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A comparative study on effect of iliotibial band myofascial release on functional disability in patients with knee osteoarthritis

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Abstract
Mechanical neck pain is also known as nonspecific neck pain. It is also defined as generalized neck pain provoked by sustained neck posture, neck movement, pain on palpation of cervical musculature without pathologies. Aim of the study is to compare the effectiveness of Muscle Energy Technique and Mulligan SNAGS on pain, and active cervical range of motion for individuals with mechanical neck pain.30 subjects according to inclusion and exclusion criteria were randomly divided in to two groups for the study where, The results were analyzed by Paired t-test or Wilcoxon signed ranks test (Intra- group Comparison) and unpaired t-test or Mann-Whitney U test (Inter-group Comparison) comparing Muscle Energy Technique and Mulligan SNAGS groups for post-treatment effects. Both the groups showed effectiveness regarding to VAS and Cervical ROM. However, the group receiving MET was more effective as compared to Mulligan SNAGs, Result of the study shows that Group A which received MET and Group B which received Mulligan SNAGs have good effect in reducing pain and increasing CROM. But when both the groups are compared, the group which received MET showed better improvement that the group who received Mulligan SNAGS. Hence alternative hypothesis is accepted at p=0.001 and null hypothesis is rejected.

Keywords: Muscle energy Technique (MET), Mulligan SNAGS, Mechanical Neck Pain, VAS, ROM.

Introduction
Mechanical neck pain is also known as nonspecific neck pain. It is also defined as generalized neck pain provoked by sustained neck posture, neck movement, pain on palpation of cervical musculature without pathologies. The International Association for the study of Pain (IASP) has defined neck pain as:" Pain perceived as arising from anywhere within the region bounded superior nuchal line, inferior by an unoriginally transverse line through the tip of the first thoracic sinous process, and laterally by the saggital plane tangential to the lateral border of neck. Mechanical neck pain, i.e. the presence of acute or chronic pain in the cervical region, is located in the posterior and posterolateral parts of the neck, and is sometimes accompanied by remote referred pain to the upper limb or head, or symptoms of vertigo. Individuals with neck pain that lack an identifiable patho-anatomic cause for their symptoms are usually classified as having mechanical neck pain. Direct patho-anatomic cause of mechanical neck pain is rarely identifiable. It is believed to be caused by a mechanical dysfunction involving various anatomical structures of the cervical spine, essentially of musculoskeletal origin, causing restricted movement and pain.

The majority of cases of neck pain originate in mechanical factors: repetitive movements, lack of work breaks, static jobs, and holding the head and/or arms in the same position for long periods of time [2, 3, 4]. The precise nature of the cause of mechanical neck pain is not clear; however, it has been attributed to stimulation of the afferent nociceptive fibers present in the cervical interapophyseal joints, intervertebral discs, paravertebral muscles, and other soft tissues. Recent studies have suggested that the cervical interapophyseal joints may be the main cause of neck pain. Mechanical Neck Pain is a common complaint; with appoint prevalence of nearly 13% and life time prevalence of nearly 50%. Pain and Impairment of the Neck is common. It is estimated that 22%to 70% of population will have neck pain sometime in their lives. Prevalence of neck pain increases with age and is most common in women.

According to the World Health Organization 50% of adults' experience neck pain during their lifetime. The frequent presence of neck pain in the general population is estimated at between 10% and 15%, with women being more commonly affected than men. More than a third of patients who visit the doctor with neck pain present symptoms lasting more than six months, or recurring symptoms. (Mechanical neck pain can result from hypertonic posterior cervical muscles that may occur due to sustained partial neck flexion when reading, writing, operating a computer terminal for prolonged periods, sewing, by holding a stooped posture or by gross trauma. The aetiology of mechanical neck pain is poorly understood and mostly multifactorial, including poor posture, depression, anxiety, neck strain and occupational or sporting activities [6, 7]. Some researchers state that any event or condition (e.g. incorrect posture, ageing, acute injury, congenital or developmental defects) which leads to altered joint mechanics or muscle structure or function, can result in mechanical neck pain.

According to classification and diagnostic criteria of neck patient's, four subgroups have been recognized:

a. neck pain with mobility deficits
b. with movement coordination impairments,
c. with headache,
d. with radiating pain.

Subjects with mechanical neck pain demonstrate of pain and significant reduction in range of movement (ROM) of the neck is a frequent finding in individuals with mechanical neck pain.

The intent of the study is to compare the efficacy of muscle energy technique and Mulligan SNAGS on pain, and cervical ROM in individuals with mechanical neck pain.

Objective of the study

- To determine the effect of muscle energy technique in reducing pain and improving functional range of motion among patients with Mechanical Neck Pain.
- To determine the effect of Mulligan (SNAGS) in reducing pain and improving functional range of motion among the patients with Mechanical Neck Pain.
- To compare the effectiveness of muscle energy technique over Mulligan (SNAGS) in reducing the pain and improving functional range of neck among patients with Mechanical Neck Pain.

Hypothesis

Null hypothesis (H_0)

- There will be no significant difference between the effectiveness of Muscle energy technique and Mulligan SNAGs on pain and ROM in subjects with Mechanical Neck Pain.

Alternate hypothesis (H_1)

- There will be significant difference between the effectiveness of Muscle energy technique and Mulligan SNAGs on pain and ROM in subjects with Mechanical Neck Pain.

Methodology

Study sample size

30 subjects was taken for this study who satisfy the inclusion criteria and are divided into two groups and compared with the treatment procedures with 15 in each groups.

Study design

Experimental study design

Study population

Subjects diagnosed with MECHANICAL NECK PAIN are eligible for this study.

Study setting

Study will be conducted at

- OPD, Department of Physiotherapy, HOSMAT Hospital, Bangalore
- OPD, Department of Physiotherapy, Ravi Kirloskar Hospital, Bangalore and other associated hospital in Bangalore.

Group A - MET plus conventional therapy (moist heat pack and isometrics neck exercises)

Group B - Mulligan SNAGs plus conventional therapy.

Sampling methods

Purposive sampling technique

Study duration

The study was conducted for total of 12 months.

Selection criteria

Inclusion criteria

1. Both male and female.
2. Age group between 30-45years.
3. Patients with Visual Analoge Scale score of 6-9.
4. Without radiating pain at the arm.

Exclusion criteria

1. Age less than 30years and greater than 45years
2. Patients with Visual Analoge Scale less than 6.
3. Recent surgery in and around shoulder and cervical region.
4. Cervicogenic headache.
5. Radiculopathies.
6. Whiplash associated disorders
7. Vascular diseases of neck and progressive neurological deficit.
8. Verteberobasilar insufficiency. Any deformity (example: Torticollis, Sprengel's deformity, Scoliosis).

Outcome measures

Visual analogue scale

Range of motion

Materials used

- Stool
- Treatment couch
- Pillow
- Towel
- Goniometer
- Stationaries

Variables

Dependent variables

Pain and Range of motion.

Independent variables

Muscle energy technique, Mulligan SNAGS, Moist heat packs, isometric neck exercises

The subjects for the study was taken from the outpatient department of hosmat hospital, ravi kirloskar hospital and

other tie up hospitals in Bangalore. The subjects referred to the physiotherapy department with the diagnosis of Mechanical Neck Pain were screened for inclusion and exclusion criteria. The subjects who were qualified for the trial will be explained the aim and objectives of the study. The subjects were requested to sign the consent form. The subjects were measured for their baseline outcome measures. A total 30 subjects who fulfill the inclusion criteria were included for the study and allotted into 2 groups.

Group A - Met with conventional therapy
Group B - Mulligan snags with convetional theray
The subjects with both groups received intervention for 6 days in a week for 2 weeks.
The baseline measurements will be compared to the data at the end 2 weeks.

Procedure for intervention
Subjects were allocated into two groups randomly by concealed envelope, the outcome measures will be measured at baseline.
Conventional therapy for both groups:
Conventional therapy in form of moist heat pack and Isometric Neck Exercises were given once a day for 6 consecutive days a week for 2 weeks.
Moist heat pack: Moist heat pack to neck region was given for period of 15 to 20 minutes, before intervention.
Isometric Neck exercise: Isometric exercises were performed in the seated position by resistance applied by the therapist at the forehead (cervical flexion, extension, rotation and side bending) for 10 sec holds for 10 repetitions, after intervention [32].
Interventional therapy for both groups
Interventional therapy was given every alternative days for 3 days a week for 2 weeks to the subjects of both the groups.
Group A- Muscle Energy Technique
For Lower cervical vertebrae (C3- C7)
For example C3-C4, patient was taken in supine position with neck slightly flexed passively by the therapist.
The right middle finger was placed over the right pillars of C3-C4 and the neck taken to the maximum position of side-bending rotation to the right, engaging the barrier.
The left hand was placed over the patient's left parietal and temporal areas. With this hand offering counterforce, the patient was invited to side-bend and rotates to the left, for 5 seconds.
Post isometric relaxation of these muscles following the 5-7-second mild contraction, after which the neck was taken to its new barrier, and the same procedure repeated 2 or 3 times.
For Upper Cervical vertebrae (C1-C2)
The patient lies supine and the therapist passively flexed the subject's head and neck approximately 45º until a sense of resistance was palpated. If the direction of restriction was at left, then rotated the head to the left until a restrictive barrier was palpated. The subject was then instructed to gently push into the practitioner's hand (rotate to the right) for 5 seconds, followed by 5 seconds of relaxation for 3 times.
Group B–Mulligan SNAGS
Rotation and Lateral flexion-
Indications: painful and/or limited Rotation or

Lateral flexion
Position: Patient sitting upright with head in neutral.

Contact: medial border distal phalanx of one thumb on articular pillar, other thumb reinforces it to provide the mobilization force.

Glide: up toward the eyeball in the plane of the facet.

Movement: rotates or laterally flexes the head towards painful side while therapist maintains glide.

Extension and Flexion
Indications: painful and/or limited extension or flexion.

Position: patient sitting upright with head in neutral.

Contact: Medial border distal phalanxes of one thumb on spinous process, other thumb reinforce sit to provide the mobilization force.

Glide: up centrally toward the eyeballs in the plane of the facets.

Movement: extends or flexes while therapist maintains glide.
The technique was repeated 6 times. For progression repetitions of the SNAG was increased from 6 to10. The post interventional measurements were recorded on the end of 2weeks of treatment in the form of VAS and active cervical ROM. Thus, Obtained pre and post interventional measurements for both outcome measures, such as VAS and active cervical ROM were subjected to the statistical analysis.

Procedure for outcome measures
Goniometer was used to measure the cervical ROM under the active supervision and direction of the therapist.

Flexion
Testing position: sitting with thoracic & lumbar spine well supported by the back of the chair.
Stabilization: shoulder girdle is stabilized to prevent flexion of the thoracic and lumbar spine
Centre: over the external auditory meatus
Proximal Arm: perpendicular or parallel to ground
Distal Arm: parallel to the longitudinal axis of tongue depressor

Extension
Testing position: sitting with thoracic & lumbar spine well supported by the back of the chair.
Stabilization: shoulder girdle is stabilized to prevent flexion of the thoracic and lumbar spine
Centre: over the external auditory meatus
Proximal Arm: perpendicular or parallel to ground
Distal Arm: parallel to the longitudinal axis of tongue depressor

Lateral flexion
Testing position: sitting with thoracic & lumbar spine well supported by the back of the chair. Cervical spine in 0 degree of flexion, extension and rotation
Stabilization: shoulder girdle is stabilized to revent flexion of te thoracic and lumbar spine
Center: over the spinous process of C7
Proximal Arm: spinous process of the thoracic vertebrae so that the arm is perpendicular or parallel to ground
Distal Arm: dorsal midline of the head

Results

The results were analyzed by Paired t-test or Wilcoxon signed ranks test (Intra- group Comparison) and unpaired t-test or Mann-Whitney U test (Inter-group Comparison) comparing Muscle Energy Technique and Mulligan SNAGS groups for post-treatment effects. Both the groups showed effectiveness regarding to VAS and Cervical ROM. However, the group receiving MET was more effective as compared to Mulligan SNAGs, Result of the study shows that Group A which received MET and Group B which received Mulligan SNAGs have good effect in reducing pain and increasing CROM.

Table 1: Age distribution of patients studied

Age in years	Group A	Group B	Total
30-40	12(80%)	13(86.7%)	25(83.3%)
41-50	3(20%)	2(13.3%)	5(16.7%)
Total	15(100%)	15(100%)	30(100%)
Mean ± SD	37.20±4.54	36.13±3.89	36.67±4.19

P=0.495, Not Significant, Student t test

The table depicts the distribution of age in group A and Group B. Out of 30 patients, 25(83.3%) were of age group 30-40 and 5 (16.7%) were of age group 41-50.Both the group shows evenly distribution of patients according to age.

Table 2: Gender distribution of patients studied

Gender	Group A	Group B	Total
Female	6(40%)	6(40%)	12(40%)
Male	9(60%)	9(60%)	18(60%)
Total	15(100%)	15(100%)	30(100%)

P=1.000, Not Significant, Chi-Square Test

Table 2 shows the distribution of gender in both the groups. Out of 30, 12(40%) were female and 18(60%) were male. Similar numbers of male and female patients are present in both the groups.

Table 3: ROM: Day 1- A Comparison of study variables in two groups studied

ROM: Day1	Group A	Group B	Total	P value
VAS	7.07±0.88	7.00±0.85	7.03±0.85	0.834
F	35.53±3.38	36.27±3.56	35.90±3.43	0.567
E	37.20±3.21	37.27±3.75	37.23±3.43	0.959
RSF	31.87±3.60	32.53±3.27	32.20±3.40	0.600
LSF	32.47±3.23	32.20±2.60	32.33±2.88	0.805
RR	49.67±4.48	50.20±4.35	49.93±4.35	0.743
LR	52.60±4.03	51.47±5.17	52.03±4.59	0.509

Student t test (Two tailed, independent)

In table 3, VAS and ROM between two groups is compared for day1. The overall picture shows that VAS score and flexion, extension, Right side flexion, Left side flexion, Right Rotation, Left Rotation scores are similar for both the groups and P value do not show any significance.

Table 4: ROM: Day14- A Comparison of study variables in two groups studied

ROM: Day14	Group A	Group B	Total	P value
VAS	1.07±0.96	1.40±1.30	1.23±1.14	0.431
F	45.33±3.04	41.40±2.03	43.37±3.23	<0.001**
E	52.07±3.06	48.07±2.76	50.07±3.51	0.001**
RSF	40.73±2.55	38.07±2.15	39.40±2.69	0.004**
LSF	40.20±1.86	37.07±2.25	38.63±2.58	<0.001**
RR	67.07±4.04	59.93±4.61	63.50±5.59	<0.001**
LR	67.53±4.29	60.13±4.52	63.83±5.74	<0.001**

Student t test (Two tailed, independent)

VAS and cervical ROM is compared between the groups in day14. The VAS score for Group A in Day 14 is 1.07±0.96 and for Group B is 1.40±1.30. Cervical flexion is 45.33±3.04 for Group A and 41.40±2.03 for Group B. Cervical Extension is 52.07±3.06 for Group A and 48.07±2.76 for Group B. RSF is 40.73±2.55 for Group A and 38.07±2.15 for Group B. LSF is 40.20±1.86 for Group A and
37.07±2.25 for Group B.RR is 67.07±4.04 for Group A and 59.93±4.61 for Group B. Similarly for Group A, LR is 67.53±4.29 and 60.13±4.52 for Group B. All the P value shows highly significance at <0.001**.

Table 5: difference of day 1 and day 14 - A Comparison of study variables in two groups studied

Difference score of pre and post	Group A	Group B	Total	P value
VAS	6.00±0.53	5.60±0.83	5.80±0.71	0.127
F	9.80±2.48	5.13±2.23	7.47±3.32	<0.001**
E	3.53±2.56	0.80±4.26	2.17±3.72	0.042*
RSF	8.87±2.88	5.53±3.25	7.20±3.46	0.006**
LSF	7.73±2.87	4.87±3.54	6.30±3.49	0.021*
RR	17.40±5.64	9.73±4.99	13.57±6.53	<0.001**
LR	14.93±5.30	8.67±5.25	11.80±6.08	0.003**

Student t test (Two tailed, independent)

The difference between the pre and post score for VAS and cervical ROM is compared in this table. S compared to Group B, Group A has higher difference scores for all the parameters. Flexion, Right Side Flexion, Right Rotation and Left Rotation shows highly significance at <0.001**, 0.006**, <0.001** and 0.003** respectively whereas rest of the parameters are just significant.

Table 6: VAS- a comparison at day 1and day 14

VAS	Day 1	Day 14	% difference
Group A (n=15)			
0	0(0%)	5(33.3%)	33.3%
1-3	0(0%)	10(66.7%)	66.7%
4-6	4(26.7%)	0(0%)	-26.7%
7-10	11(73.3%)	0(0%)	-73.3%
Group A (n=15)			
0	0(0%)	5(33.3%)	33.3%
1-3	0(0%)	9(60%)	60.0%
4-6	4(26.7%)	1(6.7%)	-20.0%
7-10	11(73.3%)	0(0%)	-73.3%
P value	1.000	1.000	-

Chi-Square test/Fisher Exact test

VAS comparison between the group is shown in Table 6 for Pre and post treatment score. The VAS score is given a range. In day 1, 0% were having VAS score below 4 whereas 26.7% were in range 4-6 and 73.3% were in range 7-10. In day 14, 33.3% is having VAS score 0 and 66.7% is having score 1-3. However, none of the subjects in Group A in Day 12 had VAS score above
As compared to Group A, Group B do share the same VAS score distribution in Day 1 but in Day 12, only 60% has VAS score of 1-3 and also this group has the subject (6.7%) whose VAS score is in range 4-6.
This shows that both the group have significant improvement in VAS score in Day 14. But when compared between the group, Group A VAS score is improved more than that of Group

Statistical Methods

Descriptive and inferential statistical analysis has been carried

out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. The following assumptions on data is made,

Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Leven`s test for homogeneity of variance has been performed to assess the homogeneity of variance.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher Exact test used when cell samples are very small.

Significant figures

+ Suggestive significance (P value: 0.05<P<0.10)

* Moderately significant (P value: 0.01<P ≤ 0.05)

** Strongly significant (P value: P≤0.01)

Statistical software

The Statistical software namely SPSS 18.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.**

Discussion

The purpose of the study was to compare the effectiveness of MET versus Mulligan SNAGs to reduce pain and to increase ROM in mechanical neck pain. Result obtained from this present study shows that when the mean reduction values of VAS and ROM were analyzed within the groups, it was statistically significant in both the groups. But when comparison was done between that, MET was more effective in reducing pain and improving ROM. VAS score assessment for pain showed significant improvement in both the groups after the treatment.

Moist heat therapy which is a superficial entity helps to relieve pain by reducing spasm and also produce a relaxing effect. By reducing viscosity of visco elastic collagen, heat increases tissue extensibility and makes connective tissue less resistant active or passive stretch.

Isometric Neck Exercises increase intramuscular co-ordination by enhancing motor unit activation synchronization and/or firing rate within a given muscle. A static contraction generates higher level of tension than concentric contraction. This will lead to increase in muscle strength and improve mobility.

One of the reasons of improvement in VAS score in Group A may be the hypoalgesia effect of MET. Some studies suggest MET and related post isometric techniques reduce pain and discomfort when applied to the spine or muscles. The mechanisms are not known, but may involve central and peripheral modulatory mechanisms, such as activation of muscle and joint mechanoreceptors that involve centrally mediated pathways, like the PAG in the midbrain, or non opioid serotonergic and noradrenergic descending inhibitory pathways. Thus MET has profound effect on pain and disability.

The present study gives similar result as a study conducted by Viswas Rajadurai (2011) [17] suggesting that MET reduces tension in the jaw muscles and subsequently reducing pain and improving Maximal Mouth Opening (MMO) in patients with Temporomandibular Dysfunction. Where Gupta S. *et al*. (2008) [2] also suggested that Post isometric relaxation is more effective in decreasing pain and disability and increasing cervical Range of Motion (ROM) in nonspecific neck pain. Our results for Group A are supported by a study by Abha and Angusamy, who compared postisometric relaxation with integrated neuromuscular inhibition technique on upper trapezius trigger points and concluded that MET is effective in improving pain, and functional status.

The statement is further supported by B. Sharmila [37] on effects of the MET versus conventional exercises in nonspecific neck pain in secondary school teachers are in accordance with our results for Group A, which concluded that post isometric relaxation had better reduction in pain and disability.

In Mulligan SNAGS potentially, the accessory glide component could ameliorate any of these problems by either separating the facet surfaces or releasing the entrapped meniscoid, or by allowing the entrapped meniscoid to return to its intra- articular position, or perhaps by stretching adhesions. The other mechanism such as in the gate control theory. In addition, descending pain-inhibitory systems may be activated, the end range positioning in movement with the SNAG may engage these inhibitory systems and reduce pain and disability.

A systemic review by Bill V *et al*. (2006) [26] on Mulligan's mobilization with movement, positional faults and pain relief, found that it has rapid ameliorative effects on pain and function during and initially after a single treatment application and also after a course of treatment. On the other hand, Reid SA *et al*. (2007) [25] stated that that Mulligan SNAGS are clinically and statistically very effective in reducing neck pain in subjects of cervicogenic dizziness. It has significant immediate and sustained effect in reducing dizziness and disability too. Now for the improvement of ROM other possible mechanism rather than pain mechanism is explained by some researchers.

Mulligan proposed that when an increase in pain-free range of movement occurs with a SNAG it is primarily the correction of a positional fault at the zygo pophyseal joint, although SNAG also influences the entire spinal functional unit. One study conducted by Maria Moutzouri (2008) [39] examined the effect of Lumbar SNAGS in asymptomatic subjects and did not found any significant improvement in lumbar flexion ROM. On the other hand Self SNAGS were also found to be effective in treatment reducing pain and disability and improving cervical ROM in the study conducted by Shilpi Chhabra *et al*. (2008) [2, 31], among Computer professionals. So both the techniques are proved to be effective in reducing pain and disability and in improving ROM in mechanical neck pain.

Conclusion

Result of the study shows that Group A which received MET and Group B which received Mulligan SNAGs have good effect in reducing pain and increasing CROM. Hence alternative hypothesis is accepted at p=0.001 and null hypothesis is rejected. But when both the groups are compared, the group which received MET showed better improvement that the group who received Mulligan SNAGS. The MET technique was found to be more effective because of increased blood circulation to the part, active muscle

contraction and passive stretching causing increased flexibility of the structure.

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