantly higher rate of De Quervain's disease than men.[17] An elevated risk of diagnosis was linked to conditions like diabetes, lupus, rheumatoid arthritis, and hypothyroidism.[18]

Cortico-motoneuronal connections link the strength of control with hand and finger dexterity. The quick, task-specific proprioceptive adaptation of hand and finger forces to an object is linked to the cerebral command. "Power grip" actions (like reaching and grasping a cup) involve the hand and fingers working together as a single unit, whereas "precision grip" movements (like picking up a raspberry) involve the fingers moving independently of the hand.[19] In order to enhance precision grip force, external wrist stabilization might cause a greater activation of the muscles.[20] The neural control differentiates between power and precision grip movements.[19] Hand cupping, power gripping, precision gripping are the root of evolutionary developments.[21]

This study aims to tell about whether there is any difference between power and precision grip in patients affected by De Quervain's disease. The study will help to spread awareness about this particular condition among medical practitioners. The result of the study would provide an objective data and indicates the medical practitioners in considering the examination of grips of patients with De Quervain's disease.

Methodology

Over the course of six months, 86 participants from the Ghurki Trust and Teaching Hospital, GTTH, Lahore, Pakistan, participated in a descriptive cross-sectional study (June 2023 - Dec 2023) after the approval from Ethical Review Committee of Lahore College of Physical Therapy, LMDC (Ref no LCPT/DPT/ERB/21). The sample size was calculated by using the World Health Organization (WHO) sample size calculator under the following formula with 3.7% population size, 95% Confidence interval and error of margin 0.05.[22] Independent sample T test has been applied. Patients were selected for the study after confirming the diagnosis of De Quervain's disease on the basis of Finkelstein's test. According to the test the therapist ask the patient to make a fist around a thumb and to perform an ulnar deviation. Test performed on both hands. Positive test was indicated by pain over the abductor pollicis longus and extensor pollicis brevis tendons at the wrist. Non-probability convenient sampling was used. The inclusion criteria were patients from both the genders of 20-39 years of age with confirmed diagnosis of either right or left hand. Patients were excluded based on prior history of musculoskeletal or inflammatory disorders of hand or wrist, any past history of hand or wrist fractures, any tendon injuries or repairs, any history of carpal tunnel syndrome.

After informing the patient about the study, informed consent was obtained, protecting patient identity. Dynamometer was used to check the power grip and interpreted as weak, normal and strong by therapist and Nine Hole Peg Test (NHPT) was used to check the precision grip. Firstly subject was allowed to sit and take the nine pegs from a container, one by one and place them into holes on the board as quickly as possible. Only the hand being evaluated should perform the test. Stop watch should be started from the moment the participant touches the first peg until the moment the last peg hits the container. Data collection procedure was completed from Ghurki trust teaching hospital. The data was entered and analyzed using statistical Package for social sciences (SPSS) version 16. Continuous variables were presented in the form of mean and standard deviation. The

study variables were presented in the form of descriptive statistics (tables and graphs).

Results

The results showed total participants were 86, 34 participants were in age of 20-24, 13 participants were in age of 25-29, 23 participants were in age of 30-34 and 16 participants were in age of 35-39. Out of 86 participants, 33 were males (38.4%) and 53 were females (61.6%). The results showed minimum weight of phone was 138g and maximum weight was 271g with Mean± SD of 1.88±24.97. The results showed that in males on affected side 20 were weak 12 were normal and 1 was strong and on un-affected side 20 were weak 12 were normal and 1 was strong whereas in females 42 were weak, 11 were normal and 0 was strong and on un-affected side 38 were weak, 13 were normal and 2 were strong (Table 1). The results showed that males on affected side had mean± SD of 1.18±0.68 and on un-affected side had mean± SD of 1.78±0.11 and also showed a significant value because the P-value was 0.00 and in females, the affected side had mean± SD of 1.20±0.40 and on un-affected side had mean± SD of 1.32±0.54 and did not show any significant value because the p-value was 0.34 (Table 2, Figure 1 & 2). The results showed that male on affected side had mean± SD of 25.06±2.90 and on un-affected side had mean± SD of 23.51±3.05 and did not show any significant value because the P-value was 0.80 and in female, the affected side had mean± SD of 25.49±2.93 and on un-affected side had mean± SD of 23.58±2.27 which showed a significant value because the P-value was 0.04. Independent sample T test has been applied. P-value is calculated through independent sample T test (Table 3).

Table 1: Descriptive statistics of affected and un-affected Power grip.

Gender	Affected Side			Un-affected Side		
	Frequency/ Percentage			Frequency/Percentage		
	Weak	Normal	Strong	Weak	Normal	Strong
Male	20 32.3%	12 52.5%	1 100%	20 34.5%	12 48.0%	1 33.3%
Female	42 67.7%	11 47.8%	0 0%	38 65.5%	13 52.0%	2 66.7%

Table 2: Comparison of Power Grip between affected and un-affected side

Gender	Affected Side	Un-affected Side	P-Value
	Mean ± SD	Mean ± SD	
Male	1.18 ± 0.68	1.79 ± 0.11	<0.001***
Female	1.21 ± 0.41	1.32 ± 0.55	0.349

Significance level: p<0.001***

Table 3: Gender comparison of precision grip between affected and un-affected side

Gender	Affected Side	Un-affected Side	P-Value
	Mean ± SD	Mean ± SD	
Male	25.06 ±2.90	23.52 ± 3.05	0.808
Female	25.49 ±2.94	23.58 ± 2.27	0.042*

Significance level: p<0.05*

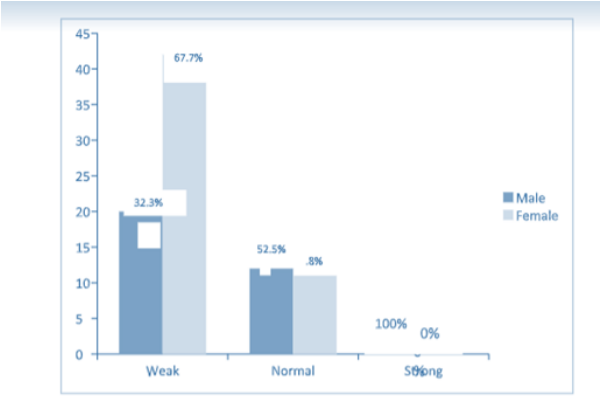

Figure 1: Bar chart of affected Power Grip

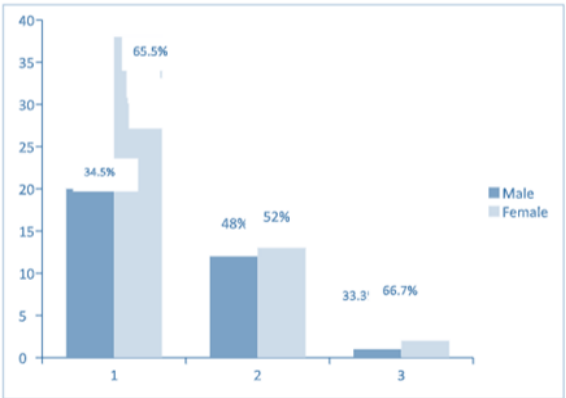

Figure 2: Bar chart of un-affected Power Grip.

Discussion

The current study's goal was to evaluate the power and precision grip in De Quervain's disease patients on both their affected and unaffected sides. De Quervain's disease was diagnosed using Finkelstein's test. Dynamometer was used in measurement of Power grip and 9 Hole Peg Board test was used in measurement of precision grip.

In 2020, a study showed the prevalence of De-Quervain's disease of both right and left side of hand whereas the current study showed the comparison between affected and un-affected side of hand for both male and female genders.[23]

A study was conducted by and showed that there were significant difference of grip strength in males dominant and non-dominant hand compared to females and the current study also showed the significant difference on both affected and unaffected side in male gender and did not show any significant difference in female gender. [24]

In 2020, a study was conducted by and showed the association between smartphone addiction and thumb/wrist pain, patient-rated wrist and hand evaluation (PRWHE) questionnaire used to evaluate wrist/hand pain and showed a significant correlation between smartphone addiction and high PRWHE scores whereas the current study showed the correlation of wrist/hand pain with mobile phone's weight and assessment of pain done through Finkelstein' test. [25]

A study conducted by and showed the prevalence of De Quervain's disease which concluded by saying that females were more prevalent and the current study also showed the consistent results with female greater prevalence compared to males. [24]

This study has small sample size. Time frame was limited. As reporting pain is subjective, patient interpretation and expression may impact the reliability of self-reported data. Differences in individual symptoms showed variations in De Quervain's disease severity. Further studies should be conducted on larger population. Consider a longitudinal study design to track changes in power and precision grip over time. Conduct a clinical assessment to evaluate De Quervain's disease severity, considering factors like pain levels, joint mobility, and inflammation. Consider applying power and precision grip in patients having musculoskeletal or inflammatory disorders.

Conclusion

The study concluded that by comparing affected and un-affected side of males and females. There is a significant difference in male power grip however female power grip didn't show any difference. Also female precision grip showed a significant difference and male didn't show any difference. This study recommends the evaluation of hand grip strength and dexterity in patients with De Quervain's disease. By assessing these aspects, health care providers lead to more targeted and effective treatment strategies to improve hand function and quality of life.

References

1. Nishimura Y, Tsutsumi M, Yamamoto R, Sakuraya T, Emura K, Arakawa T. Morphological differences between the dorsal and palmar septa of the first extensor compartment in relation to the brachioradialis and pronator quadratus. Annals of Anatomy-Anatomischer Anzeiger. 2024;253:152228.
2. Laszlo F-N, Johanna T, Reka HJ, Andrea MA, Noemi S, Agnes S-P, et al. Treatment of De Quervain's tendinopathy with conservative methods. ORVOSI HETILAP. 2020;161(11):419-24.
3. Rossi C, Cellocco P, Margaritondo E, Bizzarri F, Costanzo G. De Quervain disease in volleyball players. The American journal of sports medicine. 2005;33(3):424-7.
4. Fakoya AO, Tarzian M, Sabater EL, Burgos DM, Marty GIM. De Quervain's Disease: A Discourse on Etiology, Diagnosis, and Treatment. Cureus. 2023;15(4).
5. Reada B, Alshaebi N, Almaghrabi K, Alshuaibi A, Abulnaja A, Alzahrani K. Prevalence and Awareness Evaluation of De Quervain's Tenosynovitis among Students in the Kingdom of Saudi Arabia'. International Journal of Pharmaceutical Research & Allied Sciences. 2020;9(4):151-7.
6. Medic-Pericevic S, Mikov I, Spanovic M, Maric N, Zvekic-Svorcan J, Krasnik R. De Quervain's tenosynovitis as an occupational disease in agricultural worker: A case report. Work. (Preprint):1-7.
7. Som A, Wermuth HR, Singh P. Finkelstein sign. StatPearls [Internet]: StatPearls Publishing; 2022.
8. Satteson E, Tannan SC. De quervain tenosynovitis. StatPearls [Internet]: StatPearls Publishing; 2022.
9. Liu M, Liu M, Yang W, Mei O, Xia H, Tu H, et al. Effectiveness and safety of moxibustion for De Quervain disease: A protocol for systematic review and meta-analysis. Medicine. 2020;99(49).
10. Dressendorfer R, Matlick D, Council RO, Richman S. De Quervain's Syndrome. 2020.
11. Young SW, Young TW, MacDonald CW. Conservative management of De Quervain's tendinopathy with an

orthopedic manual physical therapy approach emphasizing first CMC manipulation: a retrospective case series. Physiotherapy Theory and Practice. 2022;38(4):587-96.
12. Benites-Zapata VA, Jiménez-Torres VE, Ayala-Roldán MP. Problematic smartphone use is associated with de Quervain's tenosynovitis symptomatology among young adults. Musculoskeletal Science and Practice. 2021;53:102356.
13. Huang P, Hong C-l, Liang C-C, Wu W-T, Wang J-H, Yeh K-T, editors. De Quervain Tenosynovitis as a Risk Factor of New-Onset Adhesive Capsulitis: A Nationwide Cohort Study. Healthcare; 2023: MDPI.
14. Drapeza Jr RC, Navasca SB, Dones III V, Rimando CR. The effects of taping on de Quervain's disease: A systematic review and meta-analysis. Journal of Bodywork and Movement Therapies. 2022;32:218-27.
15. Prasad CRK, Pratyusha AC, Sharmila C, Durga P, Sowjanya K, Harika K. Dynamometer based hand grip strength as a clinical tool for objective assessment of post-operative residual muscle weakness. Indian journal of anaesthesia. 2022;66(10):707-11.
16. Daglan E, Morgan S, Yechezkel M, Rutenberg TF, Shemesh S, Iordache SD, et al. Risk Factors Associated With de Quervain Tenosynovitis in Postpartum Women. HAND. 2024;19(4):643-7.
17. Wolf JM, Sturdivant RX, Owens BD. Incidence of de Quervain's tenosynovitis in a young, active population. The Journal of hand surgery. 2009;34(1):112-5.
18. Hassan K, Sohn A, Shi L, Lee M, Wolf JM. De Quervain tenosynovitis: an evaluation of the epidemiology and utility of multiple injections using a national database. The Journal of Hand Surgery. 2022;47(3):284. e1-. e6.
19. Dietz V. Neural coordination of bilateral power and precision finger movements. European Journal of Neuroscience. 2021;54(12):8249-55.
20. Popp WL, Richner L, Lambercy O, Shirota C, Barry A, Gassert R, et al. Effects of wrist posture and stabilization on precision grip force production and muscle activation patterns. Journal of Neurophysiology.
21. Chavez TJ, Morrell NT. The evolution of the human hand from an anthropologic perspective. The Journal of Hand Surgery. 2022;47(2):181-5.
22. Adachi S, Yamamoto A, Kobayashi T, Tajika T, Kaneko T, Shibusawa K, et al. Prevalence of de Quervain's Disease in the General Population and Risk Factors. The Kitakanto Medical Journal. 2011;61(4):479-82.
23. Maurya P, Priyanka G, Palkar A. Prevalence of De-Quervain's tenosynovitis in tailors. International Journal of Health Sciences and Research. 2020;10(2):2249-957.
24. Sharif MS, Alam MM, Akhtar MW, Shabbir S, Gul MM, Asad G. Prevalence of Dequervains Tenosynovitis in 20-40 Years Old Mobile Users. Journal of Health and Rehabilitation Research. 2024;4(1):1153-7.
25. Baabdullah A, Bokhary D, Kabli Y, Saggaf O, Daiwali M, Hamdi A. The association between smartphone addiction and thumb/wrist pain: A cross-sectional study. Medicine. 2020;99(10).