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Effectiveness of Upper Cervical SNAG Versus Maitland Mobilization on Pain, Headache Disability and Depression in Patients with Cervicogenic Headache - An Experimental Study

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ABSTRACT

BACKGROUND: Cervicogenic headache (CH), a common form of secondary headache, is considered to originate from the upper cervical spine, particularly the C1–C2 zygapophyseal joints. It is clinically characterized by pain localized to one side of the head, or predominantly on one side, without switching sides.
PURPOSE: To determine the effects of upper cervical SNAG versus Maitland mobilization on pain, headache disability and depression in patients with cervicogenic headache.
METHOD: Total 42 patients were included and divided into two groups. Group A was treated with upper cervical SNAG with conventional therapy and Group B was treated with Maitland mobilization with conventional therapy for 2 weeks. Outcome measures were assessed with pre and post intervention with Headache Diary, HIT-6, BDI-II.
RESULT: The results of this study showed statistically significant improvement in headache frequency, intensity, duration, Headache Impact Test-6, Beck Depression Inventory-II in patients with cervicogenic headache with the use of upper cervical SNAG and Maitland mobilization (within group analysis) (P value $\leq$ 0.001). In between group analysis, Maitland mobilization with conventional therapy was found to be more predominant than upper cervical SNAG with conventional therapy. Also, upper cervical SNAG and Maitland mobilization were equally effective in reducing headache frequency, intensity, duration and depression. (P value $\geq$ 0.02).
CONCLUSION: Maitland mobilization with conventional therapy was found to be more effective in reducing headache disability than upper cervical SNAG with conventional therapy. Also, upper cervical SNAG and Maitland mobilization were equally effective in reducing headache frequency, intensity, duration and depression.

KEYWORDS: Upper cervical SNAG, Maitland mobilization, Headache Impact Test

INTRODUCTION

The International Headache Society (IHS) has classified headaches into 14 different types and subtypes. These include primary headaches caused by vascular or muscular factors, and secondary headaches that develop due to other causes such as inflammation or injuries involving the head and neck.[1-2]

Cervicogenic Headache (CH) may originate from the C1-C2 zygapophyseal joints.[3] It is among the most frequently occurring secondary headaches and results from disorders of the structures in the cervical region.[4] It is frequently associated with a segment-specific reduction in range of motion (ROM), which can be objectively assessed using the Cervical Flexion–Rotation Test (CFRT). IHS classifies cervicogenic headache (CH) as a secondary headache characterized by pain referred from a cervical source and perceived in one or more regions of the head and/or face. The pain may be unilateral or bilateral and commonly involves the occipital, frontal, or retro-orbital areas. CH is also often accompanied by sub-occipital neck pain.[1] CH occurs in 15–20% patients with chronic headaches.[5]

Typical clinical features of CH include unilateral headache radiating from the neck to the eye, tenderness in the occipital or upper cervical region, painful and limited neck movement, and anxiety.[6-10] Symptoms associated with cervicogenic headache (CH) may result from referred pain and a decreased cervical range of motion (ROM). Attacks can often be triggered mechanically, either by prolonged or awkward neck positions or by applying pressure to localized hypersensitive areas, such as tendon insertions. Pain typically occurs on the same side (ipsilateral) in the occipital region and may radiate to the forehead, with forehead pain being as intense, or even more intense, than the pain at the back of the head.[11-13]

Upper Cervical Sustained Natural Apophyseal Glide (SNAG): Mulligan manual therapy uses low velocity joint mobilization which involves active movement while causing moderate discomfort. This idea involves applying painless, constant pressure on the upper cervical spine to reduce symptoms or improve mobility within that area. This mobilization technique which consists in applying a direct force on the C1-C2 segment during active neck rotation by the patient. This technique can be applied manually by the therapist.[14]

Maitland Mobilization: The International Maitland Teachers' Association (IMTA) describes the Maitland concept as a systematic approach to examining, assessing, and treating neuro musculoskeletal disorders using manipulative physiotherapy (Hengeveld, 2002). This approach emphasizes an open-minded, non-judgmental, flexible, and patient-centred attitude when managing individuals with movement system disorders (Sahrmann, 2001).[15]

MATERIALS AND METHOD

- Study Design: An Experimental Study
- Study Population: Patients with Cervicogenic Headache
- Study Setting: Various Physiotherapy OPDs in Vadodara City
- Study Duration: 7 months (October 2025 to April 2026)
- Study Period: 2 weeks (every alternate day)
- Sampling Method: Convenience Sampling Method
- Sample Size: 46 patients

- **Inclusion Criteria:**
  - Age group: 18 to 65 years
  - Gender: both male and female
  - Patients with cervicogenic headache according to ICHD-3 criteria (11.2.1)[1].
  - Headache aggravated or provoked by neck movements or postures with minimum average pain intensity of 3 on NPRS self- reported scale.
  - Unilateral headache that begins and spreads in the neck frontotemporal area at least 5 times during the last 1 month.
  - Tenderness (Grade I or II) in at least one of the joints of the upper cervical spine (C1-C2).
  - CFRT positive (if a side-to-side difference of 8° or more is present).[36]
  - Willingness to participate in the study

- **Exclusion Criteria:**

- Reported diagnosis of another type of headache (e.g. Migraine) that causes two or more episodes per month.
- History of trauma or surgery around neck region within past 6 month.
- Cervical instability
- Cervical tumor or malignancy
- Congenital/acquired conditions of the cervical spine
- Patients who had symptoms related to vertigo, giddiness, visual or auditory problems since last 3 months.
- Any health-related disorders that affected the outcome measures and treatment protocol of the study.

➢ **Materials Used:**

- Informed Consent Form
- Patient Information Sheet
- Wooden Plinth
- Stainless Steel Stool
- Bubble Inclinometer
- Headache Diary
- Headache Impact Test-6 scale
- Beck Depression Inventory-II scale

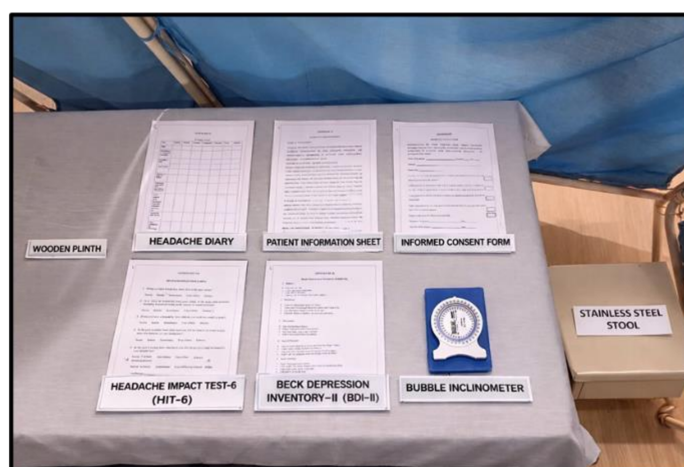


Figure 1. Materials used

➢ **Outcome Measures:**

1) Headache Diary: [16]

According to American Headache Society [ASH] weekly headache diary is very helpful assessment tool for headache. The headache diary reveals following parameters:

a) Frequency
b) Duration
c) Intensity

2) Headache Impact Test-6 (HIT-6): [ICC = 0.77]

The Headache Impact Test (HIT-6) was developed in 2003. It has six questions. Each question has five options and the respondents have to encircle one of the options. It has been translated in 27 countries.[17]

The HIT-6 consists of six items. A set of six items is select representing the six main content areas covered in widely use surveys (pain, social functioning, role functioning, vitality, cognitive functioning, and psychological distress).[18] The patient answers each of the six related questions using one of the following five responses: “never”, “rarely”, “sometimes”, “very often”, or “always”. These responses are summed up to produce a total HIT-6 score that ranges from 36 to 78. A higher score indicates a greater impact of headache on the daily life of the respondent.[19]

3) Beck depression inventory-II (BDI-II): [ICC = 0.72 to 0.91]

The Beck Depression Inventory-II (BDI-II) has become one of the most widely used measures to assess depressive symptoms and their severity in adolescents and adults. It is a 21-item self-report measure that taps major depression symptoms according to diagnostic criteria listed in the Diagnostic and Statistical Manual for Mental Disorders. Items are summed to create a total score, with

higher scores indicating higher levels of depression.[20]

- Flowchart of Procedure:

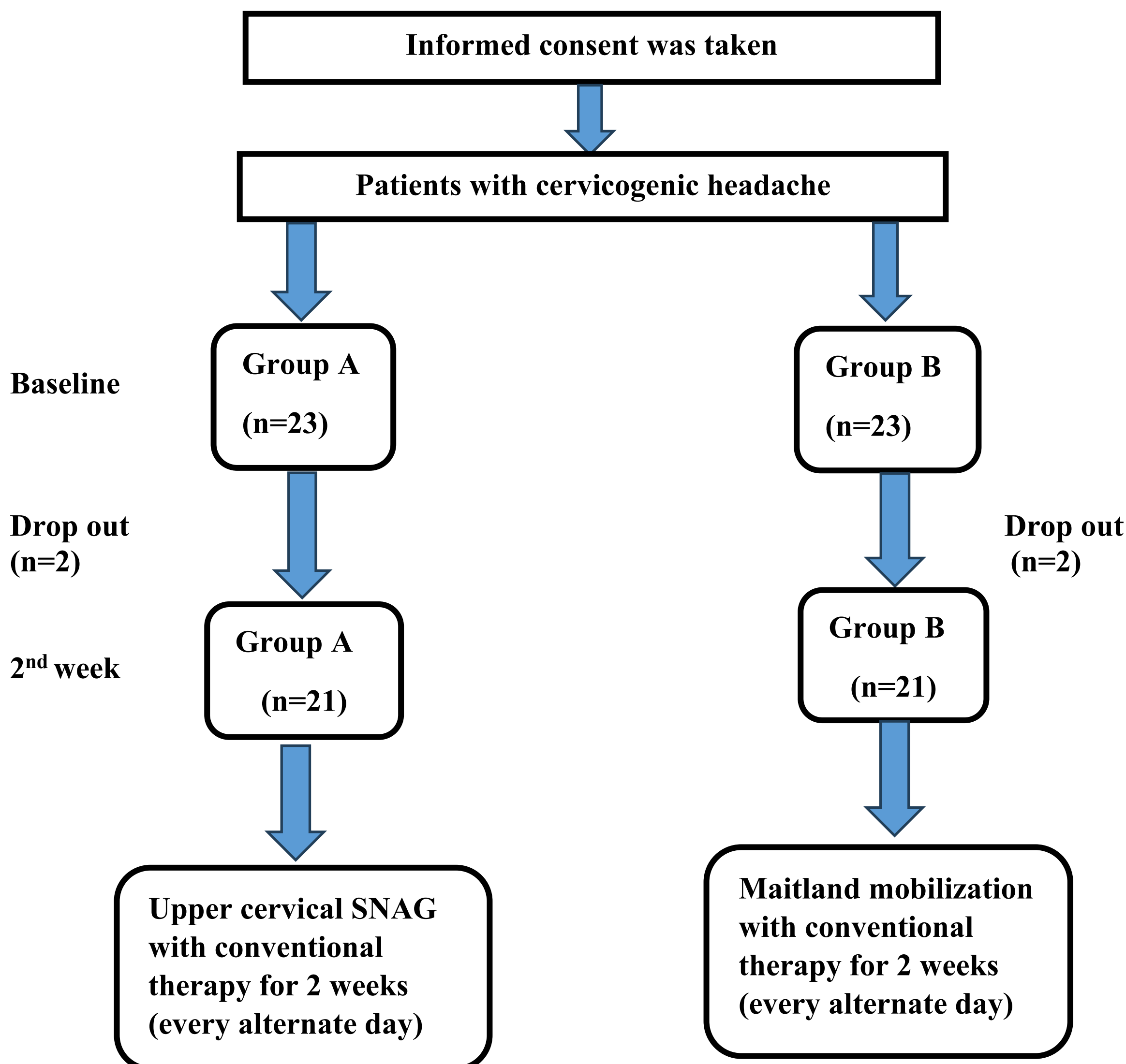


Figure 2. Consort Diagram

- Intervention:

Group A: Upper Cervical SNAG plus conventional therapy

Patient position: Sitting

Group A received SNAG plus conventional therapy in upper cervical region every alternate day for 2 weeks. SNAG technique was performed with the patient sitting upright in a chair. The physiotherapist stabilized the occiput with the index, middle, and ring fingers of one hand while placing the little finger on the C2 spinous process. After placing the hands in this way, the head was stabilized by the forearm support and the spinous process was gently pushed ventrally with the other hand. With this maneuver, C2 slides forward under C1 and therefore C1 moves forward relative to the skull. Physiotherapist applied the movement for 10 seconds in each glide with a rest time of 30 seconds in between and 10 repetitions.[21,14]

Figure 3. Upper cervical SNAG

Group B: Maitland mobilization plus conventional therapy

Patient position: Prone

Group B received Maitland mobilization plus conventional therapy in upper cervical region every alternate day for 2 weeks. The patient was in prone lying and the therapist stood at the head of the patient. Therapist's thumbs were placed at the level of the spinous process of the hypomobile cervical vertebra and a posteroanterior (PA) oscillatory pressure was applied using grade II and grade III Maitland's manual therapy techniques. This oscillatory mobilization was performed at a frequency of 2Hz for 2 minutes and repeated 3 times. The rest time between each mobilization was 1 minute after mobilization.[22]

Figure 4. Maitland Mobilization

Conventional therapy:[7]

- Neck Active exercises: 10 repetitions in all direction in pain free range.
- Isometric Neck exercise: 5-10 seconds brief but maximum contraction each held for 5-10 seconds for flexors, extensors, side flexors and rotators.
- Shoulder scapular exercises: 10 repetitions

DATA ANALYSIS

Data was analyzed by IBM SPSS 29.0 software and Microsoft excel 2023. Prior to the statistical analysis test, data was screened for normal distribution by Shapiro-Wilk's test. According to normality test, tests were applied for within group (paired t-test) and between group (unpaired t-test) for headache frequency, headache intensity, headache duration, Headache Impact Test-6, Beck Depression Inventory-II.

RESULTS

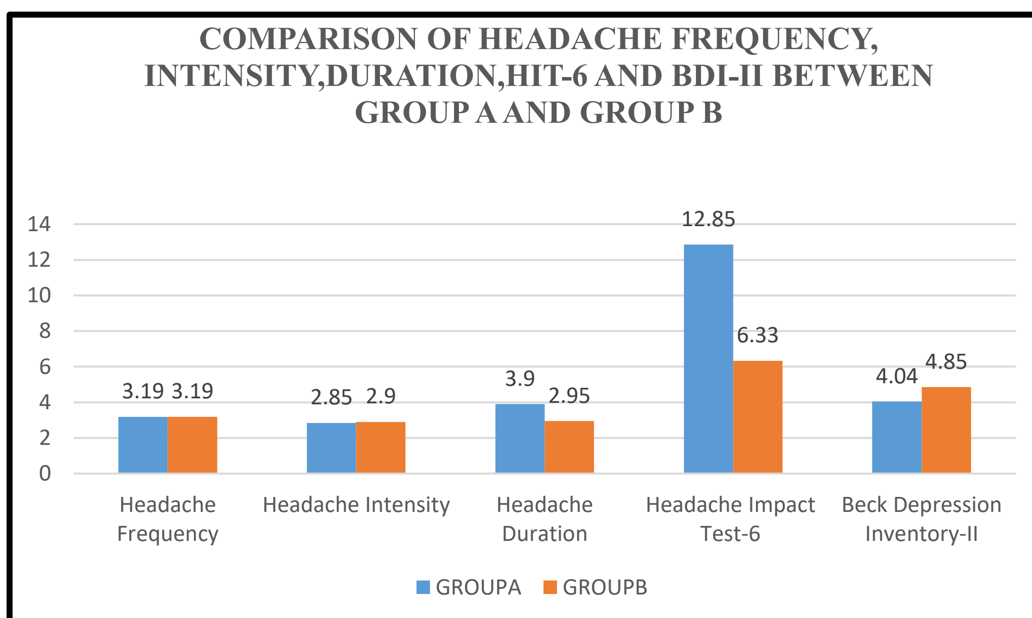
- In this study, a total of 42 patients were recruited, 21 in each group.
- Group A was given Upper cervical sustained natural apophyseal glide and Group B was given Maitland mobilization. The descriptive characteristics of all variables were as follows:

Table 1: Baseline Data

GROUPS	GROUP A	GROUP B
NO. OF PATIENTS	21	21
AGE	31.23 ± 8.49	32.04 ± 7.16
GENDER	FEMALE:13	FEMALE:13
	MALE:8	MALE:8

Table 2: Intergroup Analysis Between (Group A and Group B)

OUTCOME MEASURES	GROUP A MEAN ± SD	GROUP B MEAN ± SD	t VALUE	P VALUE	REMARKS
HEADACHE FREQUENCY	3.19±1.12	3.19±1.12	0.00	1.00	Not Significant
HEADACHE INTENSITY	2.85±0.96	2.90±1.09	-.15	0.882	Not Significant
HEADACHE DURATION	3.90±1.33	2.95±1.49	2.17	0.036	Not Significant
HIT-6	12.85±1.71	6.33±1.49	13.15	<0.001	Significant
BDI-II	4.04±2.41	4.85±2.63	-1.03	0.306	Not Significant



Graph 1: Mean difference of headache frequency, intensity, duration, HIT-6, BDI-II between Group A & Group B

- Here, the absolute difference was measured by unpaired t-test for headache frequency, intensity, duration, Headache Impact Test -6, Beck Depression Inventory-II as shown in table 4.8. It showed statistically significant difference in Headache Impact Test-6. But, for headache frequency, intensity, duration, Beck Depression Inventory-II, it showed no statistical difference.

DISCUSSION

The study was conducted on 42 patients and were divided into group A (21 patients) and Group B (21 patients). Out of total patients, 62% were female and 38% were male in both Group A & Group B were selected on the basis of convenience sampling method. Baseline measurement of age and gender were taken on day 1.

Patients in group A were given treatment in the form of upper cervical SNAG technique with conventional therapy and group B was treated with Maitland mobilization with conventional therapy and post-intervention, data was collected at the end of 2nd week. Mean age in group A and group B was 31.23 ± 8.49 and 32.04 ± 7.16 respectively.

First objective of this study was to determine the effect of upper cervical SNAG technique with conventional therapy on pain (Headache Diary), headache disability (HIT-6), and depression (BDI-II) in patients with cervicogenic headache. One of the most widely used manual therapy methods for treating CH is SNAG Mulligan mobilizations, as stated in the American Physical Therapy Association's (APTA) 2017 "Neck pain Guidelines", which found that SNAG C1-C2 significantly improved both short and long term outcomes for patients with neck pain and CH. Mohamad A. Adham et al.[23] in 2019 did a study named "Combined use of cervical headache SNAG and cervical SNAG half rotation techniques in the treatment of cervicogenic headache." 48 patients (mean age Group A 29.4 ± 2.6, Group B 29.3 ± 2.5, Group C 29.7 ± 2.7 years) with cervicogenic headache were randomly assigned to three equal groups: Group A (Headache SNAG), Group B (C1-C2 SNAG rotation), and Group C (combined). Neck Disability Index was used to examine neck intensity and cervicogenic headache symptoms. The 6-item Headache Impact Test scale was used to examine headache severity and its adverse effects on social life and functions. Flexion-Rotation test was used to assess rotation range of motion at the level of C1-C2 and confirmed by a cervical range of motion device. Sustained natural apophyseal glide mobilizations used in the study were effective in reducing cervicogenic headache and dizziness in all groups with a greater improvement in the combined group.

Second objective of this study was to determine the effect of Maitland mobilization with conventional therapy on pain (Headache Diary), headache disability (HIT-6), and depression (BDI-II) in patients with cervicogenic headache.

Maitland mobilization enhanced range of motion through both mechanical and neurophysiological mechanisms. Both transient and permanent alterations in the length of connective tissues, such as the joint capsule of the zygapophyseal joints, muscles and ligaments, were significantly influenced by mechanical actions.

Shehri Al Abdullah et al.[24] in 2018 conducted a study entitled "Comparative study of Mulligan (SNAG) and Maitland Mobilization in neck pain." 50 patients (aged 30 to 50 years) were included as per pre-defined inclusion and exclusion criteria and randomly assigned into two groups; each having 25 patients. Group A was given conventional therapy (Active, Isometrics exercises, Moist hot pack) plus SNAG while Group B was given conventional therapy (Active, Isometric exercises, Moist hot pack) plus Maitland's mobilization for 4 weeks, 3 sessions per week one session per day. The patient's outcome measures were assessed by Visual analog scale, NDI (Neck Disability Index) and Goniometry for cervical range of motion. The results of the study suggested that both SNAG and Maitland techniques improved the symptoms of neck pain.

Third objective of this study was to compare the effect of Maitland mobilization with conventional therapy on pain (Headache Diary), headache disability (HIT-6), and depression (BDI-II) in patients with cervicogenic headache.

Muhammad Khan et al.[25] in 2014 performed a study named "Efficacy of C1-C2 Sustained Natural Apophyseal Glide (SNAG) Versus Posterior Anterior Vertebral Mobilization (PAVMs) in the Management of Cervicogenic Headache" The study was conducted on 60 patients with CGH. In this study, patients were divided into two groups, group A and group B equally. Group A of 30 patients received SNAG and at the same time Group B of 30 patients were treated with PAVMs. Outcome Measures: Pain and disability were measured on Visual Analog Scale (VAS) (0-10) and Neck Disability Index (NDI). The study showed significant results for both the interventions in the treatment of CH but SNAG mobilization has been more effective in reducing pain in CH patients.

CONCLUSION

The results of this study accepted the alternative hypothesis and showed statistically significant improvement in headache frequency, intensity, duration, Headache Impact Test-6, Beck Depression Inventory-II in patients with cervicogenic headache with the use of upper cervical SNAG and Maitland mobilization (within group analysis) by paired t-test.

In between group analysis by unpaired t-test, Maitland mobilization with conventional therapy was found to be more effective than upper cervical SNAG with conventional therapy.

Hence, Maitland mobilization with conventional therapy was found to be more predominant in improving headache disability than upper cervical SNAG with conventional therapy. Also, Maitland mobilization and upper cervical SNAG were equally effective in reducing headache frequency, intensity, duration, and depression in patients with cervicogenic headache.

Limitations

- Small sample size.
- In this study, the treatment protocols were provided to the wide age range of the study sample.
- Long term effect of the study was not assessed and home program was not provided to the group of patients.
- As this study was a comparative study, it did not include the control group.
- Gender distribution was unequal.

Future Recommendation

- Future studies should be conducted within different age groups and longer follow-up periods by giving home programs in order to increase the effectiveness of treatment.

Declaration by Authors

Ethical Approval: Ethical Approval was obtained for the study by Institutional Review Board (IRB) with the proposal number PPC/OW/1325M/2025

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Conflict of Interest: The authors declare no conflict of interest.

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