

## Effect of Manual Therapy in Reducing Neck Pain in Patients with Hernia Nucleus Polposus Cervicalis

Dimas Liwung Sasongko Putro, Wahyu Tri Sudaryanto

Physiotherapy Department, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta

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### ABSTRACT

**Background:** Herniated Nucleus Pulposus Cervicalis (HNPC) is a medical condition characterized by the posterior or posterolateral protrusion of the intervertebral disc, resulting from the degeneration of the fibrous annulus. This protrusion exerts pressure on the nerve roots and spinal cord, leading to the development of neurological disorders. This study aimed to assess the efficacy of manual therapy in alleviating neck pain among patients diagnosed with cervical herniated nucleus pulposus.

**Subjects and Method:** A randomized controlled trial was carried out at JIH Hospital in Yogyakarta from August to September 2023. Fourteen patients diagnosed with cervical herniated nucleus pulposus (HNPC) were purposively sampled for the study. Seven patients underwent manual therapy as an intervention, while the remaining seven received standard treatment as the control group. The dependent variable assessed was neck pain, measured using a visual analogue scale (VAS). The independent variable was orthopedic manual physical therapy. The differences in neck pain scores between the two groups were analyzed using an independent t-test.

**Results:** Following the intervention, the pain score in the intervention group (Mean 2.43; SD= 1.13) exhibited a significant reduction compared to the control group (Mean= 4.86; SD= 0.90), with a p-value of 0.001.

**Conclusion:** Orthopedic manual therapy effectively alleviates neck pain in individuals with cervical herniated nucleus pulposus.

**Keywords:** orthopedic manual therapy, neck pain, cervical herniated nucleus pulposus

### Correspondence:

Dimas Liwung Sasongko Putro. Physiotherapy Department, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta. Jl. Garuda Mas No. 2, Gatak, Pabelan, Kartasura, Sukoharjo, Central Java 57169. Email: liwung65@gmail.com. Mobile: 081392172245.

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### BACKGROUND

Herniated Nucleus Pulposus Cervicalis (HNPC) frequently contributes to neck pain in adults. The spectrum of the condition varies from mild to severe, with potential life-threatening implications. This ailment is a commonly encountered neck disorder.

Cervical Nucleus Pulposus Hernia manifests as a condition wherein the intervertebral disc protrudes posteriorly or posterolaterally due to the degeneration of the fibrous annulus. The resulting bulge exerts pressure on nerve roots and the spinal cord, giving rise to neurological disorders (Cicco and

Willhuber, 2023). Herniated Nucleus Pulposus (HNP) is a condition characterized by frequent pain in the spinal segments. HNP occurs when the nucleus pulposus, a rubbery, gellike substance, protrudes from the intervertebral discs or spinal joints (Dydyk et al., 2023).

Cervical Nucleus Pulposus Hernia disorders typically affect individuals between the ages of 30 and 50, with a higher prevalence observed in the age range of 20 to 40 years when the nucleus pulposus remains gelatinous. Risk factors for HNPC include degenerative factors, static mechanical factors such as malposition, and dynamic mechanical factors such as injuries (Cicco and Willhuber, 2023).

According to the World Health Organization (WHO), neck pain ranks as the second most prevalent musculoskeletal disorder following low back pain (WHO, 2022). It is a widespread condition and a primary contributor to global disability (Kazeminasab et al., 2022). The prevalence of neck pain worldwide ranges from 16.7% to 75.1% (Nair et al., 2022). Based on the 2010 Global Burden of Disease study, neck pain stands as the fourth most common cause of disability in the United States (Hoy et al., 2014). Neck pain is characterized by an uncomfortable sensation of varying intensity that impacts one of the structures within the cervical spine. Frequently transient, this condition often lacks a discernible cause or connection to a neck injury (Misailidou et al., 2010).

The International Association for the Study of Pain (2017) stated that chronic pain in the neck or cervical column is categorized within musculoskeletal disorders (Meleger and Krivickas, 2007). Neck pain is characterized as enduring discomfort in the posterior cervical region, spanning from the inion to the first thoracic vertebra, persisting for 3 months or longer. It arises from degenerative or inflammatory disorders of the joint,

frequently accompanied by nerve pain in the neck or cervical region. This condition can impede movement, leading to disability and a reduction in quality of life. The repercussions of neck pain extend beyond individuals to impact their families, communities, healthcare systems, and employment (Binder, 2007).

Orthopedic manual physical therapy (OMPT) stands as a specialized discipline within physiotherapy/physical therapy dedicated to addressing neuromusculoskeletal conditions. Rooted in clinical reasoning, OMPT employs a targeted treatment methodology that encompasses manual techniques and therapeutic exercises. This approach is guided by the integration of scientific and clinical evidence, as well as the individualized biopsychosocial framework of each patient (Hidalgo, 2016). Manual therapy, also known as manipulative therapy, is a specialized skill wielded by physiotherapists or physical therapists to address neuromusculoskeletal issues through hands on techniques and targeted therapeutic exercises. The primary objectives include pain reduction, enhanced joint mobility, tissue repair, and improvement in the extensibility, stability, and function of muscles and joints. Boyles et al. (2011) discovered that manual therapy, involving mobilizations such as cervical or thoracic spine push techniques and cervical non-push mobilizations (e.g., PA glides, lateral glides in ULTT1 position, rotations, retractions), can effectively diminish pain, enhance functionality, and augment joint range of motion.

Manual orthopedic physical therapy may involve a sequence of Mobilization with Movement (MWM) and Mulligan Manual Therapy (MMT). MWM empowers therapists to execute rotational movements, joint slides, or a blend of both until a patient, who was previously experiencing pain, achieves

relief. The Mulligan method adheres to the principle that mobilization should always occur at an angle parallel to the affected joint, ensuring that most mobilizations take place in a weight-bearing position, indicating the percentage of body weight applied to the injured area (Vicenzino et al., 2007). At the moment of injury, even minor changes in joint position (detectable via radiographic examination) can lead to restricted movement or discomfort. The Mulligan method addresses these slight joint alterations by applying movements opposite to the existing changes until the joint becomes pain-free and normal function is restored (Westad et al., 2019; Hing et al., 2019). Manual therapy, a relatively modern approach, employs pain-free, low-speed joint mobilization techniques, often incorporating an active movement component (Bishop et al., 2015).

## SUBJECTS AND METHOD

### 1. Study Design

Randomized controlled trial carried out at JIH Hospital in Yogyakarta, from August to September 2023.

### 2. Participants

A total of 14 patients with cervical nucleus pulposus hernia were selected for this study using purposive sampling techniques. Exclusions comprised individuals with fractures, spondylosis, spondylolisthesis, osteoporosis, tumors, or acute inflammation. The participants were divided into two groups: the intervention group (7 patients) received manual therapy, incorporating orthopedic manual physical therapy, sustained natural apophyseal glides, thoracic spine mobilization, and direction movement control training; while the control group (7 patients) received standard treatment.

### 3. Study Variables

The independent variable was manual therapy. The dependent variable was neck pain.

### 4. Operational Definition of Variables

#### Orthopedic Manual Physical Therapy (OMPT)

is a specialized branch of physiotherapy/physical therapy dedicated to addressing neuro-musculoskeletal conditions. This manual therapy encompasses various techniques, including (1) Sustained Natural Apophyseal Glides (SNAG), such as the SNAG C1-C2 rotation technique applied within a specific region of the patient. The therapist positions their thumb over the transverse process of C1 and proceeds to glide ventrally with active rotation, performing a maximum of 3 repetitions. Another technique, Thoracic Spine Mobilization (TSM), involves the patient crossing their arms in front of their chest while sitting in a chair without leaning against the wall. The physical therapist administering the intervention positioned a device consisting of two tennis balls affixed with athletic tape between the patient's first lumbar vertebra and the fourth thoracic spinous process (Johnson and Grindstaff, 2012). The patient was instructed to flex the thoracic spine to its maximum range within 3 seconds, followed by extending the thoracic spine to its maximum range within the next 3 seconds. After ten repetitions of these active flexion-extension movements, the device was positioned between the spinous processes of the fifth and eighth thoracic vertebrae, and the same set of movements was repeated 10 times. (3) Direction-movement control training refers to an exercise program designed to enhance overall body function by improving the functionality, endurance, precision of head repositioning, range of motion, and endurance of the cervical flexors.

**Neck pain** is a discomfort of varying intensity that impacts one of the structures of the cervical spine. This condition is typically transient and may not be attributed to a specific cause or neck injury (Guzman et al., 2009).

**5. Study Instruments**

The Visual Analogue Scale (VAS) was utilized to measure pain intensity in patients with Cervical Herniated Nucleus Pulposus.

**6. Data analysis**

All data were analyzed using SPSS 21.0 (SPSS, Inc.). Descriptive statistics were employed to summarize the age and neck pain scores of the participants. The efficacy of manual therapy in reducing neck pain

**1. Univariate Analysis**

This study comprised 5 female (35.71%) and 9 male (63.29%). Table 1 illustrates that the average age of the research subjects was 43 years old. This findings showed that

was assessed using an independent t-test. Differences between the means were considered significant at a 5% probability level ( $p < 0.05$ ), with a confidence interval (CI) set at 95%.

**7. Research Ethics**

This research was conducted with ethical approval obtained through a permission letter, which encompassed informed consent and confidentiality. The ethical clearance for this research was granted by the Research Ethics Committee of the Educational Institution at UNRIYO under reference number: 018.3/FIKES/PL/VIII/-2023.

**RESULTS**

the average pain score for all research subjects was 5.43. Following the intervention, the average pain score for all research subjects decreased to 3.64.

**Table 1. Sample characteristics**

Variables	n	Mean	SD	Min.	Max.
Age (years old)	14	43	11.96	20	63
Neck pain (pre treatment)	14	5.43	1.22	3	7
Neck pain (post treatment)	14	3.64	1.59	1	6

**Table 2. Differences in pain scores before and after intervention across the groups.**

Groups	n	Mean	SD	p
<b>Pain score before treatment</b>				
Control	7	5.57	1.13	0.679
Intervention	7	5.28	1.38	
<b>Pain score after treatment</b>				
Control	7	4.86	0.90	0.001
Intervention	7	2.43	1.13	

Table 2 outlined the differences in pain scores before and after intervention across groups. At baseline, there was no difference in pain scores between the intervention group (Mean= 5.28; SD= 1.38) and control (Mean= 5.57; SD= 1.13), with  $p = 0.679$ . It

indicates an equal distribution of pain characteristics in both groups. Following the intervention, the pain score in the intervention group (Mean= 2.43; SD= 1.13) demonstrated a significant decrease com-

pared to the control group (Mean= 4.86; SD= 0.90), with  $p= 0.001$ .

## DISCUSSION

Hernia of the Nucleus Pulposus Cervicalis (HNPC) is a condition in which the intervertebral disc protrudes posteriorly or posterolaterally due to the degeneration of the fibrous annulus. This protrusion results in pressure on the nerve roots and spinal cord, leading to neurological disorders (Chen et al., 2017).

Herniated Nucleus Pulposus Cervicalis (HNPC) typically affects individuals aged 30 - 50 years, with a heightened prevalence observed between 20 - 40 years when the nucleus pulposus retains its gelatinous nature. Risk factors for HNPC include degenerative changes, static mechanical factors such as malposition, and dynamic mechanical factors like injuries. The incidence of HNPC constitutes approximately 20% of the total cases of herniated nucleus pulposus, with 80% occurring in the lumbar area (Bono et al., 2010; Nadeak, 2019). Neck pain is a discomfort of varying intensity that impacts one of the structures in the cervical spine. This condition is typically temporary and may not have a discernible cause or be a consequence of a neck injury (Ridder et al., 2021; Qu et al., 2022). Herniation is more prone to occur posterolaterally, particularly where the annulus fibrosus is thinner and lacks the structural support provided by the posterior longitudinal ligament. The proximity of the herniation to the traversing cervical nerve root can lead to compression, potentially causing radiculopathy within the associated dermatome (Dydyk et al., 2023).

Manual therapy, also known as manipulative therapy, is a specialized skill employed by physiotherapists or physical therapists to address neuromusculoskeletal issues. This approach utilizes hands-on techniques and therapeutic exercises with the

goals of alleviating pain, enhancing joint coverage, fostering tissue repair, and improving the extensibility, stability, and function of muscles and joints (Sebastian, Deepak, 2005). Boyles et al. (2011) discovered that manual therapy, involving cervical or thoracic spine push mobilizations and cervical non-push mobilizations (such as PA glides, Lateral Glides in ULTT1 position, Rotations, Retractions), demonstrated effectiveness in reducing pain, enhancing function, and increasing joint range of motion (ROM).

The findings of this study highlight the efficacy of manual therapy in alleviating neck pain among patients with cervical herniated nucleus pulposus. Thoracic flexion dissociation evaluates the capacity to actively isolate and control low cervical flexion while maneuvering the thoracic spine into flexion (Joshi et al., 2019). The overhead arm raise dissociation focuses on retraining the capacity to actively isolate and control low cervical flexion while facilitating shoulder movement in overhead flexion. Similarly, forward head lean dissociation aims to retrain the ability to actively isolate and control upper cervical flexion while facilitating movement in the lower cervical spine into flexion (Kim et al., 2018). The emphasis is on retraining the coordination of movement patterns rather than solely focusing on the range of movement or muscle activation strength (Latash, 2018).

## AUTHOR CONTRIBUTION

Dimas Liwung Sasongko Putro conceived and designed the analysis, measured neck pain level, and collected the data. Wahyu Tri Sudaryanto performed the analysis, interpreted the results of analysis, and co-authored the paper with Dimas Liwung Sasongko Putro.



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### CONFLICT OF INTEREST

All authors assert that there are no conflicts of interest.

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