Pericranial Tenderness in Females With Episodic Cervical Headache vs Asymptomatic Controls: A Cross-sectional Study

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Abstract

Objectives: The purpose of this study was to compare pericranial tenderness of females with episodic cervical headache vs matched asymptomatic controls.

Methods: Through a single-blind, cross-sectional study, pericranial tenderness was compared between 20 females with episodic cervical headaches (29.4 ± 13.2 years) and 20 age-matched female asymptomatic controls (30.1 ± 13.7 years). Pericranial tenderness was bilaterally measured in a headache-free period with the "total tenderness score" (TTS) in the suboccipital, temporal, frontal, masseter, upper trapezius (UT), levator scapula, and sternocleidomastoid (SCM) muscle insertions. Passive cervical mobility, headache intensity, frequency, and duration were secondary outcomes. Analysis was done with a 95% confidence level (SPSS version 22). The Mann-Whitney U-test was used to compare pericranial, cephalic, cervical, and muscle-specific tenderness between groups. Correlations between passive cervical mobility and headache characteristics and the TTS were estimated with Spearman's ρ.

Results: The headache group (1.25 ± 0.89) showed a 2 times higher ($P < .05$) pericranial TTS compared to the control group (0.62 ± 0.70). Higher ($P < .05$) scores were observed for the left suboccipital, temporal, masseter, UT, levator scapula, and SCM muscles and the right suboccipital, frontal, UT, and levator scapula muscles. Grouping the tenderness scores into cervical (suboccipital, UT, levator scapula, SCM) and cephalic (frontal, temporal, masseter) regions revealed greater scores ($P < .05$) in the headache group. In the latter, the TTS was significantly positively correlated with passive cervical extension ($\rho = 0.78$).

Conclusion: Consistent higher tenderness scores were observed and suggest involvement of sensitization in patients with episodic cervical headaches. A positive correlation was seen between passive cervical extension and sensitivity. (J Manipulative Physiol Ther 2018;41:488-495)

Key Indexing Terms: *Headache; Posture; Central Nervous System Sensitization; Pain Threshold; Neck*

Introduction

Headache is 1 of the most frequently reported complaints in working women for which primary care physicians and physiotherapists are consulted.[1] Some of these headaches can be provoked by poor sitting postures.[2-4]

In Europe, people spend 5 to 6 hours a day on sitting activities.[5] Higher prevalence of musculoskeletal complaints were, nevertheless, reported when daily use of the computer exceeded 3 hours.[6] Risks of developing such complaints are positively correlated not only to work hours but also to the female sex.[7] A cross-sectional study by Malinska and Bugajska revealed that headache was the most important complaint in 55% of female employees who regularly used portables while working.[8]

Another remarkable fact is that sitting behavior during the use of mobile computing technologies, such as a laptop, desktop, smartphone, or tablet is often characterized by an increased forward head position (FHP).[9-13] In particular, cervical headaches can be provoked and worsened by a pronounced FHP. Such habitual posture can create abnormal loading on cervical structures and thereby affect the cervical range of motion (CROM).[14-17]

The CROM is an important feature and diagnostic criterion in the examination of patients with headache.[18,19] A restricted CROM has implications on proprioceptive mechanisms of the cervical spine. Proprioceptive failure can reduce postural control and increase the load on spinal tissue.[16] An augmented CROM, on the other hand, can cause tissue deformation via creep and enlarge the neutral zone.[20] A

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dysfunctional CROM can alter spinal posture, change the habitual posture, eventually be harmful, and lead to activation of nociceptors.[21,22] Through repetitive nociceptive stimuli (wind-up), second-order neurons in the dorsal root become sensitized and even induce neuroplastic changes.[23] In patients with posture-related headache, nociceptive cervical stimuli might first sensitize the trigeminocervical complex, whereas in time, repeated noxious input can cause central sensitization.[2,24] The latter has been mooted as an underlying mechanism in chronic tension-type headache. These patients present with an increased pain sensitivity in cephalic and extra-cephalic muscles.[24] Hence, sensitization of nociceptive pain pathways in the central nervous system, due to prolonged nociceptive stimuli, seems a plausible explanation for the conversion of episodic into chronic pain. The most accepted theory is that episodic headache is more related to peripheral and chronic headache to central mechanisms.[24,25] These findings indicate a generalized increased pain sensitivity and support a central sensitization hypothesis.[26] Yet, the International Headache Society emphasizes that an increased pericranial tenderness is a feature in both episodic and chronic tension-type headaches. The latter was confirmed by a recent study by Palacios Ceña et al, in which similar local and widespread pressure hyperalgesia was found for episodic and chronic tension-type headache. These results could indicate involvement of peripheral and central mechanisms in both forms of headache.[27]

The aforementioned inconsistencies and chronification in 3% to 5% of all patients with episodic headache necessitate more in-depth research on episodic headache. Besides, most studies focus on chronic headache.[24-30] Women seem to have a greater risk for the development of chronic pain because of a lower pain threshold for mechanical stimuli.[31] Because a dysfunctional CROM is considered to be a potential source of spinal musculoskeletal symptoms, neck mobility, and muscle tenderness seem to be related.[3,16,20-22,32]

The purpose of this study was to compare pericranial tenderness of females with episodic cervical headache vs matched asymptomatic controls.

Methods

Design

A single-blind, cross-sectional comparison of pericranial tenderness between females with episodic cervical headache in a headache-free period vs matched asymptomatic controls was performed. Pericranial tenderness (total tenderness score [TTS]),[28,33,34] passive CROM, and their interrelation were compared between a cervical headache group and an asymptomatic control group (C-group). Patients with episodic headache were targeted because indications of centralization exist.[27]

Participants

Sixty-four potential candidates for the headache group and C-group responded to a general call, which was launched at the Hasselt University. Using an informative questionnaire, containing the inclusion and exclusion criteria (based on the International Headache Society, 2013), 62 female participants were selected. Twenty participants met the criteria for the headache group (Fig 1). Twenty asymptomatic participants were matched for age and sex to compose the C-group.

Characteristics
Episodic headache
Cervical stiffness
Headache worsens with provocative manoeuvres/postures
At least 2 of the following characteristics:
1. Pressing or tightening (nonpulsating)
2. Mild or moderate intensity
3. Reduced cervical range of motion
4. Neck pain related to the headache

Provocation
Headache provoked by at least 1 of the following:
1. Poor cervical posture (eg, forward head posture)
2. Sitting posture
3. Repetitive cervical movement
4. Prolonged posture

Autonomous
1. No nausea or vomiting
2. No photophobia or phonophobia

Duration
At least 10 episodes of headache occurring on 1-14 days per month on average for >3 months (≥12 and ≤180 days/year) and lasting from 30 minutes to 7 days

Fig 1. *Inclusion criteria for the headache group.*

Selection of the participants for the headache group took place through an examination and interview by a manual therapist and a physician. Inclusion criteria for the headache group were women between 18 and 58 years of age who met specific headache criteria (Fig 1). Exclusion criteria were pregnancy, physiotherapy for head or neck problems 12 months before the study, serious pathology (neurologic: diseases of the central or peripheral nervous system; cardiovascular: blood pressure related pathology; endocrine: diabetes; musculoskeletal: pathology or deformities affecting the spine), pain radiation in the upper extremities, and a history of neck or head trauma. Inclusion criteria for the C-group were asymptomatic females between 18 and 58 years of age. Exclusion criteria were pregnancy and history of neck or head trauma or pain.

The study is registered at ClinicalTrilas.gov (ID: NCT02887638). The Medical Ethical Committee of the Ziekenhuis Oost-Limburg granted approval for the study (reference: B371201423025), and all participants signed the written informed consent, in which information was given concerning the confidentiality of the data. Included participants were anonymized through a numeral code according to their features (headache or control). The researcher (S.M.) who performed the testing and statistical analysis only had access to encoded data. An independent researcher (A.V.) provided the encoding. The protection of