



Neck pain: is it part of a migraine attack or a trigger before a migraine attack?

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Abstract

Background A migraine is a primary headache disorder characterized by recurrent headaches that are moderate to severe. Neck pain may actually be the most common migraine symptom despite the fact that it is rarely listed among usual symptoms such as nausea and light sensitivity. The aim of this study is to determine the relationship between migraine and neck pain.

Methods A total of 50 patients (41 females and 9 males) diagnosed with migraine were included in the study. 50 patients with migraine were asked about the occurrence of neck symptoms during different phases of their attacks. Patients of both sex, aged 12–61 years, diagnosed as having migraine according to the definition of the ICHD-3- β , and having neck pain any time during the attack phase, were included in the study. Migraine severity was measured using the Visual Analogue Scale (VAS).

Results In our study, we compared the clinical and demographic characteristics of migraine patients. While 89.1% of the patients reported that their headache and neck pain started and ended concurrently, only 10.9% of them had neck pain starting at different times in comparison to migraine headache (30 min before headache, 2 h before or later than headache and 12 h later than headache).

Conclusions As a result of our study, we have concluded that neck pain begins simultaneously with migraine attacks and concurrently, and may be part of migraine attacks accordingly.

Keywords Migraine · Neck pain · Prevalence

Introduction

Migraine is a primary headache disorder with an estimated frequency of 12% in the global population. According to the World Health Organization, migraine is among the top 20 disabling problems in the world, and its health and economic burden is considerably greater compared to seizure, stroke, Parkinson's disease, multiple sclerosis, and Alzheimer's disease. The underlying pathophysiology of migraine has not been fully elucidated [1]. The high incidence of neck pain in migraine could suggest an underlying cervicogenic basis for central sensitization of nociceptive second-order neurons in

the trigeminocervical nucleus (TCN) with subsequent hyperexcitability to afferent stimulation [2].

Migraine is a debilitating disorder which is most commonly characterized by a unilateral hemicranial pulsating headache often accompanied by a variety of other symptoms such as sensory disturbances and nausea [3, 4]. A full list of migraine criteria is provided in the latest version of the Headache Classification by ICHD [5]. It has been speculated, probably for more than a century, that neck pain is a common and prominent symptom of primary headache disorders, including migraine [6]. The high prevalence of neck pain in patients with migraine perpetuates an ongoing debate about the contribution of neck muscles to headache provocation and the frequency of attacks [6–8]. On the other hand, as migraine has a putative neurovascular etiology, it is difficult to explain neck pain in migraine based on muscle tenderness. The exact pathophysiology behind this is not known. While some authors claim that neck pain is simply a symptom of the migraine attack, others postulate that dysfunctions in neck muscles may trigger migraine attacks and thereby contribute to the transition from episodic to chronic

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migraine [7, 9]. Neck pain in combination with pericranial muscle tension or tenderness is often thought to be a unique feature of tension-type headache, given its hypothesized muscular etiology. In a recent study, a 1-year prevalence rate of neck pain was higher in patients with primary headaches (85.7%) as compared to those without headache (68.4%). Among patients with primary headaches, 88% of patients suffering from tension-type headache and 76% of those suffering from migraine headache reported neck pain anytime during the attack [9].

Hence, the question we would like to answer is whether neck pain is clearly a premonitory symptom or part of the migraine attack? The aim of this study is to determine the relationship between migraine and neck pain.

Materials and methods

A total of 50 patients (41 females and 9 males) diagnosed with migraine were included in the study. All subjects gave written consent prior to participating in the study.

Detailed demographic data were recorded for each patient including name, age, gender, religious beliefs, address, education, occupation, socioeconomic status, daily activities, dietary patterns, and behavioral and social relationships. Headache interviews were designed to define the characteristics of migraine according to the International Classification of Headache Disorders-3-beta [5]. Migraine events in patients were classified as migraine without an aura or migraine with an aura. Associated migraine symptoms such as photosensitivity, phonophobia, sensitivity to smell, nausea, vomiting, vertigo, aggravation of pain by physical activity, tinnitus and neck pain were also recorded. In order to identify the characteristics of neck pain, individuals were asked about the side (unilateral or bilateral), radiation (to the upper extremities, head, or back), quality of neck pain (stabbing, cramping, lancinating, pulsating, and numbing), as well as aggravating and relieving factors related to the neck pain. Patients of both sex, aged 12–61 years, diagnosed as having migraine according to the definition of the ICHD-3- β , and having neck pain anytime during the attack phase, were included in the study. They were required to be having a minimum of five migraine attacks associated with neck pain at the time of their first visit to the hospital.

Migraine disease was confirmed by a neurologist. Severity, average duration of migraine attacks, and frequency of attacks per month were recorded by the neurologist. Migraine severity was measured using the Visual Analogue Scale (VAS) [10]. The headache diary result (HDR) was determined as: duration of headache \times frequency of headache [10].

Those patients who had a history of neck pain, with an aggravation of neck pain during the migraine phase, were

considered as ‘neck pain-triggered migraineurs’. On the other hand, the neck pain was thought to be ‘a part of the clinical presentation of migraine’ in those patients who had neck pain only during the migraine phase, without having any history of neck pain in their non-headache phase.

Patients with known brain lesions or suspected to be having one, those with a significant cervical pathology except cervical spondylosis, as well as those with a history of significant brain or cervical trauma or surgery, fibromyalgia, and any somatoform syndrome were excluded from the study.

Ethics committee approval was obtained before the study.

Statistical analysis

Normality of numerical data was tested by the Shapiro–Wilk test. Normally distributed data were tested using the Student’s *t* test and non-normally distributed data were tested by Mann–Whitney *U* test to compare two independent groups. Relationships between categorical variables were tested by the Chi-square test. For descriptive statistics, mean \pm standard deviation was provided for numerical variables and number and percentage for categorical variables. All statistical analyses were performed by SPSS for Windows, Version 24.0 and a *p* value less than 0.05 was considered statistically significant.

Results

50 migraineurs volunteered to participate in our study of whom 82% were female and 18% were male. 31 (62%) patients had migraine with aura and 19 (38%) had migraine without aura. The severity of pain was mild in 2%, moderate in 16% and severe in 82% of the patients. Sensitivity to sound was reported by 98% of patients and sensitivity to light was present in 86% of the patients. 86% of the patients had nausea, 34% had vomiting, 76% had vertigo, 46% had tinnitus, and 96% had an aggravation of pain during physical activity. 40% of the patients reported neck spasms. While 89.1% of the patients reported that their headache and neck pain started and ended concurrently, only 10.9% of them had neck pain starting at different times in comparison to migraine headache (30 min before headache, 2 h before or later than headache and 12 h later than headache). Neck pain was localized on the left side in 26% of the patients and 22% had bilateral neck pain. Neck massage appeared to alleviate the pain in 78% of the patients (Table 1).

A statistically significant difference was found between patients with migraine with or without aura in average VAS scores ($p=0.049$). As such, patients with migraine with aura exhibited greater average VAS scores (8.65 ± 1.05) versus patients with migraine without aura (7.95 ± 1.39). In

Table 1 Clinical and demographic characteristics of migraine patients

Variable	<i>n</i>	%
Gender		
Female	41	82.0
Male	9	18.0
Type of pain		
Migraine with aura	31	62.0
Migraine without aura	19	38.0
Severity of pain		
Mild	1	2.0
Moderate	8	16.0
Severe	41	82.0
Sensitivity to sound		
Yes	49	98.0
No	1	2.0
Sensitivity to light		
Yes	43	86.0
no	7	14.0
Nausea		
Yes	43	86.0
No	7	14.0
Vomiting		
Yes	17	34.0
No	33	66.0
Aggravation of pain by physical activity		
Yes	48	96.0
No	2	4.0
Sensitivity to smell		
Yes	23	46.0
No	27	54.0
Vertigo		
Yes	38	76.0
No	12	24.0
Tinnitus		
Yes	23	46.0
No	27	54.0
Neck pain		
Yes	37	74.0
No	13	26.0
Neck spasm		
Yes	30	60.0
No	20	40.0
Bilateral neck pain		
Yes	38	76.0
No	12	24.0
Time relationship		
Same	33	89.1
Different	4	10.9
Neck pain		
Right	26	52.0
Left	13	26.0
Bilateral	11	22.0
Neck massage is good		
Yes	39	78.0
No	11	22.0

Table 1 (continued)

n number of individuals. The Chi-square test was used for statistical analysis. ($p < 0.05$)

addition, nausea was more common among patients with migraine with aura compared to patients with migraine without aura ($p = 0.049$). No statistically significant associations were found with other categorical variables ($p < 0.05$) (Table 2).

Discussion

The majority of the studies and ICHD-3-beta state that migraine pain occurs most commonly in the temporoparietal region and less commonly in the occipital or orbitofacial location. However, ICHD-3-beta diagnostic criteria do not include neck pain as a site of migraine attack [5]. The presence of neck pain during migraine episodes or as a trigger for the migraine attack is rarely described [11].

In our study, neck pain was identified in 74% of 50 migraineurs. Among those, 52% had right-sided neck pain, 26% had left-sided neck pain and 22% had bilateral neck pain. While 89.1% of the patients reported that their headache and neck pain started and ended at the same time, only 10.9% of them had neck pain starting at different times in comparison to migraine headache (30 min before headache, 2 h before or later than headache and 12 h later than headache). Our results are consistent with those of some previous studies [12, 13].

Limited studies are available that focused on the frequency and pathophysiology of neck pain in migraine sufferers. In one study, 64% of the patients reported neck pain associated with migraine attack with 31% having neck symptoms during the prodromal phase [14]. In a separate study on 144 migraine patients, almost 75% reported neck pain associated with migraine attacks [15].

In another study, approximately 70% of migraine patients reported neck pain at any time during the migraine phase. Among those patients, 54.4% reported onset of neck pain coinciding with the start of the headache phase, 24.2% reported neck pain within 2 h before the headache and 7.4% experienced neck pain 2–48 h before the headache [16]. In a 2010 study involving 113 migraineurs neck pain was reported to occur more commonly in comparison to nausea symptom [8].

In our study, 86% of the migraine patients experienced nausea and 76% had neck pain.

In most studies, very often authors have considered that the neck pain is a prodromal symptom or is regarded as an extracranial manifestation of migraine if it is associated with migraine. Notwithstanding, patients generally report that their migraine “starts” in the neck, often stating that

Table 2 Comparison of patients with migraine with or without aura

	Type of pain		<i>p</i>
	Migraine with aura (<i>n</i> = 31) mean ± SD	Migraine without aura (<i>n</i> = 19) mean ± SD	
Age (years)	34.52 ± 11.54	33.11 ± 13.76	0.698*
Body weight (kg)	70.9 ± 14.71	71.37 ± 18.29	0.922*
Height (cm)	165.16 ± 8.71	165.58 ± 7.7	0.864*
Duration of pain	32.81 ± 25.71	20.26 ± 25.48	0.099*
Frequency of pain	5.97 ± 3.56	5.47 ± 3.37	0.630*
HDR	185.03 ± 165.83	116.32 ± 133.23	0.133*
VAS	8.65 ± 1.05	7.95 ± 1.39	0.049*
Severity of pain			
Mild	1	0	0.566
Moderate	4	4	
Severe	26	15	
Sensitivity to sound			
Yes	30	19	0.429
No	1	0	
Sensitivity to light			
Yes	27	16	0.775
No	4	3	
Nausea			
Yes	29	14	0.049
No	2	5	
Vomiting			
Yes	13	4	
No	18	15	0.130
Aggravation of pain by physical activity			
Yes	30	18	0.721
No	1	1	
Sensitivity to smell			
Yes	17	6	0.109
No	14	13	
Vertigo			
Yes	22	16	0.287
No	9	3	
Tinnitus			
Yes	13	10	0.461
No	18	9	
Neck pain			
Yes	22	15	0.532
No	9	4	
Neck spasm			
Yes	19	11	0.812
No	12	8	
Bilateral neck pain			
Yes	22	16	0.287
No	9	3	
Time relationship			
Same	20	13	0.577
Different	3	1	
Neck massage is good			
Yes	23	16	0.407
No	8	3	

Table 2 (continued)

n number of individuals. The Chi-square test was used for statistical analysis. (*p* < 0.05). The Student's *t* test was used for the analysis of those variables marked with *

their neck is the “cause” of their migraine. Thus, several investigators are actually studying a possible cervical origin of migraine [7, 15].

These studies have proposed certain pathophysiological mechanisms which have not been clearly established. Prolonged nociceptive stimuli from the neck structures could be an important trigger for producing continuous afferent bombardment of the trigeminal nerve nucleus caudalis, and thus, activation of the trigeminovascular system [9, 16]. In many migraineurs, the subtypes of migraine and the associated symptoms may vary from attack to attack. Therefore, sometimes the patients' version may have required the examiners' interpretation for documentation, leading to an inherent bias.

Our study has several limitations: as NP was determined throughout a simple questionnaire we were not able to perform physical examination and measurements in case of pericranial muscle tenderness and myofascial referred pain that may also contribute to migraine. In certain patients, psychological factors such as anxiety and depression, which may have a modulating effect on pain perception could not be eliminated from our study [17]. While anxiety and depression are associated with migraine, these may also cause neck pain and headache. However, in our study the role of anxiety and depression as a contributory factor for neck pain in our patients suffering from migraine, has not been evaluated. Further, the subject's willingness to report symptoms cannot be ruled out as a contributing factor.

Conclusions

Migraine is a complex heterogeneous, disabling headache disorder with a high prevalence [1]. Migraine attacks can have a range of symptoms. These symptoms often begin hours to days before the onset of the headache phase of migraine. These migraine symptoms vary from person to person. Prodromal (premonitory) symptoms can widely range from patient to patient. Some migraine sufferers complain of neck pain during migraine episodes. The association of neck pain and migraine may result from various pathophysiological mechanisms. No studies have been carried out of the possible causal association of neck pain and migraine. Furthermore, it is not known whether a reciprocal association occurs between neck pain and migraine. Neck pain could be a peripheral manifestation of migraine, but cervical mechanisms may also act as triggers for the central mechanisms of migraine.

In the current study, 89.1% of our migraine patients reported neck pain starting and ending at the same time with headache and 10.9% reported neck pain not coinciding with headache phase. This study found that neck pain was highly prevalent in patients with migraine. It was observed that in the great majority of our patients it also started and ended concurrently with headache. This result suggests that neck pain may be a symptom observed during migraine episodes.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no competing interests.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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