

## **EFFECT OF CERVICAL RADICULOPATHY ON HANDGRIP STRENGTH IN EGYPTIAN DENTISTS.**

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### **ABSTRACT**

**Background:** Cervical radiculopathy is a sensorimotor deficit syndrome that can cause of pain, numbness, and tingling in the upper extremity to electrical type pains or even weakness. Dentistry demands high accuracy and dentists frequently assume a rotated and forward head posture. This produces high static load in the neck region; with extended work duration, this static load may result in neck pain, muscle imbalance or cervical instability. **Aim of this study:** was to investigate the effect of cervical radiculopathy on handgrip strength in Egyptian dentists. **Participants and method:** Case control study was used. One hundred right handed dentists were selected from different hospitals with age ranging from 25 to 35 years old and with work experience from 5 to 15 years. Dentists were then stratified into two groups; cervical radiculopathy group A that was confirmed with a positive Spurling sign as well as a score above 30 of neck disability index. Both groups handgrip strength was measured by Jamar handgrip dynamometer. Group B consists of normal healthy dentists have experienced no pain 3 months prior to the study. **Results:** There was a significant decrease of the handgrip strength in group A when compared with that of group B ( $p < 0.0001$ ). **Conclusion:** based on the findings of this study, our results conclude that there was a significant decrease of the handgrip strength in dentists suffering from unilateral cervical radiculopathy when compared to healthy pain free dentists.

**Keywords:** cervical radiculopathy, hand grip, dynamometer

### **Introduction**

At work, the dentist assumes a strained posture (both while standing and sitting close to a patient who remains in a sitting or lying position), which causes an over stress of the spine and limbs. This refers to 37.7% of work time. The overstress negatively affects the musculoskeletal system and the peripheral nervous system; above all, it affects the peripheral nerves of the upper limbs and neck nerve roots. **(Szymanska ,2003)**

Nerve roots compression may lead to weakness, numbness and pain where the nerve travels. The pain may be felt as deep, dull and achy or may have sharp shooting pain along the path of the nerve. Muscles controlled by the affected nerve root may also be weakened **(faisal et al , 2012)**. The most commonly affected level is C5 -C6, with 86% of specimens having observable abnormalities. The C6 – C7 level is the next most frequently affected site in the cervical region. Finally, involvement of the 8th cervical nerve root by a herniated C7 –T1 disc produces a significant weakness of the intrinsic musculature of the hand. This involvement can lead to rapid atrophy of the interosseous muscles. Loss of the interosseus leadsto significant loss in fine hand motion. The most common areas of the disc herniation are C6 – C7 and C5 – C6 ( **Faisal et al ,2012)**.

Measurement of handgrip strength is an important component of hand rehabilitation because it assesses the patients' initial limitation as compared with norms. Its utility continues throughout the treatment process because it provides a quick reassessment of the patient's progress. Without the ability to grasp, a person ceases to be functionally independent and is unlikely to be able to work. Hence the aim of this study was to investigate the effect of cervical radiculopathy on handgrip strength in egyptian dentists.

## **Methods**

### **Study design and participants**

Case control descriptive study was used. One hundred dentists were selected from different learning and university hospitals in Cairo and Giza areas from May 2018 to November 2018. Before the experiment, the purpose and the procedures of the study were fully explained to all subjects, and all subjects subsequently voluntarily agreed to enroll in the present study. Inclusion criteria included the following. 1) age of 25-35 years old; 2) working from 5-15 years from different hospitals; 3) Dentists were divided into two groups, Group (A) 50 dentists are suffering from uni-lateral cervical radiculopathy that was confirmed by plain x-ray at c5 to c7 level, positive Spurling sign as well as a score above 30 of neck disability index. Group (B) 50 dentists are negative in spurling test Participants were excluded if they had the following; 1) shoulder operations 2) Fractures3) Neurovascular impairments4) Bilateral cervical radiculopathy4) Other orthopedic and neurological conditions. The Board Council of Higher Education of the School of Physical Therapy, the Institutional Review Board of Higher Education and Research of Cairo University, and the Supreme Council of Universities at Egypt reviewed and approved this study.No:P.T.REC/012/002034

### **Instrumentation:**

A Jamar hydraulic hand dynamometer (J. A. Preston Corporation, Clifton, NJ, USA) was used in this study. The Jamar dynamometer is a hydraulic tool with 5 fixed grip positions. The precision of the dynamometer is 2 kg. The grip span equivalences for the different positions in the dynamometer are I, 3.5 cm; II, 4.8 cm; III, 6.0; IV, 7.3 cm; and V, 8.6 cm.

### **Procedure:**

The test was directed by one physical therapist (5 years of experience) who was trained in the administration of the hydraulic hand dynamometer. Prior to the assessment of hand strength, all dentists were asked the complete the Neck disability index (NDI) Arabic version questionnaire with a score of 30 and above to be includes in group A, and a score below 14 to be include in group B. Additionally, a positive Spurling sign confirmed cervical radiculopathy (**Rubinstein et al ,2007**) Sensitivity of the Spurling test to nerve root pathology was 95% and specificity was 94% (**Shabat et al , 2011**) The dentist head was turned to the affected side while extending and applying downward pressure to the top of the dentist's head. A positive Spurling's

sign is when the pain arising in the neck radiates in the direction of the corresponding dermatome ipsilaterally.

For hand grip assessment; the dentist was asked to sit comfortably in a standard chair with legs, back support (without armrest). We used the same chair for every measurement. With the wrist in a neutral position, thumb facing upwards. Jamar handgrip dynamometer to show that gripping very tightly registers the best score. The hand was positioned so that the thumb is round one side of the handle and the four fingers are around the other side. The instrument should feel comfortable in the hand. The dentist was encouraged to squeeze as long and as tightly as possible or until the needle stops rising. Once the needle stops rising the dentist was instructed to stop squeezing. grip strength was read in kilograms from the outside dial and record the result to the nearest 1 kg on the data entry form. We did two further measurement to give three readings and we take the mean. The Eurofit Test Manual recommends squeezing for 3 seconds. The procedure for the Groningen Elderly Tests has the subject hang their hand by their side, one practice trial, best of three attempts with 30 seconds rest between.

### **Data analysis**

Statistical analysis was computed using SPSS for windows version 20 (SPSS, Inc., Chicago, IL).CHI squared test were conducted for comparison of general characteristics and hand grip of both groups and it was homogenous. Descriptive statistics was used to describe the means and standard deviations of the participants' characteristics. Independent t test was used to compare differences in the two groups. The level of significance was set at 0.05.

### **Result**

#### **General characteristics of the subjects:**

Comparing the general characteristics of the subjects of both groups revealed that there was no significance difference between both groups in the mean age and BMI respectively as shown in table (1) ( $P > 0.05$ ).

**Table 1. Descriptive statistics and t test for the mean age and BMI of both group**

|                          | Group A          | Group B          | MD    | t-value | p-value | Sig |
|--------------------------|------------------|------------------|-------|---------|---------|-----|
|                          | $\bar{X} \pm SD$ | $\bar{X} \pm SD$ |       |         |         |     |
| Age (years)              | 27.14 $\pm$ 2.28 | 27.76 $\pm$ 2.34 | -0.62 | -1.33   | 0.18    | NS  |
| BMI (kg/m <sup>2</sup> ) | 23.04 $\pm$ 1.25 | 22.97 $\pm$ 1.31 | 0.07  | 0.26    | 0.79    | NS  |

$\bar{X}$  = Mean; SD=Standard deviation; MD= Mean difference; t value= Unpaired t value; p value= Probability value; NS= Non-significant

### Gender distribution:

There was no significant difference in gender distribution between both groups as shown in table (2). ( $P > 0.68$ ).

|         | Group A  | Group B  | $\chi^2$ | p-value | Sig |
|---------|----------|----------|----------|---------|-----|
| Females | 30 (60%) | 28 (56%) | 0.16     | 0.68    | NS  |
| Males   | 20 (40%) | 22 (44%) |          |         |     |

**Table 2. The frequency distribution and chi squared test for gender distribution**

$\chi^2$  = Chi squared value; p value= Probability value; NS= Non-significant

### Comparison of handgrip strength between both groups

There was a significant decrease of the handgrip strength in group A compared with that of group B ( $p < 0.0001$ ). Additionally, there was a significant increase in the NDI of group A compared with that of group B ( $p < 0.0001$ ). (Table 3)

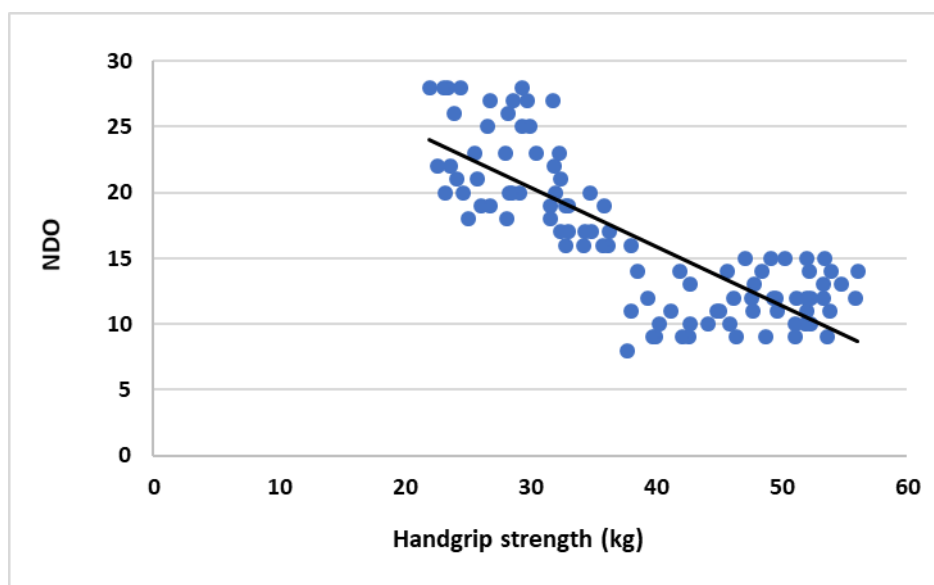
**Table 3. Comparison of mean value of handgrip strength between both groups**

|                        | Group A          | Group B          | MD     | t-value | p-value | Sig |
|------------------------|------------------|------------------|--------|---------|---------|-----|
|                        | $\bar{X} \pm SD$ | $\bar{X} \pm SD$ |        |         |         |     |
| Handgrip strength (kg) | 29.48 $\pm$ 4.29 | 47.72 $\pm$ 5.21 | -18.24 | -19.1   | 0.0001  | S   |

$\bar{X}$  = Mean; SD=Standard deviation; MD= Mean difference; t value= Unpaired t value; p value= Probability value; NS= Non-significant

### **Relationship between handgrip strength and NDI:**

The relationship between handgrip strength and NDI was strong negative significant correlations ( $r = -0.8$ ,  $p < 0.0001$ ). (figure 1).



**Figure 1. Correlation between handgrip strength and NDI.**

### **Discussion:**

The result of current study revealed that there is a significant decrease of the handgrip strength in group A (dentists with cervical radiculopathy) in comparison to controlled group B (dentists free of radiculopathy). Our result were in line with **Okada et al., (2009)** where they found a highly significant reduction in handgrip strength on with cervical radiculopathy patients on the affected side when compared to the unaffected side ( $p=0.028<0.05$ ). They explained that weakness may be due to that a myotomal involvement can ultimately lead to the weakness of the intrinsic muscles of hand. [8]

Our results were also supported by **Coric et al., (2011)** where they demonstrated that cervical radiculopathy manifests by the compression of a cervical spinal nerve and is typically characterized by upper extremity pain and sensorimotor

deficits in the area supplied by the affected nerve[2]. One explanation may include that nerve roots compression may lead to weakness, numbness and pain where the nerve travels. The pain may be felt as deep, dull and achy or may have sharp shooting pain along the path of the nerve. Muscles controlled by the affected nerve root may also be weakened due to prolonged affection (**Ludwing. et al., 1995**).[6]

Our findings were also in line with **Frienderberg et al (1995)**, where they concluded that the involvement of the lower cervical segments produces a significant weakness of the intrinsic muscles of the hand, which in turn leading to significant loss in the hand grip and leading to reduction in fine hand functions.[5]

(**Mohamed et al., 2012**) also in line with our result as they stated that .Handgrip strength and hand functions were significantly reduced in the patients with unilateral cervical radiculopathy. There were significant reductions in the handgrip and hand functions on the affected side in the patients with unilateral cervical radiculopathy when compared with the unaffected or normal side [4]

(**Egwu. et al.,2009**) also state that cervical radiculopathy may occur as a result of degenerative changes that leads to place motor, sensory and autonomic neurones in a hyperexcitable state, increase blood vessel tone, and render connective tissues more susceptible to injury without necessarily being painful that in turn leads to diminish of handgrip strength and reflexes.[7]

(**Egwu. et al.,2009**) also stated that degenerative changes may leads to changes in bones and surrounding structures which in turns leads to impairment of cervical neuromusculoskeletal system on hand function , parameters such as manual dexterity and grip strength .[7]

Our results disagree with( **Samir,2014**) who stated that there is a significant direct proportional correlation between neck pain and handgrip strength in dentists.As she took only 20 dentists from on area in saudia.The disagreement in the result is because the effect size as the sample size was small.[3]

## **Conclusion**

Based on the findings of this study, our results conclude that there was a significant decrease of the handgrip strength in dentists suffering from unilateral cervical radiculopathy when compared to healthy pain free dentists.

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### الهدف من الدراسة

تقييم قوة الامساك بالايدي لاطباء الاسنان الذين يعانون من الاعتلا العنقي و الذين لا يعانون منه في مستشفيات مختلفه.

اجريت هذه الدراسه في كلية طب اسنان من القصر العيني و كلية طب اسنان لجمعة ٦ اكتوبر و كلية طب اسنان لجامعة اكتوبر للعلوم و الفنون و مستشفى العياط المركزي و مستشفى ابو النمرس المركزي و مستشفى ام المصريين.

### خطة الدراسة

لقد تم اختيار مائة طبيب اسنان من الجنسين تتراوح اعمارهم السنية مابين ٢٥ الي ٣٥ سنة منقسمين الي مجموعتين حيث ان المجموعة الاولى مونة من خمسون طبيب اسنان يعانون من الاعتلال العنقي و خمسون طبيبا لا يعانون منه.

لقد طلب من جميع الاطباء ميلئ استبيان الاعتلال العنقي الوظيفي كما انهم تعضوا لاختبار سبارلينغ لتأكيد وجود الاعتلال العنقي و ايضا تم تقييم قوة الامساك بالأيدي للمجموعتين.

### نتائج الدراسة

أظهرت النتائج وجود فروق ذات دلالة احصائية واضحة بين المجموعتين اصالح المجموعة الثانية اظهرت النتائج وجود ضعف بنسبه كبيره في قوة الايدي في المجموعه الاولى كما ان هناك تأثير كبير علي الاعمال اليومية الحياتية للاطباء الذين يعانون من الاعتلال العنقية .