Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 05, pp.31144-31149, May, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

EFFECT OF MAITLAND MOBILIZATION VERSUS MULLIGAN (SNAGS) MOBILIZATION ON HEAD REPOSITIONING ACCURACY (HRA), PAIN AND FUNCTIONAL DISABILITY IN PATIENTS WITH CHRONIC NECK PAIN - A RANDOMIZED CONTROLLED CLINICAL TRIAL

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ARTICLE INFO

Article History:
Received 23rd February, 2016
Received in revised form
14th March, 2016
Accepted 07th April, 2016
Published online 20th May, 2016

Key words:

Chronic neck pain,
Maitland mobilization,
SNAGs,
HRA,
Copenhagen Neck Functional Disability.

ABSTRACT

Background: Spinal mobilization is commonly used in the treatment of chronic neck pain. Various methods are used to treat patient with neck pain. In chronic neck pain patients have impaired neck proprioception. Manual therapy has evidence in improving neck proprioception patient with chronic neck pain. There is no study found in comparing two spinal manipulative therapies on neck proprioception.

Objective: objective of this study is to find out effect of Maitland mobilization versus mulligan (SNAGs) on head repositioning accuracy (HRA), pain and functional disability in chronic neck pain patient.

Method: 63 patients was randomly allocated by lottery method and equally allocated into 3 groups. The 3 groups are 1) Maitland mobilization, 2) Mulligan (SNAGS) and3) Conventional treatment group. All the groups given different exercise and treatment given for 3 WEEKS (5 session / week) and they are statistically analysed by ANOVA.

Result: When comparison pain between Maitland group and Conventional group shows a mean difference of 1.38 and shows statically significant improvement ($p=0.00$). For HRA Maitland to SNAGs group and Maitland to conventional shows highly significant ($p<0.05$), and for Copenhagen Neck Functional Disability all group shows highly significant with higher improvement shown on Maitland group ($p=0.00$).

Conclusion: In this study the patients were treated with Maitland mobilization, SNAGs and conventional therapy in 3 groups, respectively. All three exercises are statistically significant in reducing the patient symptoms. But Maitland mobilization is significant in reducing the patient symptoms when it compared with conventional therapy and SNAGs mobilization.

Citation: Keyur M. Patel, Dr. M. Balaganapathy and Hinal M. Patel, 2016. "Effect of Maitland mobilization versus mulligan (SNAGS) mobilization on head repositioning accuracy (HRA), pain and functional disability in patients with chronic neck pain - A randomized controlled clinical trial", *International Journal of Current Research*, 8, (05), 31144-31149.

INTRODUCTION

The International Association for the Study of Pain (IASP) in its classification of chronic pain defines as pain perceived anywhere in the posterior region of cervical spine from the superior nuchal line to the first thoracic spinous process. Another type of classification proposed by IASP is based on duration of neck pain according to which chronic neck pain has duration of 3 months or more. (International association for the study of pain, 2004)It is the second largest cause of disability affecting up to 70% of individuals at some point in their lives causing high socioeconomic consequences in terms of health expenses and loss in working days. The reported point of prevalence varies from 5% to 35% in different countries, although the most common point prevalence is 10% to 15%. (Bovim *et al*., 1994; Hoy *et al*., 2010) The reported prevalence is somewhat higher in females as compared to males. In India reported prevalence is 6%. (Joseph henry Leonard *et al*., 2009)The cervical spine is distinct and most mobile part of the vertebral column. It has three main functions; provides stability to the head, permits motion of head in all directions and protects the structures like spinal cord, nerves and vertebral artery passing through it. (Grant, 2002; Bovim *et al*., 1994) The normal Lordotic curvature of cervical spine (30-40) along with the other spinal curvatures in lower spine provides a shock

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absorption mechanism and helps the body to maintain its centre of gravity. (Panjabi and White, 2001; Neumann *et al*., 2002) The superficial and deep muscles of cervical region plays an important role in stabilizing the cervical spine in all positions of head. (Deborah *et al*., 2004) Cues received from the visual, vestibular and cervical proprioceptive system are responsible for orientation of the head with respect to the trunk in three dimensional space so during movement signals change continuously due to changes in muscle length, visual scene and multiarticular surfaces of the cervical vertebrae. (Humphreys and Irgens, 2002; Heikkila and Wenngren, 1998; Revel *et al*., 1994) It is now well known that the proprioceptive function is more refined in neck as compared to the low back.(Susan *et al*., 2014; Persjolander *et al*., 2008) It is measured by head repositioning accuracy (HRA). Recent evidences suggests that commonly the chronic neck patients & specifically whiplash subject shows signs of dysfunctional neck proprioception when measured by standing balance and posture or by Head Repositioning Accuracy. (Humphreys and Irgens, 2002; Heikkila and Wenngren, 1998; Revel *et al*., 1994) According to Heikkila *et al*. for understanding the morbidity of neck pain, particularly after non- contact whiplash trauma, the most significant factor may be the proprioceptive dysfunction. There is now increasing evidence that dysfunction of mechanoreceptors, particularly in deep muscles, ligaments, and joints of the neck, is the main cause. (Heikkila and Wenngren, 1998) The general hypothesis for this study is there is a dissociation or dysfunction of the integrated visual, vestibular and proprioceptive systems of the neck due to trauma and/or continuing mechanical problems in chronic neck pain subjects. In particular, the loss of coordinated head, eye and upper limb movement may result in altered afferent information from vestibular, neck and visual afferents to corresponding motor neurones in the neck, visual apparatus and upper limbs. Various neck-posture reflexes which regulate these functions such as the vestibulocollic, cervicocollic, optokinetic and tonic neck reflexes may be affected and aberrant sensory information may continue to maintain dysfunctional motor loops. (Per sjolander *et al*., 2008; UlrikRoijezon, 2009; Teng *et al*., 2007) There is also evidence that dysfunction of the cervical proprioceptive system may influence both the oculomotor and vestibular systems, producing detrimental effects on the visual and vestibular systems. (Susan A. Reid *et al*., 2014; Panagis, 2009)Unfortunately, there is limited research on the effectiveness of manual therapy on neck proprioception.

For this study Null hypothesis were

1. There is no difference between the pre and post outcome measures within groups of subjects with chronic neck pain.
2. There is no difference between the pre and post outcome measures between groups of subjects with chronic neck pain.

MATERIALS AND METHODS

Total 345 subjects of neck pain in Charotar region, Gujarat, India were screened by taking inclusion and exclusion criteria in consideration. The study was then performed on 63 subjects who meet the inclusion criteria. The inclusion criteria was non-specific chronic neck pain (>3 months), males and females with age between 30 to 50 years, NPRS ≥6, willingness to participate in the study as a volunteer. Exclusion criteria was radiating pain with weakness, paraesthesia and decreased deep tendon reflex in upper limb, Rheumatologic disorders, Ankylosing spondylitis, any history of recent trauma or surgery around neck and active treatment in past one month (medical).All the subjects who were ready to participate and fit for the study were informed about the procedure and purpose of the study and written consent was taken from each subject prior to the study. The pre-treatment baseline assessment was done on 0^{th} day by the investigator other than primary investigator. The subjects were randomly allocated on the basis of close envelope lottery method into three equal groups that is Maitland mobilization, Mulligan (SNAGs) mobilization and Conventional treatment group. Post treatment blinded assessment was then taken after 3 weeks. This study was approved by Ethical Committee (AIRP/IRB/14/028).

Group 1

Maitland mobilization

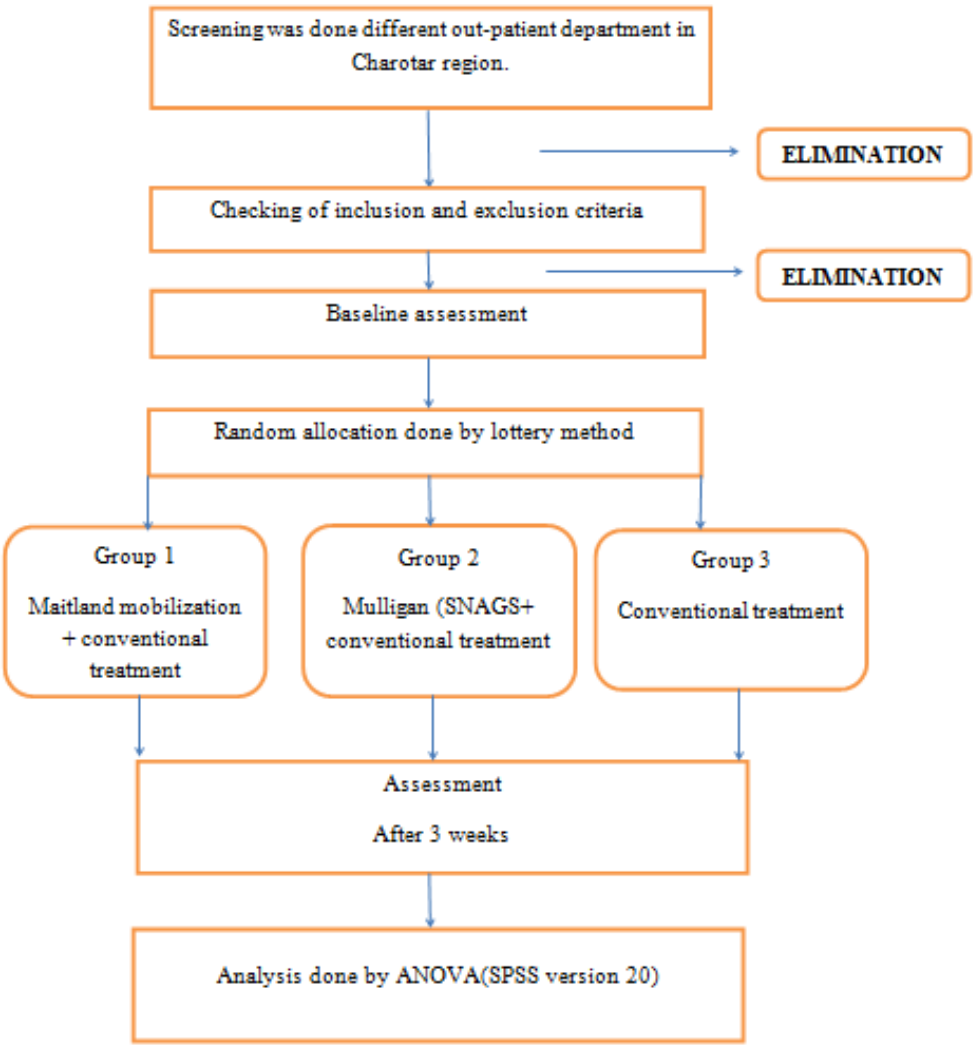
The physiotherapist palpates the neck to find the three most dysfunctional joints and then perform passive joint mobilization to those joints (as described by Maitland *et al*.). A passive joint mobilization is where the therapist uses their thumbs to rhythmically apply pressure to a vertebra usually in a posterior to anterior direction. Procedure was performed three times for 30 seconds to dysfunctional joints. After mobilization subject had to perform same exercises as conventional group.

Figure 1. Maitland mobilization

Group 2
Mulligan SNAGS (Sustained Natural Apophyseal Glides) mobilization

Participants were received SNAGs as described by Mulligan. The participant, in the sitting position, is asked to move their head in the direction that particularly produces their symptoms. As the participant moves their head, the physiotherapist gently glides the painful vertebra anteriorly and sustains the glide through the movement. During the application of the glide, the participant should stay symptom free and is instructed to stop moving if any PAIN is produced. This movement was repeated for 10 times. After mobilization subject had to perform same exercises as conventional group.

Figure 2. Mulligan (SNAGs) mobilization



Flowcharts

Group 3

Conventional treatment

1. Isometrics of neck (2sets x 10 reps)
2. Scapula stabilizer exercises (2sets X 10 reps)
3. Deep neck flexor strengthening (2sets X 10 reps)
4. Active neck movement in all direction (10 reps)

Outcome measure

Head Repositioning Accuracy: (Humphreys and Irgens, 2002; Susan A. Reid *et al*., 2014; http://www.rehabmeasures.org/Lists/RehabMeasures/PrintView.aspx?ID=1156)

Minimal clinically important difference wasstill not established. But for this study 25% difference from base line was considered as an improvement. For HRA, subjects were seating, with the laser mounted helmet, facing a paper target, against the white wall 90 cm away. To eliminate visual cues, subjects' vision was occluded using black eye belt. Subjects were asked to find, and then memorize, their straight forward, head position.

Figure 3.Head Repositioning Accuracy

This was recorded on the paper target as the 'neutral' position. Subjects were asked to move their head maximally in each of extension, left rotation, right rotation and flexion, coming back to the 'neutral' position after each maximal head movement. Each movement was repeated 5 times, followed by a 2-minute break and then 5 repetitions of the next movement. Each movement was required to take place over 2 seconds, and all movements were recorded on the paper target. A deviation from the neutral after active head displacement was calculated in centimetres after the procedure as Head Repositioning Error (HRE).

0-10 Numeric Pain Rating (Rachel Tappan *et al*., 2013; Pietrobon *et al*., 2002)

MCID is raw change of 3 points or 27% (percent of raw in total = 3 points/11 points) is required for meaningful change.

Copenhagen Neck Functional Disability Scale (r=.89) (Jordan A, Manniche *et al*., 1998)

MCID was still not established. But difference of 30% from base line was taken as an improvement.

Data analysis

The response variables were found to be consistent with a normal distribution, so parametric statistics were used. Means, standard deviations, and 95% confidence intervals were calculated for all outcome measures and p value < .05 considers as significant level. Comparisons of groups at baseline and after 3 weeks were conducted with One-Way Analysis of Variance (ANOVA), and data were analysed in SPSS Version 20.

Total 63 participants were selected for this study and randomly allocated in three different groups. Group 1 Maitland, Group 2 Mulligan (SNAGs) and last Group 3 Conventional.

RESULTS

In this study both males and females were almost present in all three groups with mean age in Maitland mobilization 38.7, Mulligan mobilization 39.66 and conventional group 39.3.

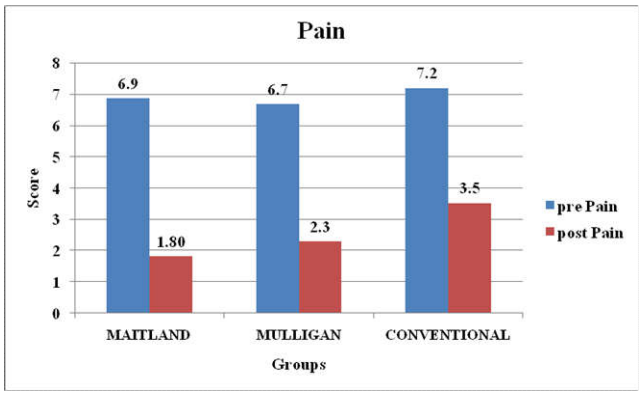
Table 1. ANOVA

Outcome measures	Group	Group	Mean difference	p-value
Pain	Maitland	Mulligan	0.66	0.28
		Conventional	1.38	0.00*
	Mulligan	Conventional	0.71	0.24
Copenhagen Neck Functional Disability	Maitland	Mulligan	2.57	0.01*
		Conventional	7.28	0.00*
	Mulligan	Conventional	4.71	0.00*
Head Repositioning Error (FLEXION)	Maitland	Mulligan	2.07	0.00*
		Conventional	1.20	0.09
	Mulligan	Conventional	0.86	0.28
Head Repositioning Error (EXTENSION)		Mulligan	0.4	0.05*
	Maitland	Conventional	2.69	0.00*
	Mulligan	Conventional	2.72	0.00*
Head Repositioning Error (RIGHT ROTA.)		Mulligan	1.73	0.05*
	Maitland	Conventional	3.30	0.00*
	Mulligan	Conventional	1.56	0.09
Head Repositioning Error (LEFT ROTA.)		Mulligan	1.84	0.02*
	Maitland	Conventional	3.95	0.00*
	Mulligan	Conventional	2.10	0.00*

*. The mean difference is significant at the 0.05 level.

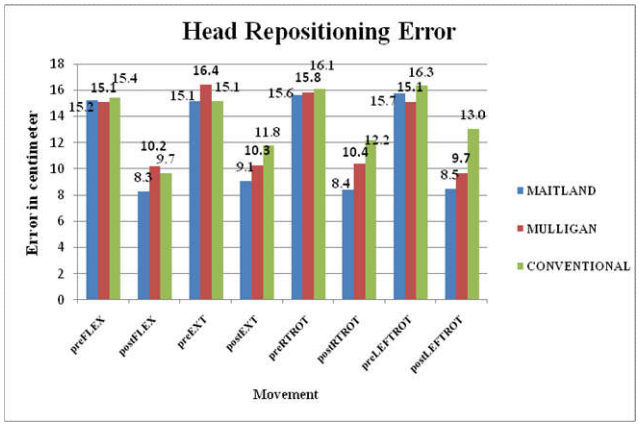
The above results (Table-1) suggest that Maitland mobilization is significant in reducing patient's symptoms when compared with Mulligan mobilization and conventional therapy group.

MCID selected for pain was 3 points raw change. All three groups showed more than 3 points improvement which suggests meaningful change (Graph – 1).



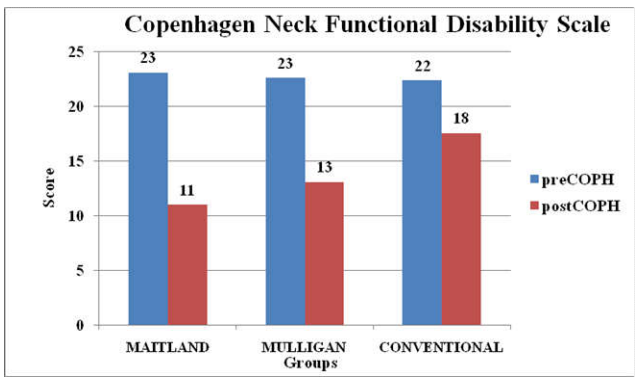
Graph 1 - Pain

The selected MCID for Head Repositioning Error was at least 25% from baseline. For flexion HRE all three groups showed significant change (Graph - 2). For extension, right rotation and left rotation both Maitland and Mulligan mobilization groups showed meaningful change except the conventional group (Graph – 2)



Graph 2 – Head Repositioning Error

For Copenhagen Neck Functional Disability MCID selected was 30% from the baseline and only conventional treatment group doesn't show 30% improvement according to MCID selected (Graph- 3).



Graph 3 – Copenhagen Neck Functional Disability Scale

DISCUSSION

The study was a randomized controlled clinical trial to find out the effect of Maitland mobilization versus Mulligan mobilization on Head Repositioning Accuracy, pain and functional disability in patients with chronic neck pain. The data analysis revealed that all three groups showed significant improvement in reducing the patient's symptoms. But Maitland mobilization showed significant improvement in reducing patient's symptoms when compared with Conventional treatment and Mulligan mobilization. On comparing Maitland Mobilization group with conventional treatment group, clinically as well as significant improvement at p value < 0.05 (p=0.007) was seen in pain with mean difference of 5 and 3 respectively. In other study a significant reduction in reported pain was experienced by the symptomatic exercise versus symptomatic non exercise group and there wasn't any control group. In the present study comparison was done between three groups and result suggested that Maitland group shows significant improvement. (Humphreys and Irgens, 2002) For Head Repositioning Accuracy, when two manual therapies were compared Maitland group had shown greater improvement in HRE than Mulligan group in post treatment after 3 weeks. The decrease in HRE found in flexion was 6.94 cm, in extension 6 cm, in right rotation 7.2 cm and left rotation 7.2 cm which constitutes a clinically significant change (Graph - 2). This indicates that Maitland approach is clinically beneficial in treating chronic neck pain subjects. Another study was done on effect of proprioceptive exercise on symptomatic group for 4 weeks and compared with non-symptomatic group and they recruited Sixty-three subjects and 56 subjects completed the 4-week study. And found that Active HRA was significant in reducing neck pain subjects in comparison with control subjects (ANOVA, $p < 0.001$). At 4-weeks, the symptomatic exercise group demonstrated significant improvement in HRA in all active movements compared to the other groups (ANOVA, $p < 0.001$). (Humphreys and Irgens, 2002; Susan A. Reid *et al*., 2014) But this study done proprioceptive exercises and compared with asymptomatic group so there was difficult to say that this treatment help in improve HRE. When comparing the other study they used CROM for measuring the HRE but they found that neither SNAGs nor Maitland mobilization had meaningful effect on joint position sense in cervicogenic dizziness also they found that CROM not sufficient sensitive to detected the small changes that occur with HRE. They suggested that using head-mounted laser to measure HRE may be more accurate and sensitive. In our study we used head-mounted laser to measure HRE. (Susan A. Reid *et al*., 2014)

For functional activity we used Copenhagen Neck Functional Disability index. This scale consist of total 30 score and higher the score higher the functional limitation. We used this scale against Neck Disability Index, because we found that some point were not directly relevant to Indian population so in Copenhagen Neck Functional Disability all 15 questions were relevant to Indian population, where they encounter with their daily activity. Manual therapy group showed significant improvement in their daily activity with p value <.05. Where Maitland group showed highest improvement in score compared to SNAGs. Mean difference in Maitland was 12, in

SNAGs was 9 and conventional was 4 respectively. In all 3 groups we found that in Copenhagen Neck Functional Disability's one component (question number 15- do you feel that neck pain will influence your future?) all the subjects had fear about again neck pain can occur.

Future recommendations

- A long duration of study with a proper follow-up can be done.
- Sophisticated three-dimensional, ultrasound, motion analysis systems are available for measuring real-time head positioning as well as calculating differences in active head displacement with repeated movements.

Conclusion

In this study, the subjects were treated with Maitland mobilization, Mulligan (SNAGs) mobilization and conventional treatment in 3 groups, respectively. All three exercises are statistically significant in reducing the subject symptoms. But Maitland mobilization is significant in reducing the subject symptoms when it is compared with conventional therapy and SNAGs mobilization.

Conflict of Interest

The author reports no conflict of interest.

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