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THE EFFECTIVENESS OF COMBINATION THERAPY FOR TREATING NON-SPECIFIC NECK PAIN

Dr. Yogesh Patil, Dr. Shikha Paasi, Assistant Professor, Tilak Maharashtra Vidyapeeth's Indutai Tilak College of Physiotherapy, Pune

Abstract
The purpose of this study is to investigate the effectiveness of contemporaneous cervical traction and infrared exposure (Group I) in the treatment of non-specific neck discomfort in comparison to the effectiveness of sequential cervical traction followed by exposure to an infrared lamp (Group II). The research project included a total of 52 participants who were randomly assigned to one of two groups. Treatment was administered to each group for a total of five consecutive days. According to the findings, both treatments led to improvements in cervical disability and intensity of pain that were statistically significant enough to be considered significant. Group I, in which patients were subjected to simultaneous infrared radiation and cervical traction, was shown to have significantly lower ratings on both the Neck Disability Index (NDI) and the Visual Analogue Scale (VAS). On the other hand, the VAS decreased from 7.3±0.933 to 3.4±0.640, and the NDI decreased from 17.81±1.551 to 10.1±1.476. The NDI decreased from 17.1±1.50 to 11.40±2.096 in Group II, which received sequential therapy. Additionally, the VAS decreased from 6.9±0.78 to 4.1±0.860. Both of these reductions were observed in the present study. Based on the statistical analysis, it was observed that there were significant differences ($p < 0.0001$) between the two groups. When comparing the post-treatment assessments of Group, I and Group II, it was found that there were significant differences in the degree of improvement. This was observed in both the VAS and the NDI. These findings provide valuable information regarding the efficacy of these therapies, which can direct future therapeutic decisions for the management of neck discomfort that is not specific to a particular condition.
Keywords: *Cervical Traction; Neck Disability Index; Spinal Muscles; Visual Analogue Scale.*

Introduction

The prevalence of neck pain is increasing significantly, posing a significant challenge to public health. Neck pain can arise from anatomical or functional abnormalities in the spine, muscles, ligaments, joints, or due to improper posture (Popescu and Lee, 2020). Nevertheless, the precise aetiology of neck pain is sometimes unidentified, leading to its classification as "non-specific neck pain." Occasionally, neck pain can develop into a chronic condition, resulting in significant expenses and time consumption for the medical healthcare system in terms of diagnosis and treatment. Additionally, Chronic Neck Pain (CNP) might result in work absenteeism and diminish the overall quality of life (Ghodrati et al., 2017).

Typically, the majority of neck problems do not exhibit any identifiable underlying malfunction or aberrant anatomical structure (Tsakitzidis et al., 2013). The incidence of idiopathic neck pain ranges from 67% to 71% in various studies. Research has demonstrated that the majority of individuals will have neck discomfort at some point in their lives. Despite the prevalence and recognition of this issue, several individuals are unable to derive advantages from existing therapies. Research has indicated a higher incidence of this condition in females compared to males. Prolonged and excessive use of our muscles might lead to various injuries. Typically, our body's response to these traumas involves the formation of scar tissue and adhesions. Additionally, soft tissue problems in the vicinity of the head and neck might restrict the range of motion of the neck, leading to neck pain and muscle weakness. Consequently, numerous therapy approaches are implemented in order to restore the functionality of soft tissues in individuals with CNP (Wang et al., 2022).

The annual prevalence of chronic neck pain in the adult general population varies from 12.1% to 71.5%, with the majority of estimates falling between 30% and 50%, regardless of whether there is a sprain or injury present (Gevers, 2018). The chronic neck pain classified into different grades, with 5% of patients experiencing Grades III and IV neck pain. These grades are characterized by severe pain intensity and significant impairment. The study demonstrated the widespread occurrence and

significant influence of neck pain on overall well-being, affecting 15% of patients who reported moderate to severe neck pain. Grade II is characterized by a significant level of pain intensity and minimal restrictions in daily activities (MacDermid et al., 2016).
Cervical diseases are prevalent, causing varying degrees of disability and incurring significant costs. Mechanical traction is frequently employed as a component of a complete outpatient program. Recovery and restoration of physical or mental abilities. The efficacy of this treatment has frequently been called into question due to inconclusive research and a lack of data on cost-effectiveness (Kalra and Kalra, 2016). Mechanical traction involves the utilization of a mechanical apparatus to exert a pulling force on the neck, specifically targeting the cervical vertebrae. This may be implemented continuously or intermittently. Degenerative disc disease, hypomobile facet joints, and herniated discs are the indications for this type of intervention (Meadows et al., 2015). Potential physiological effects of the treatment include vertebral body separation, facet joint movement and sliding, intervertebral foramen enlargement, ligament tightening, spinal curve straightening, and muscle lengthening (Sadeghi, 2022). It has also been established that traction can reduce pain through the activation of mechanoreceptors, relaxation of muscles, and inhibition of reflex muscle guarding (Majeng, 2015). Further empirical evidence is necessary in order to determine the exact effects of this type of therapy on pain, functionality, and satisfaction among patients, specifically in different subtypes of diseases and with symptoms of variable durations (Edwards et al., 2021). The aforementioned data will function as an invaluable resource when making therapeutic decisions in the future. Non-specific neck pain is characterized by its lack of a specific underlying cause and its uncomplicated nature (Dewitte et al., 2016). The symptoms may also vary with time and in response to varying degrees of physical exertion. Non-specific neck pain encompasses acute, subacute, and chronic distress in the neck that cannot be attributed to an abnormal anatomical structure (Dewitte et al., 2019). Concerning the duration of symptoms, opinions diverge. Conversely, irritation in the neck may be classified as acute (permanent for less than four weeks), subacute (permanent for one to four months), or chronic (permanent for over four months) (Cohen, 2015).
On the basis of the site of the pathogenic alterations, the clinical symptoms can be classified as local cervical syndrome, cervicomedullary syndrome, cervicobrachial syndrome, or cervicocephalic syndrome (Baarbé et al., 2018). Heat application, collar treatment, drug administration, massage therapy, electrotherapy, traction, and exercises are all viable treatment modalities for cervical disorders (Wong et al., 2016). According to a report by Hüttlich (2023), the application of a cervical collar can efficiently mitigate compression of the vertebral artery through the stabilisation and extraction of the cervical spine. A wide range of physical therapy techniques are commonly utilised in the management of cardiopulmonary rehabilitation (CR). Nevertheless, the most effective physical therapy strategy for CR is still unknown. Among these options, cervical traction has been regarded as the preferred therapy (Romeo et al., 2018).
Application of heat to a specific area stimulates the activity of microscopic nerve fibers called C-fibers, which in turn suppress pain signals in the spinal cord and enhance the perception of body position. Heat treatment can also activate different areas of the brain, promoting psychosomatic effects. The heat wrap provides benefits by indirectly influencing the brain through the warming of the skin and providing physical support to areas of the body experiencing pain. Multiple studies have examined the treatment of musculoskeletal issues and low back pain utilizing various physical modalities as standalone treatments, comparing them to alternative therapy choices or a placebo. There is inconsistent evidence for individual therapy approaches (Caylor et al., 2019).

Objectives

1. To assess the comparative effectiveness of simultaneous cervical traction and infrared exposure (Group I) versus sequential cervical traction followed by infrared lamp exposure (Group II) in reducing pain intensity, as measured by the Visual Analogue Scale (VAS).
2. To assess the comparative effectiveness of simultaneous cervical traction and infrared exposure (Group I) versus sequential cervical traction followed by infrared lamp exposure (Group II) on functional disability, as measured by the Neck Disability Index (NDI).

Hypothesis

H_0: There is no significant difference in the efficacy of sequential therapy (cervical traction followed by infrared therapy exposure, represented by Group II) and combination therapy (cervical traction along with infrared exposure simultaneously, represented by Group I).

H_1: There is a statistically significant difference in the efficacy of sequential therapy (cervical traction followed by infrared therapy exposure, represented by Group II) and combination therapy (cervical traction along with infrared exposure simultaneously, represented by Group I).

Literature Review

In cervical traction, a force is applied to the neck in order to relieve nerve compression induced by intervertebral discs and separate the cervical segments. Various methodologies and treatments, varying timeframes have been suggested in the scholarly literature. There is several research that examine the physiological consequences of physical modalities are:

According to Kalsi-Ryan et al. (2013), noninvasive therapy comprises a range of physical therapist-administered techniques such as cervical traction, exercise, posture education, and manual therapy that specifically targets the cervical and thoracic spine. The utilization of these numerous procedures is commonplace in multimodal approaches to intervention.

Fritz et al. (2014), suggested that there has been no comprehensive analysis that has assessed the efficacy of cervical traction when used in conjunction with other physical therapy techniques for cervical radiculopathy. Given these circumstances, it became apparent that a thorough assessment and statistical analysis of randomized controlled trials (RCTs) were required to determine the effects of manual and mechanical cervical traction in combination with other physical therapy techniques, as opposed to physical therapy procedures without traction, on discomfort and impairment in adults with CR.

According to Manchikanti et al. (2014), one of the methods for treating disc and nerve irritation-related neck and upper extremity pain that doesn't involve facet joints is cervical epidural injections. Using an interlaminar or transforaminal route, cervical epidural injections are one of the fastest-growing interventional method modalities for treating upper extremities and chronic neck pain.

Stark et al. (2014) provided evidence supporting the superior efficacy of continuous low-level heat wrap therapy in the treatment of acute nonspecific low back pain when compared to oral pain medication. Further investigation is recommended by the European Guidelines for the management of persistent non-specific low back pain regarding the effectiveness of different physical therapy combinations. Therefore, the aim of this research was to evaluate the efficacy of a treatment protocol that incorporated numerous physical interventions in the management of musculoskeletal pain syndromes.

Engquist (2015) determined that both intermittent and continuous cervical traction had a substantial impact on reducing neck and arm pain, improving nerve function, and increasing neck mobility. Nevertheless, the intermittent traction proved to be more efficient than the continuous version.

Ravisankar et al. (2015) found that individuals with chronic cervical spondylosis showed more improvement when treated with a combination of CT (computed tomography) and exercise, compared to analgesics. Therefore, exercises targeting the C T & neck muscles may yield more benefits in treating chronic cervical spondylosis compared to nonsteroidal anti-inflammatory drugs (NSAIDs). Both cervical traction and hot back are utilized as independent treatments for alleviating pain in patients with cervical spondylosis. However, no studies have been conducted on their combined effectiveness. This superficial heating modality, such as an infrared lamp, is administered concurrently with cervical traction.

Savva et al. (2016) observed that the patients with CR may not experience significant benefits from physiotherapy combined with traction, which is targeted at enhancing hand strength, reducing neck discomfort, and relieving nerve impingement. This conclusion is drawn because to the poor methodological quality of the data.

Johnson (2017) found that combining frequent physiotherapy techniques (such as hotpack, ultrasound, and TENS) with home exercises for a duration of three weeks resulted in a significant gain in hand

grip strength and a major reduction in neck and arm discomfort in individuals with C7 radiculopathy caused by a herniated disc.
Lemieux et al. (2020) assessed the efficacy of noninvasive therapies for chronic pain. Based on their findings, the evidence for the efficacy of noninvasive management was equivocal, and no intervention demonstrated superiority or consistent effectiveness compared to others. However, cervical traction (CT) continues to be commonly advised for patients with CR, and it is regularly employed as an additional method in outpatient rehabilitation.
Miyata and Usuda, (2020) suggested that analgesic impact of electrotherapy is likely due to several factors, including improved microcirculation, heightened muscle oxidative capacity, the release of neurotransmitters like serotonin, higher generation of mitochondrial ATP, elevated release of endorphins, and anti-inflammatory effects. The subject of discourse pertains to the extracellular activation of the dorsal column. By inhibiting the C-fibers via the gate control mechanism, the perception of pain is neutralized. The application of high-frequency transcutaneous electrical nerve stimulation (TENS) was found to induce a decrease in the excitability of the human motor cortex.

Methodology
In total, 52 individuals participated in this inquiry. A subsequent screening procedure was implemented in order to exclude participants who failed to satisfy the predetermined criteria of the study. Subsequent to the assessment procedure, the participants were randomly assigned to one of two study groups. Every individual underwent treatment for a period of five consecutive days.
Group I comprised individuals who were concurrently exposed to infrared radiation and cervical traction for a total of 20 minutes daily, over the course of five consecutive days.
Group II comprised individuals who underwent cervical traction for a period of 20 minutes, subsequent to which they were exposed to an infrared lamp for an additional 20 minutes. The aforementioned remedy was carried out for a span of five consecutive days.
The research employed an experimental design to assess the comparative efficacy of two therapeutic approaches for non-specific cervical discomfort. Numerous tools and instruments were utilized in the investigation, including an infrared lamp, a traction unit, and a stool.
Variables
Age, height, weight, an infrared lamp, and a cervical traction device are all independent variables. The cervical disability index and the visual analogue scale are dependent variables.
Criteria for inclusion
• Cervical discomfort
• Individuals aged 20-35 of any gender
• Medically confirmed instances of non-specific neck pain
• Individuals who are prepared to take part in the research
• BMI between 18-24.9Kg/m2
Exclusion criteria
• Proficient in comprehending the English language
• Individuals with a confirmed diagnosis of any neurological, mental, skin, or cardiovascular disorder
• Patients reporting pain that spreads to other areas of the body
• Participants displaying trigger points in the trapezius muscle.
• Individuals with musculoskeletal disorders that could impair their performance
• Skin conditions that can be worse by either an increase in temperature or the use of lubricants, such as eczema.
• In the presence of cancerous tumors.
• If there has been a previous fracture or surgery in the neck area.
• Any contraindications related to the use of an infrared lamp or traction. Various types of ocular surgery as documented by individuals.
Procedure
Written consent was obtained from all participants following an explanation of the protocol and resolution of any questions they had concerning the study. By their designated group, the patients were

directed to finish the neck disability index on the initial day before commencing therapy. Subsequently, on the sixth day, they were instructed to retake the same task as the remaining patients. The subject was seated on a multipurpose stool, ensuring that their feet were securely grounded and that their arms were supported without strain by their thighs. The placement of an infrared floodlight. Before and after the treatment session, both groups were provided with instructions to complete a visual analog scale (VAS). Before and after each therapy session, data on the Neck Disability Index and the Visual Analogue Scale were compiled.

Results

Table 1 displays the allocation of individuals into two groups (I and II) according to their age, weight, and height. Group I has a mean age of 30.5 years and a standard deviation (SD) of 5.40. In comparison, Group II has a slightly higher mean age of 31.7 years with an SD of 5.38. Group I has an average weight of 69.68 kg with a standard deviation of 17.62, while Group II has an average weight of 71.00 kg with a standard deviation of 12.48. The height distribution reveals that Group I has an average height of 167.72 cm with a standard deviation of 8.01, but Group II has a slightly lower average height of 167.25 cm with a standard deviation of 7.38. These data offer a brief overview of the demographic traits of the participants in the study, ensuring that the groups are roughly similar in terms of these initial variables. During the analysis as well as interpretation of the research's outcomes, it is important to analyze any significant disparities or similarities in these indicators between the two groups.

Table 1: Distribution of subjects by age, Height and weight

Group	Number of Patients	Mean	±SD
Age			
I	26	30.5	5.40
II	26	31.7	5.38
Weight			
I	26	69.68	17.62
II	26	71.00	12.48
Height			
I	26	167.72	8.01
II	26	167.25	7.38

Table 2 presents the average values before and after treatment, as well as the standard deviations, for two scales NDI and VAS in Group I. The t-test statistical analysis reveals a substantial disparity in both NDI and VAS scores pre- and post-treatment. The average score for NDI reduced from 17.81±1.551 before therapy to 10.1±1.476 after treatment. The t-value is 378 and the p-value is less than 0.0001, indicating that the intervention resulted in a statistically significant reduction in neck disability.

In a similar vein, the mean VAS score exhibited a decline from 7.3±0.933 before intervention to 3.4±0.640 after intervention. The obtained t-value is 378, and the corresponding p-value is below 0.0001. These results suggest that Group I experienced a highly significant reduction in pain intensity subsequent to the treatment.

Table 2: NDI and VAS values for Group I

Scales	Pre Mean ± SD	Post Mean ± SD	Value of T	P Value
NDI	17.81± 1.551	10.1±1.476	378	< 0.0001
VAS	7.3± 0.933	3.4 ± 0.640	378	< 0.0001

Table 3 displays the mean values prior to and following treatment, along with the corresponding standard deviations, for two instruments administered to Group II: The Neck Disability Index (NDI) and the Visual Analogue Scale (VAS). The statistical analysis using the t-test reveals a significant discrepancy in the NDI and VAS scores before and after the treatment. After treatment, the mean NDI score for Group II decreased from 17.1±1.50 prior to therapy to 11.40±2.096. The obtained t-value of 324 and p-value of less than 0.0001 suggest that the intervention significantly reduced cervical disability.

Regarding the VAS, Group II exhibited a decrease in mean score from 6.9±0.78 prior to treatment to 4.1±0.860 subsequent to treatment. The t-value is 324 and the p-value is less than 0.0001, indicating that Group II experienced a statistically significant reduction in pain intensity after receiving the treatment.

Table 3: NDI and VAS values for Group II

Scales	Pre Mean ± SD	Post Mean ± SD	Value of T	P Value
NDI	17.1 ± 1.50	11.40 ± 2.096	324	< 0.0001
VAS	6.9±0.78	4.1±0.860	324	< 0.0001

Significant differences in improvement in terms of post treatment VAS scores were seen between Group A and Group B (Table 2 and 3). When comparing the post-treatment NDI scores of Group I, and Group II, there was a substantial difference in the level of improvement in terms of NDI. Based on the aforementioned findings, it may be concluded that there is a statistically significant difference between groups I and II.

Discussion

The objective of this study was to assess the relative efficacy of simultaneous cervical traction and infrared exposure (Group I) compared to sequential cervical traction followed by infrared lamp exposure (Group II) in reducing pain intensity and functional disability in individuals with non-specific neck pain. The findings demonstrated substantial enhancements in both cohorts, however, specific factors and ramifications warrant more examination. The findings suggest that both therapeutic approaches, whether implemented concurrently or in that order, effectively mitigated pain and improved functional outcomes among individuals experiencing non-specific neck pain. When conducting a comparison between the two groups, it is crucial to highlight that Group I, which underwent concurrent infrared exposure and cervical traction, experienced significantly reduced levels of neck impairment and pain intensity. In a comparable fashion, the outcome measures of Group II, which underwent cervical traction followed by infrared lamp exposure in that order, improved significantly. Therefore, the research provides evidence supporting the efficacy of both therapeutic approaches. The results of this study offer valuable insights for medical professionals and practitioners involved in the management of generalized neck pain. Patients with this condition may benefit from a combination of cervical traction and infrared radiation, administered either concurrently or sequentially, according to the findings of this study. This data can aid medical practitioners in selecting appropriate interventions in consideration of patient preferences, available resources, and individualized treatment strategies. Although the current study provides insight into the effectiveness of the suggested treatments, there are opportunities for additional research. Subsequent inquiries could delve into the enduring consequences and viability of the noted enhancements. Furthermore, given the diverse composition of non-specific neck pain, investigating the efficacy of these treatments in distinct subgroups or with different durations of symptoms could yield more nuanced understandings. The results add to the expanding collection of research on non-invasive treatments for neck discomfort, highlighting the potential advantages of multimodal therapy. The findings establish a basis for additional investigation and improvement of treatment regimens to achieve improved patient outcomes in dealing with non-specific neck pain.

Conclusion

Ultimately, the study sought to assess the relative efficacy of concurrent cervical traction and infrared exposure (Group I) vs consecutive cervical traction followed by infrared lamp exposure (Group II) in persons experiencing non-specific neck discomfort. The demographic analysis showed a somewhat similar age distribution between the two groups. Both cohorts exhibited notable enhancements in neck disability and pain intensity, as indicated by large reductions in Neck Disability Index (NDI) and Visual Analogue Scale (VAS) values subsequent to the therapies. In Group I, there was a substantial decrease in NDI (from 17.81±1.551 to 10.1±1.476) and VAS (from 7.3±0.933 to 3.4±0.640) scores, which indicates a considerable improvement in neck impairment and pain intensity. Similarly, Group II showed notable enhancements, as evidenced by a decrease in NDI scores from 17.1±1.50 to

11.40±2.096 and a decrease in VAS ratings from 6.9±0.78 to 4.1±0.860. Significantly, the post-treatment Visual Analogue Scale (VAS) ratings indicated a notable disparity in improvement between Group I and Group II. The results indicate that both treatment methods successfully relieved non-specific neck pain. However, the combination of cervical traction and infrared exposure (Group I) showed a statistically significant benefit over sequential therapy (Group II) in terms of reducing pain. The study provides useful insights into the effectiveness of different therapeutic approaches, serving as a basis for making educated decisions in the treatment of non-specific neck pain.

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