



State and trait anger and its expression in cluster headache compared with migraine: a cross-sectional study

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Abstract

Background Anger is involved in the emotional experience of pain. Individuals with migraine are more likely to hold their anger-in than controls. However, only one study evaluated anger in cluster headache (CH). The objective is to compare anger between migraine and CH patients.

Methods One hundred thirty-five migraine and 108 CH patients completed the State Trait Anger Expression Inventory (STAXI-2), composed of 7 subscales. State Anger measures the intensity of the individual's angry feelings at the time of testing. Trait Anger evaluates general predisposition to become angry. Anger Expression Out and Anger Expression In measure the extent to which anger could be overtly expressed or suppressed. Anger Control Out and Anger Control In evaluate how individual try to control the outward or inward expression of anger. Anger Expression Index is a general index.

Results CH patients have higher median scores than migraine patients in State Anger (46 vs 44, $p = 0.012$). CH patients have lower scores in Anger Control Out (44 vs 50, $p = 0.016$). In subgroup analysis, CH patients during the cluster period have higher scores than chronic migraine patients in State Anger (47 vs 44, $p = 0.035$), while CH patients in headache-free period did not differ from migraine patients.

Conclusions Migraine and CH patients differ in state anger, indicating that CH patients experienced higher intensity of anger during the time of testing. These data add new information about emotional regulation in headache patients and could support the hypothesis of different emotional and behavioral responses to pain in migraine and CH patients.

Keywords Pain · STAXI-2 · Emotional regulation · Chronic headache

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Abbreviation

CH Cluster headache

Background

The experience of headache involves cognitive and emotional aspects that could influence the development, course, and severity of the pain itself [1–4].

Anger, as negative affective state, is one of the emotions mostly reported in the experience of pain [5].

Anger is described as “a belief that a person one cares for (often oneself) has been treated without respect” (either through physical threats or threats to self-esteem). Anger typically involves cognitive appraisal and an action tendency [6]. From a functionalist point of view on emotions, anger can have an adaptive value: it motivates the organism to fight and its display is a form of social communication [7].

It has been argued that anger can influence the perception of pain. While evidence certainly supports an influence of a suppressive anger regulation style on pain responses, literature increasingly suggests that a predominantly expressive style of anger regulation (via direct verbal or physical expression) also impacts on pain responses [8]. Also in headache patients (in particular in migraine and tension-type headache patients), similar conclusions can be drawn [9–11].

Individuals with migraine are more likely to hold their anger-in than those without headache [9, 12, 13]. Individuals who hold anger-in experience increased pain severity [14] and failure to express anger leads to more disability [12, 15]. Some authors found that higher anger-out at baseline predicted greater subsequent mean daily headache severity in migraine patients [8]. Overall, either too much expression or inhibition of anger appears to have deleterious effects.

Contrarily to migraine and tension-type headache, in cluster headache patients, anger has not been thoroughly assessed yet. Only one study evaluated aggressiveness differences between CH and migraine patients, indicating that CH patients (especially chronic cluster headache and active period cluster headache patients) reported higher scores in the self-aggression/depression subscale [16]. Moreover, there are studies that suggest the potential dual role of the posterior hypothalamus in both aggression and CH [8, 17, 18]. The objective of our study is to evaluate differences between migraine and cluster headache patients in anger levels and in anger expression by using a questionnaire that evaluates multidimensional aspects of anger. We hypothesized differences in anger between the two groups.

Method

In this cross-sectional study, all consecutive patients attending the Headache Center of IRCCS Institute of Neurological Sciences of Bologna over 2 years (from June 2012 to May 2014), satisfying inclusion criteria for episodic cluster headache (3.1.1) and chronic cluster headache (3.1.2), were recruited and compared with a group of migraine patients. All patients were classified according to the International Classification of Headache Disorders 3rd Edition [19].

Exclusion criteria were as follows: foreign language as mother tongue, secondary headaches, age < 18, non-compliance. Secondary headaches were ruled out by clinical examination, biochemical tests, and neuroimaging studies, when indicated.

Principal investigator (MR) informed each patient that the study aimed to evaluate emotional aspects in patients with different primary headaches. Participants gave written informed consent. The study was carried out in accordance with the Declaration of Helsinki; the study protocol was approved

by the Ethics Committee of the Local Health Service of Bologna, Italy (protocol number: 12060/CE).

Patients were administered the State Trait Anger Expression Inventory (STAXI-2) [20], a 56-item questionnaire that was developed to assess state anger, trait anger, and anger expression and to measure the way these components contribute to medical conditions. The questionnaire is composed of seven subscales. State Anger refers to the intensity of the individual's angry feelings at the time of testing. Trait Anger evaluates a person's general predisposition to become angry. Anger expression is measured by the following: Anger Expression Out (the extent to which anger could be expressed in an outwardly manner), Anger Expression In (the extent to which anger is suppressed), Anger Control Out (prevention of explosive manifestations of anger), Anger Control In (trying to relax and reduce angry feelings), and Anger Expression Index (an overall index of the individual tendencies to express anger). The questionnaire has been translated into several languages and its psychometric properties have been examined in many studies [21, 22].

After filling in the questionnaire, patients could ask to the principal investigator any additional question about it.

STAXI-2 questionnaire results of the groups were compared: migraine patients and cluster headache (CH) patients. In order to compare the scores between the groups, the raw scores were transformed into *T* scores that take into account sex and age differences in anger levels and in anger expression [22].

Additional analyses were performed on the 3 following subgroups: chronic and episodic cluster headache in the active period, chronic and episodic cluster headache in the headache-free period, and chronic migraine. The three subgroups were selected in order to evaluate differences between cluster patients in the active period and cluster patients in the non-active period, and to compare two different primary headaches that were similar for the impairment level (such as chronic migraine and cluster headache in active period).

Moreover, to classify the patients according to the pharmacological treatment they are undergoing, we compared, within every group, differences in State Anger and in Anger Control Out subscales comparing patients with pharmacological therapy and patients without it.

This is the primary analysis of these data, and they were pre-planned. No statistical power calculation was conducted prior to the study; the sample size was based on the available data.

Statistical analysis

In the descriptive analysis, age was presented as mean and standard deviation (SD), while categorical variables as absolute and relative frequency (%). In the continuous variables, the normal distributions were checked with the Shapiro-Wilk test.

The subscale scores were presented as median and interquartile range (IQR). The Kruskal-Wallis test was used to evaluate the difference between groups (migraine vs CH) and subgroups (chronic cluster headache and cluster headache in the active period vs cluster headache in headache-free period vs chronic migraine). All p values were based on 2-sided tests and $p < 0.05$ was considered significant. The correction for multiple comparisons was not performed because the primary objective was to evaluate the differences between migraine and CH patients in State Anger and Trait Anger scales. The other subgroup analyses were pre-planned and were evaluated only as explorative analyses.

Statistical analysis was performed using statistical package Stata SE 14.2 (Stata Corp. 2015) [23].

Results

A total of 326 patients with headache, referring to the Headache Center, met the inclusion criteria, and accepted to participate. Analyses were conducted on the 243 patients with complete questionnaires and clinical data.

According to the original ICHD 3rd Edition (beta version), 135 patients were diagnosed as with migraine without aura (86 episodic, 49 chronic) and 108 patients were diagnosed as with cluster headache (93 episodic, 15 chronic). Table 1 shows patients' demographic, headache characteristics, and preventive treatments. Participants of the migraine group and of the cluster headache group differed in sex ($p < 0.001$) and in educational level ($p = 0.009$). As expected, most patients with CH were male (75%, 81/108), in contrast with female migraine patients (89%, 120/135), and the mean age of onset in cluster headache patients is later than in that migraine patients (16.4 vs 27.7 years, $p < 0.001$).

Questionnaire results are shown in Table 2. CH patients have significant higher median scores than migraine patients (46 vs 44, $p = 0.012$) in State Anger and significant lower median scores in Anger Control Out subscale (50 vs 44, $p = 0.016$). Moreover, CH patients have suggestive higher median scores in Anger Expression Index (58 vs 56, $p = 0.059$), while migraine patients have suggestive higher median scores in Anger Expression In (58 vs 56, $p = 0.073$).

No differences were found in Trait Anger subscales ($p = 0.915$) and in the other subscales.

In subgroup analysis (Table 3), patients with CH during the cluster period ($n = 50$) have higher median scores than chronic migraine patients ($n = 49$) in State Anger (47 vs 44, $p = 0.035$) while CH patients in the headache-free period ($n = 53$) did not differ from chronic M patients. No differences were found in other subscales.

Results showed that in migraine patients there are no significant differences in State Anger (44 [44–48] vs 44 [44–48]), and in Anger Control Out subscales (48 [42–54] vs 50 [44–

54]), between patients with pharmacological therapy and patients without it. Also in the CH group, there are no significant differences between patients with pharmacological therapy and patients without it in State Anger (46 [44–56] vs 44[44–56]), and in Anger Control Out subscales (44 [36–52] vs 46 [40–54]).

Discussion

The results indicate that migraine and CH patients differ in state anger, but not in trait anger. In CH, especially during the cluster period, a higher intensity of anger feelings was detected during the time of testing. These results suggest that there are no dispositional differences in anger feeling, even if we compare two different diagnoses of headache that are similar as for the impairment level (chronic migraine and cluster headache during active period). Whereas between migraine and cluster headache patients there are differences in emotional state during pain, cluster headache patients appear to feel more anger in the cluster period than cluster headache patients do in the headache-free period and than chronic migraine patients [24].

These data could confirm the different emotional correlates to pain between migraine and cluster headache patients and support the bio-behavioral hypothesis of different behavioral responses to stress in migraine and CH patients [25]. Observations of CH patients during the attacks are consistent with the behavior of an individual fighting against pain or running away from it, actively coping with pain, and the presence of high state anger in cluster headache is in line with this hypothesis.

On the contrary, migraine patients during the attacks show a withdrawn passive behavior, utilizing catastrophizing coping behavior and hopeless thoughts.

It is interesting to notice that cluster headache patients, especially those in active period, have lower scores than migraine patients in Anger Control Out subscale, indicating that they express their anger-out most frequently than migraine patients. Obviously, data about anger level are not enough to achieve conclusions about behavioral differences between the two groups. Further aspects need to be investigated, evaluating not only other emotions (like sadness and fear) but also coping behavior and cognitive strategies to cope with pain.

Moreover, by looking at the data in a critical and argumentative perspective and analyzing the way in which anger is expressed, a high score was detected both in migraine and in CH patients in Anger Expression Index. This score provides an overall estimate of the person's tendencies to express anger either outwardly toward other people or inwardly toward themselves. In particular, a tendency of migraine patients to suppress anger was observed when they are angry or furious and to monitor and control the physical or verbal expressions of anger. This indicates that in some situations, the angry feelings are suppressed and replaced with guilt, anxiety, and depression as the person blames

Table 1 Socio-demographic and clinical characteristics of the study population

	Migraine patients (<i>n</i> = 135) <i>N</i> (%)	Cluster headache patients (<i>n</i> = 108) <i>N</i> (%)	<i>p</i> value
Age, mean ± SD	41.3 ± 12.0	44.3 ± 11.3	0.108
Sex			< 0.001
Male	15 (11.1)	81 (75.0)	
Female	120 (88.9)	27 (25.0)	
Education			0.009
Primary/secondary	26 (19.3)	37 (34.3)	
High school	57 (42.2)	30 (27.8)	
Graduate	39 (28.9)	24 (22.2)	
Missing	13 (9.6)	17 (15.7)	
Age of onset, mean ± SD	16.4 ± 9.3	27.7 ± 11.6	< 0.001
Frequency			< 0.001
Episodic	86 (63.7)	93 (86.1)	
Chronic	49 (36.3)	15 (13.9)	
Drug prophylaxis			
Anti-depressant	21	2	
Beta-blockers	8	1	
Antiepileptic	10	2	
Verapamil	0	34	
Lithium	0	8	
Cortisone	0	2	
Others	9	3	
None	48	27	
Missing	39	29	

themselves for the problems surrounding the anger-provoking situation. These data are in line with previous literature about anger-in in migraine patients [9] but our data could not statistically confirm this tendency.

On the contrary, CH patients (especially those in the active period) show lower scores in the Anger Control Out subscale, indicating that they do not tend to monitor and control the physical or verbal expressions of anger, neither monitoring themselves to prevent any explosive manifestations of their anger.

The major limit of the study is the lack of a control group without headache and gender differences between the two groups of the sample. In fact, especially anger expression is

influenced by gender, and gender socialization can affect how men and women handle their anger. For these reasons, raw STAXI scores have been transformed into *T* scores by using the questionnaire manual which takes into account sex and age differences and compare data with the healthy general population.

It could be useful to consider the kind of pharmacological therapy, but migraine and cluster headache need different pharmacological treatments (as shown in Table 1), so medications of the two groups cannot be compared. Moreover, in our sample, as shown in Table 1, the medications used in every group are many and different, and statistical comparisons would not be representative.

Table 2 Median and interquartile range (IQR) subscales scores in migraine and CH patients

STAXI-2 subscales	Migraine patients (<i>n</i> = 135)	Cluster headache patients (<i>n</i> = 108)	<i>p</i> value
State Anger	44 (44–48)	46 (44–55)	0.012
Trait Anger	50 (42–58)	48 (42–60)	0.915
Anger Expression Index	56 (54–60)	58 (56–60)	0.059
Anger Expression In	58 (52–64)	56 (48–63)	0.073
Anger Expression Out	56 (50–62)	56 (52–63)	0.319
Anger Control In	46 (42–50)	45 (40–50)	0.207
Anger Control Out	50 (42–54)	44 (40–54)	0.016

Table 3 Median and interquartile range (IQR) subscales scores in chronic migraine, chronic CH, and CH in active period and CH in headache-free period patients

STAXI-2 subscales	Chronic migraine (<i>n</i> = 49)	CH in active period (<i>n</i> = 50)	CH in headache-free period (<i>n</i> = 53)	<i>p</i> value
State Anger	44 (44–48)	47 (44–62)	44 (44–48)	0.035
Trait Anger	50 (44–58)	49 (42–60)	48 (42–60)	0.948
Anger Expression Index	56 (54–60)	58 (56–60)	58 (54–60)	0.105
Anger Expression In	59 (50–64)	56 (48–64)	58 (50–62)	0.502
Anger Expression Out	58 (50–62)	56 (50–64)	56 (52–62)	0.979
Anger Control In	48 (44–52)	46 (38–50)	44 (40–48)	0.125
Anger Control Out	50 (42–54)	43 (36–54)	46 (40–52)	0.132

Another limit is that depression and pain level were not analyzed in the two groups. Depression plays an important role both in migraine [26, 27] and in CH [28, 29] patients.

According to these limits, the interpretation of the results needs further studies to be extended to general headache populations. In particular, there is the need to evaluate correlations between state anger, depression, and pain intensity.

Conclusions

To sum up, the principal result of our research is the difference in the level of anger during the time of testing between the groups. These data could tell us something about the different behaviors of CH and migraine during pain and add new information about the emotional regulation involved in headache attacks. In the literature about chronic pain (such as low back pain), evidence suggests that how anger is regulated—expression, inhibition—may have greater consequences for chronic patients' pain and functioning than their level of trait anger [30], and our data about migraine and cluster headache are in line with these results.

Possible future psychological treatments need to take into account these considerations, focusing not on the reduction or the increase of anger levels, but on the awareness of emotional status during pain [31] and on its modulation by analyzing cognitive and behavioral appraisal of pain and of other stressful events.

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Availability of data and materials All data generated or analyzed during this study are available from the corresponding author on reasonable request.

Authors' contributions MR collected, analyzed, and interpreted the data and was a major contributor in writing the manuscript.

SC, GG, VF, and GP recruited patients and performed the neurological evaluation.

SC, GP, and PC interpreted the results.

SAC completed the dataset.

CZ analyzed the data.

DB and PC reviewed the manuscript.

All authors read and approved the final manuscript.

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Compliance with ethical standards

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

Ethics approval and consent to participate Informed consent was obtained by all individual participants included in the study. The study was carried out in accordance with the Declaration of Helsinki; the study protocol was approved by the Ethics Committee of the Local Health Service of Bologna, Italy (protocol number: 12060/CE).

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