Objective: The purpose of this study is to compare the efficacy of Mulligan’s Glides like sustained natural apophyseal glides and muscle energy technique (MET) in the management of individual with cervicogenic headache (ICH).

Methods: A total of 30 ICH were recruited by the simple random sampling to participate in this two-group pretest-posttest, single-blinded randomized clinical study. Recruited ICH was randomly allocated into two groups, Group A and Group B. ICH in Group A was provided with Mulligan’s SNAGs of 3 glides/session/day×5 days/week×4-week duration, while in Group B, ICH received MET for suboccipital muscles for 6 times/session/day×5 days/week×4 weeks. Both the groups received the common intervention of stretching and strengthening for cervical muscles for 4 weeks. Pain scores (visual analog score [VAS]), disability (headache disability index [HDI]), and cervical extension range of motion (ROM) were documented at baseline and 4th week after intervention and analyzed.

Results: Group B demonstrated significance difference (p<0.05) in HDI, VAS, and cervical extension ROM when compared to Group A.

Conclusion: 4 week MET has the sufficient potential to decrease neck pain, disability, and increase cervical mobility among ICH as a non-surgical management.

Key words: Cervical pain, Cervicalgia, Cervicodynia, Physical therapy techniques, Range of motion.
The subjects were allotted to the group based on the randomly chosen chit. Once the block was allotted, next row block was opened. Thus, equal numbers of subjects were assigned to each group over time. Group A received MSNAG [17] for cervical spine and Group B received MET [16,19] for suboccipital muscles. Stretching and strengthening exercises for rectus capitis anterior, rectus capitis lateralis, longus colli, longus cervicis, semispinalis, splenius capitis and cervicis, scaleni, sternomastoid, upper trapezius, pectoralis major and levator scapulae, rhomboids, and serratus anterior muscles for both the Groups A and B were given as a common intervention. Both the groups received the above-said intervention for 4 weeks period. The Consolidated Standards of Reporting Trials [20] flow chart describing the details of the study is displayed in Fig. 1.

Mulligan’s SNAGs in Group A

MSNAG was given to the recruited ICH in Group A. The subject is seated, and the therapist stands behind the patient. The patient’s head is cradled between the therapist body and his right arm. The right index, middle, and ring fingers wrap around the base of occiput, and the middle phalanx of little finger lies over the spinous process of C2 vertebra. The lateral border of the left thenar eminence lays over the right little finger. A gentle pressure is now applied by the therapist in a ventral direction on the spinous process of C2 vertebra while the skull remains neutral. This was quietly taken forward until end range is felt and this position was maintained for at least 10 s. A total of 3 glides were given per session/day×5 days/week for 4 weeks’ duration (Fig. 2).

MET in Group B

MET was received by Group B. The technique was administered for the suboccipital muscles, obliquus capitis superior and inferior, and rectus capitis posterior major and minor. The patient was positioned comfortably in supine lying position, and the therapist stands behind the patient. One hand of the therapist supports the patient’s occiput, while the lateral border of index finger of the other hand is placed superior to the spinous process of the axis to stabilize it and anterior aspect of the therapist’s shoulder rest on patient’s forehead. The therapist applied a force to the occiput in a posterosuperior direction and asked the patient to poke the chin out and hold the position for 5 s. This stretches the suboccipital muscles, and the subject is instructed to relax by poking the chin. This technique was given for 6 times/session/day×5 days/week×4 weeks (Fig. 3).

Common intervention of stretching and strengthening

The stretching and the strengthening exercises were given to both Groups A and B as a common intervention. The exercises were given for rectus capitis anterior, rectus capitis lateralis, semispinalis, splenius capitis, splenius cervicis, longus colli, longus cervicis, sternomastoid, scalene, upper trapezius, levator scapulae and pectoralis major, rhomboids, and serratus anterior muscles. The duration of stretching was 15 s with 5 repetitions initially. Later, progression is made by increasing the duration from 30 s and repetition by 10 times. Strengthening exercises for the muscles initially begins with 10 repetitions maximum which are then finally progressed to 15 repetitions maximum per session.

Outcome measures

Both the groups were measured for their level of pain (visual analogue scale [VAS]), disability (headache disability index [HDI]), and cervical range of motion (ROM) (degree of extension) between Group A and Group B at baseline and 4th week post-intervention.

Data analysis

The collected demographic and outcome measures were assessed for their normality using Shapiro–Wilks test. As the data follow normal distribution, all the descriptives were expressed in mean±standard deviation. Paired t-test was adopted to find the differences within Group A and Group B for pre-post intervention changes, while independent t-test was used to compare the changes in mean values of HDI, VAS, and cervical extension ROM between Group A and Group B at baseline and end of 4th week intervention. The data were analyzed using statistical
software, Statistical Package for the Social Science (SPSS), IBM SPSS version 20.0 (Armonk, NY: IBM Corp.). The p<0.05 was considered to be statistically significant.

RESULT
Thirty subjects with cervicogenic headache were recruited for the study. Among them, 6 were male and remaining 24 were females. There exists no significant difference in the demographic characteristics between the two groups (Table 1). Both groups were compared at baseline and at the end of last exercise session for the following outcome measure, HDI (Graph 1), VAS (Graph 2), and Neck Extension ROM (Graph 3) were displayed. In all the outcome measures, Group B shows significant (p<0.05) improvement when compared to Group A.

DISCUSSION
The study was conducted on 30 subjects with cervicogenic headache. Group A was intervened with SNAG and Group B with MET, whereas stretching and strengthening exercises were given as a common intervention. Outcome measures included were Headache Disability Index scale, pain intensity by VAS, and cervical extension ROM by goniometer which was measured before the treatment and at the end of 4 weeks of treatment.

This study supports the findings of Hall et al. [17] demonstrating that SNAGs were effective in increasing the cervical ROM and also concluded the findings of Burns et al. [16] that the application of muscle energy technique can produce acute increases in the active overall regional cervical ROM and significant reduction of pain and disability.

In MET, the neurological effects of loading of Golgi tendon organ of a skeletal muscle by an isometric contraction produce a post-isometric relaxation effect in the muscle. The pain is due to the muscle’s inability to restore its anatomical length and joint restriction as a result of muscle tightness and shortening. Thus, MET physiologically relaxes the overactive muscle, thereby reducing the pain and improving the joint ROM.

The application of SNAG influences correcting irregular position of articular elements and achieving correct biomechanics of the cervical spine. This technique causes a decrease in excessive reactivity of cervical nuclei of trigeminal nerve and blocks A-beta fibers stimulus that may result in pain relief and also limit the headache disability [17,23].

This study supports the findings of Patra et al. showing that Mulligan’s SNAGs were an effective treatment in the management of cervicogenic headache [24].

There is a reduction of mean value of HDI, VAS, and improved cervical extension ROM in both the groups. However, the mean value of Group B post-test of HDI and VAS when compared with Group A had lesser mean value, implicating that MET (Group B) had potential to reduce disability and pain among ICH. This was even supported by increased cervical extension ROM in Group B. Hence, MET has higher potential to increase cervical mobility and thereby decrease the disability and pain among ICH.

CONCLUSION
Both MET and Mulligan’s SNAGs have their role in the non-surgical management of cervicogenic headache. However, among both, MET has higher potential toward the management of ICH.

AUTHOR’S CONTRIBUTIONS
Veena Kirthika S - Project work and report writing. Padmanabhan K - Review of the article. Selvaraj Sudhakar - Data analysis and result. Vijaya Kumar M - Review of the article.

Table 1: Demographic characteristic of the individuals with cervicogenic headache recruited in Group A and Group B

| Parameters       | Group A (male=3; female=12) | Group B (male=3; female=12) | p   |
|------------------|------------------------------|------------------------------|-----|
| n                | 15                           | 15                           | -   |
| Age (years)      | 26.2±6.8                     | 25.7±7.1                     | 0.91|
| Weight (kg)      | 62.4±7.5                     | 59.2±9.6                     | 0.72|
| Height (cm)      | 168.2±9.2                    | 170.5±6.9                    | 0.31|
| BMI (kg/m2)      | 22.8±2.1                     | 22.3±2.9                     | 0.96|

BMI: Body mass index

Graph 1: Headache disability index between Group A and Group B

Graph 2: Visual analog score between Group A and Group B

Graph 3: Cervical extension between Group A and Group B
CONFLICTS OF INTEREST
The authors do not have any conflicts of interest.

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