

Mckenzie method complemented with exercises program for long-term cervicogenic headache management: A Case Report

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Abstract: The objective of my study was to determine the effectiveness of the combination between Mckenzie techniques and therapeutic exercises, targeting the cervical regions, for treatment of cervicogenic headache. The Mckenzie techniques were series of retraction exercises done every two hours and progressed as needed. The combination between Mckenzie techniques and the therapeutic exercises has initiated from the first treatment session starting by activation of deep cervical flexors and extensors, increasing their endurance capacity, passing through stretching exercises for several muscles and mobility exercises for the upper cervical segments especially the atlanto-occipital joint, and ending by higher level strength and endurance. A 27-year-old male with a primary complaint of left-side sub occipital and occipital, severe intermittent pain. The patient met the criteria for cervicogenic headache as by Sjaastad and Fredriksen. He was functionally limited in driving, watching TV, and moving-around for prolonged period, and participating in gymnasium exercises. Two more scales were used; “Numeric Pain Scale” to measure the episodes prior to each session, and “neck disability index”. The first and third scales were completed in the first and last sessions to show the difference in the functional activities. The patient reported a significant decrease in his headache episodes and intensity, and demonstrated an increase in the functional activities. A solid treatment program deals with the mechanical deformities and muscle impairments in the cervical region, may results in long-term relief of CGH.

Keywords: Cervicogenic headache, Exercises, Mckenzie.

I. INTRODUCTION

Among headache categories, migraine, tension-type headache, and cervicogenic headache (CGH) which has been defined as a secondary headache arises from the neck and radiates to forehead, orbital region, temples, vertex, or ears, the third one probably is the most controversial one, because its clinical features may overlap with other types.

Cervicogenic headache is referred pain from cervical structures innervated by the upper three cervical spinal nerves (1), characterized as recurrent, long-lasting (2), strictly unilateral when the headache is mild, but it may spread to the contralateral side if the pain is severe. The important feature is that pain never dominates on the contralateral side to a greater extent (3).

In 1983 Sjaastad introduced the term “cervicogenic headache” (CGH). Diagnostic criteria have been established by several expert groups (International Headache Society,1988, Sjaastad, 1990, The International Association for the Study of Pain, 1994, and others), with agreement that these headaches start in the neck or occipital region and are associated with tenderness of cervical paraspinal tissues.

Although the exact pathophysiology of headaches remains unknown, many studies have been conducted to establish an accepted explanation of CGH. Zito et al. (2006) examined 27 subjects with CGH and reported that C1/2 segmental dysfunction was an important factor in headache diagnosis (4). In 2010, Willy Halim et al, mentioned that The lateral atlantoaxial joint has long been reported as a source of cervicogenic headache (5).

Certainly for neck pain, clinical studies have established that the zygapophysial joints are the single most common source of pain after whiplash injuries, and account for at least 50% of cases (6). The C2–C3 zygapophysial joint is innervated by the third occipital nerve. Pain stemming from this joint is seen in 27% of patients presenting with cervicogenic headache after whiplash injury (1).

Anatomical studies have suggested that the C2 nerve may be more susceptible to injury than the other structures because the C2 ganglion is not protected within a bony structure, therefore, the pain originates from the C2 nerve will radiate to occipital region (2).

Consistent with those hypotheses, in 2011, Juan Zhang et al, have claimed that the injured the second cervical nerve (C2) and C1–C2 atlantoaxial joint or C2–C3 zygapophysial joint can induce symptoms of the CGH.

Hence, pathologic, inflammatory, and traumatic changes around these joints can be a source of referred head pain.

Prevalence estimates range from 0.4% to 2.5% of the general population to 15% to 20% of patients with chronic headaches (7,8), with a female preponderance [2:1] (9).

The type of treatment recommended to patients with CGH appears more dependent on the specialty of the treating physician than the science or research supporting it. The four treatment options generally recommended are surgery for a number of pathological entities; cervical spine manipulation; injections of various cervical structures with a variety of agents; and medication (10).

Management of cervical headache usually focuses on musculoskeletal impairment thought to be causative or contributing to the patient's headaches. Several manual therapy approaches have been used in the management of cervicogenic headache including high velocity manipulative thrust techniques, low velocity passive mobilization techniques and techniques combining passive movement at the segmental level with active movement (Jull et al 2002, Mulligan 1995, Nilsson et al 1997, Schoensee et al 1995, Whittingham et al 1994) (11, 12, 13, 14, 15).

McKenzie recommends a series of cervical exercises to decrease CGH symptoms and maintain correct cervical alignment. These exercises are performed every two hours and progressed based on changes in symptom frequency and intensity. If an exercise fails to reduce CGH pain, a new component is added and the prior exercise is discontinued. In this way, the patient is given control of the treatment (16).

II. METHOD

A 27-year-old man referred to physiotherapy clinic from orthopedic clinic. He suffered from left-sided posterior occipital severe intermittent pain extended to the area around his left eye for more than two years with negative X ray results.

The patient was diagnosed with CGH according to the criteria of Sjaastad and Fredriksen (3):

(1) unilateral pain starting in the neck and radiating to the front temporal region, (2) pain aggravated by neck movement, (3) restricted cervical range of motion (CROM), (4) joint tenderness in at least one of the joints of the upper cervical spine (C1-C3), and (5) headache frequency of at least 1 per week over a period greater than 3 months. These criteria demonstrated moderate to good reliability (17).

A. Measurement

Measurement of headache severity was determined by a Numeric Pain Scale to measure the episodes prior to each session, with 0 representative of "no pain" and 10 representative of "worst pain possible" (11). It has been found to be both valid and reliable in rating pain intensity (18). The Patient-Specific Functional Scale, which has been found to have high test-retest reliability and validity for use in subjects with neck dysfunction (19), was used to assess four functional limitations were frequently achieved by the patient and to rate the effect of the headache on participation.

The effects of the patient's neck pain on his daily living activities was measured using the "neck disability index" questionnaire, which has been found valid and reliable. With 0% representative of "no disability" and 100% representative of "full disability" (20). An English version was used, because the patient was highly educated, and he can speak and write English very well.

Additional demographic details, including headache characteristics and associated features, were also assessed by the McKenzie form.

Cervical range of motion was measured using a measurement tape, which has been proven to be a valid and reliable (21).

B. Procedure

Prior to acceptance in the study, the patient was required to sign a “patient consent statement”.

All the mentioned scales and questionnaires were completed by the patient, then he was examined to determine if his headache met the third and/or fourth criteria of Sjaastad and Fredriksen: restricted cervical range of motion (CROM), and/or joint tenderness in at least one of the joints of the upper cervical spine (C1-C3), which were defined as a positive findings on any one of the tests.

The cervical spine was manually examined to determine the dominant symptomatic cervical motion segment, table 1. This consisted of passive accessory and passive physiological intervertebral motion tests (Maitland et al., 2001; Monaghan, 2001).

While the CROM were measured be a measurement tape, and the results were recorded in table 2.

TABLE I: Domains of upper cervical spine joints palpation (C1-C3).

Examined segment	Result
Atlanto-occipital (0/C1)	Tender & restricted
Atlanto-axial (C1/C2)	Tender & restricted
(C2/C3) Spinous process	Tender & restricted
(C2/C3) zygapophyseal joint	Tender & restricted
(C3/C4) Spinous process	normal

TABLE II: Domains of examinations

	Movement	Distance between...	ROM degree in cm.	
			First session	Last session
CROM	Flexion	Chin → sternal notch	2	0
	Extension		15	18
	Protrusion		14	13
	Retraction		8	6
	Right Rotation	Chin → Acromion process	9	9
	left Rotation		4	7.5
	L/Lateral flexion	Acromion process→ Lower edge of ear lobe	6	4
	R/Lateral flexion		4	4
flexion–rotation test	To left side	Chin → Acromion process	4	8
	To right side		8	8

III. CASE DESCRIPTION

He reported that his headache pain fluctuating between 4/10 and 6/10, and he had 3-4 episodes in the preceding week. He stated that his symptoms started since 2 years following involving in road car accident. He claimed that the only method to alleviate his symptoms was taking analgesics and immediate sleeping. He described his sleeping position as side-lying with one pillow. Post treatments had included pain killers, muscle relaxants, electrical therapy, and physical therapy exercises. Over all, the patient felt that his symptoms were worsening.

Sitting posture evaluation revealed moderate forward head protrusion with moderate rounded shoulders, increased thoracic kyphosis, and decreased lumbar lordosis.

Four functional limitations were assessed using the Patient-Specific Functional Scale. He rated his ability to drive his car as a 5, his ability to watch TV as a 6, his ability to move around as a 4.5, and his ability to participate in exercise program in the gymnasium as a 0.

IV. TREATMENT PLAN

The treatment plan was based on the Mckenzie method for management of CGH, complemented by a well-specified therapeutic exercises program focusing on the deep neck and scapular supporting muscles.

Mckenzie method for managing of CGH based on postural correction, and performing a sequence of exercises, by which, if the current exercise that was done for several days, fail to improve the symptoms, further progression is necessary as follow:

Retraction, retraction with patient's overpressure, retraction with clinician's overpressure, retraction/extension, and retraction/extension in supine.

The therapeutic exercises program, also, consists of a series of exercises that improved gradually according to the improvement in the neck and scapulae muscles power.

Finally, both Mckenzie procedures and therapeutic exercises are done concurrently, and the treatment plan lasted a total of eight sessions (2 sessions/week, for 4 weeks).

V. TREATMENT COURSE

Week one:

Session 1

That session was dedicated for the essentials, creating a precise diagnosis, and building a treatment plan.

Initially, creating a precise diagnosis started by history taking, followed by examining of the patient to determine if his headache met the predefined criteria by which he classified as a CGH case.

As mentioned before, the accessory and physiological intervertebral motion of the patient's upper cervical spine (C1-C3) were tested, and the results were recorded in table 1.

For the CROM, the patient was asked to sit upright on a chair, and perform all cervical movements actively. While the flexion-rotation test was done passively by the examiner from supine. all movement were measured by a measuring tape and the results were recorded in table 2.

From the recorded results, there were a marked loss of the accessory movements, and moderate tenderness in Atlanto-occipital (0/C1), Atlanto-axial (C1/C2), (C2/C3) Spinous process, and (C2/C3) zygapophyseal joint.

Moreover, there were a moderate limitation in the cervical extension, retraction, left lateral rotation, and a severe limitation in flexion-rotation to left side. Therefore, the patient was met both criteria, and a was decided that it is a case of CGH.

After that, the patient was asked to complete the previously mentioned scales and questionnaires.

Secondary, in the treatment plan section, the patient was taught how to correct his sitting posture, and instructed to practice it frequently throughout the day (min. 4 times) and the position is held for 10-15 seconds.

Later on, the patient was asked to rate his pain according to VAS, and he rated it as a 7/10. He was taught how to perform a retraction from upright sitting on a chair; he was asked to look straight ahead and pull the head posteriorly while maintaining the eyes and chin on a level plane. He was asked to retract slowly until the end range, held for 2-3 seconds and then relaxed. He was asked to repeat it 10 times.

After 3 sets of retraction, he claimed that his headache was increased to be a 8/10. He was assured and required to practice a set of 10 retractions every 2 hours throughout the day or when the symptoms aggravated.

Later, the muscle system impairment was the second target, therefore, specific activation and training of the deep neck and scapular supporting muscles was initially performed due to their functional role of active postural support, as follow;

a) Deep flexors; the patient was instructed to lie in supine on a small pillow, nodding his head, while palpating the superficial neck flexors (sternocleidomastoid (SCM) & scalene) with his index & thumb to avoid its action, and ensure performance is within the deep flexors (longus capitis and colli).

Unfortunately, he was unable to nod his head without the action of the superficial neck flexors, which gave me an evidence that the cervical extensors are particularly tight, and the superficial flexors have contracted early to overcome the resistance.

Therefore, the patient was instructed to nod his head with palpation the superficial neck flexors from standing position, his thorax & head were stabilized to a wall, to ensure that the flexion occurs in the cranio-cervical segment. The nod should be held for 10 count and repeated 10 times, twice daily (Jull et al 2002) (11).

Finally, the patient was instructed to lengthen the cervical extensors from sitting, by pushing his head downward with his hand for 5 seconds and repeat 10 times, several times throughout the day, to allow a freer nod motion.

b) Deep extensors; the patient was in supine, a towel is folded in one side to provide a cervical lordosis support while its other side under the head, the patient was instructed to lean his head backward against the towel. Resistance was light to encourage contractions of the deep muscles (semispinalis cervicis and multifidus) rather than superficial muscles (splenius capitis and semispinalis capitis). The exercise should be performed for a 10 times, and repeated twice daily (22).

Session 2

The second session was after 4 days instead of 2 days, because the patient was very busy, as he claimed. He claimed that he performed the exercises in the first two days, while neglected them, except the stretching exercises, in the other two days that is because he was too busy. He mentioned that he had no headache episodes in the first two days, but he had 3 episodes of headache in the other two days, rated as a 5.5/10.

All the given exercises were reassessed. There were a moderate improvement in the retraction; his cervical extensors were not tighten. And he was, fortunately, able to nod his head from supine without the action of the superficial neck flexors.

He was instructed to continue with the same program until the next session.

Week two:

Session 3

The patient reported that he performed a set of 10 retractions every two waking hour, and he claimed that there were no headache episodes at all in the prior days, except the day of the 3rd session in which I met him. He justified that due to a heavy and long office work sat him at his office chair for more than three continuous hours without any rest intervals. When I met the patient it was 3 pm, and he was still suffering of a unilateral occipital pain radiating to his left orbital region, was rated as a 4/10, that had never alleviated by taking analgesics and sleeping for more than 2 hours.

In the session, he was instructed to achieve a set of 10 retractions from sitting. It was noticeable that the retractions were not reaching the end-range, and his both SCM were tighten.

The patient was taught how to perform contraction from sitting with his over pressure, by pushing his chin with his fingers posteriorly in the horizontal plane till the end-range, and hold for 2-3 seconds, then relax. He was instructed to perform 10 contractions every 2 hours.

He was also taught how to lengthen the SCM, and instructed to perform it 4 times throughout the day.

In the therapeutic exercises section, he was shifted to the endurance exercises as follow;

a) Deep flexors.

Patient is supine, palpating both SCM, begins to train endurance to his deep cervical flexors (longus capitis and colli) by nodding his head at various degree levels. Performing 10 *10 second holds (23).

b) Deep extensors.

Patient in four-point kneeling position, extend his neck up against gravity, at various degree levels (23).

c) Scapulae.

The scapular muscles are trained with repeated inner range holds in the neutral scapular position in prone or side lying (23).

By the end of that session, he was instructed to take care of his sitting position and perform the new exercises as described.

Session 4

The patient revealed that he achieved the required exercises exactly as described, and since the last session, he has no headache episodes at all.

He was asked to perform a set of 10 contractions with his over pressure. There was a good improvement in ROM, but it was not complete.

Reassessment of the endurance exercises revealed a good and smooth achievement. The patient was instructed to continue with same program till the next session.

Week three:

Session 5

Upon arrival, the patient was sad and disappointed; that was because his symptoms, as he said, were as severe as the early onset. He rated it as a 8/10, started in the left half of the head, and worsen to become bilateral.

He reported that he was a pain-free all the time, but his pain aggravated after a heavy duty required him to move around for several hours in the work field.

The patient was instructed to lie in supine without a pillow for about 10 minutes. Following that, he felt that his CGH concentrated in the left side only, and he rated it as a 7/10. Later on, he was instructed to perform a set of 10 retractions from sitting, which lead to decreasing his pain to a 5/10. A set of 10 retractions with his fingers overpressure was done, and decreased the pain to 3/10. Another set of 10 retractions with the clinician's overpressure was done, and abolished his pain completely to be a 0/10.

The patient was assured, and instructed to perform 10 retractions with his fingers overpressure every 2 hours.

Moreover, following a successful week of endurance exercises achievement, progressive resistance exercises were introduced for the craniocervical flexors & extensors as follow;

a) Higher load flexor progressions.

The patient sitting on an exercise ball, hands crossed over his chest, neck in neutral position, starts to lean backward as possible.

b) Band retraction.

The band is held looped around the back of the head to apply resistance to a retract motion to strengthen the cervical extensors (23).

c) Integrated extension.

Prone on a ball, the head and neck are brought up into cervical neutral, the arms lifted off the ball to activate scapular stabilized, and then the sternum lifted off the ball to recruit thoracic extensors.

Each exercise was required to be performed with 5 seconds hold*10 repetitions, 4 times a day.

Session 6

The patient was noticeably in a good physical and psychological situation. He claimed that he returned to gymnasium and joined his exercises with full awareness and a little fear. He also reported that he had only one headache episode, rated it as a 3/10, occurred following a prolonged period of TV watching.

He was instructed to continue with same program, and he was asked to take care of his head posture while exercising and watching the TV.

Week four:

Session 7

In that session, the patient revealed that he felt a discomfort in the occipital area following a long period of office work, driving, or watching TV, but there was no headache.

Reassessment of CROM was achieved. All movements were completed, except retraction, and flexion rotation to the left side. There was no tenderness in the upper cervical region.

Therefore, the patient was shifted to retraction with extension from sitting. In which he was instructed to pull the head posteriorly to the end-range, then lift the chin up and tilt the head back, hold 2-3 seconds*10 times/2 hours.

Moreover, the patient was taught how to increase his cervical mobility by himself, particularly, flexion rotation to the left side.

The exercise was done by instructing the patient to sit tall in a chair, tip chin down slightly before rotating, a towel is used to stabilize the segment and over-press the chin toward left rotation as could as possible.

Before terminating the session, the patient was instructed to perform all the mentioned exercises at home.

Last session

Was 4 days following the prior one. The patient was very happy. He reported that he had no pain during the last days, but a little discomfort when achieving a task for a long period.

The patient's four functional limitations were again assessed using the Patient-Specific Functional Scale. He rated his ability to drive his car as an 8, his ability to watch TV as a 9, his ability to move around as an 8, and his ability to participate in exercise program in the gymnasium as a 6.

VI. DISCUSSION

Many studies have been done to show the effectiveness of physical therapy in reducing the frequency, duration, and intensity of cervicogenic headache.

Ordway et al, demonstrated that progressive cervical retraction exercises are beneficial for mobilizing the cervical spine without unnecessary symptom aggravation (24). Jull et al, revealed the effectiveness of manual therapy and low-load exercises in reducing CGH symptoms (25). William P. et al. studied the effectiveness of manual therapy for balancing CI and a home exercise program, including cervical retractions progressed as required, in CGH treatment (26).

In the case report, a combination of Mckenzie techniques and therapeutic exercises has been used. Mckenzie techniques; particularly, retraction exercises were targeting the mechanical deformities and limitations, while therapeutic exercises were targeting the muscle impairments. As a result, the patient felt that the program had helped him to improve very well, and increase his functional capability as well.

VII. LIMITATIONS

Although a greater improvement in the treatment of CGH by Mckenzie techniques complemented by therapeutic exercises is explicitly evident in the results presented, a several limitations should be acknowledged; a combination of both techniques appeared to be beneficial, but the benefit of either used alone; according to the author knowledge, is unknown. Moreover, the study was limited to a 28 days only, therefore, the long-term effect of the program is not guaranteed. Finally, the ability to generalize the results is impossible as the outcomes were based only on case report study.

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