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Effects of Multi-modal Therapeutic Approach in Cervical Radiculopathy

Farah Shaheen, Muhammad Salman Bashir*, Naveed Anwar*, Nosheen Manzoor*, Kehkshan Khalid*, Sana Tauqeer*

Shalimar Hospital, Lahore Pakistan, *Riphah International University, Lahore Pakistan

ABSTRACT

Objective: To determine the effect of Mechanical cervical traction and Laser therapy along with isometric neck exercises in cervical radiculopathy patients.

Study Design: Quasi-experimental study.

Place and Duration of Study: Kannan Physiotherapy and Spine Clinic, Lahore Pakistan, from Jul to Dec 2020.

Methodology: The study included cervical radiculopathy patients with symptoms for over two weeks. The diagnosis was confirmed by the orthopaedic department. The subjects were allocated to two equal groups by lottery method. Group-A Received Laser therapy with isometric neck exercises, and Group-B received mechanical traction with isometric neck exercises. The neck disability index, numeric pain rating scale and patient-specific function scale were used to collect data, which was analyzed using SPSS-22.

Results: Out of the 128 patients, 64(50%) were in each of the two groups. The overall mean age was 41.95±36.50years, and 76(59.4%) participants were male. After three weeks of treatment sessions, statistically significant improvement was found in decreasing pain within group B having mechanical traction along isometric neck exercises (p<0.05).

Conclusion: Our study concluded that both treatment techniques, Laser therapy with isometric neck exercises and mechanical traction with isometric neck exercises, effectively decreased pain; however, mechanical traction with isometric neck exercises was superior.

Keywords: Isometric neck exercises, Laser therapy, Mechanical Traction, Numeric pain rating scale.

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INTRODUCTION

Cervical radiculopathy is a common condition with an incidence of 83 per 100,000. The prevalence is high in the fifth decade of life, which is 203 per 100,000. The significant causes of compression of the cervical nerve root are prolapsed intervertebral disc and stenosis.[1] Although this pain can also occur in the absence of compression. Pain, tingling sensation, and numbness in the upper extremity lead to functional limitation.[2]

The subjective history, Physical examination, imaging techniques, needle (EMG), and provocative tests support the diagnosis of cervical radiculopathy. Self-reported assessment by a patient plays a vital role.[3] The percentage of normal recovery is unknown. Several conservative treatments are used in the treatment of cervical radiculopathy. They have positive results in the management of cervical radiculopathy with severe pain and neurological lesions.[4]

Previous literature revealed the effect of a single type of therapy, either active Laser or placebo, in cervical radiculopathy. The current study will compare the effect of multi-modal therapeutic approaches, including Mechanical traction, Laser therapy and cervical isometrics in cervical radiculopathy. The incidence of cervical radiculopathy was reported to be higher than cervical herniation & cervical spondylotic changes, but there are lots of differences that exist.[5]

Cervical disc herniation and spondylosis are both factors causing radicular pain originating from the cervical region.[6] Therefore, the perception of cervical radiculopathy due to compression pathology is not perfect. Either nerve root inflammation may occur in the absence of a compressive lesion, or Nerve root compression is not painful in the absence of inflammation. Soft tissues affected by these conditions cause referred pain.[7]

The main frequent source of radicular pain in patients is the compression of spinal nerves. Anterior degeneration in the uncovertebral posterior involving zygapophyseal joints and decreased disc height are contributing factors. There are only 20 to 25 per cent cases of nucleus pulposus herniation responsible for lumbar spine disorders.[8,9] Spinal infections and tumours are less common causes of cervical radiculopathy.[10] While conservative treatments have shown positive results in managing cervical radiculopathy,

Correspondence: Dr Naveed Anwar, Riphah International University, Lahore Pakistan

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the existing literature predominantly focuses on the efficacy of single therapeutic approa-ches, such as active laser or placebo. This study aims to address the gap by investigating the effectiveness of a multimodal therapeutic approach, combining mechanical cervical traction and laser therapy with isometric neck exercises. By comparing these two treatment modalities, the research contributes valuable insights into a comprehensive treatment strategy for cervical radiculopathy, potentially optimizing patient out-comes and guiding clinical decision-making in physiotherapeutic interventions for this prevalent condition.

METHODOLOGY

The quasi-experimental study was conducted at Kannan Physiotherapy and Spine Clinic, Lahore, Pakistan from July to December 2020 after approval from the Ethical Review Committee (PT/2020/REC/IRB/024). The sample size was calculated using Epitool software, taking a mean difference 6.8 from previous literature.[4]

Inclusion Criteria: Patients aged 18-55 years with limited cervical range of motion along radicular pain distal to the elbow were included in the study.

Exclusion Criteria: Patients having history of steroids, tumour, muscle weakness of an upper extremity, absent tendon reflex, sensory loss and whiplash history were not included in the study.

The lottery method was used for grouping after getting written consent (Figure). The convenient sampling technique was used to collect the data. An Orthopedic surgeon diagnosed the patients based on physical examination and referred them to the Physiotherapy Department. Group-A received Endo Laser 22 with an inbuilt Cervical syndrome two treatment protocol with frequency 10,000Hz, dose 3.0j/cm2 for 2 minutes, and isometric neck exercises for five sessions a week for three weeks. Group-B received Mechanical traction, intermittent mode with a 10-second hold and 5-second rest for 10 minutes, and isometric neck exercises in five weekly sessions for three weeks. The traction was equal to 10-15% of the body weight of each patient and calculated prior to intervention. After completing 15 treatment sessions, both Groups were re-assessed with different variables. With Neck Disability Index Numeric Pain Rating Scale, Patient-specific functional scale, and cervical range of motion with Goniometer to evaluate pain, functional disability and limited range of motion on the initial visit, first and third week.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 22.00. Shapiro-Wilk test was used to check the normality of data, which was found to be normally distributed, leading to the use of the parametric tests for analysis. Mean and standard deviation were used to express the data. The independent sample t-test was used to measure the treatment effect between the two groups. The *p*-value of ≤0.05 was considered significant.

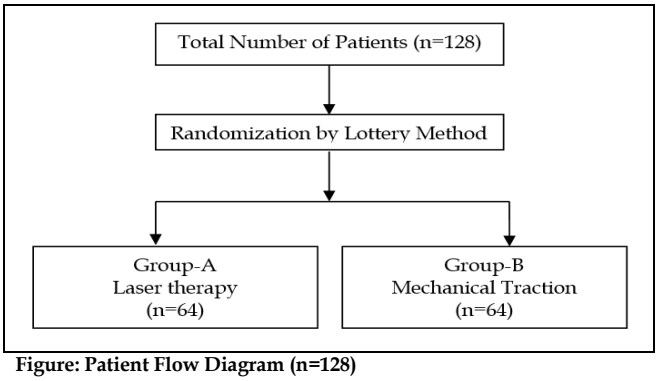

Figure: Patient Flow Diagram (n=128)

RESULTS

Of the 128 patients, 64(50%) were included in each group. The overall mean age was 41.95±36.50 years. Out of 128 participants, there were 76 (59.37%) males and 52(40.63%) females. Group-A was treated with Laser therapy through isometric neck exercises, and Group-B was treated with mechanical traction through isometric neck exercises. Statistically significant improvement was found in Group-B with a mean of 14.98±1.475 for Neck Disability Index, a mean of 1.80±.519 for Numeric Pain Rating Scale and a mean of 7.66 ±0.781 for Patient Specific Functional Scale than Group-A with 16.92±2.768 for NDI,4.55 1.42 for NPRS and 2.59±.684 for PSFS as shown in Table-I &II.

Table-I: Comparison of Neck Disability Index, Numeric Pain Rating Scale, Patient Specific Functional Scale, Range of Motion between the Study Groups (n=128)

Parameters	Group-A Laser therapy (Mean±SD)	Group-B Mechanical Traction (Mean±SD)	*p*-value
Neck Disability Index	16.92±2.768	14.98±1.475	<0.001
Numeric Pain Rating Scale	4.55±1.425	1.38±519	<0.001
Patient Specific Functional Scale	2.59±.684	7.66±781	<0.001
Active Neck Flexion(°)	40.09±4.403	46.11±2.703	<0.001
Active Neck Extension(°)	45.47±5.058	57.22±3.114	<0.001
Active Neck Lateral flexion Right(°)	37.84±3.835	43.52±2.211	<0.001
Active Neck Lateral flexion Left(°)	37.41±3.384	42.70±3.059	<0.001
Active Neck rotation Right(°)	31.36±7.484	76.19±3.172	<0.001
Active Neck rotation Left(°)	64.72±5.479	74.91±3.659	<0.001

Table-II: Comparison of Neck Disability Index, Numeric Pain Rating Scale, Patient Specific Functional Scale, Range of Motion between the Study Groups (n=128)

Parameters	Group-A Laser therapy (Mean±SD)	Group-B Mechanical Traction (Mean±SD)	*p*-value
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DISCUSSION

The study was performed to determine the result of Low-Level Laser Therapy, Mechanical traction, and isometric neck exercises to relieve cervical radiculopathy symptoms. All the participants were divided into two groups, group A and group B. Group A was treated with low-level laser treatment for three weeks.[11] A pre-treatment and post-treatment evaluation was performed. Group A was treated with low-level laser therapy for three weeks. The mean baseline values for NDI were 78.97, and the mean third-week values were 16.92. The level of significance was favourable, with a value of $p<0.001$. Group B was treated with mechanical cervical traction and evaluated after three weeks. The level of significance was favourable, with a value of $p<0.001$. The mean baseline values for NDI were 69.36, and the mean third-week value was 14.98.

In 2016, a Randomized Controlled Trial was performed to evaluate the effect of mechanical cervical traction versus manual traction in cervical radiculopathy, which showed considerable improvement in pain with a mean pre 6.26 mean post 1.43 as compared to other groups treated with manual traction (Pain mean pre 6.80, mean post 3.85 through NPRS.[12] Conventional treatments consisted of physiotherapy exercises, mechanical cervical traction, and anti-inflammatory drugs to decrease pain in cervical radiculopathy.[13] Clinical mechanical traction and physiotherapy exercises improved pain and increased the range of motion because the traction force managed by the machine was uniform throughout the session.[14]

Another RCT showed that LLLT decreases radiating pain in the arm and improves neck mobility when applied to neck exercises.[15] It involves different healing processes, including inflammatory, proliferative, and remodelling phases. Low-level laser therapy significantly improved the recovery of nerves through direct impact on neural structures that were affected by inflammation and compression.[16,17] A systemic review and meta-analysis of RCT was conducted in 2018 to determine the effectiveness of adding cervical traction and physiotherapy exercises in cervical radiculopathy patients. It had shown significant improvement in NDI and Pain.[18]

LIMITATIONS OF STUDY

This study was carried out only in one hospital. Despite the limitation, the current study was preliminary which thoroughly investigated the effectiveness of laser therapy and cervical traction along isometric neck exercises in cervical radiculopathy patients.

CONCLUSION

The study concluded that the treatment techniques, Laser therapy and Mechanical traction along isometric neck exercises effectively improved the range of motion and function and decreased pain and disability in cervical radiculopathy patients.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

FS & MSB: Data acquisition, critical review, approval of the final version to be published.

NA & NM: Data analysis, data interpretation, drafting, approval of the final version to be published.

KK & ST: Study design, drafting the manuscript, concept, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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