

Grip Strength as a Predictor for the Severity of Carpal Tunnel Syndrome in Female Patients

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Abstract

Objective to evaluate the role of grip strength measurement as a predictor for the severity of CTS in relation to EMG findings.

Methods: A prospective study was conducted at Prince Hashem bin Alhussein Hospital in Alzarqa/Jordan; in the time between Feb 2008 and June 2008. Twenty six consecutive female patients with positive EMG results were included in the study. They were interviewed regarding various risk factors including; associated illnesses; number of children, body mass index and repetitive strain. The presenting symptoms and the results of Tinel and Phalen tests were noted. Grip power was measured using a (Smedly type) hand held dynamometer. Lastly, the results of the nerve conduction studies were examined in relation to grip strength. We have included a matching control group of healthy females to compare the grip power measurements.

Results: A total of 26 females with abnormal nerve conduction studies were included in the study. Mean age was 47.1 years. Mean body mass index was 30. Mean number of children was 4.8 children. Numbness in all fingers was the most common presentation. Nerve conduction studies were reported as severe in 15 cases 57.7 %, moderate in 10 cases 38.9% and mild only in one case 3.8%. Mean grip power was 13 kg among patients with CTS whereas mean grip power among healthy controls was 21 kg. The more severe cases as proved by electrophysiological studies were having weaker hand grip.

Conclusions: Weak grip appears to be associated with CTS severity. We need to establish guidelines for the normal values in our population to aid in the screening process for carpal tunnel syndrome.

Keywords: Carpal Tunnel Syndrome, Grip Strength, Parity, Body Mass Index, Nerve Conduction Studies.

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Introduction

Carpal tunnel syndrome is usually a clinical diagnosis confirmed by electrophysiological studies. The frequency of carpal tunnel syndrome is variable among studies.

ELmedianny ¹ mentioned that considerable controversy exists about the extent, etiology and

contribution of risk factors in carpal tunnel syndrome. Rempel ² concluded that there is no perfect gold standard for diagnosis of CTS although electrodiagnostic study findings are the most accurate single test, false negative and false positive have been documented. The complaints of numbness and parasthesia in the hands is a common presentation among females with large families. Their hand complaints prevent them

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from good sleep at night due to night pain and disturbing them while doing their house chores during the day. The complaint of weak hands is frequent. We aimed at evaluating the grip strength in relation to nerve conduction findings in a group of females presenting to our clinic. We hoped to establish a role for grip power testing as a simple and objective screening tool for CTS.

Methods

The study period was from February to June 2008. The study was performed at Prince Hashem Hospital in Alzarqa/Jordan. We considered patients presenting with pain and or numbness in one or more of the three lateral fingers as possible candidates for Carpal Tunnel Syndrome (CTS). Two tests (Tinel and Phalen test) were performed for all subjects included in this study. They were considered positive when applying the test would reproduce presenting symptoms of pain or numbness in digits 1, 2, and or 3 (median nerve distribution). When CTS was suspected either on basis of history or examination we sent patients for Electrophysiological Studies (EMG) at the Royal Rehabilitation Center. Severity grade was assigned following the American Association of Electrodiagnostic Medicine criteria of CTS.³ We have studied 26 consecutive females with positive EMG results. Only one hand was included in the study; the more severe ones. Patients with previous trauma or injury to the wrist were excluded. All patients performed a grip power test using a hand held dynamometer (Smedly type). The median of 3 readings was taken as the grip power. A control group of 26 females with similar age group and no diseases affecting the hands was included.

Results

The total number of females sent for electrophysiological studies was 35. We included 26 females with positive results for CTS. Mean age of participants was 47.1 (range 34- 66 years). Mean number of children was 4.8 (range 0-8 children). Twenty two women (84.6% percent) were housewives. Three women (11.5%) were

tailors and only one woman (3.8%) was a teacher. Mean body mass index was 30 (range 24-35). Table (1) shows the demographic characteristics of participants. Numbness in all fingers was the most common presentation in 17 patients (65.4%). Nerve conduction studies were reported as severe in 15 cases 57.6%, moderate in 10 cases 38.9 % and mild only in one case 5.6%. Mean grip strength was 13: 15: 19, respectively whereas mean grip power among healthy controls was 21 kg (range 12-30). The results of the clinical examination and the diagnostic tests are shown in table (2).

Table (1): Characteristics of participants.

<i>Age</i>	<i>47.1 Years</i>	<i>34-66 Years</i>
<i>Number of children</i>	<i>4.8 children</i>	<i>0-8 children</i>
<i>BMI</i>	<i>30</i>	<i>24-35</i>
<i>Job</i>	<i>Housewife</i>	<i>22 women 84.6%</i>
	<i>Tailor</i>	<i>3 women 11.5%</i>
	<i>Teacher</i>	<i>One 3.8%</i>

Table (2): The results of the clinical examination and the diagnostic tests.

<i>Presenting symptoms</i>	<i>Number of cases</i>	<i>Percentage</i>
<i>Pain +/- numbness in one finger</i>	-	-
<i>Pain+/- numbness in two fingers</i>	6	23.1%
<i>Pain+/- numbness in three fingers</i>	3	11.5%
<i>Pain+/- numbness in all fingers</i>	17	65.4%
<i>Repetitive stress</i>	13	50%
<i>Night pain</i>	22	84.6%
<i>Parasthesia</i>	21	80.8%
<i>Dropping things</i>	14	53.8%
<i>Diagnostic tests</i>		
<i>Phalen positive</i>	20	76.9%
<i>Tinel positive</i>	15	57.7%
<i>Associated illness</i>		
<i>No illness</i>	18	69.2%
<i>Thyroid disease</i>	3	11.5%
<i>Rheumatoid arthritis</i>	4	15.4%
<i>Diabetes Mellitus</i>	1	3.8%
<i>Electrophysiologic testing</i>		
<i>Mild</i>	1	3.8%
<i>Moderate</i>	10	38.5%
<i>Severe</i>	15	57.7%

Discussion

CTS is by far the most common neuropathy. De Krom⁴ found in a study to evaluate the presence of CTS in the community, that 3.4% of adult females were known to have carpal tunnel syndrome with an additional 5.8% of females in whom the condition had not previously been detected. Ferry⁵ performed a similar study in the United Kingdom with a prevalence estimate of between 7% and 16%. We could not find any studies indicating the frequency in Jordan or in the region. Gomez⁶ after studying several thousand people in the community had found out that a compressive lesion of the median nerve can be present in patients with atypical or even no symptoms. Burke⁷ stated that symptoms are mild and infrequent at the onset and may resolve spontaneously for months or years. Rempel² described the symptoms as classic when patients presented with numbness, tingling, burning, or pain in at least 2 of digits 1, 2, or 3, palm pain, wrist pain, or radiation proximal to the wrist. He described the symptoms as possible when symptoms are present in at least one of the three lateral digits. If no symptoms in the three lateral digits the diagnosis of CTS was unlikely.

Most frequent symptoms in our study group were numbness and pain in all fingers. Night pain was a dominant feature among our patients. This is a similar finding as found by Bahou,⁸ Lam⁹ and Nora.¹⁰ These results indicate the strong value of night pain as a presenting symptom.

Many studies show that CTS affects women in middle age. Mean age 45 years, 55 years, 53 years respectively as reported by Bahou, Lam and Tay.⁹⁻¹¹ In agreement with these results, the mean age among our patients was 47.1 years.

Carpal tunnel syndrome was frequently attributed to repetitive stress as in tailors, computer users etc. but no studies were found to report about CTS as a result of heavy house chores; which appears to be the most common cause among females in our sample. Bahou⁹ found repetitive strain in 66% in his study group, whereas repetitive stress mainly in the form of house

activities such as cooking, cleaning, washing and wringing clothes was reported in 55.6% of women in our study. Slightly, more than half the women in the sample considered their house chores as heavy and are the cause of repetitive strain, whereas the rest considered their house activities as the usual daily load. A few (3 women) were either tailors or doing a lot of needle work, no case was related to using computers. These findings might be explained by the low socioeconomic nature of the place of study, where most women are housewives without an official employment. Nora¹⁰ found that 15% only had a systemic illness. We have found that 34% were having an associated illness. Thyroid disease was most prevalent followed by rheumatoid arthritis and least represented was diabetes mellitus. DM might be weakly associated with CTS as found by Becker¹² and this could be explained by the fact that many diabetics have peripheral neuropathy preventing them or their doctors to refer them for EMG testing. Kaplan¹³ studied the effect of menopause on 5587 women. He found that women with CTS had more pregnancies and earlier onset of menopause. He indicated that the hormonal changes due to pregnancy might have a long-term effect, thus causing CTS around the menopause. Stolp-smith¹⁴ studied CTS in pregnancy among 10873 women. He concluded that severe CTS to warrant therapy is uncommon in pregnancy and usually will disappear after delivery. Most of the women in our study were having large families with the number of children of up to eight which means they would have increased load through their household activities, but no one had symptoms related to pregnancy. Arori¹⁵ found out in her review article that occupational CTS is uncommon and it is essential to exclude all other causes particularly the intrinsic factors such as obesity before attributing CTS to occupation. Several studies^{7, 11} have suggested that obesity is a significant risk factor for the development of Carpal Tunnel Syndrome (CTS). High body mass index was also confirmed by Boz¹⁶ to be a significant risk factor in both sexes. Becker¹² has explained the fact that accumulation of fat tissue inside the carpal tunnel or by increase of the hydrostatic pressure throughout the canal.

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Obesity was prevalent in a large percentage among our patients.

The Wikipedia ¹⁷ defined grip strength as the force applied by the hand to pull on or suspend from objects and is a specific part of hand strength.

Mathiwoz ¹⁸ used grip and pinch grip data to compare strength in healthy adult (20-75 years). He used Jamar type dynamometer. The mean grip strength in his sample ranged from 28.4 kg for the right hand and 24.4 kg for the left hand. This result is higher than the grip strength among our healthy controls (mean of 21kg). Kamarul ¹⁹ tested the grip strength in adult Malaysian people and found different results from published literature. Malaysian people seemed to have weaker grip strength when compared to people in western societies. Age, hand dominance, height, weight and occupation even leisure activities interfere with the grip strength as reported by Bohanan, ²⁰ Geere, ²¹ Cauley ²² and Werle. ²³ Slatkowsky ²⁴ measured the grip strength using the hand dynamometer (Jamar type, in kg) in osteoarthritis, rheumatoid arthritis and healthy controls. The results were 18.2, 14.6 and 21, respectively. In our sample, grip strength among CTS patients was nearly half the value for healthy controls. This result indicates that CTS is associated with a decline in the grip strength among affected people. We could not find studies that evaluated the relationship between grip power and CTS severity. We could not find studies about normal reference for the grip strength in our country or in the region. Therefore, further studies with larger sample size are needed to establish normal values in our population and to establish the role for quantitative grip power testing in the evaluation of CTS patients.

Conclusion

Weaker grip strength was associated with more severe EMG findings. Hand held dynamometry might be an easy, low cost method aiding in the screening for CTS and selection of patients for the more costly and time consuming EMG.

The risk factors and normative data for grip strength and nerve conduction studies published in western literature might be different in our community. We need to establish guidelines for the screening of CTS relevant to the nature of our society.

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قوة قبضة اليد باعتبارها مؤشراً لمدى شدة متلازمة النفق الرسغي في المرضى الإناث

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الملخص

الهدف: هو تقييم دور قياس قوة قبضة اليد باعتبارها مؤشراً لشدة متلازمة النفق الرسغي في المرضى الإناث ومقارنتها بنتائج الدراسات الكهروفسيولوجية (دراسات التوصيل العصبي).

الأساليب: دراسة أجريت في مستشفى الأمير هاشم بن الحسين في الزرقاء/ الأردن، في الفترة ما بين فبراير 2008 ويونيو 2008. اشتملت الدراسة على ستة وعشرين مريضة على التوالي من اللواتي اظهرن نتائج ايجابية في الفحوصات الكهروفسيولوجية. وتم عمل استبانة بشأن عوامل الخطر المختلفة بما في ذلك الأمراض المرتبطة بها، وعدد الأطفال، ومؤشر كتلة الجسم والإجهاد المتكرر. ولوحظت أعراض تقدم ونتائج الاختبارين تنل وفالن. تم قياس قوة قبضة اليد باستخدام (نوع Smedly) دينامومتر. وأخيراً تم فحص نتائج دراسات التوصيل العصبي ومقارنتها بقوة قبضة اليد. ولقد شملت الدراسة مجموعة مراقبة مطابقة من الإناث الأصحاء لمقارنة قياسات قوة قبضة اليد.

النتائج: كان متوسط العمر بين المريضات في العينة هو 47.1 سنة. وكان متوسط مؤشر كتلة الجسم 30. وكان متوسط عدد الأطفال 4.8 طفلاً. كان الخدر في جميع أصابع اليدين هو العرض الأكثر شيوعاً. وجاءت دراسات التوصيل العصبي في المستوى الحاد في 15 حالة 57.7 %، المستوى المتوسط في 10 حالات 38.9 %، والخفيف في حالة واحدة فقط 3.8 %. كان متوسط قوة قبضة اليد 131 كغ بين المريضات اللاتي يعانين من متلازمة النفق الرسغي في حين أن قوة قبضة اليد بين الأصحاء كانت 21 كغم. وكانت قوة قبضة اليد الأضعف بين الحالات الشديدة في دراسات توصيل العصب.

الاستنتاجات: يبدو ان ضعف قوة قبضة اليد يترافق مع شدة متلازمة النفق الرسغي. ونحن بحاجة إلى وضع مبادئ توجيهية للقيم الطبيعية في بلادنا للمساعدة في عملية الفرز لمتلازمة النفق الرسغي.

الكلمات الدالة: متلازمة النفق الرسغي، قوة قبضة اليد، ومؤشر كتلة الجسم، ودراسات التوصيل العصبي.