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THE EFFECT OF MULLIGAN TECHNIQUE (MWM) AND MYOFASCIAL RELEASE (MFR) ON PAIN, RANGE OF MOTION AND NECK DISABILITY IN PATIENTS WITH CERVICAL RADICULOPATHY: A COMPARATIVE STUDY

Shakir Rasool[1], Sarabjeet[2] and Shyamal Koley[3]*

[1]Assistant Professor, Department of Physiotherapy, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[2]Acting Head and Assistant Professor, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.
[3]Professor and Head, Department of Physiotherapy, Associate Dean, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.

***Corresponding Author: Dr. Shyamal Koley**
Professor and Head, Department of Physiotherapy, Associate Dean, University School of Allied Health Sciences, Rayat Bahra University, Mohali, Punjab, India.

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ABSTRACT

Cervical radiculopathy (CR) is a common clinical condition characterized by the compression or irritation of one or more nerve roots in the cervical spine. It is typically caused by degenerative changes in the spine, such as herniated discs, bone spurs, or narrowing of the spinal canal. The objective of the study is to analyze and compare the effect of Mulligan technique and Myofascial release on pain, range of motion and neck disability in patients with CR. A total of 45 patients with CR aged 18-60 years were selected purposively for the present study. The subjects were further divided into three groups comprising of 15 patients in each group. Patients in Group-A were treated with conventional therapy only, while in Group-B, patients were treated with Mulligan technique with conventional therapy, and in Group-C, patients were treated with Myofascial Release with conventional therapy. Variables like NDI, ROM and VAS data was collected on 1st (pre- treatment) session, 7th (post treatment) and 15th (post treatment) session. The Results of present study revealed that within group changes in VAS, NDI and Range of motion were statistically significant in all groups. On the other hand, between Group-B and Group-C, there was a statistically significant improvement for the above traits, showing the superior result in Group-B. It might be concluded from the findings of the present study that Mulligan technique was statistically more effective in decreasing pain, neck disability and improving range of motion in patients with CR.

KEYWORDS: Cervical Radiculopathy, Mulligan technique, Myofascial Release.

1. INTRODUCTION

Cervical radiculopathy (CR) is a common medical complication which is characterized by the compression or irritation of one or more nerve roots in the cervical spine. It is typically caused by degenerative changes in the spine, such as herniated discs, bone spurs, or narrowing of the spinal canal.[1,2] The cervical spine is composed of seven vertebrae, labeled as C1 to C7, which provide support and flexibility to the neck. Between each pair of vertebrae, there are intervertebral discs that act as shock absorbers and allow for smooth movement. The nerve roots, which branch out from the spinal cord, exit the spinal column through small openings called foramina.[3,4,5]

When the nerve roots in the cervical spine become compressed or irritated, it can lead to CR. This compression can occur due to various factors, including disc herniation, where the inner gel-like material of the disc protrudes and presses against a nerve root. Bone spurs, also known as osteophytes, can develop as a result of degenerative changes in the spine and narrow the space available for the nerve roots.[6] Additionally, conditions such as spinal stenosis, where the spinal canal narrows, or spondylosis, the general wear and tear of the spine, can contribute to CR.[7]

The most common symptom of CR is neck and arm pain, which can range from mild to severe. The pain often follows a specific pattern depending on the affected nerve root. For example, compression of the C7 nerve root typically causes pain that radiates down the back of the arm and into the middle finger. Other symptoms

include weakness in the affected arm and hand, numbness or tingling sensation, and decreased reflexes.[8]

In the United States, it has been estimated that the annual incidence of CR is approximately 83 cases per 100,000 people. The annual incidence of CR was 107.3 per 100,000 for men and 63.5 per 100,000 for women.[9]

The prognosis for CR varies depending on several factors, including the severity of the nerve compression, the underlying cause, and the individual's overall health. With appropriate treatment, the majority of patients experience a significant improvement in their symptoms. However, it is important to note that the recovery process can be gradual, and some individuals may require ongoing management of their symptoms.[4]

CR is a disease of the cervical spine and a space-occupying lesion that occurs because of pathological problems with cervical nerve roots. The impingement typically produces neck and radiating arm pain or numbness, sensory deficits, or motor dysfunction in the neck and upper extremities. CR can be diagnosed by the thorough history and physical examination. To confirm the diagnosis, magnetic resonance imaging (MRI) or computed tomography (CT) myelogram should be done.[10]

The treatment approach for CR depends on the severity of symptoms and the underlying cause. In many cases, non-surgical interventions are initially recommended. These may include rest, physical therapy, pain medications, and the use of cervical collars or braces to immobilize the neck and provide support. Physical therapy exercises aim to strengthen the neck muscles, improve range of motion, and alleviate pressure on the nerve roots. Pain medications, such as non-steroidal anti-inflammatory drugs (NSAIDs) or muscle relaxants, can help to reduce pain and inflammation.[11]

If conservative measures fail to provide relief or if the symptoms worsen, surgical intervention may be considered. The surgical options include disectomy, where the herniated disc is removed, and fusion, where two adjacent vertebrae are fused together to stabilize the spine. These procedures aim to decompress the affected nerve root and relieve symptoms.[12] However. in the present study, an attempt has been made to analyze and compare the effect of Mulligan technique and Myofascial release on pain, range of motion and neck disability in patients with CR.

2. MATERIALS AND METHODS

The present study was based on purposively selected 45 confirmed cases of CR both males and females, aged 18-60 years, collected from the OPD of Department of Physiotherapy, Rayat Bahra University, Mohali, Punjab, India. The subjects meeting the inclusion criteria were included with no history of any fracture of cervical spine, any infection and inflammation of cervical spine, any previous history of cervical spine. Subjects with Spurling's test positive and Neurodynamic test for upper limb positive were included in the study.

The subjects were further divided into three groups for interventions. Group-A consisted of 15 subjects who were treated with conventional therapy (hot pack, TENS and neck isometrics exercises). Group-B consisted of 15 subjects who were treated with Mulligan technique with conventional therapy, and in Group-C, 15 patients were treated with Myofascial release with conventional therapy. A written informed consent was taken from each participating subject. A prior explanation regarding the treatment was given to the subjects who were enrolled in the study. The study was approved by institutional ethical committee.

Intervention given to the subjects

The total duration for the study was 1 year. All the groups had treated for 5 times a week for 2 weeks. Patients with CR in all the groups were assessed for Visual Analogue Scale (VAS), Neck Disability Index (NDI) scale, and Range of Motion (ROM) of the patients with CR.

Hot Pack: The hot pack was applied on the neck in supine or prone position for 10-15 minutes.

Transcutaneous Electrical Nerve Stimulation (TENS): Low Transcutaneous electrical nerve stimulation with frequency of 2 Hz was applied to the patient in supine or sitting position to decrease the pain. Active electrode was placed on motor point and the indifferent electrode was placed on the site of pain.

Isometric Neck Exercises: Isometrics exercises for flexion, extension, lateral flexion and rotation were performed. Therapist applied the resistance by his hand and asked the patient to hold it for 10 seconds. Procedures were applied as per described by Chung and Jeong.[13]

Mulligan Technique: A flexion, extension, rotation and lateral glide were performed.

Flexion Glide: Patient was seated on a chair. Cervical spine and head were set in neutral position. A painless passive PA glide was applied in the plane of the facets on either of the spinous processes. While the glide was sustained, the patient actively moved his/her neck in the direction that previously produced the symptoms (flexion).

Rotation Glide: Patient was in sitting position. Cervical spine and head were set in neutral position. A painless passive PA glide was applied in the plane of the facets on either of the spinous processes. While the glide was sustained, the patient actively moved his/her neck in the direction that previously produced the symptoms (Rotation).

Extension Glide: Patient was in sitting position. Cervical spine and head were set in neutral position**.** A painless passive PA glide was applied in the plane of the facets on either of the spinous processes. While the glide was sustained, the patient actively moved his/her neck in the direction that previously produced the symptoms (Extension).

Lateral Flexion Glide: Patient was in sitting position. Cervical spine and head were set in neutral position**.** A painless passive PA glide was applied in the plane of the facets on either of the spinous processes. While the glide was sustained, the patient actively moved his/her neck in the direction that previously produced the symptoms (lateral flexion)**.** If symptoms were free, the patient applied over pressure further into the movement restrictions.

Myofascial Release (MFR): To relieve muscular tension and break up scar tissue, myofascial release uses a combination of gentle stretching and massage. The therapist applied gentle sustained pressure and stretching techniques to the affected areas of the patient's body. This pressure helped to release the fascial restrictions, allowing the tissues to return to their normal state. The therapist might use his hands, knuckles, elbows, or specialized tools to apply the pressure. Myofascial release aims to restore the balance between muscle and fascia, improve circulation, and promote the body's natural healing response.

Statistical Analysis

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured variables. One way ANOVA was used for between-group differences followed by post hoc Bonferroni. Percentage improvement of the selected variables studied in various groups was analyzed by standard statistical methods. Data were analyzed using SPSS (Statistical Package for Social Science) version 20. A 5% level of probability was used to indicate statistical significance.

3. RESULTS

Table 1 showed the descriptive statistics of selected variables in different conditions among patients with CR. In day 1 (pre-treatment), the maximum value of VAS was found in Group-B (6.93), followed by Group-A (6.86), and the least in Group-C (6.73). After, post treatment on 7th and 15th days, the maximum value for this trait was found in Group-A (5.86 and 4.66 respectively.), followed by Group-C (4.13 and 2.20 respectively), and the least in Group-B (4.06 and 1.26 respectively). In day 1 (pre-treatment), the maximum value of NDI was found in Group-A (33.46), followed by Group-C (33.29), and the least in Group-B (33.20). After, post treatment on 7th and 15th days, the maximum value for this trait was found in Group-A (33.20 and 30.06 respectively), followed by Group-C (33.2 and 25.2 respectively), and the least in Group-B (27.46 and 12.8). In day 1, the maximum value of flexion was found in Group-B (44.93), followed by Group-A (42.53), and the least in Group-C (38.46). After post-treatment on 7th and 15th day, the maximum value was found in Group-B (46.73 and 48.73 respectively), followed by Group-A (43.73 and 45.4 respectively), and the least in Group-C (41.53 and 44.2 respectively). In day 1, the maximum value of extension was found in Group-A (38.73), followed by Group-B and C (36.13 and 36.13 respectively). After, post treatment on 7th and 15th day, the maximum value was found in Group-B (40.6 and 46.0 respectively), followed by Group-A (40.6 and 42.46 respectively), and the least in Group-C (39 and 41.73 respectively). In day 1, the maximum, value of lateral flexion was found in Group-C (31.53), followed by Group-B (30.66), and the least in Group-C (29.6). After, post treatment on 7th and 15th day, the maximum value was found in Group-B (36 and 38.93 respectively), followed by Group-C (33.8 and 36.26 respectively), and the least in Group-C (30.66 and 31. 53 respectively). In day 1, the maximum value of rotation was found in Group-C (45.73), followed by Group-B (44.86), and the least in Group-A (43.46). After post treatment on 7th and 15th day, the maximum value was found in Group-B (50.86 and 56 respectively), followed by Group-C (48.86 and 52.13 respectively), and the least in Group-A (44.86 and 45.73 respectively).

Table 1: showed descriptive statistics of selected variables in different conditions in patients with CR.

Variables	Conditions	Group-A N=15 Mean ±SD	Group-B N=15 Mean ±SD	Group N=15 Mean ±SD	F-value	p-value
VAS	Pre-treatment	6.86±1.12	6.93±1.03	6.73±0.96	0.143	0.867(NS)
	Post-treatment after 7 days	5.86±1.35	4.06±1.43	4.13±1.06	9.320	0.000(S)
	Post-treatment after 15 days	4.66±1.11	1.26±1.16	2.2±1.74	24.714	0.000(S)
NDI	Pre-treatment	42.53±2.92	44.93±3.32	38.46±6.66	7.510	0.002(S)
	Post-treatment after 7 days	43.73±3.12	46.73±2.25	41.53±5.02	7.643	0.001(S)
	Post-treatment after 15 days	45.4±3.04	48.73±1.43	44.2±4.57	7.708	0.001(S)
Flexion	Pre-treatment	38.73±3.53	36.13±3.77	36.13±3.77	2.471	0.097(S)
	Post-treatment after 7 days	40.6±4.45	40.6±2.87	39±4.53	0.789	0.461(S)
	Post-treatment after 15 days	42.46±2.94	46±2.90	41.73±4.47	6.297	0.004(S)
Extension	Pre-treatment	29.6±2.55	30.26±1.83	30±0.07	0.262	0.771(NS)

	Post-treatment after 7 days	30.66±2.31	36±1.60	33.8±2.78	20.596	0.000(S)
	Post-treatment after 15 days	31.53±2.26	38.93±2.69	36.26±2.54	47.677	0.000(S)
Lateral Flexion	Pre-treatment	43.46±3.75	44.6±3.20	44.2±5.00	0.301	0.742(NS)
	Post-treatment after 7 days	44.86±3.20	50.86±2.99	48.86±4.68	10.187	0.000(S)
	Post-treatment after 15 days	45.73±3.15	56±2.69	52.13±4.35	33.431	0.000(S)
Rotation	Pre-treatment	43.46±3.75	44.6±3.20	44.2±5.00	0.301	0.742(NS)
	Post-treatment after 7 days	44.86±3.20	50.86±2.99	48.86±4.68	10.187	0.000(S)
	Post-treatment after 15 days	45.73±3.15	56±2.69	52.13±4.35	33.431	0.000(S)

Table 2: Inter-group comparison of percentage improvement of selected variables in different groups in patients with CR.

Variables	Post treatment after 7 days			Post treatment after 15days		
	Group-A Pre-Vs Post treatment	Group-B Pre-Vs Post treatment	Group-C Pre-Vs Post treatment	Group-A Pre-Vs Post treatment	Group-B Pre-Vs Post treatment	Group-C Pre-Vs Post treatment
VAS	14.5	41.41	38.6	32.06	81.81	67.31
NDI	3.76	17.28	0.27	10.16	61.44	24.30
Flexion	1.81	4.01	7.98	6.74	8.45	14.9
Extension	4.82	12.3	7.94	9.63	27.3	15.4
Lateral Flexion	3.58	18.9	12.6	6.52	28.6	20.8
Rotation	3.22	14.03	10.54	5.22	25.5	17.94

The inter-group comparison of percentage improvement of selected variables in different groups in patients with CR was shown in Table 2. For VAS, patients had the maximum decrement of pain in post-treatment after 7 and 15 days, was recorded the maximum as 41.41% and 81.81% respectively in Group-B, followed by Group-C (38.6% and 67.31% respectively), and the least in Group-A (14.5% and 32.06% respectively). For NDI, patients had the maximum decrement of disability in post-treatment after 7 and 15 days, was recorded the maximum as 17.28% and 61.44% respectively in Group-B, followed by Group-C (0.27% and 24.30% respectively) and the least in Group-A (3.76% and 10.16% respectively). For flexion, patients had the maximum improvement of range of motion in post-treatment after 7 and 15 days, was recorded the maximum as 7.98% and 14.9% respectively in Group-C, followed by Group-B (4.01% and 8.45% respectively), and the least in Group-A (1.81% and 6.74% respectively). For extension, patients had the maximum improvement of range of motion in post-treatment after 7 and 15 days, was recorded the maximum as 12.3% and 27.3% respectively in Group-B, followed by Group-C (7.94% and 15.4% respectively), and the least in Group-A (4.82% and 9.63% respectively). For lateral flexion, patients had the maximum improvement of range of motion in post-treatment after 7 and 15 days, was recorded the maximum as 18.9% and 28.6% respectively in Group-B, followed by Group-C (12.6% and 20.8% respectively), and the least in Group-A (3.58% and 6.52% respectively). For rotation, patients had the maximum improvement of range of motion in post-treatment after 7 and 15 days, was recorded the maximum as 14.03% and 25.5% respectively in Group-B, followed by Group-C (10.54% and 17.94% respectively), and the least in Group-A (3.22% and 5.22% respectively).

4. DISCUSSION

CR is one of the disabling conditions in the fifth decade of life. The symptoms of this condition are one of the most serious functional limiting factors for a patient in the society.[2] The findings of the present study showed that the Mulligan technique was more effective than the Myofascial release, subsequently supporting the alternative hypothesis of the study. The findings also showed that the Mulligan technique significantly helped in decreasing pain, disability and increasing the range of motion. Prabhakar and Ramteke[14] quoted that the treatment-effects revealed that significant differences could be observed between the effects of cervical mobilization and TENS when compared using a control group. The results of their study demonstrated that the manipulative physiotherapy treatment for cervical spine and exercise protocol was capable of producing beneficial effects on pain, functional disability in subjects with lower cervical radiculopathy associated with CR. TENS were effective in reduction of pain and disability in patients with CR.

Conventional physiotherapy, like hot pack, TENS and isometrics are also effective in CR patients and in present study too, it has been found significantly effective, and several supportive studies concluded in this direction. Rafiq et al.[15] highlighting the comparative study between neuro-mobilization and conventional physiotherapy concluded that the combination of nerve mobilization and conservative treatment were effective in treating the patients with CR.

Myofascial release with conventional physiotherapy showed good results in terms of reducing pain and disability in present study but not as effective as conventional therapy with Mulligan mobilization. Gauns et al.[16] conducted a study in which they took 40 subjects

and were divided into two groups, Group-A was treated with conventional therapy and Group-B was treated with Myofascial with conventional therapy and they concluded that there was statistically significant change was present for pain, cervical flexure endurance, ROM, and functional abilities with $p < 0.05$ for both the groups, except for neck flexor endurance in control group.

Several studies have reported that Mulligan mobilization is effective in reducing disability, in improving range of motion and functional levels. In the present study, it was found that Mulligan mobilization was also effective in terms of same outcome measures. Exelby[17] reported that application of Mulligan mobilizations in the management of spinal conditions could assist in the correction of dysfunctional movement. Moulson and Watson[18] reported that cervical SNAGs had a sympathoexcitatory effect on the upper limbs in relation to potential mechanisms for manipulation induced analgesia.

Niaz et al.[19] concluded that Mulligan technique was much more effective than Maitland technique in terms of less pain and normal range of motion for CR. In the present study, conventional therapy with Myofascial release were also clinically effective but conventional physiotherapy with Mulligan were significantly more effective than Myofascial release.

Both the groups showed significant improvement in ROM. This might be due to the fact that pain was found to be the limiting factor. Therefore, as the treatment techniques helped in relieving the pain, the ROM simultaneously improved. The present study had demonstrated that both Mulligan mobilization and Myofascial release with conventional physiotherapy were effective in reducing pain and disability, and improving ROM. Mulligan with conventional physiotherapy did show better results in reducing pain and disability and improving ROM.

6. CONCLUSION

From the findings of the present study, it might be concluded that Mulligan technique was much more effective in decreasing pain, neck disability and improving range of motion in patients with CR and there was statistically significant difference between Mulligan technique and Myofascial release.

7. Declaration by Authors

The authors hereby declared that it was their original peace of research and had not been sent to any other journal for publication.

8. Acknowledgement

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9. Conflict of interest:

The authors declare no conflict of interest.

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