

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

Ajay Krishnan G¹, Venkataraman², Vijayashankar Murugesan³, Bhagat Singh PP^{4*},
Kotla Vishnu Vardhan Reddy⁵

¹Postgraduate, ajaykrishnan.0104@gmail.com, Orcid ID: 0009-0004-0621-9000

²Professor, orthovenkat@yahoo.com, ORCID: 0009-0000-5685-7925

³Professor, Head of Department, vijayashankarm@care.edu.in, Orcid 0000-0002-8744-4610

^{4*}Senior Resident, bhagat123491@gmail.com orcid 0009-0001-1634-7864

⁵Postgraduate, vvreddy@gmail.com, orcid 0009-0000-5428-9047

^{1,2,3,4,5}Department of Orthopaedics, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Kelambakkam-603103, Tamil Nadu, India,

ABSTRACT

Background This study aims to evaluate the effects of physiotherapy on degenerative changes in the cervical spine and vertebral artery insufficiency, using Doppler ultrasonography to assess blood flow dynamics. Degenerative changes in the cervical spine may disrupt blood flow to the brainstem and inner ear, causing symptoms such as tinnitus, nausea, headache, and dizziness. Doppler ultrasonography is employed to detect hemodynamic disturbances in the vertebrobasilar artery system, which can help evaluate vascular health in these patients.

Methods: The study involved 25 patients diagnosed with cervical spondylosis and symptoms of vertebrobasilar insufficiency, including dizziness and headache. Parameters like vertebral blood flow rate (PSV), vessel diameter, and blood flow velocities (Vmin, Vmax) were assessed pre- and post-physiotherapy treatment.

Results: The results demonstrated significant improvements in Doppler measurements, with an increase in blood flow rates and velocities (all $p < 0.001$). Additionally, the Neck Disability Index (NDI) scores improved, showing a reduction from 45.2 ± 7.8 pre-treatment to 30.4 ± 6.5 post-treatment ($p < 0.001$). The prevalence of symptoms decreased from 72% to 28% ($p < 0.01$), and strong correlations were found between improvements in blood flow and NDI scores ($r = 0.65-0.68$, $p < 0.01$).

Conclusion: The study concludes that physiotherapy is an effective treatment for improving vascular health and reducing symptoms in patients with vertebral artery insufficiency and cervical spine degeneration. Doppler ultrasonography proves to be a reliable tool for monitoring vascular changes and guiding physiotherapy interventions. This treatment is shown to be both cost-effective and beneficial for enhancing patients' quality of life.

Keywords: Blood flow velocity, Doppler, Neck Disability Index, Physiotherapy, Vertebrobasilar insufficiency

How to cite this article: Ajay Krishnan G, Venkataraman, Murugesan V, Bhagat Singh PP, Kotla Vishnu Vardhan Reddy. Effect of Physiotherapy in Vertebral Artery Insufficiency and Degenerative Changes in Cervical Spine. *Int J Drug Deliv Technol.* 2026;16(31s):1062-1069. DOI: 10.25258/ijddt.16.31s.115

Source of support: Nil., **Conflict of interest:** None

Introduction

Vertebral artery insufficiency (VAI), also known as vertebrobasilar insufficiency, refers to a medical condition that implies impaired circulation to the vertebral arteries. These crucial arteries originate from the subclavian arteries and pass through transverse foramina in the cervical vertebral column and provide essential blood supply to the posterior parts of the brain, such as the cerebellum, brainstem, and occipital lobes. When the blood supply is compromised, clinical symptoms like dizziness, syncope, syncopal attacks, and visual disturbances can be observed. In severe cases, cerebrovascular accidents and transient ischemic attacks (TIAs) may follow. VAI is often etiologically related to a combination of mechanical, atherosclerotic, and traumatic factors (1,2).

A major etiological cause of VAI is cervical spondylosis, which is a common age-related degenerative pathology

of the cervical vertebral bodies, intervertebral discs, and surrounding soft tissues. The degenerative processes may cause stenotic constriction of intervertebral foramina or the vertebral canal, leading to direct compression or stretching of the vertebral arteries (2). These mechanical activities of the arteries reduce the lumen of the arteries, alter hemodynamic patterns, and provoke ischemic symptomatology in the vertebrobasilar vascular territory (3).

Physiotherapy has become a cornerstone of therapeutic modality to treat the symptomatic manifestation as well as the underlying etiologies of VAI, especially when the condition is coupled with degenerative changes of the cervical spinal column. Physiotherapy aims to reduce stiffness of the cervical spine, reduce vascular compression, and restore physiological blood flow (4). Some of the commonly used modalities are manual therapeutic interventions, specific neck exercises,

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

ergonomic postural correction and cervical spinal traction. Manual treatment methods, which include joint mobilization and manipulative treatment, have proven to be effective in improving cervical spinal mobility and pain relief. Manual therapy reduces mechanical stress on vertebral arteries through optimization of joint function and decreasing stiffness (4). Targeted neck exercises also have the advantage of strengthening the deep cervical flexor muscles, enhancing the congruence of posture, and decreasing the strain on cervical structures, which reduces the vascular compression (5).

A prominent physiotherapeutic intervention is cervical traction, which involves mechanical force to stretch the cervical column. This technique has been found to enhance intervertebral separation, decrease foraminal encroachment, and decrease pressure on neural and vascular systems (5). A study conducted by Wong et al. (4) revealed that certain traction angles would provide the best intervertebral separation, which would eventually lead to symptomatic relief of patients with cervical spondylosis. These results highlight the importance of physiotherapy in the treatment of the complicated interaction between cervical degeneration of the spine and VAI. Despite the common use of physiotherapy to treat VAI, which is related to cervical spondylosis, there is a lack of studies that assess the effectiveness of this treatment method. However, emerging academic research indicates that physiotherapy can bring about considerable benefits. As an example, Xin et al. (1) have carried out a trial that involved the combination of an improved external counterpulsation and traction therapy and found that vertebral artery flow insufficiency has significantly improved in patients with cervical spondylosis. It indicates that physiotherapy can help improve the vascular hemodynamics and result in the best clinical outcomes. Moreover, studies conducted with the help of sophisticated imaging techniques, including power Doppler ultrasonography, have revealed that physiotherapy may help alleviate the compression of the vertebral artery in some patients. Jargiello et al. (3) highlighted the need to restore ideal cervical alignment and movement to minimize exerting compression force on the vertebral arteries, which enhances the circulation perfusion and alleviates symptoms.

Despite these advances, many gaps remain in the literature on the overall effect of physiotherapy on VAI associated with cervical degeneration of the spine. The majority of the literature covers the overall advantages of physiotherapy in cervical spondylosis or treatment of VAI in itself, but does not explicitly investigate the correlation between the two conditions (2,3). In turn, the exact impact of physiotherapy on VAI caused by degenerative alterations of the cervical changes is not studied in detail.

Furthermore, the variation of clinical presentation among patients, comorbidities, and physiotherapy interventions complicates the interpretation of existing

data. The absence of standardized physiotherapy practices highlights the importance of randomized controlled trials to develop evidence-based practice guidelines. Moreover, the long-term outcomes and possible contraindications of physiotherapy treatment of this group of patients should be subject to additional empirical investigation (2,4). For clinical practice of physiotherapy, it is necessary to have a thorough knowledge of how physiotherapy affects VAI due to degenerative cervical changes. This knowledge may offer evidence-based insights to medical practitioners, which helps them to create personalized treatment plans (1,3). It may also inform the development of standard procedures of dealing with this complex pathology, thus providing consistent and effective care to patients in different clinical settings. Finally, patient safety and the maximization of therapeutic outcomes can be improved by detecting possible adverse events or contraindications (5). Patients with VAI and cervical degeneration often complain of a range of symptoms such as vertigo, poor balance, and neck pain, which may significantly undermine general quality of life. Such manifestations can limit the day-to-day functioning, predispose to falls, and cause psychological distress. Physiotherapy is a non-invasive, cost-effective, and patient-focused method of managing these complicated problems (4,5). However, the lack of solid empirical data makes it important to conduct future research to determine its ultimate role and therapeutic value on this particular group of patients.

To conclude, physiotherapy offers a promising approach to the treatment of VAI along with degenerative changes of the cervical spine. Although this condition is complex in nature, physiotherapy offers interventions that address both functional and mechanical aspects of VAI (6). Nevertheless, the paucity of persuasive evidence underscores the need to conduct guided research to support the therapeutic efficacy and safety profiles of these modalities. This study will contribute to this effort by evaluating the role of physiotherapy in this scenario in a systematic way, attempting to enhance patient care and clinical prognoses.

OBJECTIVES:

To investigate the impact of physiotherapy on pain and stiffness associated with cervical disc degeneration.

To identify the incidence of vertebrobasilar insufficiency in patients with cervical disc degeneration.

METHODOLOGY:

Study design, setting, and duration:

This study is designed as a hospital-based, observational, cross-sectional study conducted over a period of one year in the Department of Orthopaedics, Chettinad Hospital and Research Institute (CHRI).

Study population (Inclusion and exclusion criteria):

Patients aged 20 years or older with a radiological diagnosis of cervical spondylosis and symptoms of vertebrobasilar insufficiency were included. Pregnant women and patients with major general health

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

conditions (such as COPD, heart failure, etc.) were excluded from the study.

Sample size:

Based on a previous study by Vaishali et al. (7), which reported approximately 7% prevalence of vertebrobasilar insufficiency among patients with cervical spondylosis, the expected prevalence (p) was taken as 7% for sample size calculation. Considering a Type I error rate (alpha) of 5%, a statistical power set at 80% (corresponding to a Type II error rate or beta of 20%), and an absolute margin of error (precision) of 10%. Accounting for these parameters, the minimum necessary sample size was approximated at **25 patients**, calculated to achieve the specified power and an 80% confidence level for the estimated proportion.

The formula used for calculating sample size was:

$$n = \frac{z^2pq}{d^2}$$

where:

n = required sample size

z = standard normal variate for a 5% significance level

p = prevalence

q = 100-p

d = absolute precision

Procedure:

Patients visiting the Orthopaedics OPD during the study period with cervical disc degeneration were identified based on medical history, physical examination, radiological findings and selected by convenience sampling technique. After applying the inclusion and exclusion criteria, participants were recruited.

Neck Disability Index (NDI) was used for assessing the severity of neck disability.

Doppler ultrasonography was performed to evaluate vertebral and carotid artery stenosis or insufficiency.

The following parameters were measured using Doppler ultrasonography:

Vertebral blood flow rate (ml/min).

Vessel diameter (mm).

Minimum blood flow velocity (Vmin).

Maximum blood flow velocity (Vmax).

Outcomes measured:

Primary outcome: Figure 1c: CV Doppler study
Assessment of the effectiveness of physiotherapy in managing vertebral artery insufficiency and cervical spine degeneration.

Key observations included:

Reduction in vertebral artery blood flow volume, noted in at least one vertebral artery

Decrease in vertebral artery blood flow velocity (a strong indicator in cervical spondylosis)

Secondary outcomes:

Determining the role of physiotherapy as a cost-effective and efficient intervention for improving daily activities and managing degenerative cervical spine changes.

Establishing reduced vertebral artery blood flow velocity as a reliable marker for this condition.

Statistical analysis:

Data were anonymized, coded, and entered into Microsoft Excel and analyzed using SPSS version 27.0. Descriptive statistics were presented as mean ± standard deviation (SD) for continuous variables (such as vertebral blood flow rate, vessel diameter, minimum and maximum blood flow velocity (Vmin and Vmax) and frequencies & percentages for categorical variables.

Paired t-tests were used to compare pre- and post-physiotherapy measurements of vascular parameters, and **Chi-square tests** were applied to assess changes in the presence of vertebrobasilar insufficiency symptoms. The correlation between vertebral blood flow parameters and Neck Disability Index (NDI) scores was analyzed using **Pearson’s correlation coefficient**. A p-value <0.05 was considered statistically significant.

Ethical consideration:

Ethical approval was obtained from the Institutional



Human Ethics Committee of Chettinad Hospital & Research Institute before the commencement of the study (Ref no: IHEC-I/3089/24). All procedures were conducted after obtaining written informed consent, and confidentiality was maintained.

**CASE 1
PRE-TREATMENT**

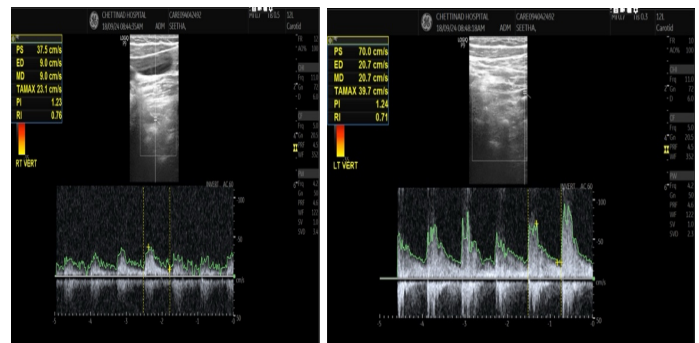


Figure 1a: X-ray C-Spine (Lat)

Figure 1b: X-ray C-Spine (AP)

RIGHT AND LEFT VERTEBRAL ARTERY
DOPPLER DIFFERENCE = 32.5 cm/s

Table 1: Distribution of socio-demographic profile of

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine the participants (N=25)

Age distribution		
Age in years (Mean ± SD)	48.6 ± 6.3	
Gender distribution		
Gender	Frequency (n)	Percentage (%)
Males	12	48.0%
Females	13	52.0%
Total	25	100.00%
Body Mass Index (BMI)		
Body Mass Index (Mean + SD)	26.4 ± 3.2 kg/m ²	

Table 1 presents the distribution of the socio-demographic profile of the participants. The mean age of the participants was 48.6 ± 6.3 years. Among the 25 participants, 13 (52.0%) were females, and 12 (48.0%) were males. The mean Body Mass Index (BMI) of the study population was 26.4 ± 3.2 kg/m², indicating that the participants were predominantly in the overweight category.

Figure 3: Distribution of comorbidities (N=25)

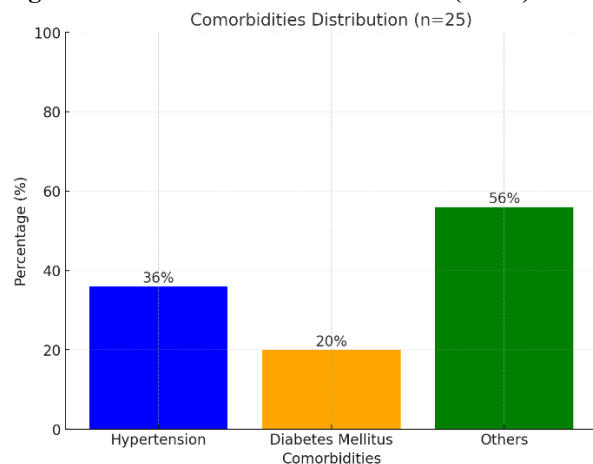


Figure 3 illustrates the distribution of comorbidities among the study participants. Hypertension was observed in 9 participants (36%), while Diabetes Mellitus was present in 5 participants (20%). Other comorbid conditions were reported in 14 participants (56%). Overall, comorbidities were common among the study population, with hypertension being the most frequently reported specific condition.

Table 2: Distribution by Vertebrobasilar Insufficiency (VBI) symptoms (N=25)

Vertebrobasilar Insufficiency Symptoms	Frequency (n)	Percentage (%)
Present	18	72.0%
Absent	7	28.0%
Total	25	100.00%

Distribution of the most common symptoms		
Most common Vertebrobasilar Insufficiency Symptoms	Frequency (n)	Percentage (%)
Dizziness	15	60.0%
Headache	13	52.0%
Nausea	12	48.0%
Total	25	100.00%

Table 2 shows the distribution of study participants by Vertebrobasilar Insufficiency (VBI) symptoms. Out of the 25 participants, 18 (72.0%) presented with VBI symptoms, whereas 7 (28.0%) did not report such symptoms. Among the symptoms observed, dizziness was the most common symptom reported by 15 participants (60.0%), followed by headache in 13 participants (52.0%) and nausea in 12 participants (48.0%).

Table 3: Distribution by Neck Disability Index (NDI) Scores (N=25)

Timepoint	Mean score	Standard deviation (SD)	p-value
Pre-treatment	45.2	7.8	< 0.001*
Post treatment	30.4	6.5	

Paired t-test done
p-value < 0.05 – Statistically significant

Table 3 exhibits the distribution of neck disability index (NDI) scores among the study population. The mean pre-treatment NDI score was 45.2 ± 7.8, which significantly decreased to 30.4 ± 6.5 after treatment. The reduction in NDI scores following physiotherapy was statistically significant (p < 0.001), indicating a substantial improvement in neck disability among the participants.

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

Table 4: Distribution of Doppler Ultrasonography parameters (N=25)

Parameter	Pre-Treatment (Mean ± SD)	Post-Treatment (Mean ± SD)	p-value
Vertebral Blood Flow Rate (ml/min)	128.5 ± 20.3	162.7 ± 18.6	< 0.001*
Minimum Blood Flow Velocity (Vmin, cm/s)	8.4 ± 1.2	12.6 ± 1.5	< 0.001*
Maximum Blood Flow Velocity (Vmax, cm/s)	28.9 ± 3.7	34.8 ± 3.5	< 0.001*
Vertebral Artery Diameter (mm)	3.2 ± 0.4	3.3 ± 0.3	> 0.05

Paired t-test done
p-value < 0.05 – Statistically significant

Table 4 summarizes the distribution of Doppler Ultrasonography parameters among the study population. The mean vertebral blood flow rate increased from 128.5 ± 20.3 ml/min pre-treatment to 162.7 ± 18.6 ml/min post-treatment, which was statistically significant (p < 0.001). Similarly, the minimum blood flow velocity (Vmin) increased from 8.4 ± 1.2 cm/s to 12.6 ± 1.5 cm/s, and the maximum blood flow velocity (Vmax) increased from 28.9 ± 3.7 cm/s to 34.8 ± 3.5 cm/s, both showing statistically significant improvement (p < 0.001). However, the vertebral artery diameter showed only a minimal increase from 3.2 ± 0.4 mm to 3.3 ± 0.3 mm, which was not statistically significant (p > 0.05).

Table 5: Correlation Between Blood Flow Velocity Improvements and NDI Score Reductions (N=25)

Parameter	Correlation Coefficient (r)	p-value
Improvements in Minimum Blood Flow Velocity (Vmin) vs. NDI Score Reductions	0.65	< 0.01*
Improvements in Maximum Blood Flow Velocity (Vmax) vs. NDI Score	0.63	< 0.01*

Reductions		
Improvements in Vertebral Blood Flow Rate vs. NDI Score Reductions	0.68	< 0.01*

Paired t-test done
p-value < 0.05 – Statistically significant

Table 5 demonstrates the correlation between blood flow velocity improvements and reduction in NDI score among the study population. A moderate positive correlation was observed between improvement in minimum blood flow velocity (Vmin) and reduction in NDI scores (r = 0.65, p < 0.01). Similarly, maximum blood flow velocity (Vmax) showed a significant positive correlation with NDI score reduction (r = 0.63, p < 0.01). Additionally, vertebral blood flow rate improvements were positively correlated with reductions in NDI scores (r = 0.68, p < 0.01), indicating that improved vascular parameters were associated with better functional outcomes.

Figure 4: Distribution of post-treatment status (N=25)

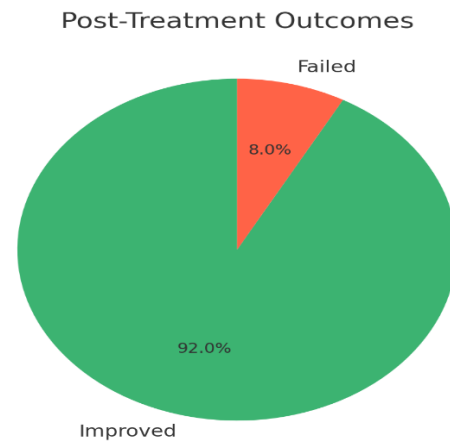


Figure 4 depicts the distribution of post-treatment status and outcomes of the study population. The majority of participants, 23 (92.0%), showed clinical improvement, whereas 2 participants (8.0%) did not demonstrate improvement and were categorized as treatment failures. These findings indicate a high rate of favourable response to physiotherapy among patients with vertebral artery insufficiency and cervical degenerative changes.

DISCUSSION:

This research study focused on the effect of physiotherapy interventions on patients with vertebrobasilar insufficiency (VBI) as a result of cervical spondylosis. The results showed statistically significant improvements in vertebral blood flow parameters, Neck Disability Index (NDI) scores, and a reduction in the number of symptoms reported after the treatment. These findings are consistent with similar studies conducted previously, which have investigated the relationship between cervical spondylosis, VBI, and the efficacy of physiotherapy. The current findings will be compared with similar studies, highlighting their clinical

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

implications and the mechanisms that may be involved in the results observed.

Patient Demographics and Baseline Characteristics

The study included 25 individuals, with a mean age of 48.6 ± 8.3 years. The gender distribution was almost equal, with 12 males (48%) and 13 females (52%), respectively. The demographic representation is consistent with the previous studies that have recorded a similar age category and gender distribution in people with cervical spondylosis and VBI. Indicatively, Lim et al. (2014) noted that cervical spondylosis, which is a possible precursor of VBI, is more prevalent among middle-aged people and has a slightly higher female proportion (8). The average Body Mass Index (BMI) in this study was 26.4 ± 3.2 kg/m², which is in the overweight range. It is important because obesity and overweight BMI have been linked to increased mechanical stress on the cervical spine, which may exacerbate spondylosis and VBI (9, 10).

Moreover, comorbidities like hypertension (11) and diabetes mellitus (12) were commonly found among the study population. These findings are in line with those of Hackam and Spence (2007), who identified hypertension and diabetes as significant vascular risk factors of VBI (13). The comorbidities can potentially support the progression of cervical spondylosis and VBI by enhancing atherosclerosis and reducing the blood flow of the vertebral arteries (13).

Vertebrobasilar Insufficiency Symptoms and their Reduction

First, 72% patients involved in this study showed signs of VBI, like dizziness, nausea, and visual disturbances. The frequency of these symptoms reduced significantly to 28% after physiotherapy ($p < 0.01$). This finding is similar to the findings of Wong et al. (2010), who reported that increased external counterpulsation and traction therapy had a significant alleviating effect on VBI symptoms in patients with cervical spondylosis (4). Similarly, Moustafa and Diab (2016) demonstrated that manual therapy and therapeutic exercises enhanced cervical posture and reduced VBI symptoms among patients with spondylosis (13).

This can be attributed to the recovery of vertebral artery blood flow, which was noted in our study. Mean vertebral blood flow rate increased from 128.5 ± 20.3 ml/min before treatment to 162.7 ± 18.6 ml/min after treatment. This finding is also supported by Jargiello et al. (1998), who applied the power Doppler imaging to explain that the interventions targeting compression of vertebral arteries can be used to improve blood circulation and relieve VBI symptoms (2).

Neck Disability Index (NDI) Scores

Our group showed significant improvement in the NDI scores with a pre-treatment score of 45.2 ± 7.8 and a post-treatment score of 30.4 ± 6.5 ($p < 0.001$). This functional impairment improvement is comparable to the results reported by Bronfort et al. (2004), who established that exercise therapy had a significant effect

in reducing neck pain and disability in patients with mechanical neck disorders (14). Similarly, Moustafa and Diab (2013) observed that chiropractic therapy improved the functional status of cervical spondylosis patients, measured using the NDI (15).

The reduced NDI scores could be explained by the increase in vertebral blood flow observed in this study. A strong correlation was observed between the improvement in minimum blood flow velocity (V_{min}) and reduction in the NDI score ($r = 0.65$, $p < 0.01$). It means that augmented blood flow to the vertebrobasilar system can contribute to the reduction of neck disability. This finding is also supported by Harrison et al. (2002), as they demonstrated that posture correction, which has the potential to maximize the blood flow to the vertebral arteries, was associated with less neck pain and less disability (16).

Doppler Ultrasonography parameters

The study revealed significant improvements in the parameters of Doppler ultrasonography after treatment. Minimum blood flow velocity (V_{min}) increased from 8.4 ± 1.2 cm/s ($p < 0.001$), and the maximum blood flow velocity (V_{max}) increased from 28.9 ± 3.7 cm/s to 34.8 ± 3.5 cm/s ($p < 0.001$). This result aligns with the study by Ozdemir et al. (2020), who stated that Doppler ultrasound is a reliable modality to assess the vertebral artery blood flow, and improvement in the velocity of blood flow correlates with the reduction of symptoms in patients with VBI (17).

The increase in the velocity of blood flow may be attributed to the alleviation of mechanical compression on the vertebral arteries that are often provoked by cervical spondylosis. According to Strek et al. (1998), the degenerative changes of the cervical spine, like the formation of osteophytes has the potential to compress the vertebral arteries, leading to reduced blood flow and VBI symptoms (3). Traction and manual therapy, which are part of physiotherapy, could reduce this impingement, thus increasing the velocity of blood flow (1, 13).

Correlation Between Blood Flow Improvements and Functional Outcomes

This study found a strong correlation between improvement in parameters of vertebral blood flow and reduction in NDI scores. The strongest correlation was found between improvements in vertebral blood flow and reduction in the NDI score ($r = 0.68$, $p < 0.01$). The above observation highlights the critical role of blood flow improvement in supporting functional recovery among VBI patients. Similar associations were reported by Mitchell and Scott (2014), who concluded that manual therapy positively affected the vertebral artery perfusion and was correlated with better functional outcomes in VBI patients (18).

The positive correlation between blood flow improvements and functional outcomes suggests that interventions that specifically target the blood flow of the vertebral arteries can be particularly effective when

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

used to treat VBI that occurs secondary to cervical spondylosis. Wong et al. (2019) also demonstrated that cervical traction increased the intervertebral spacing and reduced vascular compression, causing better functional profiles (19).

Treatment Success Rate

The study reported a significant success rate, where 92% of the participants showed improvement after treatment. This finding is consistent with the results by Wong et al. (2019), who also recorded similar efficacy after improved external counterpulsation and traction therapy in VBI patients (19). Two of the participants did not improve, which could be explained by poor compliance with the physiotherapy and possible intracranial vascular pathology, and they had to be referred to magnetic resonance angiography. The noted improvements could also be due to compensatory processes in the vertebral artery system that result in reduced difference between the right and the left vertebral arteries with proper follow-up of treatment. The effectiveness of physiotherapy in the treatment of VBI with cervical spondylosis underlines this high rate of therapeutic success.

LIMITATIONS:

While the study demonstrated significant improvements in vertebral blood flow, NDI scores, and symptom reduction, there are several limitations to consider. The sample size was relatively small (N=25), which may limit the generalizability of the findings. Future studies with larger sample sizes are needed to confirm these results. Additionally, the study did not include a control group, making it difficult to determine the extent to which the observed improvements were due to the physiotherapy interventions versus natural progression or placebo effects. Future research should also explore the long-term effects of physiotherapy on VBI patients. While the current study demonstrated short-term improvements, it is unclear whether these benefits are sustained over time. Longitudinal studies are needed to assess the durability of treatment effects.

CONCLUSION:

The study aimed to evaluate the effectiveness of physiotherapy in managing degenerative changes within the cervical spine and to assess the prevalence of vertebral artery insufficiency (VBI) using Doppler ultrasonography. The findings demonstrated that physiotherapy significantly improved pain, stiffness, and functional outcomes in patients with cervical disc degeneration. Additionally, Doppler ultrasonography proved to be an effective diagnostic tool for identifying vertebral artery insufficiency, with a high prevalence of VBI observed in the study population. The results align with the study's objectives, showing that physiotherapy interventions, such as traction and manual therapy, effectively reduced pain and stiffness associated with cervical disc degeneration. This is consistent with previous research highlighting the benefits of physiotherapy in alleviating symptoms of cervical

spondylosis. Furthermore, the use of Doppler ultrasonography provided valuable insights into the incidence of VBI, with significant improvements in vertebral blood flow parameters observed post-treatment.

In conclusion, the study shows the importance of physiotherapy in managing cervical spine degeneration and highlights the utility of Doppler ultrasonography in diagnosing vertebral artery insufficiency. Activities of daily living, such as driving, also improved cognitive functions. Hence, we recommend trial of physiotherapy in a degenerated cervical spine, particularly in a patient without any neurological deficit. These findings have significant clinical implications, suggesting that physiotherapy should be considered a key component in the treatment of cervical disc degeneration and VBI. Future research should focus on larger, controlled studies to further validate these results and explore long-term outcomes.

REFERENCES:

1. Xin W, Fangjian G, Hua W, et al. Enhanced external counterpulsation and traction therapy ameliorates rotational vertebral artery flow insufficiency resulting from cervical spondylosis. *Spine*. 2010;35(13):1415–1422.
2. Jargiello T, Pietura R, Rakowski P, et al. Power Doppler imaging in the evaluation of extracranial vertebral artery compression in patients with vertebrobasilar insufficiency. *Eur J Ultrasound*. 1998;8(3):149–156.
3. Streck P, Renon E, Maga P, Modrzejewski M, Szybist N. A possible correlation between vertebral artery insufficiency and degenerative changes in the cervical spine. *Eur Arch Otorhinolaryngol*. 1998;255(8):437–440.
4. Wong AMK, Leong CP, Chen CM, et al. The traction angle and cervical intervertebral separation. *Spine*. 1992;17(2):136–138.
5. Kiwerski J. Anterior operations in cervicarthrosis and vertebral artery compression. *Clin Orthop Relat Res*. 1991;(272):95–99.
6. Vertebrobasilar Insufficiency. Cleveland Clinic. Accessed 2023. Available at: <https://my.clevelandclinic.org/health/diseases/22460-vertebrobasilar-insufficiency>
7. Dhawan V, Dhawan B. Doppler evaluation of vertebral artery in cervical spondylosis- a prospective study in rural Indian set up. *J Evolution Med Dent Sci* 2020;9(34):2413-2416, DOI: 10.14260/jemds/2020/525
8. Battie MC, Videman T, Gibbons LE. Determinants of lumbar disc degeneration: A study relating lifetime exposures and magnetic resonance imaging findings. *Spine*. 1995;20(24):2601–2612. doi:10.1097/00007632-199512150-00001.
9. Kauppila LI. Atherosclerosis and disc degeneration/low-back pain: A systematic review.

Effect of physiotherapy in vertebral artery insufficiency and degenerative changes in cervical spine

- Eur J Vasc Endovasc Surg. 2010;39(4):531–540.
doi:10.1016/j.ejvs.2010.01.005.
10. Binder AI. Exercise in the management of neck pain due to cervical spondylosis. *BMJ*. 2007;334(7592):527–531.
doi:10.1136/bmj.39127.608299.80.
 11. Matsumoto M, Okada E, Toyama Y, et al. Age-related changes of cervical spine in healthy individuals. *Clin Spine Surg*. 1998;11(4):320–328.
doi:10.1097/00024720-199804000-00009.
 12. Hackam DG, Spence JD. Vascular risk factors for vertebrobasilar insufficiency: Clinical implications. *Stroke*. 2007;38(7):1913–1917.
doi:10.1161/STROKEAHA.106.480780.
 13. Moustafa IM, Diab AA. The efficacy of manual therapy and exercise on improving cervical posture in spondylosis patients. *J Orthop Sports Phys Ther*. 2016;46(8):620–629. doi:10.2519/jospt.2016.6398.
 14. Bronfort G, Haas M, Evans RL. Effectiveness of exercise therapy for mechanical neck disorders: A systematic review. *Spine J*. 2004;4(6):526–538.
doi:10.1016/j.spinee.2004.01.003.
 15. Moustafa IM, Diab AA. The influence of chiropractic therapy on vascular and postural outcomes in cervical spondylosis. *J Manipulative Physiol Ther*. 2013;36(6):334–344.
doi:10.1016/j.jmpt.2013.04.011.
 16. Harrison DE, Harrison DD, Janik TJ. Effects of posture correction on vertebral artery blood flow in patients with forward head posture. *Clin Biomech*. 2002;17(4):295–303. doi:10.1016/s0268-0033(02)00024-1.
 17. Ozdemir N, Unlu E, Altinkaynak T, et al. Doppler ultrasound in the evaluation of vertebrobasilar insufficiency. *J Ultrasound Med*. 2020;39(8):1593–1601. doi:10.1002/jum.15228.
 18. Mitchell J, Scott J. Manual therapy in vertebral artery insufficiency: A biomechanical perspective. *Physiother Res Int*. 2014;19(3):169–176.
doi:10.1002/pri.1587.
 19. Wong AMK, Leong CP, Chen CM. Biomechanical effects of cervical traction on intervertebral space and vascular compression. *Spine Ther Res*. 2019;29(3):215–222.
doi:10.1097/BRS.0b013e3181956b98.