# ORIGINAL ARTICLE: Efficacy of C1-C2 Sustained Natural Apophyseal Glide (SNAG) Versus Posterior Anterior Vertebral Mobilization (PAVMs) in the Management of Cervicogenic Headache

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**Abstract:** *Objectives*: To determine the effect of a C1-C2 sustained natural apophyseal glide (SNAG) as compare to posterior anterior (PA) vertebral mobilization on cervicogenic headache.

*Study Design*: Randomized Control Trial.

*Method*: 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. A pre tested and structured questionnaire was used to collect data. Data was entered and analyzed by using SPSS 19.

*Outcome Measures*: Pain and disability was measured on Visual Analog Scale (VAS) (0-10) and Neck Disability Index (NDI) before and after the treatment.

*Results*: The study showed significant results for both the interventions in the treatment of CGH but SNAG mobilization has been more effective in reducing pain in CGH patients.

*Conclusions*: On the basis of this study, it is proved that cervical SNAGS is more effective for the treatment of cervicegenic headaches as compared to PAVMs.

**Keywords:** Cervicogenic Headache, Sustained Natural Apophyseal Glide, Posterior Anterior Vertebral Mobilization, Mulligan Mobilization.

## INTRODUCTION

Cervicogenic headache (CGH) is a challenging complaint that is commonly faced by physiotherapists in clinical practice. The International Headache Society (IHS) placed cervicogenic headache in the secondary headache sub-group. The global prevalence of headache is about 47%, whereas 15% to 20% of those are CGH [1]. Females are four times more prone to CGH than males. Persons with chronic CGH experience significant restriction of everyday function and are limited to social involvement, and emotional sufferings. Beside this, the poorer quality of life is seen in these individuals than normal [2, 3]. The IHS defines cervicogenic headache (CGH) as “pain, referred from a source in the neck and perceived in one or more Regions of the head and/or face.” It is often exaggerated by neck movement, constant uncomfortable head position or external force over the occipital region or upper cervical on the painful side. Headache may arise from various structures of the cervical spine, containing the zygapophyseal joints (occiput-C1, C2, C3) [3, 4]. Key features of CGH usually are unilateral headache without side-shift combined with neck pain and decreased movement [4]. Up to about 70% of frequent intermittent headache are reported with associated neck pain making CGH difficult to diagnose. The C1-C2 segment is considered essential to be examined in CGH diagnosis. The relative importance of C1-C2 as a prime cause of CGH has been well established. The cervical flexion-rotation test (FRT) is used to assist in the diagnosis of CGH and, in particular, C1-C2 segmental dysfunction. This manual test involves moving head to fully flexed position, so that spinal movement is ideally controlled to C1-C2, then measuring cervical rotation in this position. Normal range of movement is 44° to each side. Hall and Robinson have found that subjects with CGH are seemed to have about 17° less rotation toward the pain side in the FRT, as compare to those with no head pain or migraine with aura. FRT has 91% sensitivity and 90% specificity for diagnosis of CGH [5].

Most beneficial form of treatment for CGH has not been established, but the variety of invasive and non-invasive treatments have been reported. The non-invasive treatment for the CGH include transcutaneous electrical nerve stimulation, massage, exercise, manipulation or mobilization [6]. Mulligan has defined a unique mobilization method for the management of

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ISSN: 1814-8085 / E-ISSN: 1927-5129/14 

articular dysfunction in CGH. In this approach an accessory motion combined with spinal active movement (C1-C2 sustained natural apophyseal glide (SNAG) is used to return normal range of C1-C2 rotation when the FRT reveals rotation limitation at this section [7]. Whereas Maitland Joint mobilization is another technique, suggested for the treatment of CGH. This involves the passive movements, usually rhythmic in nature which varies in amplitude (grade I-IV) but never exceed joint's normal range of motion. Posterior anterior (PA) vertebral mobilization are executed as described by Maitland to the involved sided segments to decrease pain and increase ROM [8].

Joint mobilization with 8-12 treatments over 6 weeks are recommended in CGH in clinical practice guideline in adults [9]. Although manual therapy (mulligan SNAG and PA mobilization) is frequently used for CGH in therapeutic practice but there is limited evidence for their effectiveness and there are no clinical trials that have compared these techniques for the treatment of CGH [7, 8]. Therefore, the purpose of this study was to determine the efficacy of the C1-C2 self-SNAG and Posterio anterior mobilization in subjects with CGH and a positive FRT test. It was hypothesized that the C1-C2 self-SNAG would have significant immediate effects on FRT range of motion, with long-term reduction in self-reported headache symptoms, when compared with posterior anterior mobilization technique.

## METHODOLOGY

### Study Design

It is a randomized control trial, experimental study directed on 60 patients suffering from cervicogenic headache.

### Study Duration

The study has been conducted in duration of one year (March 2012- February 2013).

### Sampling Method

A sample size of 60 patients was calculated through Epi with a point prevalence 18.1%26 at 95% confidence level and margin of error is 0.05. 60 Patients were part of this study equally divided into two groups.

**Group A:** 30 patients were given SNAG mobilization.

**Group B:** 30 patients were given PAVMs.

### Study Setting

Institute of Physical Medicine & Rehabilitation (IPM&R) Dow University of Heath Sciences Karachi and Al-Ain Poly Clinic, Karachi.

#### *Inclusion Criteria*

A total of 60 diagnosed patients of CGH were selected including male and female equally, having at least one episode in previous 3 months; age group of the study population was 20 to 50 years.

#### *Exclusion Criteria*

Patients with migrainous headache, tension type headache, Upper cervical spine instability, diagnosed depression, VBI, history of cervical surgeries, CVA, TIA and pregnant females.

### Data Collection Procedure

The study is being conducted on 60 patients including male and female, with age range of 20-50 years. All participants were suffering from cervicogenic headache and diagnosed by neurologist. The consent was sought from the subject before participating into the study, thereafter; the subjects were randomly divided into two groups, Group A and Group B, each consisting of 30 patients. Both groups received cold pack on cervical spine for 12 minutes before applying the main intervention. Six treatment sessions were carried out over 6 consecutive weeks. Pain intensity was examined by a Visual Analog Scale [10] and function was measured with Neck Disability Index (NDI) both pre-treatment and post-treatment by self-administered questionnaires. The questionnaires were pre tested and structured for the collection of data. Data was analyzed on SPSS version 19. Independent *t*-test was applied to determine the effectiveness of the interventions.

### Ethical Consideration

According to ethical consideration patient privacy, hygiene factor and relationship with physiotherapist and environment of the place which were associated with patient treatment were considered essential.

## RESULTS

This study showed analysis of both treatment protocols given to a sample of 60 patients suffering from cervicogenic headache. Where Group A

**Table 1: Outcome Measures: Mean improvement at Baseline & Post Intervention**

| Characteristics | Days | SNAG Group Mean(SD) | PAs Mobilization Group Mean(SD) | P-value |
|---|---|---|---|---|
| Neck disability index | Baseline | 49.9 ±12.4 | 51.02±14.8 | 0.831 |
| | 6th session | 14.28±4.9 | 24.62±11.85 | 0.004 |
| Visual analog scale | Baseline | 6±1.1 | 6.27±1.2 | 0.541 |
| | 6th session | 2±0.53 | 3.06±0.79 | 0.000 |

consisting of 30 patients, received SNAGs while Group B consisting of 30 patients was given PAVMs for the pain management. Mean age of the total sample was 42.53 years and Out of 60 patients, 63% were female while 37% males. The Neck disability index (NDI) was use to assess the impact of neck pain on functional limitation at baseline and post last intervention. It was found that mean NDI score at baseline in SNAGs group was (49.9 ±12.4) and after six treatment sessions mean improve was calculated as reduced to (14.28±4.9). Whereas, in PAVMs group mean NDI score at baseline was (51.02±14.8) that reduced to (24.62±11.85).

Moreover, the Visual Analog Scale was used to measure intensity of pain, before and after the treatment. It was observed that mean intensity of pain in patients of SNAG Group was (6±1.1) and after the treatment it was reduced to (2±0.53). While in PAs Mobilization Group, intensity of pain on Visual Analog Scale before the treatment was (6.27±1.2) and after treatment it was reduced to only (3.06±0.79). The data was analyzed to find out the effectiveness of SNAG mobilization in comparison to PAVMs for the management of cervicogenic headache. Independent *t*-test was applied to determine the effectiveness of these interventions and it was found that both SNAG mobilization and PAVMs are effective in the management Cervicogenic headache. However, when compared SNAG mobilization group has shown to be more effective in management of Cervicogenic headache Table **1**.

## DISCUSSION

All the patients in this study were between the age group of 20-50 years with CGH without migrainous headache, tension type headache, and diagnosed depression cases, VBI, having history of cervical surgeries, CVA, TIA and pregnant females. In our study, the patient's response to specific treatment was assessed on Visual Analog Scale (VAS). All patients felt relief in pain after the given treatment but there was prominent reduction in pain in patients who underwent SNAG mobilization compared to PAVMs at C1-C2 level. Hall and colleagues reported that Mulligan has described a C1-C2 SNAG as a treatment of choice in the management of patients having cervicogenic headache [11]. In this study, this technique was most beneficial in reducing pain in cervicogenic headache patients. According to Schoensee *et al.* [12] Maitland PA mobilization at C1-2 level is effective in managing CGH whereas the current study also proved that this intervention has more positive effects but in comparison to SNAG was slight less effective. Other treatment options for managing cervicogenic headache include cervical isometric strength exercises [13] which are prescribed for home plan. These exercises are might be effective if done for long period of time but SNAG and PAVMs shows immediate effects that could be for shorter duration but are more effective.

A study evaluating the effects of mobilization and specific exercise did not show significantly better results than the single intervention alone. In the same study 10% subjects showed better results with combined therapy which was clinically relevant [14]. We used different outcome measures therefore direct comparison to our study cannot be made and participants received 12 treatment sessions in that study as compared to our study in which 6 treatment sessions were applied. Both studies concluded that manual therapy is a better treatment choice for cervicogenic headache patients. Several other studies showed benefit of manual therapy in cervicogenic headache [15,16]. In present study we did not include exercise therapy so that the sole effect of two mobilization techniques could be evaluated. We recognize that cervicogenic headache is a complex disorder involved both cervical joint dysfunction and muscular component and all aspects of this condition shall be explored during management [17]. In present study we did not measure range of motion of the cervical spine, range of rotation in end-range flexion is normally 40–44° to each side [18]. In contrast, subjects

with C1/2 dysfunction have significantly less rotation [19]. This explains the fact that mobilization will increase range of motion hence reduce pain and function in cervicogenic headache patients. This is supported by Hall *et al.* [11] study demonstrated immediate 15° improvement in range of rotation following a C1-C2 self-SNAG mobilization in intervention group as compared to placebo group. There was no long term follow up therefore it is not clear whether reduction in headache symptoms is directly related to change in range on motion.

Neuromodulation effect of joint mobilization is a possible physiological explanation by which C1-C2 mobilization could have reduced headache symptoms. Stimulation of mechanoreceptors within the joint inhibits the pain at spinal cord level as in pain gate theory [20]. In addition the end range of rotation with SNAG mobilization may engage the descending pain inhibitory system which may be activated and mediated by areas like periaqueductal gray of the midbrain [21,22].

Other explanation may be that mobilization is thought to break down adhesions and stretch surrounding tissues hence increase range of motion and decrease pain. It is difficult to establish whether the results are due to neurophysiological change in pain modulation or an effect on joint stiffness.

## CONCLUSION

CGH has an involved biomechanical and neural mechanism with cervical association, which makes the task of studying cervicogenic headache challenging. However given its incidence and often disabling nature, optimal treatment quest is necessary. SNAG and PAVMs established improved outcomes on pain characteristics with Visual Analog Scale. Both the interventions were well endured and no adverse reactions were experienced, but SNAG was comparatively more effective. It is suggested that further research should be carried out on a higher scale involving more subjects and a long continuation. There is still room for Pakistani physiotherapists to prepare themselves with appropriate training and take part in more research activities so that they can contribute to successful patients treatment.

## REFERENCES

[1] Umar M, Naeem A, Badshah M, Zaidi S. A randomized control trial to review the effectiveness of cervical mobilization combined with stretching exercises in cervicogenic headache. J Public Health Biolo Sci 2012; 1(1): 09-13.

[2] Page P. Clinical suggestion cervicogenic headaches: an evidence based approach to clinical management. Int J Sports Phys Ther 2011; 6 (3): 254-66.

[3] Hall T, Briffa K, Hopper D. Clinical Evaluation of Cervicogenic Headache: A Clinical Perspective. J Man Manip Ther 2008; 16(2): 73-80.

[4] Penzien DB, Andrasik F, Freidenberg BM, Houle TT, Lake AE 3rd, Lipchik GL, *et al*. Guidelines for Trials of Behavioral Treatments for Recurrent Headache, First Edition: American Headache Society Behavioral Clinical Trials Workgroup. Headache 2005; 45(2): 110-32. http://dx.doi.org/10.1111/j.1526-4610.2005.4502004.x

[5] Hall T, Briffa K, Hopper D, Robinson K. Long-Term Stability and Minimal Detectable Change of the Cervical Flexion-Rotation Test. J Orthop Sports Phys Ther 2010; 40(4): 225-9. http://dx.doi.org/10.2519/jospt.2010.3100

[6] Haldeman S, Dagenais S. Choosing a treatment for cervicogenic headache: when? what? how much? Spine J 2010; 10(1): 169-71. http://dx.doi.org/10.1016/j.spinee.2009.10.013

[7] Exelby L. The Mulligan concept: Its application in the management of spinal conditions. Man Ther 2002; 7(2): 64-70. http://dx.doi.org/10.1054/math.2001.0435

[8] Petersen SM. Articular and Muscular Impairments in Cervicogenic Headache: A Case Report. J Orthop Sports Phys Ther 2003; 33(1): 21-30. http://dx.doi.org/10.2519/jospt.2003.33.1.21

[9] Bryans R. Decina P. Clinical Practice Guideline for the Management of Headache Disorders in Adults. Canadian Chiropractic Association and the Canadian Federation of Chiropractic Regulatory and Education Accrediting Boards 2012.

[10] Fleming R, Forsythe S, Cook C. Influential Variables Associated with Outcomes in Patients with Cervicogenic Headache. J Man Manip Ther 2007; 15(3): 155-64. http://dx.doi.org/10.1179/106698107790819846

[11] Hall T, Chan HT, Christensen L, Odenthal B, Wells C, Robinson K. Efficacy of a C1-C2 Self-sustained Natural Apophyseal Glide (SNAG) in the Management of Cervicogenic Headache. J Orthop Sports Phys Ther 2007; 37(3): 101-07. http://dx.doi.org/10.2519/jospt.2007.2379

[12] Schoensee SK, Jensen G, Nicholson G, Gossman M, Katholi C. The effects of mobilizations on cervical headache. J Orthop Sports Phys Ther 1995; 21(4): 184-96. http://dx.doi.org/10.2519/jospt.1995.21.4.184

[13] Ylinen J, Nikander R, Nykänen M, Kautiainen H, Häkkinen A. Effect of neck exercises on cervicogenic headache: a randomized controlled trial. J Rehabil Med 2010; 42(1): 344-49. http://dx.doi.org/10.2340/16501977-0527

[14] Jull G, Trott P, Potter H, Zito G, Niere K, Shirley D, *et al*. A randomized controlled trial of exercise and manipulative therapy for cervicogenic headache. Spine 2002; 27: 1835-1843. http://dx.doi.org/10.1097/00007632-200209010-00004

[15] Jensen OK, Nielsen FF, Vosmar L. An open study comparing manual therapy with the use of cold packs in the treatment of post-traumatic headache. Cephalalgia 1990; 10: 241-250. http://dx.doi.org/10.1046/j.1468-2982.1990.1005241.x

[16] Nilsson N, Christensen HW, Hartvigsen J. The effect of spinal manipulation in the treatment of cervicogenic headache. J Manipulative Physiol Ther 1997; 20: 326-330.

[17] Zito G, Jull G, Story I. Clinical tests of musculoskeletal dysfunction in the diagnosis of cervicogenic headache. Man Ther 2006; 11: 118-129. http://dx.doi.org/10.1016/j.math.2005.04.007

[18] Hall T, Robinson K. The flexion-rotation test and active cervical mobility: A comparative measurement study in cervicogenic headache. Man Ther 2004; 9: 197-202. http://dx.doi.org/10.1016/j.math.2004.04.004

[19] Dvorak J, Antinnes JA, Panjabi M, Loustalot D, Bonomo M. Age- and gender-related normal motion of the cervical spine. Spine 1992; 17(Suppl 10): 393-398. http://dx.doi.org/10.1097/00007632-199210001-00009

[20] Wright A. Hypoalgesia post-manipulative therapy: a review of a potential neurophysiological mechanism. Man Ther 1995; 1: 11-16. http://dx.doi.org/10.1054/math.1995.0244

[21] Sterling M, Jull G, Wright A. Cervical mobilisation: concurrent effects on pain, sympathetic nervous system activity and motor activity. Man Ther 2001; 6: 72-81. http://dx.doi.org/10.1054/math.2000.0378

[22] Vicenzino B, Collins D, Benson H, Wright A. An investigation of the interrelationship between manipulative therapy-induced hypoalgesia and sympathoexcitation. J Manipulative Physiol Ther 1998; 21: 448-453.

Received on 21-04-2014 Accepted on 20-05-2014 Published on 03-06-2014

http://dx.doi.org/10.6000/1927-5129.2014.10.31