Clinical Trial Protocol
Iranian Registry of Clinical Trials

10 Jun 2026

The effectiveness of C1-C2 Sustained Natural Apophyseal Glide mobilization and Mulligan traction in comparison with Maitland mobilization and traction on cervicogenic headache

Protocol summary

Study aim

Comparison of the Effectiveness of SNAG Mobilization Combined with Mulligan Cervical Traction on Pain Intensity and Frequency, Cervical ROM, Disability, and Treatment Sustainability in Adult Patients with Cervicogenic Headache Compared to Maitland Mobilization in 2025

Design

This single-center, single-blind randomized trial (1:1) enrolls 54 participants, blinded to group assignment. Both participants and assessors are blinded to group assignment.They are randomly allocated to the Mulligan or Maitland group using four-block balanced randomization via www.sealedenvelope.com by an independent researcher.

Settings and conduct

The study is conducted in physiotherapy clinics under Iran University of Medical Sciences in Tehran. Assessment and treatment are performed by separate individuals to maintain blinding. The Mulligan group receives SNAG mobilization and Mulligan traction, while the Maitland group receives Maitland mobilization and traction. Both groups undergo six 20-minute sessions, twice a week for three weeks.

Participants/Inclusion and exclusion criteria

Main Inclusion Criteria Unilateral headache, or headache predominantly on one side without side-shifting Headache accompanied by neck stiffness and pain that worsens with neck movement FRT restriction greater than 10 degrees Main Exclusion Criteria Headache originating from sources other than the cervical spine Any cervical fracture or history of neck surgery Any physiotherapy or chiropractic treatment received in the past 3 months Any contraindication to manual therapy

Intervention groups

Mulligan Group: Participants in this group will receive SNAG mobilization combined with traction according to the Mulligan approach. Maitland Group: Participants in this group will receive mobilization combined with traction according to the Maitland approach.

Main outcome variables

Pain frequency and pain intensity

General information

Reason for update

Acronym

IRCT registration information

IRCT registration number: **IRCT20251118068034N1**
Registration date: **2025-12-22, 1404/10/01**
Registration timing: **registered_while_recruiting**

Last update: **2025-12-22, 1404/10/01**
Update count: **0**

Registration date

2025-12-22, 1404/10/01

Registrant information

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Name of organization / entity

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Recruitment status

Recruitment complete

Funding source

Expected recruitment start date

2025-12-11, 1404/09/20

Expected recruitment end date

2026-04-19, 1405/01/30

Actual recruitment start date
empty
Actual recruitment end date
empty
Trial completion date
empty

Scientific title
The effectiveness of C1-C2 Sustained Natural Apophyseal Glide mobilization and Mulligan traction in comparison with Maitland mobilization and traction on cervicogenic headache

Public title
Comparative mobilization and traction techniques for cervicogenic Headache:
Purpose
Treatment
Inclusion/Exclusion criteria
Inclusion criteria:
Unilateral headache or headache predominantly on one side without side shifting Headache accompanied by neck stiffness and pain, which increases with neck movement Cervical spine dysfunction Restricted cervical range of motion and a limitation of more than 10 degrees in the Flexion-Rotation Test Headache episodes occurring at least once per week during the past three months Age between 18 and 60 years Participants must have the ability to understand and read Persian to complete the questionnaires
Exclusion criteria:
Headache originating from sources other than the cervical spine Patient with cervical disc herniation Any fracture or history of surgery in the cervical region Patient has received any physiotherapy or chiropractic treatment in the past 3 months Any history of severe osteoporosis, bone tumor, rheumatoid arthritis, or ankylosing spondylosis History of pain-reducing injections Instability of the upper cervical vertebrae Cervical artery insufficiency Pregnancy Any contraindication to manual therapy Presence of vascular disorders, such as cervical carotid artery disease Absence from two or more consecutive treatment sessions
Age
From **18 years** old to **60 years** old
Gender
Both

Phase
N/A
Groups that have been masked

- Participant
- Outcome assessor

Sample size
Target sample size: **54**
Randomization (investigator's opinion)
Randomized
Randomization description
The study is designed as a single-blind, single-center randomized clinical trial with a 1:1 allocation ratio. In this study, both the participants and the outcome assessors will be blinded to the group allocation. The study will commence after registration of the protocol in the Research System of Iran University of Medical Sciences, obtaining an Ethics Code, and subsequently receiving a clinical trial registration number from IRCT.ir. Eligible participants who provide written informed consent will be randomly assigned to either the SNAG with traction group or the Maitland mobilization group using blocked balanced randomization with a 1:1 ratio. Randomization will be performed by an individual outside of the research team prior to the start of the study. Participants will remain unaware of their group allocation. For generating random numbers (random allocation), the online system www.sealedenvelope.com will be used. This process will be based on block randomization with blocks of four, in which each four-digit block includes a combination of odd and even numbers: two even and two odd. Even numbers will indicate assignment to the Mulligan group (receiving SNAG mobilization combined with Mulligan traction), while odd numbers will indicate assignment to the Maitland group (receiving Maitland mobilization). The order of participant entry into the study will follow this random allocation to ensure balanced group sizes. After randomization, each even or odd number from the four-digit blocks will be placed sequentially into numbered sealed envelopes. Each envelope will be assigned to participants in order of study entry. The therapist will open the envelope during the treatment session and provide the corresponding intervention according to the number inside. Objective outcome measures, including the Cervical Flexion-Rotation Test and cervical range of motion assessments, will be conducted by a physiotherapy expert with at least 5 years of experience in treating musculoskeletal disorders. The assessor will remain completely blinded to the participants' group allocation to ensure proper blinding. Envelopes will be delivered to the therapist by the clinic secretary according to participant entry order. Participants in both groups will be matched for gender and will have similar characteristics regarding inclusion and exclusion criteria
Blinding (investigator's opinion)
Single blinded
Blinding description
The assessment and treatment will be conducted by two different individuals, and the assessor will have no knowledge of the group to which each participant has been assigned, thereby ensuring the principles of blinding are maintained. In addition, treatment sessions are scheduled so that the assessor is not present during the interventions of the other group, preventing any possibility of awareness of group allocation and ensuring that blinding procedures are fully maintained. Additionally, participants will not be informed about the treatment received by members of the other group. Treatment sessions will be scheduled so that participants' appointments do not overlap as much as possible, minimizing the risk of contamination bias. Sessions for the Mulligan group will be held on odd-numbered days, and sessions for the Maitland group on even-numbered days.
Placebo

Not used

Assignment

Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee

Ethics committee of Iran University of Medical Sciences

Street address

Iran University of Medical Sciences – School of Rehabilitation Sciences, No. 5, Madadkaran Street, Shah-Nazari Street, Madar Square, Mirdamad Boulevard, Tehran, Iran

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Approval date

2025-10-15, 1404/07/23

Ethics committee reference number

IR.IUMS.REHAB.REC.1404.005

Health conditions studied

1

Description of health condition studied

cervicogenic headache

ICD-10 code

G44.86

ICD-10 code description

Cervicogenic headache

Primary outcomes

1

Description

Mean Pain Intensity: In this study, pain refers to the discomfort experienced by the patient as a result of this condition. Pain intensity is measured using the Numeric Pain Rating Scale (NPRS), ranging from 0 (no pain) to 10 (the highest possible pain), and is recorded by the participant in the headache questionnaire.

Timepoint

Pain intensity is measured before the start of the study, at the final treatment session, and also at the three-month follow-up.

Method of measurement

In this study, pain intensity is assessed using the Numeric Pain Rating Scale (NPRS). Participants rate their pain at each time point on a scale from 0 to 10, where 0 represents “no pain” and 10 represents “the worst possible pain.” This scale is completed by the participants themselves in the headache questionnaire and serves as the primary measure of pain intensity throughout the study.

2

Description

Mean frequency of headache: The mean frequency of headache in this study is determined based on the data recorded in the daily diary. Participants are required to mark the days of each month on which they experience a headache. The number of marked days per month is then extracted, and the mean of these monthly values over the course of the study is calculated and reported as the mean headache frequency.

Timepoint

The headache frequency in this study is measured before the start of the study, at the final treatment session, and also at the three-month follow-up.”

Method of measurement

In this study, the mean headache frequency is determined based on a daily diary. Participants are required to mark the days of each month on which they experience a headache. The number of marked days per month is then extracted, and the mean of these values over the course of the study is calculated and recorded as the mean headache frequency.

Secondary outcomes

1

Description

Mean duration of headache in the past month: The mean duration of headache attacks in the past month represents the average length of each headache attack over the last 30 days, typically calculated using a daily headache diary.

Timepoint

The duration of headaches in this study is measured before the start of the study, at the final treatment session, and also at the three-month follow-up.

Method of measurement

The duration of headache attacks is measured using a daily headache diary, in which patients record the start and end time of each attack. The duration of each attack is then calculated, and the mean duration over the study period (e.g., one month) is determined. This method allows for accurate assessment of changes in headache duration and patterns before and after therapeutic interventions.

2

Description

Mean flexion-rotation range: The Flexion-Rotation Test (FRT) is a specific test for assessing the function of the atlantoaxial joint (C1-C2) and is commonly used in patients with cervicogenic headaches.

Timepoint

The mean flexion-rotation range in this study is measured before the start of the study, at the final treatment session, and at the three-month follow-up.

Method of measurement

In this test, the patient lies supine on a table with the shoulders positioned at the end, while the therapist supports the head using their abdomen. The patient's neck is gently brought into full flexion to lock the lower cervical segments, focusing movement primarily at the C1-C2 level. The head is then slowly rotated to the right and left while maintaining this flexed position, and the range of rotation in each direction is measured using a goniometer. This method allows precise evaluation of C1-C2 movement limitations and patterns, serving as a specific measure of upper cervical spine function.

3

Description

Functional disability resulting from headache: The term "disability" refers to a set of limitations and impairments—physical, cognitive, or emotional—caused by a disease or injury, as well as environmental barriers that reduce social participation. Over time, the concept has broadened to encompass various aspects of the disability process. In this study, participants' functional disability is assessed using the Persian version of the Henry Ford Hospital Headache Disability Inventory. This Persian version, designed to evaluate disability due to headaches, was culturally adapted by Jabbari et al. in 2021.

Timepoint

Functional disability resulting from headache in this study is measured before the start of the study, at the final treatment session, and at the three-month follow-up.

Method of measurement

In this study, functional disability is assessed using the Persian version of the Henry Ford Hospital Headache Disability Inventory, culturally adapted by Jabbari et al. (2021). The questionnaire includes 25 items evaluating the perceived impact of headaches on daily life, scored as "yes" (4 points), "sometimes" (2 points), or "no" (0 points), with a total score out of 100—higher scores indicate greater disability. Its reliability and validity are well established, with a Cronbach's alpha of 0.91 and content validity indices of 0.85–0.99.

4

Description

Mean cervical range of motion: cervical range of motion refers to the amount of movement the cervical spine can perform in different directions without causing injury to the muscles, ligaments, or nerves, including flexion, extension, right and left lateral flexion, and right and left rotation.

Timepoint

The mean cervical range of motion in this study is measured before the start of the study, at the final treatment session, and at the three-month follow-up.

Method of measurement

In this study, the angles are measured using a goniometer with the participant in a seated position.

Intervention groups

1

Description

Mulligan Intervention group: In the Mulligan intervention group, the patient is seated on a chair with their back supported by the chair's backrest. The head and neck are kept in a neutral position without movement, and the hands rest on the thighs or knees. The therapist stands beside and in front of the patient, stabilizing the patient's trunk against the chair back with their pelvis. One of the therapist's hands is placed behind the patient's head so that the middle crease of the little finger rests on the posterior aspect of the C2 spinous process. The other hand (the mobilizing hand) applies a gentle horizontal pressure in the plane of the upper cervical facet joints using the thenar eminence, maintained for 10 seconds. The patient is then asked to actively rotate the head toward the side with less pain at the end of the glide, and the same is repeated with neck extension. If pain increases during any movement, the active movement is stopped and performed in the opposite direction, or the technique is modified. If the patient experiences significant headache relief, the technique can be repeated 6 to 10 times. In the first session, one set of three repetitions is performed, and in subsequent sessions, 3 to 5 sets of 6 to 10 repetitions are applied. If pain increases, the technique is stopped and the reverse direction (Reverse SNAG) is applied.In the Reverse SNAG technique, the patient sits with their back supported and head and neck in neutral. The therapist stands in front of and slightly to one side of the patient, stabilizing the C2 vertebra using the thumb and middle finger either on the anterior aspect of the transverse process or posterior aspect of the spinous process. The other hand encircles the patient's occiput and gently guides the head forward in the horizontal plane, maintaining this stretch for 10 seconds. If headache relief is achieved, the technique is repeated 6 to 10 times. A soft layer such as a sponge can be used to reduce pressure if contact points are sensitive. If only minor improvement occurs, the therapist may adjust the force, angle, or duration of the applied pressure.For cervical traction, the patient lies supine with knees bent, head in neutral or slight extension, and hands on the abdomen or thighs. The therapist sits on a chair at the head of the treatment table, facing the patient's feet, with the supinated forearm placed under the upper cervical vertebrae so that the radial aspect contacts the lower occiput. The other hand stabilizes the patient's chin to prevent neck flexion during traction. If there is excessive thoracic kyphosis, a small folded towel can be placed under the head to maintain neutral or slightly extended cervical posture. Traction force is applied perpendicular to the cervical spine and maintained for at least 10 seconds while monitoring headache response. The technique can be repeated several times if symptoms improve. If symptoms worsen, the technique is stopped, and if

improvement is minimal, the force, angle, or duration can be adjusted. For some patients, bending the knees and tilting the pelvis posteriorly can reduce lumbar discomfort, and using the thicker part of the therapist's forearm can help distribute pressure if contact with the spinous processes is painful.The Mulligan interventions are conducted in six sessions, two sessions per week for three weeks, with each session lasting 20 minutes.

Category

Treatment - Other

2

Description

Maitland Intervention group: For the Maitland intervention group, participants undergo cervical vertebral joint mobilization. First, the physiotherapist identifies the four upper cervical intervertebral joints (C0-C1-C2-C3) that show the greatest functional limitation or pain by palpation. The patient lies prone on the treatment table with hands on the forehead, while the therapist stands beside the table, placing their thumbs on the cervical spinous processes and performing rhythmic oscillatory mobilizations with large amplitude and low speed. These movements include posterior-anterior, unilateral and bilateral forces on the spinous and transverse processes, as well as transverse forces on the first to third cervical vertebrae. The intensity of the therapist's hand movement starts at grade II, increases to grade IV, and ends at grade I.Each mobilization technique for each joint is applied for 30 seconds to 2 minutes, with three to five repetitions per session, and 60–120 oscillations at a rate of 2–3 oscillations per second. Painful points receive additional attention. For more precise assessment and mobilization of the C1–C2 joints, the patient's head may be actively rotated 30–40 degrees toward the affected side, and unilateral techniques can be applied in the same direction if needed.In the Maitland upper cervical spine traction technique, the patient lies supine with the neck in a neutral or slight flexion position. The therapist sits or stands at the head of the patient, with hands positioned to cradle the skull from the sides, fingers along the posterior line, and thumbs on the cheeks or temples. A gentle, controlled upward force is applied along the cervical spine. The movement is linear and smooth, without lateral or rotational pressure. Each traction is held for 10–30 seconds and repeated several times, with the head returned to rest between repetitions. Traction is usually performed at grade I–II unless severe motion restriction exists. The duration and number of sessions are the same as in the Mulligan group.ChatGPT can make mistakes. Check important info. See Cookie Preferences.

Category

Treatment - Other

Recruitment centers

1

Recruitment center

Name of recruitment center

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Full name of responsible person

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Sponsors / Funding sources

1

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Name of organization / entity

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Grant name

Grant code / Reference number

Is the source of funding the same sponsor organization/entity?

Yes

Title of funding source

Iran University of Medical Sciences

Proportion provided by this source

100

Public or private sector

Public

Domestic or foreign origin

Domestic

Category of foreign source of funding

empty

Country of origin

Type of organization providing the funding

Academic

Person responsible for general inquiries

Contact

Name of organization / entity
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Full name of responsible person
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Position
Student

Latest degree
Bachelor

Other areas of specialty/work
Physiotherapy

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Sharing plan

Deidentified Individual Participant Data Set (IPD)
No - There is not a plan to make this available

Justification/reason for indecision/not sharing IPD
There is no further information available.

Study Protocol
Yes - There is a plan to make this available

Statistical Analysis Plan
Yes - There is a plan to make this available

Informed Consent Form
Yes - There is a plan to make this available

Clinical Study Report
Undecided - It is not yet known if there will be a plan to make this available

Analytic Code
Not applicable

Data Dictionary
Not applicable

Title and more details about the data/document
Data such as all primary, key secondary, and secondary outcomes are eligible for publication.

When the data will become available and for how long
The access period begins three months after the publication of the results.

To whom data/document is available
Access is granted to researchers affiliated with academic and scientific institutions, as well as individuals working in industry.

Under which criteria data/document could be used
The use of all data for unauthorized reproduction or

copying is prohibited. However, using the scientific results of the study to conduct advanced or broader research is permitted, provided written approval is obtained from the principal investigator responsible for public correspondence.

From where data/document is obtainable

To request access to the data, please contact the study's public correspondence officer: Faezeh Sedghi Mobile: +98 919 621 9107 Email: Faezehsedghi2000@gmail.com Address: Department of Physiotherapy, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran Postal Code: 1545913487

What processes are involved for a request to access data/document

o obtain the documents, please send an email from your institutional address to the public correspondence officer of the study. The requested documents will be provided within 4 weeks after the review and approval of the request.

Comments