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Research Article

Investigation of Functional Disability, Pain, And Quality of Life in Patients with Cervical Radiculopathy by Gender

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Abstract

Aim: This study aimed to compare pain, functional limitation, disability, and quality of life in females and males with cervical radiculopathy and to evaluate their relationship.
Material and Method: A total of 111 patients of both genders, 81 (72.98%) females and 30 (27.02%) males, were included in the study. Pain and numbness of the patients were evaluated with the Numeric rating scale (NRS), neck disabilities with the Neck disability index (NDI), and quality of life with the EuroQol Five-Dimensions– 3-Level (EQ-5D-3L). Functional limitation caused by cervical radiculopathy was assessed with the Cervical radiculopathy impact scale (CRIS).
Results: The average age of the patients was 45.59±11.00. While the severity of neck and arm pain was similar between genders ($p>0.05$), numbness radiating to the arm and hand was more severe in females ($p=0.027$). Also, female's quality of life outcomes was worse than males ($p<0.05$). However, there was no difference between genders in CRIS subheading scores ($p>0.05$). This study determined a moderate negative correlation between CRIS symptoms and quality of life parameters and a moderate-weak correlation between CRIS symptoms with pain and numbness ($p<0.01$).
Conclusion: This study determined that female's disability and quality of life were worse. In addition, the severity of numbness females feel in the upper extremities is higher. Additionally, functional limitation is associated with pain and quality of life in patients with cervical radiculopathy.

Keywords: Cervical radiculopathy, functional disability, pain, quality of life

INTRODUCTION

Radiculopathy may be elaborated as the pathology in which progression along a spinal nerve and its processes is limited or blocked. Clinically, pain and paresthesia occurring in a single extremity and radiating along a nerve root suggest radiculopathy. Symptoms may also include muscle weakness and loss of sensation. Cervical radiculopathy is a clinical syndrome caused by compression of the cervical nerve nerves. It is a condition of fractures due to underlying dysfunction in the cervical spine nerves, nerve roots, or both (1). It is most distinguished from spondylotic changes such as cervical disc herniation and proliferation of bone cells in this area, which lead to nerve root loosening and inflammatory changes (2).

It manifests itself with pain as the initial symptom. When the pain spreads from the neck to the shoulder and arm, cervical radiculopathy, which causes sensory complaints and motor weakness, should be suspected. Cervical radiculopathy occurs in the weakness of a nerve root, accompanied by sensory and motor complaints or reflex changes depending on the condition of the affected nerve (3). Cervical radiculopathy is observed in both genders and varies mostly between 50–54 (4). The incidence rate of cervical radiculopathy was 83.2/100.000/year. Depending on gender regime, it is more common in males, 107.3/100.000/year, 63.5% (5). The performance of cervical radiculopathy is less than that of lumbosacral radiculopathy. A prevalence study stated that while cervical radiculopathy was 3.5/1000, lumbosacral radiculopathy was 9.8/1000 (6).

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The most common cause of cervical radiculopathy is foraminal spinal nerve compression in the foraminal area (70–75%). The factors that cause this are disc degeneration that narrows the neurological foramen due to loss of distribution in the vertebra or intervertebral disc, posterolateral herniation of the intervertebral disc, and cervical spondylosis due to degenerative changes in the vertebral body, the joints occurring in the anterior or the facet joints in the posterior (7). Causes of cervical radiculopathy vary depending on age. While disc herniations and acute damage are frequently responsible in the young population, foraminal changes due to osteophyte and spondylosis are frequently responsible in older ages (8).

Unlike axial neck pain, radiculopathy often presents with unilateral pain. This may be replicated with ipsilateral dermatome. However, a diagnosis of cervical radiculopathy can be made even if there is no pain in the arm. In addition, the pain can spread to the arm and cause loss of sensation along the dermatome. Additionally, weakness along the myotome where it spreads may accompany patients. It has been reported that radicular pain is most caused by C7 root involvement, followed by C6 and C8 levels, respectively (9). Therefore, surgery, inflammatory drugs, steroid injections, and physical therapy are recommended for treatment in patients. Surgical treatment often significantly improves pain and limitation when other treatments have failed (1,3,4).

Degenerative changes in the spine observed with aging and neck posture and nerve damage and compression in individuals with disc herniations may cause radicular pain. However, previous studies clearly stated the relationship between pain caused by regularly developing cervical radiculopathy and functional deficit, disability, and quality of life due to expanding radiculopathy (1-3). In addition, the lack of a general outcome study evaluating the functional limitation caused by radicular pain has led to a deficiency in evaluating functional limitation (10). The Cervical Radiculopathy Impact Scale (CRIS) is a newly developed scale that uses this ability to evaluate the functional limitation of radicular pain. This potential extends the gap between pain, functional disability, disability, and quality of life with cervical radiculopathy (10,11). However, the relationship between functional limitation due to cervical radicular pain and clinical symptoms has not been adequately examined. Additionally, this limitation due to radiculopathy may differ between genders. In a study, Singh et al. showed that females with cervical radiculopathy had more disability (12). However, the results were insufficient since it was studied in a small sample. Therefore, the difference between genders remained unclear. The hypotheses of this study are that women with cervical radiculopathy have more pain and limitation and that functional limitation is associated with pain and quality of life. Within the scope of this research, this study aimed to elucidate the relationship between pain, functional disability, disability, and quality of life in patients with cervical radiculopathy.

MATERIAL AND METHOD

This study, which is a cross-sectional observational study, included patients who referred to the neurosurgery outpatient clinic of Karabük University Training and Research Hospital and were diagnosed with cervical radiculopathy. Eighty-one females and 30 males were included in the study. The inclusion criteria for patients were as follows: age over 18 years, with nerve root compression in the cervical region, with or without neck pain consistent with a magnetic resonance imaging (MRI) diagnosis, radiating pain neck or upper extremity, showing nerve root compression, including numbness or paresthesia. Patients showing clinical and radiological symptoms were included. Patients with severe neurological deficits, spine malignancies, cervical surgery within the last 12 months, and pregnant patients were excluded from the study.

All procedures followed were by the ethical standards of the committee responsible for human experimentation and the Declaration of Helsinki. The study was approved by the University Ethics Committee (2023-KAEK-111), and informed consent was obtained from all study participants.

Patients who met the inclusion criteria were asked to answer the survey face-to-face. Through the questionnaire, patients' age, gender, height, weight, duration of symptoms, affected side, etc., information was recorded. The severity of pain and numbness of the patients was evaluated using the numeric rating scale (NRS), functional limitation using the Cervical Radiculopathy Impact Scale (CRIS), disability using the Neck Disability Index (NDI), and quality of life using the EuroQol five-dimensions – 3-level scale (EQ-5D-3L).

Outcome Measure

Numeric Rating Scale

The NRS was used to measure the severity of pain. Scores on the scale range from 0 to 10. A score of 0 indicates no pain and 10 indicates unbearable pain. In the study, NRS was used for three different assessments: neck pain (NRS-neck), pain radiating to the arm (NRS-arm), and numbness in the finger, hand, or arm (NRS-numbness) (11).

Cervical Radiculopathy Impact Scale

The CRIS is a scale that evaluates functional limitations in patients with cervical radiculopathy (10). The CRIS Turkish version was used in this study (11). This scale consists of 3 subheadings and includes a total of 21 questions. First title: The symptoms comprised nine items covering pain in the neck, shoulder, and arm/hand/fingers, as well as related to tingling, loss of strength, and stiffness in the neck. Another title is Energy and postures (6 items), and the 3rd subheading consists of items related to functional limitations due to pain and symptoms in actions and activities (6 items).

Neck Disability Index

The NDI is a scale that evaluates the impact of neck pain on daily living activities. This scale consists of

10 sections, including severity of pain, personal care, weightlifting, reading, headache, concentration, work life, driving, sleep and leisure activities. Each section consists of 6 responses scored between 0 and 5. Patients select the option that best suits them from each section. An increase in points indicates an increase in disability. The test scores were collected at the end of the survey, and the patients' deficiencies were determined. Turkish validity and reliability were tested by Telci et al. in 2009 (13).

The EuroQol Five-Dimensions – 3-Level

The individual's quality of life was evaluated using the Turkish version of the EQ-5D-3L. This scale consists of two subheadings, and the first subheading is the EQ-5D index scale. An index score between -0.59 and 1 is calculated from the first subheading of the scale. In the index score, 0 points indicate death, 1 point indicates perfect health, and negative scores indicate closed consciousness (14). The second subtitle of the scale is the EQ-5D-3L Visual Analog Scale (VAS) scale. It is a VAS containing values between 0 and 100 that evaluate the health status of individuals on the same day. In the scale, individuals' quality of life scores ranging from 0 to 100 are noted, and as the score increases, the quality of life increases (15).

Statistical Analysis

The number of patients to participate in the study was determined using the Gpower program (G*Power Universität Düsseldorf: Psychologie). According to the data obtained from the pilot study, it was calculated that for a significant correlation between pain and functional disability (r=0.318), 95% confidence interval, and 95% power, at least 102 people would need to participate in the study. Considering that there may be data loss in the research, at least 112 people must participate for the 10% cut-off point.

The study evaluated the normal distribution of the data using the Shapiro-Wilk test and graphs. Analysis of qualitative variables was performed with the chi-square test and data were presented as numbers and percentages (%). Normally distributed numerical variables were shown with mean and standard deviation, and non-normally distributed ones were shown with median, minimum, and maximum values. Spearman correlation test was used for correlation in the statistical analysis of the data obtained at the end of the research. Correlation coefficients r>0.89 were considered very strong correlation, 0.70–0.89 as strong correlation, 0.40–0.69 as medium correlation, and 0.20-0.39 as weak correlation (16). Statistical significance was evaluated at p<0.05 level.

RESULTS

This study is a cross-sectional, observational study conducted. A total of 114 patients with cervical radiculopathy were screened, and three patients were excluded. Two patients had undergone cervical spine surgery last year, and one was unwilling to participate. The study was completed with 111 patients. 81 (72.98%) of the patients were female, 30 (27.02%) were male, and the average age was 45.59±11.00 (Table 1). The mean ages and BMI of males and females were similar (p>0.05). A comparison of the demographic characteristics of the patients is given in Table 1.

Table 1. Demographic and physical characteristics of the patients

	Females (n=81)	Males (n=30)	Total (n=111)	p
	X±SD Med (Min-Max)	X±SD Med (Min-Max)	X±SD Med (Min-Max)	
Age, years	46.38±10.75	43.43±11.55	45.59±11.00	0.211
Height, cm	160 (148-175)	174 (161-184)	162 (148-184)	**<0.01**
Weight, kg	73.91±14.29	80.73±12.72	75.76±14.15	**0.024**
BMI, kg/m²	29.02±5.36	27.23±4.06	28.54±5.08	0.101
Duration of symptoms, month	15 (3-72)	12 (3-60)	14 (3-72)	0.426
Comorbidities, n (%)				
No diseases	53 (65.4%)	21 (70%)	74 (66.7%)	0.650
Diabetes	4 (4.9%)	1 (3.3%)	5 (4.5%)	0.717
Hypertension	25 (30.9%)	6 (20.0%)	31 (27.9%)	0.257
Heart diseases	4 (4.9%)	3 (10%)	7 (6.3%)	0.330
Dominant hand side, n (%)				
Right	70 (86.4%)	25 (83.3%)	95 (85.6%)	0.681
Left	11 (13.6%)	5 (16.7%)	16 (14.4%)	
Affected side, n (%)				
Right	28 (34.6%)	6 (20.0%)	34 (30.6%)	0.230
Left	30 (37.0%)	16 (53.3%)	46 (41.4%)	
Bilateral	23 (28.4%)	8 (26.7%)	31 (27.9%)	

BMI: body mass index, SD: standard deviation

When genders were compared, while the neck and arm pain intensity of males and females were similar (p>0.05), numbness extending to the arms, hands, and fingers was significantly higher in females (p=0.027). Additionally, there was no difference between the functional limitation levels of the genders (p>0.05).

Female patients had more disabilities and a worse quality of life than males (p<0.05). The evaluation results for the groups are presented in Table 2. A moderate negative correlation was observed between CRIS symptoms and quality of life parameters, and a moderate-weak correlation between CRIS symptoms with pain and numbness (p<0.01). A negative correlation was also detected between pain and numbness with quality-of-life parameters. According to the evaluation results, the relationship obtained in patients with cervical radiculopathy is elaborated in Table 3.

Table 2. Pain, numbness, functional limitation, neck disability, and health-related quality of life scores of the patients

	Females (n=81)	Males (n=30)	Total (n=111)	p
	X±SD Med (Min-Max)	X±SD Med (Min-Max)	X±SD Med (Min-Max)	
NRS-neck	6 (2-9)	5.5 (2-9)	6 (2-9)	0.175
NRS-arm	5 (2-8)	4 (2-8)	5 (2-8)	0.285
NRS-numbness	4 (2-6)	3 (2-5)	3 (2-6)	**0.027**
CRIS				
Symptoms subscale	61.00±17.06	57.87±17.62	60.16±17.19	0.396
Energy and postures subscale	62.50 (4.17-95.83)	64.58 (8.33-100)	62.50 (4.17-100)	0.089
Actions and activities subscale	29.16 (0-100)	25 (0-91.67)	29.26 (0-100)	0.630
NDI	20 (7-42)	17 (4-42)	19 (4-42)	**0.021**
EQ-5D-3L index score	0.62 (0.09-0.86)	0.71 (0.09-0.81)	0.68 (0.09-0.86)	**<0.01**
EQ-VAS	50 (20-85)	60 (10-90)	50 (10-90)	**0.011**

NRS: numeric rating scale, CRIS: cervical radiculopathy impact scale, NDI: neck disability index, EQ-5D-3L: EuroQol Five-Dimensions – 3-Level, VAS: visual analog scale, SD: standard deviation

Table 3. The relationship between pain, numbness, neck disability, health-related quality of life, and functional disability in cervical radiculopathy

	Variables		1	2	3	4	5	6	7	8
1	**NRS-neck**	r	1							
		p	-							
2	**NRS-arm**	r	0.659**	1						
		p	<0.01	-						
3	**NRS-numbness**	r	0.581**	0.556**	1					
		p	<0.01	<0.01	-					
4	**NDI**	r	0.534**	0.392**	0.410**	1				
		p	<0.01	<0.01	<0.01	-				
5	**EQ-5D index score**	r	-0.309**	-0.256**	-0.315**	-0.650**	1			
		p	<0.01	<0.01	<0.01	<0.01	-			
6	**EQ-VAS**	r	-0.666**	-0.527**	-0.468**	-0.719**	0.561**	1		
		p	<0.01	<0.01	<0.01	<0.01	<0.01	-		
7	**CRIS-symptoms subscale**	r	0.386**	0.438**	0.252**	0.615**	-0.501**	-0.524**	1	
		p	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	
8	**CRIS-energy and postures subscale**	r	0.453**	0.369**	0.284**	0.413**	-0.310**	-0.400**	0.408**	1
		p	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
9	**CRIS-actions and activities subscale**	r	0.455**	0.399**	0.319**	0.516**	-0.395**	-0.506**	0.336**	0.403**
		p	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

NRS: numeric rating scale, CRIS: cervical radiculopathy impact scale, NDI: neck disability index, EQ-5D-3L: Euro Qol Five-Dimensions – 3-Level, VAS: visual analog scale r: Spearman correlation coefficient (*p<0.05; **p<0.01)

DISCUSSION

This study showed that females with cervical radiculopathy had more numbness in their upper extremities, worse disability, and poorer quality of life. However, the functional limitation they experienced due to radiculopathy was similar between genders. In addition, pain, functional limitation, disability, and quality of life are interrelated in patients with cervical radiculopathy.

Cervical spondylosis refers to degenerative changes resulting from aging in most adult populations. Spondylotic changes may also be seen in many asymptomatic adults. Radiculopathy develops due to the narrowing of the intervertebral foramen (17). The degenerative process of the cervical spine is divided into three distinct stages: (i) dysfunction, (ii) instability, and (iii) stabilization. Dysfunction occurs between the ages of 15 and 45. At this stage, radial and circumferential tears may occur in the annulus, accompanied by localized synovitis in the facet joint. Instability can occur in individuals between the ages of 35 and 70. This stage is characterized by facet joint degeneration and degradation of the internal disc with progressive resorption. This leads to stabilization, the final stage of the process that most commonly occurs after age 60. At this stage, hypertrophic bone develops around the facet joints and the disc and supports the spine. Additionally, each spinal segment may be at a different degenerative stage. While one level completes the dysfunction phase, the stabilization phase may begin at the other level. While disc herniations occur due to the dysfunction and instability phase, spinal stenosis occurs due to the late instability phase. Also, it may be due to the early stabilization phase due to bone overgrowth and disc space narrowing (18).

Evaluation methods are gaining importance in determining the effective treatment in radiculopathy, the presence of symptoms thresholding the problem, and excluding these problems. Patients with cervical radiculopathy may experience increased disability symptoms due to pain radiating to their neck, especially their arms. Studies have shown that patients with radiculopathy are restricted due to pain, and their disability symptoms increase (19). However, the evaluations focused on neck pain rather than arm and extremity pain and were insufficient to conduct a comprehensive evaluation caused by radiculopathy (20).

The CRIS, developed by Gartner et al., measures the functional limitation in patients with cervical radiculopathy due to pain reflected in the upper extremity, tingling, and additional sensory interference due to arm and neck involvement. It provides more objective information for evaluations (10). A study evaluating radiculopathy due to cervical disc herniation showed that CRIS better expresses the functional limitations of patients (12). Similarly, a study on radiculopathy due to cervical disc herniation determined that radiculopathy provided clearer information with a higher score on the CRIS compared to the neck disability questionnaire (NDQ) and that females had more functional disability (21). However, since radiculopathy causes pain and weakness in the extremities and necks of individuals, the lack of evidence regarding functional disability is noteworthy.

Although quality of life is one of the parameters that show the health status perceived by patients, measurements of this parameter are used to evaluate the effects of disease and/or injury on the activities of individuals. It is stated that these questionnaires, which the patients themselves answer, are measurement methods that reflect their health status very well. Wang et al. stated that the quality of life was significantly affected in people with chronic symptoms due to neck pain (22). However, the number of studies examining the quality of life and disability level in patients with isolated radiculopathy and the relationship between these parameters is limited. A study conducted in this context found that in the presence of radiculopathy due to disc herniation, the quality of life and the level of disability related to upper extremity function were affected more than in patients without radiculopathy (23). It has been stated that in patients with radiculopathy, the disability may result from neck pain and deficiencies in upper extremity functions. However, since this functional limitation and reduced quality of life in patients with radiculopathy may be affected by ageing, the lack of studies examining the relationship between these parameters is noteworthy (23).

Pain may also spread to both the neck and extremities in patients with radiculopathy, causing a decrease in the quality of life and functional limitations. In patients with radiculopathy due to disc herniation, neck and arm pain may vary from moderate to severe, increasing the level of disability (24). This study observed that neck disability and quality of life were worse in females than males. The results were like the findings of Oe et al., who found more disability in females than males (25). This difference is thought to be caused by female's lower physical activity levels and sedentary behavior (25). However, many physical parameters, such as repeated and increased workload during daily activities, cause posture disorders in females and increase the pressure on the cervical region. In addition, degeneration in the intervertebral disc and structures surrounding the spine with age may lead to the progression of disability. This condition results in compression of the nerves exiting the cervical spine. It is also stated that the cervical vertebrae's linear and areal dimensions may differ in females than in males. Therefore, females are more susceptible to cervical soft tissue and overuse injuries. When anatomical structures are examined, bone mineral density is lower in females. Consequently, they may be more prone to damage than males (9). However, this study determined that the functional limitation due to cervical radiculopathy was similar between genders. This may be associated with males being more active but with a high expectation level due to injury or fear of losing work capacity and productivity due to re-injury. Therefore, a detailed evaluation of functional limitation and the factors affecting it in patients with cervical radiculopathy is essential in the clinical follow-up process.

CONCLUSION

This study determined that females' disability and quality of life were worse than males. In addition, functional limitations with pain and quality of life are interrelated in patients with cervical radiculopathy. Pain and numbness have also been found to be associated with quality of life. Therefore, investigating gender differences and evaluating functional limitations in patients with cervical radiculopathy is essential in the clinical follow-up process.

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