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The effect of prepositioned upper cervical traction mobilization and therapeutic exercise on cervicogenic headache: A case study

The International Headache Society (IHS) has validated cervicogenic headache (CGH) as a secondary headache type that is hypothesized to originate due to nociception in the cervical area. CGH is a common form of headache and accounts for 15% to 20% of all chronic and recurrent headaches. CGH is commonly treated with manual and exercise therapy. To date, no studies have isolated only one manual intervention in an attempt to determine its effectiveness. In this case study we present a 28-year-old patient with right upper cervical (UC) and occipital pain who responded well to a single manual intervention technique. This technique was applied in isolation for the first three visits and two therapeutic exercises prescribed on the fourth and fifth visit. In total, manual and exercise intervention occurred over 8 visits at which point in time the patient was discharged with no UC motion impairments, an NPRS rating of 0, a NDI and HDI demonstrating a 100% improvement and a 37% improvement in FOTO score. The traction based manual intervention and two therapeutic exercises prescribed for this patient were successful in relieving UC pain and CGH. At six months follow up, the patient was still symptom free.

Key words: *Cervical traction, Mobilization, Therapeutic exercise, Cervicogenic headache*

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INTRODUCTION

Cervicogenic headache (CGH) has been described as a chronic headache that arises from the atlanto-occipital and upper cervical joints and perceived in one or more regions of the head and/or face [1]. The International Headache Society (IHS) has validated CGH as a secondary headache type that is hypothesized to originate due to nociception in the cervical area [2]. CGH is a common form of headache and accounts for 15% to 20% of all chronic and recurrent headaches [3]. Suijelekom et al. [4] demonstrated that people who experience CGH have a quality of life burden that is substantial.

Numerous studies have reported on the effectiveness of mobilization techniques and therapeutic exercises in reduction or alleviation of CGH [5-8]. McDonnel et al. reported in a case study that a patient, who had CGH for 7 years, had a significant decrease in headache intensity and frequency after performing a specific cervical active-exercise program [5]. Ylinen et al. in randomized controlled trial, divided 180 female office workers into 3 groups: strength, endurance and a control group. After a 12 week follow up, the strength group that performed isometric, dynamic and stretching exercises had a decrease in headache by 69% [6].

In a case report by Peterson et al. the author described a 27-year-old woman with complaint of a headache. She received treatment that included manual upper cervical mobilization techniques, neuromuscular re-education for the deep neck flexor muscles and scapular stabilization exercises. Following treatment, she demonstrated a decrease in headaches [7]. Shoensee et al. described a case series with 10 participants whose primary complaint was CGH. The intervention for these participants consisted of 9-12 treatment sessions of UC mobilizations. All 10 participants indicated improvement in headache frequency, duration and intensity after mobilization treatments were administered [8].

Duijn et al. presented a case report in which a participant complained of both cervical pain and temporal headaches. The participant was treated with thrust manipulation and non-thrust mobilization as well as exercises to address postural deficits and strength. At discharge, the patient demonstrated clinically meaningful improvements with regard to pain, disability and headache [9]. Hall et al. found in a randomized controlled trial that headache symptoms, when measured by a headache index, improved significantly more in subjects treated with a C1-C2 sustained natural apophyseal glides (SNAG) mobilization technique [10].

The literature provides evidence of analgesic effect and increased range of motion (ROM) and proprioception after cervical mobilization techniques. Aguirreben et al. performed systematic review with 24 studies about the effect of spinal mobilization. Evidence from this review suggests that spinal mobilizations cause neurophysiological effects resulting in hypoalgesia (local and/or distal to mobilization site), sympathoexcitation, and improved muscle function [11]. Schomacher et al. in a controlled randomized trial, showed that cervical mobilizations have analgesic effects on neck pain and movement sensation [12]. In a case report, McNair et al. described a 40-year-old individual who presented with cervical pain and motion impairments. This patient was treated with grade III down-slope mobilizations and post intervention, the patient demonstrated improvement in cervical impairments [13]. Lastly, Lluch et al. divided 18 patients randomly into two groups: an exercise and a mobilization group. The exercise group performed an active assisted exercise plus an active cranio-cervical flexion exercise. The mobilization group received passive mobilization treatment and a cranio-cervical flexion exercise. Both groups demonstrated decreased neck pain immediately post treatment [14].

The primary purpose of this case report is to describe the effect of a traction based spinal mobilization technique on UC pain and CGH when applied in isolation over three visits. The secondary purpose is to demonstrate the final functional outcome of a single patient with UC pain and CGH once two supportive exercises were prescribed on the fourth visit and at six months' post treatment were still being performed.

Case description and History:

This patient was a 28-year-old female physical therapist who was seen expressing concern regarding constant right UC and right occipital pain that was made worse with cervical flexion and right rotation. Her medical history was unremarkable and there was no history of cervical trauma. Prior to the onset of UC pain, the patient ran three times per week, running on average 10 miles per week. Since the onset of UC pain she had stopped running. Mild right UC and CGH symptoms began in her clinic while treating patients. She noted that her active cervical motion was both limited by her UC pain, and that certain active neck motion made UC pain worse. On the first day that the patient experienced UC pain, she took 600mg ibuprofen without relief. Her symptoms worsened on the second day to a moderate level and bilateral active cervical rotation and cervical flexion became more limited due to right sided UC pain. She continued to take ibuprofen without relief [15].

Within three days of her initial onset, UC symptoms had increased to what she described as a severe level. Active cervical flexion and right rotation caused a severe increase pain in the right UC and occipital region. At day three the patient saw an urgent care physician, who diagnosed her with muscle spasms and prescribed Flexeril and Naproxen [16-17]. After two days of taking Flexeril, symptoms decreased by about 50%. She continued taking Flexeril for an additional five days without any additional relief and then discontinued this medication. Her UC and occipital pain continued and active cervical motion still increased her symptoms.

At 10 days' post onset of UC symptoms, the patient noted less UC pain upon arising, but a consistent worsening of symptoms by the end of her day in the clinic [18]. On day 11, she attempted to exercise by running and after several miles her UC and occipital pain became serve. On day 12, the patient saw a physiatrist because she was unable to fully concentrate and perform her work in her clinic. The physiatrist ordered blood work and radiographs of her cervical spine, both of which were negative. The patient requested and received a referral to physical therapy and was seen the next day.

Physical Therapy Examination

Structural (Postural) Examination: As expected in a heathy female in her twenties, there was no significant changes in sagittal spinal alignment secondary to advanced degenerative changes. As a physical therapist, this patient understood the importance of good postural position of her cervical region but it was noted during the initial examination that she would consistently let her UC region lapse into extension (backward bending) during relaxed sitting [19-20].

Active Cervical Range of motion: Active motion

examination was conducted attempting to isolate a short arc UC motion flexion in the sagittal plane. In this regard the patient was verbally cued to move her chin down and in toward her throat. This reproduced a pulling sensation in the right occipital region and increased the patient's right UC pain [21]. Active left cervical side bending and active right cervical rotation reproduced right the patient's right UC and occipital pain.

Passive upper cervical coupled rotation examination: Passive motion examination was conducted with the patient in a seated position and the clinician standing on her right side. The patient's C2 vertebrae was manually stabilized with a bilateral laminar grip using the clinician's left thumb and fore finger. (Figure 1) With the C2 vertebrae manually stabilized in mid-position this passive examination technique is able to isolate motion reasonably well to the upper segments. The clinician's right hand lightly gripped over the top of the patient's left ear and passive UC LSB and RR was performed. (Figure 2&3) The passive UC coupled right rotation motion immediately reproduced the patient's right UC pain [22].

Clinical Palpation: Lastly, with the patient in a seated position, soft tissue palpation was performed in the bilateral UC and occipital area. Tenderness was reported bilaterally, but more so on the right [23].

Fig. 1. Bilateral laminar contact for manual stabilization of the C2 vertebrae

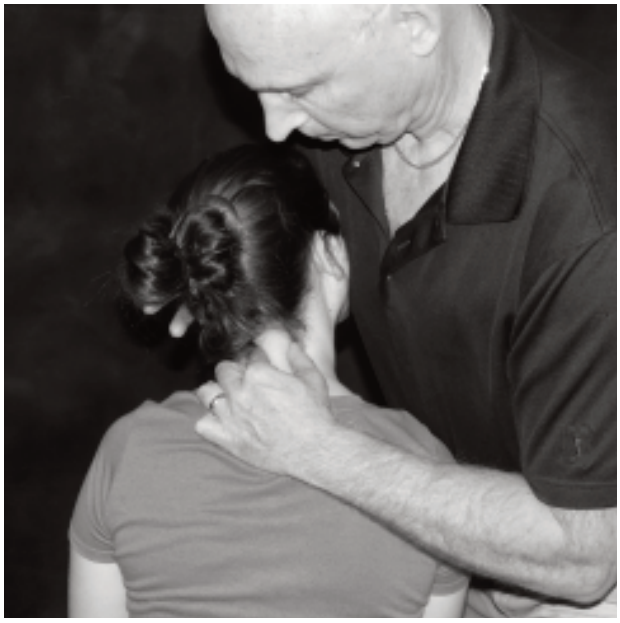

Fig. 2. UC Pre-Positioned traction mobilization - Posterior View

Fig. 3. UC Pre-Positioned traction mobilization - Side view

Course of treatment

The patient received 8 sessions of therapy over a 4-week period. Treatment consisted of a traction based UC mobilization where the patient's UC segments were carefully placed in left side bending and right rotation while holding the C2 vertebrae in mid-position. This allows for available UC soft tissue slack to be

taken up just prior the onset of UC symptoms and the delivering of a cranially directed manual traction mobilizing force [22]. This technique was the only intervention applied during the first three treatment sessions, and at the conclusion of each session the patient reported a decrease in CGH intensity when active cervical motions were reevaluated. (Figures 2&3) This same manual intervention was applied during the remaining five sessions as well. An UC flexion self-mobilization exercise (Figure 4) was added at the conclusion of the fourth treatment session and this exercise procedure was performed both in the clinic and as part of a home based exercise program [24,25]. In total, four sessions of UC traction mobilization were applied prior to the prescription of this first self-mobilization exercise. At the end of the fourth treatment session, the patient was able to perform this active UC flexion self-mobilization without provocation of UC symptoms. The patient only noted a pulling sensation in the right UC region only. At the conclusion of the fifth treatment session, the cervical extensor muscle strength building exercise was added as part of the clinic-based treatment, and as part of a home based exercise program [25]. (Figure 5)

Fig. 4. UC flexion self-mobilization (stretch) exercise

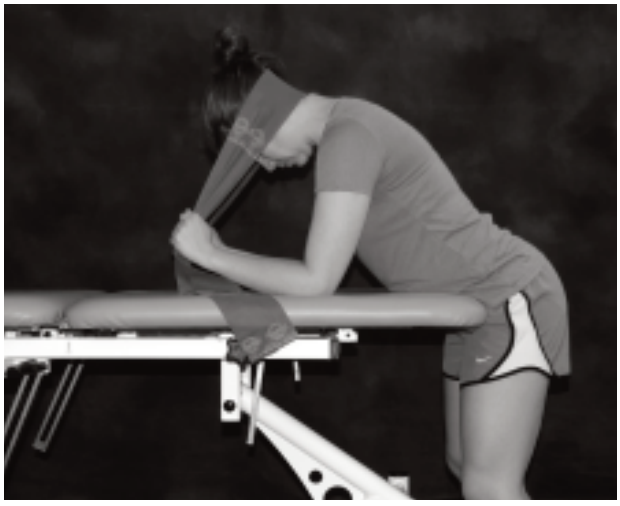

Fig. 5. Isometric cervical extensor muscle strength building exercise

Manual Intervention

Pre-positioned traction mobilization (Figures 2&3)

The clinician stabilizes the C2 vertebra in midline with his left hand and a bilateral laminar contact. The clinician passively positions the head and upper two cervical segments in UC left side bending and right rotation. The clinician maintains the UC coupled rotation as he contacts the contralateral side of the patient's occiput with his mobilizing right hand. The ipsilateral side of the patient's head contacts the clinician's upper chest area. The patient's head was lifted in a cranial direction (traction) with the clinician's right hand, chest, and legs. The stabilizing hand, left in this case, maintained a bilateral laminar contact on C2 and providing a caudal and slightly ventral force. Lifting the head in a cranial direction, and providing the stabilization force on C2 as described, allowed for a fairly specific traction load to be applied throughout the UC region. This traction based soft tissue stretching technique was held for 30 seconds and performed six times each time the patient was seen [22]. The clinical decision to use this pre-positioned UC traction technique was made base on the location of symptoms and the active and passive segmental motions that reproduced the patient's symptoms.

Active upper cervical self-mobilization with the belt (Figure 4)

This exercise was prescribed to the patient as a way to active elongate posterior upper cervical soft tissue structures. The patient was taught to place a belt around the spinous process and bilateral laminae of C2. Then, while lightly pressing their neck posteriorly into the belt, the patient was instructed and manually cued to make a downward nodding motion in order to actively flex the UC segments and elongate the posterior UC soft tissues. During this active motion, the patient's eyes moved downward just below the horizontal plane and her chin moved downward and inward towards her throat. This self-stretching motion and position was held for 10 seconds and repeated 6 times [25].

Therapeutic Exercises:

Isometric cervical extensor training (Figure 5)

In order to strengthen posterior cervical muscles, the patient was instructed to widen her base of support by abducting her hips and then perform a hip hinge over the edge of a table. An elastic band was wrapped around the patient's head. The patient was asked to gently bring her chin down and in toward their throat in order to activate her cervical flexor muscles and to elongate the posterior aspect of her neck. The patient then pulled the elastic band towards the table by extending her elbows and held this position for 10 seconds. This was repeated 10 times while the head position remained unchanged. The tension generated in the therapeutic elastic band and holding the weight of the head against gravity is designed to isometrically build strengthen in the cervical extensor muscles [24]. The patient did not report any increase in UC or occipital pain during the performance of this strength building exercise.

RESULTS

The following functional outcome measures were used in this case report: Numeric Pain Rating Scale (NPRS), Neck Disability Index (NDI) [26], Focus on Therapeutic Outcomes (FOTO) and Headache Disability Index (HDI) [27] (see Table 1 for results). The patient's self-reported scores reflected a 100% improvement on NPRS from 7/10 to 0/10 [28]. Both NDI and HDI also reflected a 100% improvement. Lastly, the patient self-reported a 37% improvement in FOTO score.

DISCUSSION

In current literature, gliding mobilization techniques have been used by many clinicians and have showed good results in treating CGH [7-10,13]. In this case report, an UC pre-positioned traction mobilization was used to reduce symptoms and improve mobility associated with CGH [22]. In a separate study, Creighton et al. demonstrated that this same UC traction mobilization technique consistently improved active cervical rotation in 93 subjects with limited cervical motion. In that same study a different group of 30 subjects underwent diagnostic ultrasound analysis of vertebral artery (VA) blood flow while this UC mobilization was performed. No change in VA blood flow velocity was demonstrated during application of this traction mobilization. The patient receiving care consistently reported a reduction in movement-related CGH symptoms after application of this traction based mobilization technique.

In addition to this manual intervention, the literature supports the use of UC self-stretching exercises in treatment of CGH [10,13]. Hall et al. [10] and Mic Nair et al. [13] demonstrated significant improvement in CGH treating patients with sustained natural apophyseal glides or (SNAGS) which essentially combines manual intervention with active motion. At the six-month telephone interview follow up, the patient in this case report noted improved UC pain control on her own with the addition of a UC flexion self-mobilization [25]. In particular, this exercise (figure 3), helped to reduce the patient's sensation of a "tightness and pulling" in the UC region during active cervical flexion. Lastly, an isometric cervical extensor muscle strength building exercise was prescribed (figure 4). The clinical decision was made to apply this exercise based on work of de las Pernaz [29], who found that females with neck pain have lower cross sectional area of cervical multifidus muscles compared to healthy females, and the work of McPartland et.al [30], who believed that patients with chronic neck pain demonstrated a greater degree of suboccipital muscle atrophy. Also at the six-month follow up, the patient reported that she was still performing this cervical extensor muscle strength building exercise (figure 4) on an "every other day" basis.

Table 1. Results of the experimental variables

Functional Outcome Measure	Initial evaluation Session one	Reevaluation Session Four	Discharge Session Eight
NPRS	7/10	2/10	0/10
NDI	36%	16%	0%
FOTO	47 points	65 points	84 points
HDI	56 points	–	0 points

CONCLUSION

In the past, physical therapy intervention for CGH has included various mobilization techniques and therapeutic exercises in cervical flexor muscle strengthening procedures. This case report, however, describes a traction based mobilization technique applied in combination with an UC flexion self-mobilization and cervical extensor muscle strength building exercise. When contacted 6 months after discharge the patient was still symptom free and continuing to intermittently perform the UC flexion self-mobilization and the elastic band cervical extensor strength building exercise. Pre-positioned traction mobilization has been shown to increase cervical rotation without change in vertebral artery blow flow [22]. This same manual intervention should be considered a safe and potentially useful manual intervention for patient with CGH as well.

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