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RESEARCH ARTICLE

Effectiveness of Chiropractic Application in Individuals with Cervical Disc Herniation: A Randomized Controlled Trial

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Abstract

Purpose: The objective of this study was to investigate the impact of chiropractic intervention on the severity of neck pain, functional capacity, and disability level in individuals with cervical disc herniation. **Method:** The study population comprised of 50 individuals with cervical disc herniation who met the inclusion criteria. The participants were randomly assigned to two groups: an intervention group (n=26) and a control group (n=24). All participants received conventional physiotherapy five days a week for four weeks. In the intervention group, in addition to conventional physiotherapy, chiropractic adjustment using a diversified technique for cervical disc herniation was applied twice a week for four weeks. The McGill Melzack Pain Questionnaire (MMPQ), the Neck Disability Index (NDI), and the Bournemouth Neck Questionnaire (BNQ) were employed to evaluate the neck pain, functionality, and disability levels of both groups before and after treatment. **Findings:** The combination of conventional physiotherapy and additional chiropractic intervention proved to be an effective approach for reducing neck pain and disability levels while enhancing functionality in individuals with cervical disc herniation post-treatment ($p < 0.001$). Nevertheless, no notable discrepancies were discerned between the control and chiropractic intervention groups ($p > 0.05$). **Conclusion:** The application of chiropractic principles and practices was observed to result in a notable diminution of both neck pain and disability levels among those presenting with cervical disc herniation, together with an enhancement of functional abilities. Therefore, this approach may be considered as a potential alternative to existing treatment options for the management of individuals with cervical disc herniation.

Keywords

Neck Pain, Cervical Manipulation, Chiropractic, Physiotherapy, Diversified Technique

INTRODUCTION

A cervical disc herniation frequently manifests as severe neck pain, shoulder impingement, and nerve discomfort. This health issue has the potential to significantly impair the quality of life of affected individuals, necessitating long-term pain management strategies (Binder, 2007).

Neck pain is a costly and widely recognized condition. There is currently no consensus among experts in the field regarding the optimal treatment plan for patients with neck pain (Kazeminasab et al., 2022). A rehabilitation program for neck pain is typically initiated following a brief period of rest

and immobilization. The modalities employed include a range of motion exercises, strengthening exercises, ice, heat, ultrasound, and electrical stimulation therapy (Eubanks, 2010). While several treatment options exist for cervical disc herniation, the number of studies in the literature about this condition is comparatively limited, particularly in comparison to the extensive research conducted on the lumbar region (Yilmaz Menek et al., 2024). Although no single intervention has been proven to be more effective than others for treating neck pain, manual therapy, which includes joint mobilization and manipulation, has been shown to improve outcomes in patients with neck pain (Blanpied et al., 2017; Hidalgo et al., 2017). In recent years, there

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has been a notable increase in the prominence of chiropractic treatment as a modality in alternative medicine. This is largely due to its potential for restoring spinal health and alleviating pain. The objective of chiropractic treatment is to achieve proper alignment of the spine through the utilization of manual manipulation techniques, which can have a beneficial impact on the nervous system (Dinich, 2013). Chiropractic spinal manipulation is a form of medical care that focuses on treating disorders affecting the neuro-musculoskeletal structure, with a particular emphasis on conditions that affect the spine (Gevers-Montoro et al., 2021). A spinal adjustment is typically defined as the application of a high-speed, low-amplitude controlled thrust to a spinal segment (Henderson, 2012).

There is evidence to suggest that manipulation is an efficacious method for the treatment of neck pain when compared with placebo or other conventional treatments (Bronfort et al., 2001; Giles & Muller, 2003; Wood et al., 2001). Moreover, a meta-analysis of individuals with chronic neck pain demonstrated that chiropractic treatments yielded favourable outcomes with respect to pain severity and functionality (Bryans et al., 2014). Nevertheless, it is noteworthy that a number of studies have failed to demonstrate a statistically significant reduction in neck pain (Bronfort et al., 2001). Further research is required to gain a deeper understanding of the efficacy of manipulation for neck pain, utilizing reliable and valid outcome measures that are sensitive to the multifaceted nature of this condition (Bale & Newell, 2005). The findings of this study will be of benefit to the physiotherapy profession, providing valuable insight and guidance for future researchers on the use of chiropractic techniques in the treatment of cervical disc herniation. The objective of this study was to investigate the impact of chiropractic intervention on the severity of neck pain, functional capacity and level of disability in individuals with cervical disc herniation. It was hypothesised that chiropractic care would result in a reduction in neck pain and disability, and an increase in functionality, in individuals with cervical disc herniation.

MATERIALS AND METHODS

Study Design

The study was conducted at the FED Physiotherapy Clinic between the dates of August 2023 and January 2024.

Ethical Implications

The approval was taken from the Üsküdar University Non-Interventional Research Ethics Committee (reference number 61351342/July 2023-21). Also, written informed Team consent was obtained from all participants before starting the study. Participant provided informed consent, with the voluntary form covering research details, risks, benefits, confidentiality, and participant rights. The research strictly adhered to the ethical principles of the Declaration of Helsinki, prioritizing participant's rights and well-being in design, procedures, and confidentiality measures.

Determination of sample size

Once the study design was complete, a power analysis was conducted to determine the appropriate sample size. A total of 50 individuals were selected as the sample size for the study, to determine the medium effect size ($f=0.25$ effect) at the alpha significance level of 95% power (0.05), using the G*Power Version 3.1.6 program. This was based on the assumption that the difference would be statistically significant. A total of 50 individuals who had volunteered to participate in the study were included. The study was conducted as a single-blind, randomized controlled trial following the ethical principles outlined in the Declaration of Helsinki.

Randomization and blinding

The study was conducted as a single-blind, randomized, controlled trial following the established principles of research design. The evaluation was conducted by an assessor who was unaware of the participants' group assignments. The study was designed as a randomized parallel-group trial. Randomization was achieved through the use of a lottery system among the participants. Individuals who met the criteria for inclusion in the study were divided into two groups: an intervention group ($n=26$) and a control group ($n=24$). The study was concluded with the participants. Figure 1 illustrates the flow of participants throughout the study.

Participants

The study participants were patients who had been diagnosed with cervical disc herniation by a neurologist. This diagnosis was reached following a neurological examination, a clinical physical examination, and a radiographic evaluation. The patients were then referred to the Physiotherapy Clinic.

To be eligible for inclusion in the study, participants were required to be between the ages of 20 and 50 years, have experienced neck pain for a minimum of three months, and have volunteered to participate. Individuals with concurrent orthopedic or neurological disorders, in addition to cervical

problems, a history of trauma in the neck region, recent participation in a physiotherapy program within the last six months, vertebralbasilar arterial insufficiency, hysteria, hypoconium, or who were presented as a patient were excluded from the study.

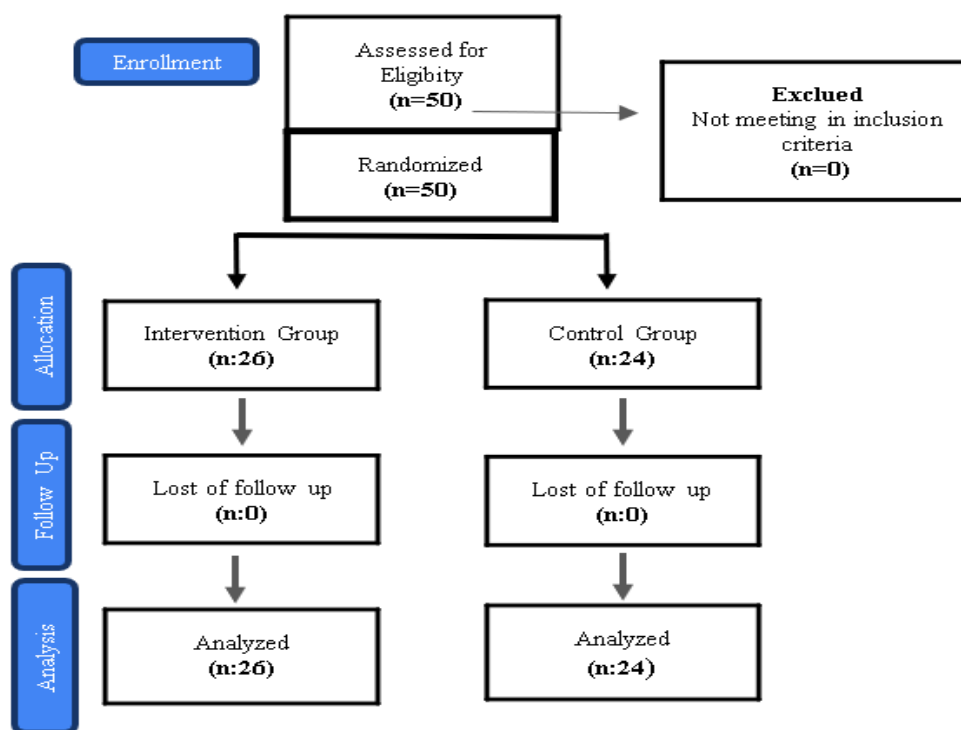


Figure 1. CONSORT flow diagram of the participants.

Intervention and procedure

The intervention and subsequent procedure were conducted following the established criteria of the study, which involved the randomization of participants into two distinct groups: the intervention group (n=26) and the control group (n=24). Conventional physiotherapy, comprising transcutaneous electrical nerve stimulation (TENS), hot packs, and ultrasound applications, was administered five days a week for four weeks to all participants. The control group did not receive any additional intervention. In the intervention group, in addition to conventional physiotherapy, chiropractic adjustment utilizing a diversified technique for cervical disc herniation was applied two days per week for four weeks. Before and following the intervention, both groups were evaluated using the McGill Melzack Pain Questionnaire, the Neck Disability Questionnaire, and the Bournemouth Neck Questionnaire to assess neck pain, functionality, and disability, respectively. All treatment procedures were

performed by a physiotherapist who was a chiropractic specialist.

Chiropractic Practice

In this application, the individual was situated on the drop table stretcher in a supine position with their arms positioned on the abdomen. The physiotherapist then proceeded to place the index finger of one hand on the spine bone and fix the head of the person by holding the occiput bone with the other hand. The subject's neck was subjected to lateral flexion, slight flexion, and rotation following the procedure to be performed on the corresponding side. The application was conducted at a high velocity with a low level of intensity.

Data Collection Tools

Sociodemographic and Clinical Information Form

The participants were asked to provide information regarding their demographic characteristics, including gender, age, educational status, and marital status.

McGill Melzack Pain Questionnaire (MMPQ)

MMPQ was developed by Melzack and Torgerson in 1971 (Melzack & Torgerson, 1971). The validity and reliability of the aforementioned have been evaluated in our country (Kuguoglu et al., 2003). The MMPQ is comprised of four sections. In the initial section, the subject is required to indicate the location of the pain on the provided diagram of the human body. Additionally, they must specify whether the pain is originating from the skin by marking the corresponding letter "D," if it is present on the body surface, by marking the letter "Y," or if it is both on the skin and on the surface, by marking both the "D" and "Y" letters. The second part comprises 20-word groups that analyze pain in terms of sensory, perceptual and evaluative aspects. Each group comprises two to six words, which describe different aspects of pain. The individual is then required to select the word cluster that is most appropriate for their pain and to indicate which word within that cluster is the most accurate description of their pain. The third section pertains to the temporal aspects of pain. The third section comprises word groups designed to ascertain the continuity and frequency of pain, as well as the factors that serve to increase or decrease pain. The fourth section comprises five-word groups, ranging from "mild" pain to "unbearable" pain, which are used to ascertain the severity of the pain experienced. The MMPQ enables the location of the pain, the sensation it creates in the individual, its relationship with time, its intensity and the level of pain that can be experienced by the individual to be determined (Melzack, 1987).

Neck Disability Index (NDI)

The NDI is comprised of ten items, which are as follows: (1) pain intensity, (2) personal care, (3) lifting loads, (4) reading, (5) headaches, (6) concentration, (7) work life, (8) driving, (9) sleep, and (10) leisure activities. Four of the items pertain to subjective symptoms, while the remaining six items relate to activities of daily living. In each section, patients are presented with six different options (A, B, C, D, E, and F) that they can use to rate the condition of that section. The options are assigned a value of 0, 1, 2, 3, 4, or 5, respectively. In accordance with the established criteria, the minimum score on the NDI is 0, and the maximum score is 50. In the NDI, a score of 0-4 is defined as indicating the absence of disability, 5-14 as indicating the presence of mild disability, 15-24 as indicating the presence of moderate disability, 25-

34 as indicating the presence of severe disability, and 35+ as indicating the presence of total disability. The NDI, which was derived from the Oswestry Low Back Pain Questionnaire by Vernon and Mior (Vernon & Mior, 1991) and adapted to the cervical region, was translated into Turkish and subsequently subjected to a validity and reliability study by Aslan et al. (Aslan et al., 2008).

Bournemouth Neck Questionnaire (BNQ)

The BNQ is a questionnaire that assesses various aspects of pain, and its impact on daily life. It evaluates pain intensity, social and functional abilities, anxiety and depression, cognitive and behavioral aspects of fear-avoidance beliefs, and coping strategies for pain. The BNQ comprises seven questions, with responses scored on a numerical analog scale ranging from zero to ten. The maximum score that can be obtained from the questionnaire is 70, with a high score indicating a high level of pain (Bolton & Humphreys, 2002). The Turkish validity and reliability of the test were evaluated (Yilmaz et al., 2019).

Statistical Analysis

The data obtained from the study were analyzed using the SPSS (Statistical Package for Social Sciences) 29.0 package program. Before undertaking the analyses, the suitability of the numerical data for normal distribution was evaluated through the utilization of Shapiro-Wilk and Skewness and Kurtosis tests. The results of the analysis demonstrated that the data were normally distributed. However, the observation values of the variables in the study were found to be below 30. Consequently, non-parametric tests were employed for the aforementioned analyses. Categorical data were presented as frequencies and percentages, while numerical data were presented as means, standard deviations, medians, minimums, and maximums. In the course of data analysis, the Mann-Whitney U test was employed for two-group comparisons, while the Kruskal-Wallis test was utilized for variables comprising more than two categories. All tests were conducted with a statistical significance level of $p < 0.05$.

RESULTS

No statistically significant differences were observed in the distribution of gender, age, marital status, and educational status variables between the intervention and control groups (Table 1) ($p > 0.05$). No statistically significant difference was observed

between the groups in the MMPQ, NDI, and BNQ pre-treatment, post-treatment, and post-treatment difference values ($p>0.05$). A statistically significant difference was observed between the

MMPQ, NDI, and BNQ values of the intervention and control groups before and after treatment ($p<0.05$).

Table 1. Statistics of demographic characteristics of the participants

Variable		Intervention Group (n=26) n (%)	Control Group (n=24) n (%)	P value
Gender	Woman	13 (50)	13 (24.2)	0.768 ^b
	Man	13 (50)	11 (45.5)	
Age (years)	20-30	13 (50)	15 (62.5)	0.392 ^a
	31-40	12 (46.2)	9 (37.5)	
	41 and more	1 (3.8)	0 (0)	
Marital status	Married	8 (30.8)	7 (29.2)	0.902
	Single	18 (69.2)	17 (70.8)	
Education status	High school and before	4 (15.4)	15 (62.5)	0.803 ^a
	University	11 (42.3)	9 (37.5)	
	Master's degree	11 (42.3)	0 (0)	

$p<0.05$; Chi-Square Test; a: Fisher Exact Test; %: percentage, n: number of individuals

Table 2. Comparison of mcgill melzack pain questionnaire, neck disability index, and bournemouth neck questionnaire scores within and between groups

Variable		Intervention Group (n=26)	Control Group (n=24)				
		X±SD (Min-Max)	X±SD (Min-Max)	P value			
p<0.05; Whitney	MMPQ	BT	67.15±8.34 (51-85)	66.04±7.65 (50-77)	0.734		
		AT	65.85±8.53 (50-86)	64.5±7.74 (49-76)	0.756		
		p ^c	<0.001	<0.001			
		BT	67.15±8.34 (51-85)	66.04±7.65 (50-77)	0.734		
		NDI	BT	14.38±7.12 (5-32)	12.08±7.26 (1-27)	0.259	
			AT	9.42±6.7 (0-24)	7.21±6.16 (0-20)	0.205	
			p ^c	<0.001	<0.001		
	AT-BT	4.96±1.54	4.88±1.83	0.968			
	BNQ	BT	31.35±13.14 (11-66)	27.13±12.41 (13-63)	0.129		
		AT	23.65±13.81 (7-60)	20.08±13.63 (7-59)	0.206		
		p ^c	<0.001	<0.001			
		AT-BT	7.69±2.38	7.04±2.27	0.280		

^b:Mann-U Test;

^b:Mann-U Test;

^c:Wilcoxon Test; n: number of people, X: Mean, SD: Standard Deviation; Min: Minimum; Max: Maximum; BT: Before Treatment; AT: After Treatment; MMPQ: McGill Melzack Pain Questionnaire; NDI: Neck Disability Index; BNQ: Bournemouth Neck Questionnaire

DISCUSSION

The objective of this study was to examine the impact of chiropractic intervention on the prevalence and severity of neck pain, as well as on functional capacity and disability level in individuals diagnosed with cervical disc herniation. The findings of the study indicated that chiropractic treatment resulted in a reduction in neck pain and disability, as well as an improvement in functionality, in individuals with cervical disc herniation. Nevertheless, no discernible difference was noted between the control group, who received conventional physiotherapy, and the intervention group, who received chiropractic treatment in addition to conventional physiotherapy.

Cervical disc herniation is defined as the protrusion of nucleus pulposus material through the annulus into the spinal canal. The degeneration of the disc is typically a painless process, with pain only occurring when the disc exerts pressure on pain-sensitive structures, such as the dura or nerve root (Ombregt, 2013). It has been shown that cervical intervertebral disc degeneration can lead to neck pain (Peng & DePalma, 2018). The presentation of neck pain in individuals with cervical disc herniation is characterized by the presence of pain caused by the disc herniation, which is perceived in the neck and radiates to the head, scapula, and arm (Risbud & Shapiro, 2014). Neck pain represents one of the primary causes of disability (Uthman, 2016; Tabassum & Azim, 2024). The majority of individuals presenting with neck pain continue to experience this symptom with a clinically variable course, exhibiting fluctuations in pain intensity and disability (Blanpied et al., 2017). Neck pain is a prevalent issue encountered in outpatient settings, representing approximately 18 to 23% of primary concerns in chiropractic practice (Beliveau et al., 2017; Cohen & Hooten, 2017). Given the diversity of diagnostic, assessment and treatment approaches to neck pain in chiropractic practice, it is crucial to develop a consistent approach that is based on the best available evidence in order to ensure optimal patient care (Bussi eres et al., 2016).

The conclusion that spinal manipulation has little effect when compared to no treatment or other non-invasive complementary and alternative medical treatments is supported by the strongest evidence. There is conflicting evidence regarding the superiority of other complementary and

alternative therapies over sham treatments or other treatments, despite the fact that they have generally been found to be superior to the no-treatment group (Cohen, 2015; Katkat & Do anel, 2024). Furthermore, the efficacy of chiropractic adjustments for the treatment of neck pain in patients with cervical disc herniation remains poorly understood (Bale & Newell, 2005; Zuo et al., 2019). Therefore, we thought that our present study can provide a significant contribution to the existing literature on this topic.

Vernon et al. applied a manipulation technique to the cervical region. Their findings indicated that a greater proportion of patients reported an improvement in pain with the sham procedure than with the real manipulation. However, no statistically significant differences were observed between the two groups in terms of pain, pain threshold, or range of motion (Vernon et al., 2012). Furthermore, a systematic review indicated that in eight of the 21 studies that evaluated cervical spinal manipulation and a type of sham-controlled manipulation, the control procedure resulted in a mean change that fell below the clinically insignificant and clinically significant minimal threshold (Vernon et al., 2011). A further study demonstrates that manipulative adjustment is an efficacious method for alleviating pain in patients with chronic mechanical neck pain, with the beneficial effects persisting for three months (Lin et al., 2013). A systematic review of the literature revealed that there is moderate evidence to suggest that spinal manipulative therapy for chronic neck pain is more efficacious than physiotherapy and general practitioner care (Bronfort et al., 2004). A review of high-quality randomized controlled trials on the mobilization and manipulation of mechanical neck pain demonstrated robust evidence that such techniques, when combined with exercises, are beneficial for the treatment of acute or chronic neck pain with or without headache (Gross et al., 2015). Additionally, another study demonstrated that the manipulation resulted in a notable reduction in neck pain and disability in patients presenting with unilateral or central neck pain (Masaracchio et al., 2013). In other studies examining the effects of spinal manipulation on neck pain and disability at varying chronicity levels, it was observed that the manipulated group exhibited improvement, yet no discernible difference was noted between the two groups (Kim, 2010; Miranda et al., 2015). The

improvement in self-reported neck pain and disability observed in our study is consistent with the findings of previous research. It is hypothesized that manual manipulation may reduce the pressure on the nervous system by providing spinal alignment (Dinich, 2013). The findings of this study indicate that there is no statistically significant difference between the control group, who received conventional physiotherapy, and the intervention group, who received chiropractic in addition to conventional physiotherapy, in terms of neck pain, disability level and functionality. It is our contention that further research is required in the form of large-scale studies with longer follow-up periods and larger sample sizes in order to ascertain the true impact of these methods. In addition, it is possible that other biopsychosocial factors may also contribute to neck pain and disability. The use of only one chiropractic technique may also have influenced the results. Further neurophysiological studies are needed to better understand the effects of this treatment method on pain mechanisms. We assert that the role of individual factors was prominent in our study and that the heterogeneity of responses to treatment among individuals requires consideration of individual differences and disease specificity. It is recommended that future studies be designed and conducted to identify such patient subgroups. Furthermore, future research should comprehensively evaluate the therapeutic effects, side effects, and costs of manipulation in comparison to other common treatments for neck pain. The incorporation of superior diagnostic instruments for pre- and post-assessment purposes would facilitate greater precision in the evaluation of its effects. Long-term follow-up studies are required to ascertain the long-term effects of manipulation and the recurrence rate of disc displacement. Furthermore, single blinding and randomization were performed in our study. However, the lack of double blinding can be considered as a limitation. The planning of larger double blinding studies that evaluate in more detail the genetic, biomechanical, and psychosocial factors that determine the effectiveness of chiropractic treatment, plan individualized patient-specific treatment, and evaluate its long-term effects are of great importance in this context. Further research is, therefore, required to provide a more complete understanding of the effect of these treatment strategies for individuals with cervical disc herniation.

Conflict of Interest

We declare that the articles we write are not involved in any particular conflict of interest and adhere to the Declaration of Helsinki.

Ethics Statement

This study followed the guidelines outlined in the Declaration of Helsinki. The approval was taken from the Üsküdar University Non-Interventional Research Ethics Committee (reference number 61351342/July 2023-21).

Author Contributions

Research Design, NU, ÖŞ; Research Data Input, NU, ÖŞ, BDH; Statistical Data Analysis, NU, ÖŞ; Data Processing, NU, ÖŞ, BDH; Manuscript Preparation, NU, ÖŞ, BDH; Journal Literacy, NU, ÖŞ, BDH. Each author has reviewed the final draft of the manuscript and given their approval.

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