

**INVESTIGATION OF THE RELATIONSHIP OF MUSCULAR ENDURANCE WITH
PAIN, NECK AWARENESS, AND KINESIOPHOBIA IN PATIENTS WITH
CERVICAL DISC HERNIATION**

Hacettepe University Non-Interventional Clinical Researches Ethics Committee

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MATERIALS AND METHODS

Participants

This study was carried out with patients diagnosed with cervical disc herniation who were presented on an outpatient basis to Hacettepe University, Faculty of Physical Medicine and Rehabilitation between July 2019 and July 2020. Patients with cervical disc herniation who met the inclusion criteria were given detailed information about the study, and signed a consent form containing the content, purpose, and evaluation methods of the study. The study was approved by the Hacettepe University Non-Interventional Clinical Researches Ethics Committee (#GO 2019 / 16-14, Date: 18.06.2019).

The study included 36 patients who met the inclusion criteria: being 18-65 years old, having a diagnosis of cervical disc herniation confirmed by MR radiography, direct radiography, and clinical and physical examination, having neck pain at rest for 3 months or more with a severity of 2 or above according to the Visual Analogue Scale (VAS) (18), having a score of 5 or more from the NDI (19), and being able to comply with the instructions of the physiotherapist. The NDI was developed to evaluate the disability caused by chronic neck pain. It was developed as the neck version of the Oswestry Low Back Pain Disability Questionnaire, which was developed by Vernon et al. Each question is scored between 0 and 5 and the level of disability of the patients is classified according to the following score scheme: 0-4 points, no disability; 5-14 points, mild disability; 14-24 points, moderate disability; 25-34 points, severe disability; and, 35-50 points, complete disability (19, 20).

Patients with spinal tumors/deformities/congenital malformations and who underwent cervical or upper extremity surgery in the previous 6 months were excluded from the study.

In a post-hoc power analysis for the sample size of the study, taking into account the correlation between neck pain during activity and cervical deep flexor muscle endurance of individuals, the statistical significance of Alpha was 5% and the confidence interval was 95%, the strength of the study ($1-\beta$) was 86% with 36 individuals with cervical disc herniation.

Assessments

Following evaluations were performed after the age, height (cm), weight (kg), body mass index (kg/m^2), gender, diagnosis, treatments received, and exercise habits of the patients were recorded;

Assessment of Muscular Endurance

The **endurance of the neck flexor muscles** was evaluated by placing the head on a 6 cm elevation in the supine hook position. With the removal of the head support, the maximum time that the patient could maintain this position without disturbing was recorded in seconds. The test was terminated after a 5-degree deviation occurred in the goniometer which followed the vertical angle of the mandible (21).

Neck extensor muscle endurance was evaluated with the arms on the side of the body in the prone position. The head and neck of the patients were positioned so that they hang from the bed, starting from chest level; and 2 kg of sand weight was placed behind the head corresponding to the C6 level with the help of a 10 cm Velcro. The maximum amount of time the patient could hold his head in this position was recorded in seconds (14).

Cervical deep flexor muscle endurance was evaluated in the supine hook position. The patients were asked to put their hands on their abdomen and look at chest level by pulling their chin inward. The maximum time in seconds they could hold their head in this position by raising their head approximately 2.5 cm was noted (22).

In order to evaluate the **trunk flexor muscle endurance**, the patients were asked to clamp their hands on the opposite shoulders in the supine hook position. They were asked to lift up the upper body until the lower end of the scapula lifted off the ground, and the maximum time in seconds they could maintain this position was recorded (14).

In order to evaluate the **endurance of the trunk extensor muscles**, the patients were placed in the prone position with the upper body hanging from the bed. The point where the bed touches the body of the individual was set to be *spina iliaca anterior superior*. The lower limb was fixed on the bed by the evaluator. In order not to lose the balance, the participants were asked to get support with their hands first, and when they were ready, they were asked to bring both hands together on their neck and lift their body parallel to the ground. The maximum time in which they could hold this position was noted in seconds (23).

In order to evaluate the **endurance of the trunk lateral flexor muscles**, the patients were placed in a side-lying position and were asked to pull their knees gently on their abdomen. The upper leg of the patient was placed in front of the other foot. The body weight of the patient was positioned on the forearm and feet, and the upper hand was placed on the opposite shoulder.

They were asked to elevate the hip until the pelvis and trunk reached a horizontal position. In the meantime, the individual was warned not to get support from the upper leg. After the movement was taught, measurements were made for the right and left sides separately, and the maximum time that they could maintain the position was recorded for both sides in seconds (23).

The endurance of the trunk stabilizer muscles was evaluated with the bridge test in prone. The individual was initially asked to place in the prone position supported on the knee and forearms. Then, they were asked to stand on their forearms and toes by raising their knees, and then they were asked to maintain this position. The time they held the position was noted in seconds (24).

Upper extremity muscle endurance was evaluated in a modified push-ups exercise position. In the prone position, hands were placed shoulder-width apart on the ground, and the trunk was asked to be brought closer to the ground with elbow flexion. Care was taken to ensure that the body weight was only on the knees and hands. After the movement was taught, the number of repetitions the patient could do over 30 seconds was noted (25).

***M. serratus anterior* and *m. trapezius* muscles' endurance** were evaluated via the scapular muscle endurance test. For the test, the patient was in standing position with shoulder and elbow flexion angles at 90°. A dynamometer (Feta 0202 1kg/10N) with a resistance of 1kg/10N was placed between hands by placing a 30 cm ruler between the elbows. The patients were asked to take the dynamometer in the position that they would be most comfortable to hold, bring their shoulders to external rotation, and pull it with both hands. The time in which they were able to hold the position without dropping the ruler was noted in seconds (14).

All muscular endurance evaluations of the patients are shown in Figure 1.

Assessment of Level of Pain

In order to evaluate the pain levels of the patients, a 10-cm Visual Analogue Scale (VAS), which was developed by Price et al. to evaluate the pain level in patients with chronic pain, was used (18). In the VAS, there is a value of 0 at the beginning of the 10 cm line and 10 at the end. It was stated to the patients that the value 0 means no pain, and the value 10 means the most severe pain. Then, they were asked to rate their neck pain on the 10 cm horizontal line. The

marked point was measured with a ruler and noted in cm. Resting pain, pain during activity, and pain at night were questioned, separately.

Assessment of Neck Awareness

In order to evaluate the neck awareness levels of the patients, the Fremantle Neck Awareness Questionnaire (FreNAQ) which developed by Wand et al. to assess neck awareness in patients with chronic neck pain, was used. The FreNAQ consists of 9 items about neck pain, attention, and proprioceptive awareness. Each question is scored between 0 and 4 (0 = Never / I never feel this way, 1 = I rarely feel this way, 2 = I sometimes feel this way, 3 = I often feel this way, 4 = I often or always feel this way). The total score of the questionnaire is between 0 and 36. Higher scores indicate higher neck awareness. The Turkish version of this questionnaire, whose adaptation was conducted by Onan et al., was used in this study (26, 27).

Assessment of the Fear of Movement

The fear of movement was assessed by the Tampa Kinesiophobia Questionnaire developed by Kori et al. The questionnaire evaluating injury avoidance and fear of movement consists of 17 items, and each item is scored between 1 and 4 (1 = Strongly disagree, 4 = Strongly agree). The total score ranges from 17 to 68. Higher scores indicate a higher kinesiophobia level (28). The Turkish version of the questionnaire, which was adapted to Turkish by Yılmaz et al., was used in current study (29).

Statistical analysis

Windows based SPSS 22 (Statistics Program for Social Sciences, version 22) (<http://www.spss.com.tr>) analysis program was used for all statistical analyses. Qualitative data are shown with number (n) and percentage (%) in the expression of the descriptive analysis results of the data. Mean (X), minimum and maximum values, and standard deviation (SD) were used for quantitative variables. The conformity of the variables to normal distribution was tested with Histogram Analysis, coefficient of variation, skewness-kurtosis, Kolmogorov-Smirnov Test, and "Normal Q-Q Plot" and "Detrended Normal Q-Q Plot". Since it was determined that the data did not conform to the normal distribution, it was decided that non-parametric conditions were met. Evaluations of the relationships between muscular endurance and pain, neck awareness, and fear of movement in participants with cervical disc herniation were made on the basis of the Spearman's correlation coefficient (ρ). The strength of the relationships was assumed: $r > 0.90$ very strong; 0.70-0.90 strong; 0.40-0.70 moderate; 0.20-

0.40 weak, and $r < 0.20$ very weak/insignificant correlation. The statistical significance level (p) was accepted as 0.05 (30).