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Comparative Efficacy of Mulligan's Mobilization and Maitland's Mobilization in Cervicogenic Headache Among Desktop Users – Interventional Study

Dr. Tanisha Patil[1], Dr. Amrutkuvar Ray jade[2*]

[1]M. P. Th, D. Y. Patil College of Physiotherapy, Kolhapur,

Email ID: tanishapatil4@gmail.com

[2*]Principal, Department of Orthopedics Manual Therapy, D.Y. Patil college of physiotherapy, Kolhapur,

Email ID: dramrutkuvarsrayjade@gmail.com

***Corresponding Author:**

Dr. Amrutkuvar Ray jade

Principal, Department of Orthopedics Manual Therapy, D.Y. Patil college of physiotherapy, Kolhapur,

Email ID: dramrutkuvarsrayjade@gmail.com

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ABSTRACT

Background: A headache is pain or discomfort in the head Headaches which rises from the cervical spine are called as Cervicogenic headache**.** The cervicogenic headache can be identified with three sets of symptoms, a unilateral headache due to movements of head/neck or poor posture. A unilateral headache due to pressure on the neck. A headache which radiates to neck or shoulder region. Among this group, the prevalence of neck disorders exceeds 50%. This study aims to evaluate the efficacy of Mulligan's and Maitland's techniques in managing cervicogenic headaches and to compare the outcomes of these two manual therapy approaches.

Methodology Interventional study was conducted on 38 desktop workers, divided into two groups. Mulligan's mobilization was applied on 19 participants which was group A and Maitland's mobilization was applied on 19 participants which was group B, along with conventional treatment in each group. Both groups underwent a 2-weeks intervention, three sessions per week. participants were evaluated pre and post treatment by goniometer was utilized to measure cervical range of motion, Numerical pain rating scale was utilized to measure pain intensity and severity of headache were assessed by using Headache disability index.

Results: The comparison revealed that group A had a greater increase in cervical rotation ($p< 0.01$) and extension ($p<0.01$) range than the group B. Group A showed significantly greater reduction in severity of headache than group B (mean value of group A: 17.00 ± 7.62 and mean value group B = 42.63 ± 16.96). Furthermore, group A also showed great improvement in pain reduction than group B (mean value of group A: 1.32 ± 1.60 and mean value of group B= 2.68 ± 1.77).

Conclusion: The findings clearly demonstrate that both treatment approaches effectively improved range of motion, and reduce pain and headache disability in individuals with Cervicogenic headache. These findings suggest that Mulligan's mobilization was significantly more effective. According to these results the intervention utilized in Group A (appears to be the preferred treatment method for reducing cervicogenic headache.

Keywords: *A Cervicogenic headache, Flexion rotation test, Manual therapy, Mulligan's mobilization, Maitland's mobilization, Desktop workers*

1. INTRODUCTION

Head pain or discomfort is known as a headache. In their clinical practice, physiotherapists frequently deal with headaches. [1]

In many nations, people are becoming more aware that headaches represent a serious public health issue. There are three different kinds of headaches, according to the International Headache Society's Headache Classification Committee (2018). [2]

Cervicogenic headaches come first, followed by migraines and tension-type headaches. Cervicogenic headaches are those that originate in the cervical spine. A cervical musculoskeletal issue is the cause of a cervicogenic headache, which is a secondary headache.

Clinical features:

Three sets of symptoms can be used to diagnose a cervicogenic headache: a unilateral headache brought on by head or neck movements or bad posture. A single headache brought on by neck pressure. A headache that spreads to the shoulders or neck. [3]

One of the most prevalent headache types in today's generation is cervicogenic headache, which is particularly prevalent in jobs requiring a lot of computer use, such as hairdressing, carpentry, and regular reading. Cervicogenic headaches (CGH) are prevalent headaches that have a detrimental effect on family life, job, and quality of life, putting a direct or indirect financial strain on society. [4]

Epidemiology: The majority of people with cervicogenic headaches, a rare chronic headache, are between the ages of 30 and 44. Based on different study findings and diagnostic criteria, its prevalence among headache sufferers varies from 0.4% to 4%. The female-to-male ratio of 0.97 indicates that the illness affects men and women nearly equally.

History and physical: Unilateral pain that does not change sides is a common complaint from patients. Usually, the neck is where the pain starts and spreads to the oculo-frontotemporal area. It might manifest as episodes of variable length or fluctuating, continuous pain that is frequently made worse by head motions

Physiotherapy management: In Physiotherapy treatment exercise therapy, electrotherapy and manual therapy are important approaches for the rehabilitation of cervicogenic headache.

Electrotherapy management: - Electrotherapy modalities are commonly used in physical therapy to alleviate pain, reduce muscle tension, and restore mobility. Several evidence-based modalities have shown benefits in managing CGH symptoms.

Exercise therapy: - Exercise therapy for cervicogenic headache typically includes deep cervical flexor training, cervical mobilization exercises, scapular stabilization, and postural correction.

Manual therapy: - Manual therapy involves hands-on techniques applied by physiotherapists to restore joint mobility, reduce muscle tension, and improve posture and biomechanics. It is one of the primary conservative treatments for cervicogenic headache.

Common Manual Therapy Techniques Used: Mobilization: Maitland's mobilization and Mulligan's mobilization techniques applied to the cervical joints to increase mobility and reduce stiffness. Both Maitlands' and Mulligan's mobilization techniques work well in manual therapy. The mechanical consequences, which include a permanent or temporary alteration in the length of connective tissues, are demonstrated by the Maitland technique, which is a passive mobilization that causes cyclic oscillatory motions of the vertebrae.

Mulligan's mobilization type of joint mobilization developed by Brian Mulligan (Mulligan 2004, Mulligan 2007). Mulligan's mobilization is a manual treatment approach that claims that by practicing mobilization with movement, the joint's osteokinematics and arthrokinematics can be returned to normal. It is said that Mulligan's mobilization approach improves the symptoms. Techniques for manipulative therapy, such as Maitland's and Mulligan's mobilization, aid in improving range of motion and reducing discomfort. These two manipulation techniques have been found to be effective in treating cervicogenic headaches. In order to determine which methodology is more effective in treating cervicogenic headaches in desktop users, the study aims to compare the effectiveness of the two methods.

2. METHODOLOGY

Materials**:** Data collection sheet, Consent form, Goniometer

Methodology: -An Interventional Analytical study conducted using consecutive sampling method

Subjects were selected according to inclusion and exclusion criteria.

Inclusion Criteria: Participants age group between 30- 50 years, Participants diagnosed with cervicogenic headache with Positive FRT (flexion-rotation test) by certified clinical physiotherapist, Participants of all genders, Participants using desktop more than 4hr / day.

Exclusion Criteria Dizziness or visual disturbance, Recent trauma or injury related to other activities like sports, etc, known congenital, inflammatory and infectious condition of cervical spine, Patient on medication (steroids/ analgesics), cervical radiculopathy.

3. PROCEDURE

The study protocol approval was taken by college research protocol committee on 23rd September,2024. The study was presented before institutional ethics committee for further approval. Ethical approval was approved reference no (D.Y. Patil university deemed to be university /IEC.176/2025), participants were screened on the basis of inclusion and exclusion criteria. Initially, a brief demographic data including name, age, gender, etc. as per data collection sheet were recorded. A written as well as informed consent was taken from all the participants willingly. On the basis of Consecutive sampling method, the participants were allocated into two groups. There were 19 participants in group A and group Beach. Pain intensity was measured using NPRS (Numerical Pain Rating Scale), cervical range of motions (ROM) [flexion, extension, rotation] was measured using universal goniometer and Headache disability index was used to measure the impact of headaches on people's daily lives. These outcome measures were assessed before first session of first week and last session of second week. The Period of intervention was two weeks.

Group A

n=19

Before application following out-come measures was assessed before first session and last session.

outcome measures: NPRS, universal goniometer, Headache disability index

Group A was received

Hot Moist pack for 10 mins after which Mulligan's mobilization (SNAG) technique for 4 repetitions with 10 seconds hold along with this technique

following exercise was be taken:

MFR for 2-3 mins.

stretching of Trapezius and Levator scapulae for 10 seconds hold of 3 repetitions

Active ROM exercise of 10 reptation.

Neck exercise isometric exercise for 10 seconds holds of 3 repetitions.

Treatment time= 30 minutes.

Group B

n=19

Before application following out-come measures was assessed before first session and last session.

outcome measures: NPRS, universal goniometer, Headache disability index

Group B was received

Hot moist pack for 10 mins after which Maitland's mobilization technique for (postero-anterior) PA and transverse direction 3-5 reptations by 60-120 oscillations / repetitions

Following exercise was be taken:

MFR for 2-3 mins.

stretching of Trapezius and Levator scapulae for 10 seconds hold of 3 repetitions

Active ROM exercise of 10 reptation.

Neck exercise isometric exercise for 10 seconds hold of 3 repetitions.

Treatment time= 30 minutes

4. RESULTS

The study involved two groups (Group A and Group B), each consisting of 19 patients, with a higher proportion of males in both groups. The results were analyzed using paired and unpaired t-tests to assess changes within groups and compare between groups. A total of 38 patients participated in the study, divided into two groups: Group A and Group B, each consisting of 19 participants. Arithmetic mean and standard deviation was calculated for each outcome measure. The statistical analysis was performed with using Microsoft excel.

Demographic distribution:

Group A

A total of 38 patients participated in the study, divided into two groups: Group A and Group B, each consisting of 19

participants. In Group A, 15 (79%) were male, and 4 (21.00%) were female.

Group B

A total of 38 patients participated in the study, divided into two groups: Group A and Group B, each consisting of 19 participants. In Group A, 16 (84.00%) were male, and 3 (16.00%) were female.

Outcome measures:

GROUP A:

TABLE NO 1:

Outcome	time Point	Mean	S.D.	P-value
NPRS	Pre	7.53	1.17	1.997E-11
	Post	1.32	1.60	
FLEXION	Pre	33.16	6.50	5.04186E-05
	Post	41.05	2.09	
EXTENSION	Pre	33.42	6.47	6.24758E-10
	Post	49.21	2.51	
ROTATION	Pre	48.95	13.29	9.84906E-11
	Post	88.42	5.01	
HDI	Pre	63.47	12.03	1.42823E-12

TABLE NO 1:

Outcomes from Group A post-intervention show significant improvement in all outcomes that were measured. The Numerical Pain Rating Scale (NPRS) indicated a notable decrease in levels of pain, with a mean of 7.53 (±1.17) before the intervention and 1.32 (±1.60) after, with a highly significant p-value of 1.997 x 10^{-11}.Spinal mobility also indicated a noticeable improvement. Extension increased from 33.42° (±6.47) to 49.21° (±2.51) ($p = 6.248 \times 10^{-10}$), and flexion also rose from 33.16° (±6.50) to 41.05° (±2.09) ($p = 5.042 \times 10^{-5}$). Rotation also showed marked improvement, with the mean values going up from 48.95° (±13.29) to 88.42° (±5.01), as evidenced by a p-value of 9.849 x 10^{-11}. A p-value of 1.428×10^{-12}Increased functional status was evidenced by the remarkable reduction in the Headache Disability Index (HDI) score from 63.47 (±12.03) to a lower value following therapy. These findings suggest that Group A's intervention was highly effective in reducing pain and improving functional mobility.

In group A post treatment Headache disability index score is decreased**.**

GROUP B:

TABLE NO 2:

Outcome	time Point	Mean	S.D.	P-value
NPRS	Pre	7.58	1.35	2.85799E-10
	Post	2.68	1.77	
FLEXION	Pre	36.32	4.96	0.001280434
	Post	41.58	5.54	
EXTENSION	Pre	37.11	8.22	8.3797E-05
	Post	42.37	6.53	
ROTATION	Pre	56.32	15.35	1.19344E-09
	Post	66.05	13.29	

HDI	Pre	59.26	9.89	1.75369E-06
	Post	42.63	16.96	

TABLE NO 2: Group B demonstrated statistically significant gains across all outcomes in the intervention period. NPRS decreased by a significant measure from pre-intervention mean 7.58 (±1.35) to post-intervention mean of 2.68 (±1.77) with extremely significant p-value of 2.858×10^{-10}. Flexion had increased from 36.32° (±4.96) to post-intervention of 41.58° (±5.54), revealing improved spinal mobility (p-value = 0.0013). Similarly, the increase in extension from 37.11° (±8.22) to 42.37° (±6.53) was significant with a p-value of 8.380×10^{-5}.Rotation increased as well from 56.32° (±15.35) to 66.05° (±13.29) with a highly significant p-value of 1.193×10^{-9}. In addition, the Headache impairment Index (HDI) was reduced from 59.26 (±9.89) to 42.63 (±16.96), representing reduced impairment and improved functional results ($p = 1.754 \times 10^{-6}$). These results suggest that Group B's intervention was effective for the reduction of pain as well as enhancement of function and mobility.

Within-Group Analysis:

A paired t-test was conducted to assess the effect of the intervention within each group.

GROUP A AND B:

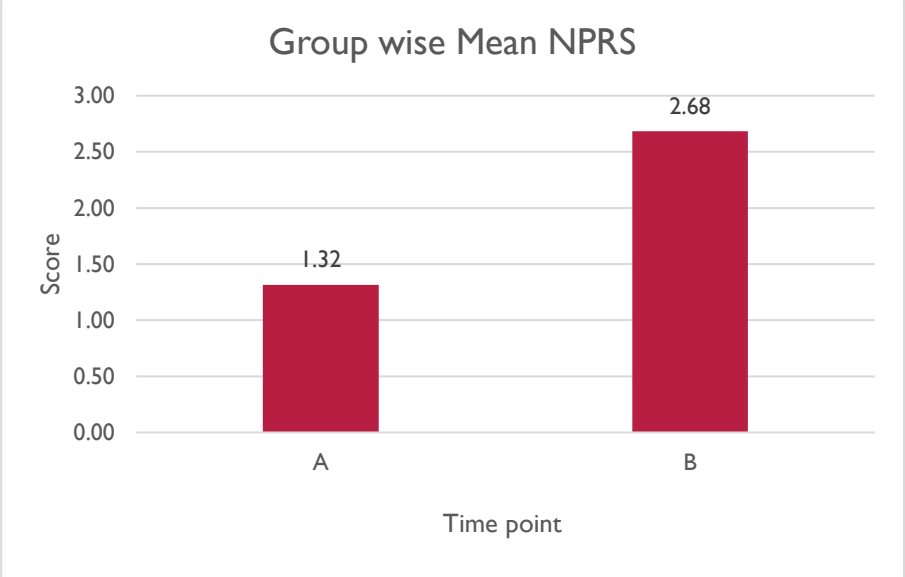
TABLE NO.-3:

Outcome	Group	Mean	S.D.	P-value
NPRS	A	1.32	1.60	0.008492792
	B	2.68	1.77	
FLEXION	A	41.05	2.09	0.35040784
	B	41.58	5.54	
EXTENSION	A	49.21	2.51	6.97755E-05
	B	42.37	6.53	
ROTATION	A	88.42	5.01	2.47416E-08
	B	66.05	13.29	
HDI	A	17.00	7.62	3.37897E-07
	B	42.63	16.96	

TABLE NO.-4:

After the intervention, comparisons between Group A and Group B showed significant differences in effectiveness. Group A complained much less of pain, recording a mean of 1.32 (±1.60) on the Numerical Pain Rating Scale (NPRS) versus 2.68 (±1.77) in Group B (p = 0.0085). The values of flexion were identical between the two groups (41.05° ±2.09 in Group A vs. 41.58° ±5.54 in

Group B), but the difference was not found to be significant (p = 0.35). Group A, however, had a significantly larger range of extension (49.21° ±2.51) compared to Group B (42.37° ±6.53), for which p-value was found to be 6.978×10^{-5}. With a highly significant difference ($p = 2.474 \times 10^{-8}$), Group A's rotation was much improved (88.42° ±5.01) compared to Group B's (66.05° ±13.29). Group A also showed better disability on the Headache Disability Index (HDI) at a mean of 17.00 (±7.62) compared with 42.63 (±16.96) in Group B ($p = 3.379 \times 10^{-7}$), indicating better functional outcomes.



GRAPH NO 1: Signifies the group wise NPRS score

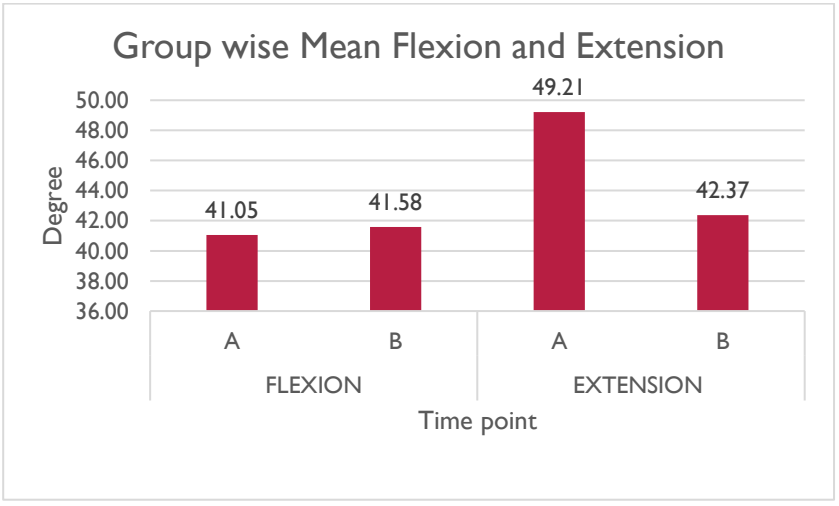
Pain (NPRS - Numeric Pain Rating Scale)

Group A: Pre = 7.53 ± 1.17 → Post = 1.32 ± 1.60 (P < 0.0001)

Group B: Pre = 7.58 ± 1.35 → Post = 2.68 ± 1.77 (P < 0.0001)

Between Groups: A = 1.32, B = 2.68 (P = 0.0084)

Group A showed significantly greater pain reduction.



GRAPH NO 2: Signifies the group wise Cervical Flexion and extension ranges.

Flexion (Range of Motion)

Group A: Pre = 33.16° ± 6.50 → Post = 41.05° ± 2.09 (P < 0.0001)

Group B: Pre = 36.32° ± 4.96 → Post = 41.58° ± 5.54 (P = 0.0013)

Between Groups: A = 41.05°, B = 41.58° (P = 0.35)

Both groups improved, no significant difference between them.

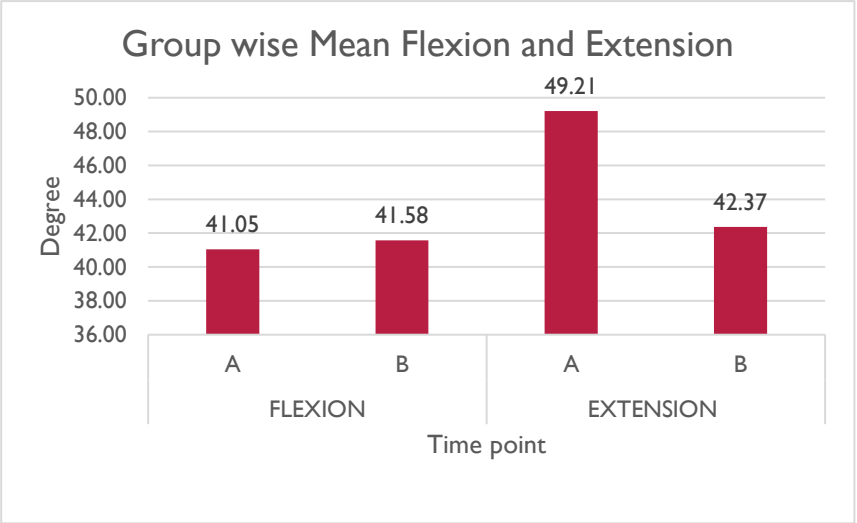
Extension (Range of Motion)

Group A: Pre = 33.42° ± 6.47 → Post = 49.21° ± 2.51 (P < 0.0001)

Group B: Pre = 37.11° ± 8.22 → Post = 42.37° ± 6.53 (P < 0.0001)

Between Groups: A = 49.21°, B = 42.37° (P < 0.0001)

Group A showed a significantly greater improvement.



GRAPH NO 3: Signifies the group wise Cervical Flexion and extension ranges.

Flexion (Range of Motion)

Group A: Pre = 33.16° ± 6.50 → Post = 41.05° ± 2.09 (P < 0.0001)

Group B: Pre = 36.32° ± 4.96 → Post = 41.58° ± 5.54 (P = 0.0013)

Between Groups: A = 41.05°, B = 41.58° (P = 0.35)

Both groups improved, no significant difference between them.

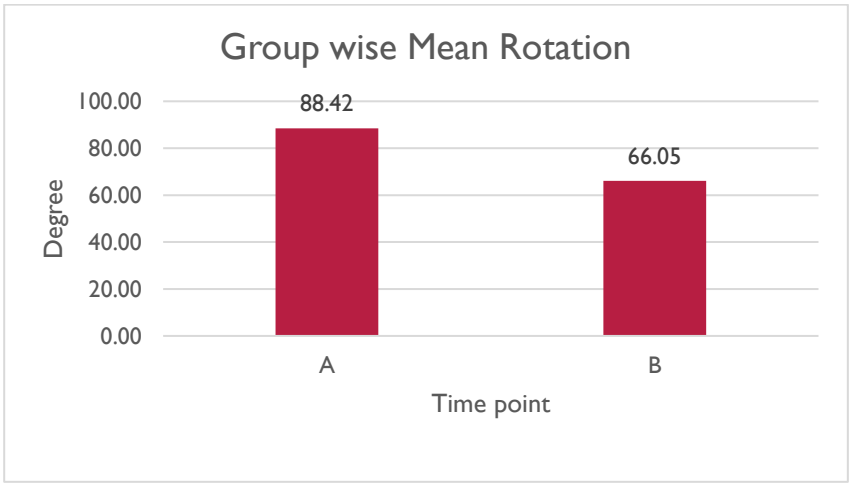
Extension (Range of Motion)

Group A: Pre = 33.42° ± 6.47 → Post = 49.21° ± 2.51 (P < 0.0001)

Group B: Pre = 37.11° ± 8.22 → Post = 42.37° ± 6.53 (P < 0.0001)

Between Groups: A = 49.21°, B = 42.37° (P < 0.0001)

Group A showed a significantly greater improvement.



GRAPH NO 4: Signifies the group wise Cervical Rotation ranges.

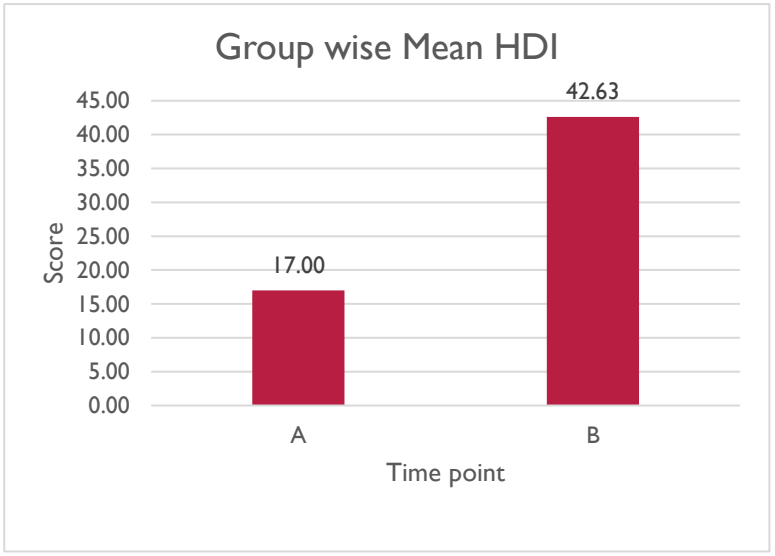
Rotation (Range of Motion)

Group A: Pre = 48.95° ± 13.29 → Post = 88.42° ± 5.01 (P < 0.0001)

Group B: Pre = 56.32° ± 15.35 → Post = 66.05° ± 13.29 (P < 0.0001)

Between Groups: A = 88.42°, B = 66.05° (P < 0.0001)

Group A had significantly better rotation improvement.



GRAPH NO 5: Signifies the group wise HDI (Headache disability index)

HDI (Health Disability Index)

Group A: Pre = 63.47 ± 12.03 → Post = 17.00 ± 7.62 (P < 0.0001)

Group B: Pre = 59.26 ± 9.89 → Post = 42.63 ± 16.96 (P < 0.0001)

Between Groups: A = 17.00, B = 42.63 (P < 0.0001)

Group A showed significantly better improvement in disability reduction.

Both groups showed improvement in all parameters. Group A had significantly better outcomes in pain reduction, extension, rotation, and disability improvement compared to group B.

5. DISCUSSION

The aim of the study was to establish whether manual therapy techniques were successful in the management of cervicogenic headaches in desktop workers. The efficacy of Maitland's mobilization, incorporating conservative management (free active exercises, MFR, deep neck muscle strengthening, and stretching exercises), and Mulligan's mobilization incorporating conservative management (free active exercises, MFR, deep neck muscle strengthening, and stretching exercises) was contrasted in this study. This research applied a 2weeks intervention comparing the efficacy of Mulligan's mobilization and Maitland's mobilization in cervicogenic headache among desktop workers. Both groups received sessions 3 times a week. The results indicated that both groups improved statistically significantly in all the parameters that were measured. Mulligan's group, however, consistently showed improved outcomes in terms of pain reduction, extension, rotation, and overall recovery from headache impairment.

This study was conducted among desktop workers. As stated by Rattaporn S. et al. (2011), extended use of the desktop may lead to the contraction of neck muscles statically, which accumulates calcium ions. Secondly, the process of metabolic waste clearance and blood flow will be impaired, leading to interference in active muscles. Awkward positions, prolonged static positioning, and repetitive movements will reduce the length of soft tissues, which will restrict or prevent the range of motion. These changes may also lead to micro lesions and pain due to insufficient oxygen and nutrients. [5, 6]

Participants in this study were between 30- 50 years of age, as per the inclusion criteria. The mean age was 40 years. This age range is significant because cervicogenic headache peaks in individuals between 30- 44 years. This is the working population age bracket most exposed to prolonged desktop use, poor ergonomics and stress all contributing to cervicogenic headache.

Gender distribution classification shows number of male participants are more than female participants in both the groups. The reason for the higher number of male participants in this study could be due to occupational demographics, as the study targeted desktop workers and a greater proportion of eligible participants in the institute were the study was conducted were male participants.

Pain: Since it affects functional mobility and overall quality of life, pain is of significant concern in cervicogenic headaches. Based on the findings of the study, the Numeric Pain Rating Scale (NPRS) scores of both groups significantly reduced, but group A post-treatment pain levels reduced more than those of group B. group A experienced a greater reduction in pain, which suggests that the intervention applied had a more potent analgesic effect.

The greater pain relief in Group A can be attributed to the unique mechanism of Mulligan's SNAG technique, which combines sustained natural apophyseal glides with active movement, promoting immediate correction of joint dysfunction and enhanced proprioceptive feedback.

Based on a study conducted by Neeti Christian, the SNAG technique proved to be statistically superior in headache reduction and disability over Maitland mobilization. The study was conducted to compare the impact of Mulligan's SNAG technique (C1-C2) and Maitland's technique (C1-C2) on cervicogenic headache among information technology workers in Gujarat, India. This proves the viability of advanced mobilization techniques towards improved pain outcomes and supports our study findings. [7]

Range of Motion (Flexion, Extension, and Rotation)

Since limited mobility may lead to compensatory reactions, increased pain, and impaired physical function, range of motion is an important measure in the assessment of cervicogenic headaches. Both groups within this study exhibited gains in range of motion, but Mulligan's group showed a greater gain.

Flexion The two groups' improvement in flexion was comparable, indicating that both treatment techniques were equally effective in enhancing anterior mobility. The influence of Sustained Natural Apophyseal Glide (SNAG) on the Flexion Rotation Test (FRT), pain level, and function in patients with cervicogenic headache was assessed in a systematic review by Cardoso et al. From the research, SNAG diminished functional symptoms and significantly reduced pain and FRT. This is further proof of how vital mobilization maneuvers are in addressing pain management and restriction of movement. [8]

Extension an interesting finding was that group A performed considerably better than group B in extension. Studies show that by reducing muscle stiffness and increasing joint compliance, methods like joint mobilization, myofascial release, and eccentric loading exercises significantly enhance extension range.

Rotation Particularly for activities involving twisting, reaching, or direction changes, rotation is a key component of efficient movement. Based on the study, group A performed better than group B regarding rotational gains. This finding suggests that the Group A intervention may have contained elements that effectively enhanced joint or spinal rotational ability. Rotational gains have been found to be closely linked with proprioceptive training, neuromuscular re-education, and core stabilization exercises. These elements may have had a role in Mulligan's group's significant gains.

Headache Disability Index (HDI Scores)

The Headache Disability Index (HDI) showed a greater reduction in Group A due to the comprehensive impact of Mulligan's mobilization on both pain and function. Improved cervical mobility, especially in extension and rotation, likely minimized stress on upper cervical structures, leading to decreased headache frequency and severity. Furthermore, the active component of SNAG may have facilitated better patient engagement and functional recovery, resulting in a more significant improvement in daily activities and emotional well-being reflected in Headache disability index scores.

6. CONCLUSION

The findings clearly demonstrate that both treatment approaches effectively improved range of motion, and reduce pain and headache disability in individuals with Cervicogenic headache. However, Mulligan's group showed significantly better outcomes, particularly in pain reduction, improved extension, rotation, and headache disability recovery. These findings suggest that Mulligan's mobilization was significantly more effective. According to these results the intervention utilized in Group A (appears to be the preferred treatment method for reducing cervicogenic headache.

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