COMBINED CERVICAL HEADACHE SNAG With CERVICAL SNAG HALF ROTATION TECHNIQUES ON CERVICOGENIC HEADACHE PATIENTS

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ABSTRACT: Background*:* Cervicogenic headache is a major problem in many people suffering from upper cervical dysfunction with a great conflict in its physical therapy management. *Objectives:* To determine the effect of C1-C2 Mulligan SNAGs Mobilizations on Cervicogenic headache and associated dizziness symptoms. *Methods:* Forty eight patients with cerviocgenic headache included in the study; from outpatient clinic of Faculty of Physical Therapy, Cairo University & New Cairo outpatient clinics, were randomly assigned into three equal groups; group A (Headache SNAG), group B (C1-C2 SNAG rotation) and group C (combined). Their mean age was (29.37±2.6), (29.31±2.54) & (29.68±2.65). Neck Disability Index used to examine neck pain intensity & CEH symptoms. 6 Items Headache Impact test "6-HIT" scale used to examine headache severity and its adverse effects on social life & functions. Flexion-Rotation Test "FRT" also used to assess rotation ROM at level of C1-C2 by "CROM" device. Dizziness Handicap Inventory "DHI" scale was used to evaluate dizziness symptoms. Evaluation done pre & post treatment and comparison between groups were quantified. Correlations between the examined parameters were also measured. Headache SNAG and C1-C2 Rotation SNAGs were done separately in group (A- B) and combined in group C as a treatment intervention. *Results:* Group C has Significant improvement in whole parameters compared to group A & B.. *Conclusion:* SNAGs mobilizations used in the study were effective in reducing cervicogenic headache & dizziness symptoms with all groups with noticeable improvement in the combined group.

Key words: cervicogenic headache , cervical headache snag, cervical snag half rotation, cervical dizziness

Introduction:

A unilateral headache associated by signs and symptoms of cervical dysfunctions which could be worsened by neck movement, poor prolonged head position or external pressure on occipital painful site could be as an indicator to what globally called Cervicogenic headache (CGH) **(Aleksander and Michael, 2012).** The In 2004; the International Headache Society defines CGH as "pain, referred from a source in the neck and perceived in one or more regions of the head and/or face." different structures of the cervical spine including the zygoapophyseal joints, might be a main contributors for such an issue **(Smith et al., 2001)** . Mobility of the cervical spine should be evaluated by addressing upper cervical joints ROM. The most common clinical diagnostic methods utilized include flexion-rotation test (FRT), active cervical ROM, passive accessory inter-vertebral movement, physiological inter-vertebral movement (PPIM/PPIVM), , Active cervical flexion test, Myofascial Trigger points assessment, Ischemic pressure tolerance test, and cervical proprioception assessment **(Ognice et al., 2007, Uthaikhup et al., 2009 and Huber et al., 2013).** Mobilization with movement concept which is known by Mulligan concept is totally distinct from other forms of manual therapy, where he described the sustain natural apophyseal glide "SNAG" to the joint with active movement done by patient toward the symptoms. In addition this glides should be pain free with proper force applied by qualified trained person **(Teys et al., 2008).** Efficacy of SNAG C1-C2 was proven & stated by **(Racicki et al., 2013 & Gross et al., 2015)** on patients suffering of acute to subacute CGH on the short and long term period, As a secondary complications for CGH people might report dizziness with prolonged neck positions or stiffness, For the moment; dizziness of cervical origin raise an area of debate and conflict regarding its management yet, a growing powerful evidence supports the treatment using manual therapy interventions **(Lystad et al., 2011).** Mulligan recommended that mobilization usually done toward the restricted site or direction of symptoms reproduction, which is difficult to find such a category of patients suffering of headache & dizziness symptoms in only one direction. Also for sake of avoiding being biased by only one SNAG technique. There is an evidence towards mobilizing symptomatic and asymptomatic cervical levels which causes immediate improving of pain and segmental mobility of same level and adjacent areas. Therefore the purpose of this study to identify the effect of using C2 headache SNAG, C1-C2 SNAG rotation in separate and Combination of both techniques on outcome measures in cervicogenic headache patients and to correlate between the amount of improvement

of headache symptoms and dizziness associated with the overall amount of functional improvement.

Methods:

The study were conducted at the Out Patient Clinics of Faculty of Physical Therapy and the "Governmental New Cairo Medical Sector" Out Patient Clinics. Forty eight patients (24 males and 24 females) with age ranged from 25-45 years diagnosed by neurologist as a chronic mechanical CGH with dizziness symptoms participated in this study. They were divided into three groups assigned randomly by systematic randomization into equal groups. Group (A) consisted of 16 (8 males and 8 females) patients got cervical headache SNAG C2, group (B) included also 16 patients who had received cervical SNAG C1-C2 half rotation techniques & group (C) which contained 16 patients had a combination of both techniques.

Subjects:

patients included in the study suffered from headache for the last three month with a unilateral neck pain and stiffness. Also limited neck ROM > 10 degrees confirmed by positive Flexion Rotation Test. In addition; associated dizziness symptoms triggered by headache & neck extension. Patients excluded out of the study if they exhibit any other types of headaches, congenital conditions of cervical spine & disc herniation or fractures. Also patients with contraindications to mobilization techniques and patients with dizziness due to vertebrobasilar insufficiency or vestibular dysfunctions.

Instrumentations: Neck Disability Index (NDI): widely survey used for evaluation of neck disability including pain intensity, personal care, lifting things, reading books , headache , concentration , work and ADL activities (Vernon, 2008). Dizziness Handicap Inventory (DHI): a scale used to assess the impact of dizziness on quality of life, moreover; designed to quantify the handicapping effect of dizziness imposed by vestibular system disease, but has also been used for persons with dizziness of other origins **(Kaufman K, 2006).** The six items Headache Impact Test (HIT-6): a scale used to examin adverse impact of headache on social functioning, role functioning, vitality, cognitive functioning and psychological distress **(Kosinski et al., 2003).** Flexion rotation test: Assessment the amount of rotation in C1- C2 by

passively flexing head of the patient then to rotate either directions by therapist hands, the test measured by using CROM device according to the method described by **(Hall et al., 2007).** This method of assessment has been shown to have high reliability both within and between examiners **(Hall and Robinson, 2004).**

Procedures: headache intensity & neck pain were measured by "NDI", while headache impact adverse effects on social and psychological life was measure using 6-HIT scale. Amount of rotation between C1-C2 was assessed by FRT and confirmed in degrees using CROM device. Dizziness symptoms reported by patients were assessed by using DHI questionnaire through interviewing patients. Treatment has done as following; all patients got a full explanation of the purpose of the treatment & its physiological benefits. Before starting the treatment all variables measures were taken for comparison, then, group (A) had the Headache SNAG technique where patient sit with erect posture on chair and therapist handle C2 spinous process with middle phalanx of one hand & other hand do the ventral glide on C2, group (B) got SNAG C1-C2 rotation techniques according to their restricted site therapist put thumb over thumb at level of C1 transverse process then, glide ventrally with active rotation to the restricted site, while, group (C) have had the combination of both techniques.

Statistical analysis:

Statistical analysis was conducted using SPSS for windows, version 22 (SPSS, Inc., Chicago, IL). The current test involved two independent variables. The first one was the (tested group); between subject factor which had three levels. The second one was the (measuring periods); within subject factor which had two levels (pre, post). In addition, this test involved four tested dependent variables (NDI, FRT, HIT6 and DHI). This exploration was done as a pre-requisite for parametric calculations of the analysis of difference.

Results:

No significant differences were noted in demographical data (age; $P = 0.909$) & (gender; $P = 0.983$) among the three tested groups (Table 1). Results of the study showed that there was statistically significant improvement in post treatment mean values of the measured variables (NDI, 6-HIT, FRT & DHI) compared to pre treatment scores within the tested groups ($P< 0.005$). In addition, same findings were

matched among the three tested groups; except the comparisons between group A & B for all variables and only group B & C in DHI scores were non-significant. (Table 3, 4, 5 & 6).

Table (1): Descriptive statistics and One Way Analysis of Variance (ANOVA) for the mean age & BMI values for the three tested groups

	Group A (N=16)	Group B (N=16)	Group C (N=16)	F-value	P-value	Level of significant
Age (years)	29.37±2.6	29.31±2.54	29.68±2.65	**0.095**	**0.909**	**N.S**
BMI (Kg/m^2)	23.12±1.44	23.21±1.40	23.18±1.20	**0.018**	**0.983**	**N.S**

*** indicated by the One Way Analysis of Variance (ANOVA), *P : probability,***
BMI: Body mass index & N.S : Non-significant

Table (3): ***Statistics for NDI at different measuring periods among different groups.***

NDI	Group A (Mean ±SD)	Group B (Mean ±SD)	Group C (Mean ±SD)
Pre	29.87 ±1.7	29.12 ±2.15	28.37±2.18
Post	10.56 ±2.22	11.37 ±1.89	5.06 ±1.06
MD	19.31	17.75	23.31
% of change	64.64%	60.95%	82.16%
Multiple pair wise comparisons between pre and post treatment values for NDI at different groups			
Pre Vs. post	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Multiple pair wise comparison tests (Post hoc tests) for the NDI among different groups at different measuring periods			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Pre	0.904	0.127	0.904
Post	0.619	0.0001*	0.0001*

MD: Mean difference & NDI : Neck Disability Index.

Table (4): ***Sstatistics and MANOVA for FRT at different measuring periods among different groups.***

FRT	Group A (Mean ±SD)	Group B (Mean ±SD)	Group C (Mean ±SD)
Pre	24.37 ±2.72	23.75 ±2.93	23.31±2.67
Post	38.06 ±1.06	39.12 ±1.66	43.06 ±0.92
MD	-13.68	-15.37	-19.75

% of change	56.13%	64.71%	84.72%
Multiple pairwise comparisons between pre and post treatment values for FRTat different groups			
Pre Vs. post	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Multiple pair wise comparison tests (Post hoc tests) for the FRT among different groups at different measuring periods			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Pre	0.999	0.857	0.999
Post	0.065	0.0001*	0.0001*

***FRT: Flexion Rotation Test.**

Table (5): Statistics and 3×2 mixed design MANOVA for HIT6at different measuring periods among different groups.

HIT6	**Group A (Mean ±SD)**	**Group B (Mean ±SD)**	**Group C (Mean ±SD)**
Pre	67.5 ±3.4	67.37 ±3.42	67.06±3.56
Post	44.12 ±2.12	43.75 ±2.17	37.75 ±1.43
MD	23.37	23.62	29.31
% of change	34.62%	35.06%	43.70%
Multiple pair wise comparisons between pre and post treatment values for HIT6at different groups			
Pre Vs. post	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Multiple pair wise comparison tests (Post hoc tests) for the HIT6 among different groups at different measuring periods			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Pre	0.999	0.999	0.999
Post	0.999	0.0001*	0.0001*

*** HIT-6: 6 Items Headache Impact Test.**

Table (6): ***Descriptive statistics and 3×2 mixed design MANOVA for DHI at different measuring periods among different groups.***

DHI	**Group A (Mean ±SD)**	**Group B (Mean ±SD)**	**Group C (Mean ±SD)**
Pre	32.87 ±1.62	32.12±1.85	35.05±1.36
Post	7.25 ±1.61	6.12 ±1.7	5.5 ±1.54

MD	25.62	26	27
% of change	77.94%	80.94%	76.05%
Multiple pairwise comparisons between pre and post treatment values for DHIat different groups			
Pre Vs. post	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Multiple pair wise comparison tests (Post hoc tests) for the DHI among different groups at different measuring periods			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Pre	0.999	0.599	0.999
Post	0.847	0.169	0.012*

*** DHI: Dizziness Handicap Invemtory.**

Discussion:

The purpose of the study was to identify the effect of using C2 headache SNAG and C1-C2 SNAG rotation as a two separate techniques and as a combination of both; on CGH with dizziness symptoms related to neck pain and stiffness. As yet, no published study investigated the influence of combination two SNAG mobilization techniques on headache & dizziness symptoms. Patients were assigned into three equal groups and had SNAGS mobilizations as a separate two interventions in group A &B and as a combination in Group C for one month three sessions per week under a qualified certified mulligan practitioner. Results of the study showed a significant improvement in all measured variable post treatment scores within groups and among the groups in favor to the third combined group. SNAGs Mulligan mobilizations are one of the most popular manual therapy techniques found to be effective in treating CGH as supported by **(peter et al., 2017)** "Neck Pain Guidelines" 2017 recommended by American Physical Therapy Association "APTA" which reported that patients with neck pain & CEG had significant improvement with self SNAG C1-C2 on short and long term period. Cervical SNAG mobilizations used in the current study come in agreement with **(Zito & Jull, 2006)** who have delivered a study investigating CGH diagnosis and stated that presence of upper cervical joint dysfunction most clearly differentiated the CGH sufferers from those with migraine with aura, also limited ROM into upper cervical ROM in cranio-cervical flexion and rotation which were not common in migraine group and concluded that impairments in the musculoskeletal system linked to clinical features will contribute to the justification

and selection of treatment for cervicogenic headache. **(Toby et al., 2007) & (Youssef &Shanab, 2013)** results were in line with our results where Toby studied the effect of SNAG C1-C2 on CGH thirty two patients with limited FRT were assigned into two groups and results came with a positive significant reduction in headache intensity and increase in neck ROM in the experimental SNAG group, while Youssef and Shanab have compared mobilizations and massage on CGH and positive results were superior to mobilization group. Regarding to current study which has examined the cervical dizziness symptoms associated with headaches reported by patients the significant improvements in symptoms were supported by results of **(Reid et al., 2008)** that showed immediate and sustained (for 12 weeks) effect in reducing dizziness, neck pain, and disability caused by cervical spine dysfunction as well as the study of **(Suzan et al., 2014)** who compared effectivness of SNAGs with Maitland mobilizations on cervicogenic dizziness and found a reduction dizziness intensity and frequency post treatment and at 12 weeks compared with baseline with no side effects reported even for 24 weeks later.

Recommendations of **Mulligan (1999)** stated that if the cervical spine extension or flexion was the symptomatic direction then the glide should be applied ventrally to C2 spinous process while the participant slowly extends or flexes their neck. while, if rotation was symptomatic then the anterior glide is should be applied to the C1 transverse process while the participant rotates his neck slowly to the symptomatic direction. Therefore; it was hard to collect patients with such specifications in research, so instead of that and to avoid being biased by one technique , samples were assigned randomly in three groups. In line with previous recommnedations, **(Maitland et al., 2001)** claimed the same that mobilization techniques should be selected according to pain site localization, direction of symptoms reproduction and the most vertebral level producing symptoms, however, previous studies of **(Vicenzino et al., 1996), (Chiradejnant et al., 2003)** and **(Cleland et al., 2005)** demonstrated the opposite that spinal mobilization to even asymptomatic areas also results in symptoms reduction and increase in segmental mobility on the same level and adjacent areas. Those results agreed with **(Rafaela et al., 2009)** who investigated the effect of different levels of cervical mobilizations on symptomatic and asymptomatic cervical levels in patients with chronic non specific cervical pain and found a significant immediate pain relief in both groups and

increase in segmental mobility on different levels. Results were consistent with the previous studies supporting interventions of the current study; where patients had symptoms and restricted directions either on rotation around C1-C2 or extension around C2, though their symptoms got improved using both techniques headache SNAG C2 and SNAG C1-C2 rotation in separate; therefore, the significant improvements were in favor to the combined group C. Improved variables in this study prove the efficacy of SNAGs mobilizations due to the direct effect of stimulating mechanoreceptors in cervical facets joints which inhibit pain by activating gate control theory mentioned by **(Wright, 1995).** Also immediate FRT improvement comes back to descending inhibitory pain mechanism which could be mediated and activated by areas of predectual grey of mid-brain as **(Sterling et al., 2001)** had claimed. Moreover to; physiological effects post mobilizations like increased blood circulation and elevated skin temperature which also reduce pain and increase ROM as reported by **(Sterling et al., 2001). (Wrisely et al., 2000)** agreed that dizziness might be a cause of cervical dysfunction in mechanoreceptors and deep muscular proprioceptors input to vestibular nuclei. In line with the previous studies **(Treleaven et al. 2003)** delivered a study including patients with dizziness symptoms and they have found that significant greater joint position errors and a higher neck pain index were likely found with experimental group than control subjects , which is consistent with cervical mechanoreceptor dysfunction being a likely cause of the symptoms, therefore; SNAGs mobilizations for upper cervical spine found to be an effective method in reduction of dizziness symptoms where mobilization applied to the upper cervical spine increases stimulation of proprioceptors in both joints and muscles of this area and normalizes afferent information to the vestibular nuclei and this explanation were supported by previous studies plus to **(Mulligan, 1994)** text book and **(Ried et al., 2008).**

Conclusion:

Results of this study proposed an objective and promising effect of SNAGs mobilization on CGH symptoms with associated dizziness through stimulating mechanoreceptors of cervical joints, muscles proprioceptors and modulation of abnormal afferent signals originating from upper cervical spine. The Improved parameters also recommend and encourage using cervical SNAGS as non invasive intervention according to the therapist assessment, findings and clinical reasoning .

Abbreviations:

- **CGH :** Cervicogenic Headache.
- **NDI :** Neck Disability Index.
- **FRT :** Flexion Rotation Test.
- **HIT-6 :** 6 Items Headache Impact Test.
- **DHI :** Dizziness Handicap Inventrory.

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Conflicts of Interest:

None