

# Pain and behaviour in cluster headache.

## A prospective study and review of the literature

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### Summary

Cluster headache (CH) has also been called "suicide headache" on account of the extremely severe pain that characterizes its attacks. It is indeed well known that CH sufferers exhibit peculiar behaviours during attacks.

The purposes of our study were: i) to investigate prospectively prodromes and clinical pain features and behaviour of patients during typical, spontaneous attacks of CH defined according to the International Headache Society classification criteria; and ii) to investigate retrospectively the premonitory signs and symptoms preceding onset of the cluster period.

Forty-two episodic CH patients consecutively referred to the University of Parma Headache Centre were asked to fill in a questionnaire soon after a "typical" CH attack. In the questionnaires, the patients were requested: a) to describe in their own words the type of pain experienced during the attack; b) to rate peak pain intensity on a visual analogue scale (VAS); c) to indicate the time elapsing between headache onset and peak pain intensity; d) to report the signs and symptoms preceding the attack (prodromes), choosing them from a 65-item list; and, e) to describe in their own words their behaviour during the attack. Each patient was also requested to report any signs and/or symptoms preceding onset of the cluster period (premonitory symptoms).

Data analysis showed that the clinical features of pain were very complex and varied widely among patients. In 85.7% of cases, patients rated their peak pain intensity (reached on average within 8.9 minutes of attack onset) at between 8 and 10 on the VAS. Most (88.1%) exhibited typical signs of psychomotor agitation (restlessness) during the attack. Prodromes were reported by almost all the patients in our sample (97.6%), and premonitory symptoms by only 40.5%.

The results of our study suggest: i) that the pain in CH cannot be described either as vascular- or as neuralgic-type; ii) that a traditional three-item scale (mild, moderate, severe) does not allow adequate categorization of pain intensity, and should be replaced by the VAS in order to reflect a broader spectrum of pain intensity; iii)

that restlessness during attacks is so frequent that it should become a CH diagnostic criterion; and, iv) that prompt and accurate reporting of prodromes and/or premonitory symptoms could be helpful in establishing early treatment.

*KEY WORDS:* behaviour, clinical features, cluster headache, pain, premonitory signs and symptoms, prodromes.

### Introduction

Cluster headache (CH) is a form of primary headache that was so called because of its characteristic time pattern. Pain during attacks is so severe that CH is also commonly known as "suicide headache". The headache is typically located in the orbital, supraorbital and temporal regions, and is always accompanied by a number of autonomic phenomena. Aside from these recurring features, there are others that are just as typical but that have yet to be clearly defined. It is difficult to describe accurately the pain that accompanies attacks of CH, a difficulty that is indirectly confirmed by the failure of the both the original and the new revised versions of the International Headache Society (IHS) classification (1,2) to provide a specific adjective for CH pain, unlike migraine pain, which it defines as "pulsating", or tension-type headache pain, which it calls "pressing/tightening (non pulsating)". In older case reports, prodromes (the signs and symptoms that precede CH attacks and alert patients to their imminent onset) apparently occurred rarely, if at all (3-5). By contrast, in 1998, Blau et al. in a retrospective study (6) were able to provide a detailed description of these prodromes. The inability to keep still during attacks as described by Kudrow (7) – himself a CH sufferer – and reported by the majority of CH patients, is not regarded as a diagnostic criterion by the first IHS classification (1), although "a sense of restlessness and agitation" does appear as a sub-criterion in the revised version (2).

It was thus deemed useful to carry out a prospective investigation of typical, spontaneous CH attacks in a consecutive series of patients, in order to evaluate: i) clinical features, especially in relation to pain; ii) the presence of any prodromal signs and/or symptoms occurring a few minutes before the onset of attacks; and iii) the patient's behaviour during attacks.

In the same sample, we also attempted a retrospective evaluation of the presence of premonitory signs and/or symptoms preceding the onset of cluster periods by a few days/weeks.

### Materials and methods

Initially, our study population consisted of all first-referral or follow-up patients seen consecutively at the University of Parma Headache Centre between June and De-

ember 2000 with a diagnosis of episodic CH according to the IHS classification criteria (1). Ultimately, however, the study sample was restricted to those with active cluster periods who were not under preventive treatment and who were presumably less than halfway through their clusters, as calculated by the average duration of previous clusters. This criterion was introduced because both literature data (8,9) and clinical experience have shown that attacks occurring at the beginning and at the end of a cluster period may exhibit different clinical features from attacks that are described as "typical" by the patients themselves and by the textbooks.

Our sample, thus recruited, was made up of 42 patients (6 women, 14.3% and 36 men, 85.7%). Their mean age at CH onset was 25.1 years – standard deviation (SD) 8.6 years (range, 14-44). Their mean age upon inclusion in the study was 40.8 years – SD 9.2 years (range, 25-59).

After giving their written informed consent to the study, the recruited patients received questionnaires to be filled in soon after a "typical" attack not treated with symptomatic drugs, and providing they had been experiencing daily attacks for at least three days. Each patient was given all the explanations needed in order to ensure correct interpretation of the questions. No preventive treatment was prescribed at this stage of the study.

In the questionnaire, we asked patients: a) to describe in their own words the type of pain experienced during the attack; b) to indicate the maximum intensity of pain by marking it on a 10-cm line that was labelled "no pain" at one end and "the worst pain possible" at the other end of a visual analogue scale (VAS); c) to indicate the interval of time, in minutes, elapsing between onset of the attack and the peak pain intensity; d) to report any signs or symptoms preceding onset of the attack – called "prodromal signs and/or symptoms" by Blau et al. (6) – choosing them from a 65-item list, and, if any were present, to indicate by how many minutes these prodromes preceded the attack; e) to describe in their own words their behaviour during the attack; and f)

to report any signs or symptoms preceding onset of the cluster period – called "premonitory signs and/or symptoms" by Blau et al. (6) – again choosing them from a 65-item list, and, if any were reported, to indicate by how many days these premonitory signs and/or symptoms preceded the cluster period. In the parts of the questionnaire given over to description of the pain and of behaviour, and to the presence of "prodromal signs and/or symptoms" and of "premonitory signs and/or symptoms", more than one answer was possible. The patients were asked to hand in their questionnaires within 7 days of the attack and, if necessary, they were given preventive treatment. All 42 patients correctly filled in and submitted their questionnaires, and all described their attacks as "typical", which was a prerequisite to proceed with our data analysis. No statistical tests were used, this being a purely descriptive study. This study received full approval from the local ethics committee.

## Results

### Pain type

Most of the patients (40/42, 95.2%) provided an elaborate, detailed description of the pain they experienced during the attack. Only two patients (4.8%) gave a single definition, respectively describing their pain as "like being gripped in a vice" and "like being stabbed by a knife". Frequently (37/42, 88.1%), whole descriptive sentences were given in place of, or to reinforce meanings conveyed by simple adjectives. The descriptions differed widely among the patients. For this reason, we decided to group the most frequent descriptions according to the meaning they conveyed (Table I).

Most patients used more than one term to define the type of pain experienced during attacks. For example, only two patients (4.8%) used a single adjective to describe their pain ("pulsating"), while just one patient (2.4%) reported the pain as indescribable. Even though

Table I - Type of pain of typical and spontaneous cluster headache attacks.

Descriptions	Females		Males		Total	
	n.	%	n.	%	n.	%
Drill – point – needle – punch – spear stab wound – knife wound – stinging piercing – shooting	4	66.6	20	55.6	24	57.1
Hammer – pangs – throbbing – pulsating rhythmic	4	66.6	18	50.0	22	52.4
Vice – external pressure – tearing gripping	1	16.7	7	19.4	8	19.0
Electrical discharge – burning	–	–	8	22.2	8	19.0
Continuous	–	–	7	19.4	7	16.7
Swollen eyeball – as if it were about to blow up	1	16.7	4	11.1	5	11.9
Indescribable	–	–	1	2.8	1	2.4

we had asked them define only the *type* of pain in this section of the questionnaire, 14 patients (33.3%) also reported its intensity, describing it as “devilish”, “gruelling”, “unbearable”, or “so violent that it is utterly intolerable”.

#### *Pain intensity*

On the VAS scale, 85.7% of the CH patients (36/42) rated the maximum intensity of pain between 8 and 10 cm, with 69.1% (29/42) rating it at between 9 and 10 cm, i.e., very close to or corresponding to the worst possible degree of pain. Only six patients (14.2%) reported a degree of pain intensity below 8 cm: three (7.1%) rated it between 6 and 6.9 cm and the other three (7.1%) between 7 and 7.9 cm. Overall, the average rating given by the 42 patients was 9.17 cm – SD 1.0 cm (range, 6-10).

#### *Interval of time elapsing between onset of the attack and peak pain intensity*

The average interval of time elapsing between the beginning of the attack and the peak of pain intensity was 8.9 minutes – SD 9.5 minutes (range, 1-45). Maximum pain intensity was reportedly reached within 3 minutes of onset of the attack in 38.1% of patients (16/42); within 4-6, 7-9 and 10-15 minutes in 16.7% (7/42), respectively, and after 15 minutes in the remaining five patients (11.9%).

#### *Prodromal signs/and or symptoms preceding the attack*

Nearly all patients (41/42, or 97.6%) reported the presence of prodromal signs and/or symptoms that preceded the onset of the attack by an average of 6.3 minutes – SD 6.9 minutes (range, 1-30). In 64.3% of cases (27/42), patients reported two to four prodromes. Fourteen patients (33.3%) reported just one prodrome and one patient (2.4%) reported nine. We divided the prodromes into four categories: i) local and painful; ii) local and painless (among which we included those listed as accompanying symptoms in the IHS classification (1) diagnostic criteria for CH); iii) general; and, iv) metaphorical. Exactly half of the patients in our sample (21/42) reported a mild sensation of “malaise/pain” in the area that was later the site of the attack; 42.9% of patients (18/42) reported the typical autonomic phenomena accompanying CH attacks; 50.0% of patients reported general symptoms, psychic ones emerging as the most common (10/42, 23.8%); and 9.5% of patients (4/42) used metaphors to describe the sensation they experienced before the onset of the attack. None of our patients reported a typical migraine visual aura prior to the attack (Table II).

#### *Behaviour during the attack*

As regards their behaviour during attacks, most patients (37/42, 88.1%) performed a complex sequence of multiple actions, in all cases characterized by an inability to keep still. Twenty-seven of them were restless, 17 engaged in stereotypical acts and 20 in an incessant search for environmental conditions that might relieve their pain (Table III, see p. 209). Only five out of 42

(11.9%) were able to keep still: either “lying down”, “standing up” or “sitting with their head bent backwards”. *Premonitory signs and/or symptoms preceding onset of the cluster period*

A total of 17 patients out of 42 (40.5%) claimed they were able to predict the beginning of the cluster period with an average latency of 23.5 days (SD, 18.8 days; range, 3-75). As premonitory symptoms, 11 of them reported sporadic, mild, very short-lasting aches on the same side as the headache, one of them described ocular paraesthesia and three a “strange sensation in the head”. No patient recognized these symptoms as similar to those of CH attacks. In 16.7% of cases (7/42), psychic symptoms – anxiety, irritability, intolerance, and abnormal mental and physical well-being – were also reported in the weeks preceding onset of a new cluster period.

## **Discussion**

The first description of CH attacks dates back to the 17th century (10,11). Since then, the terms used to define the type of pain have varied widely, “excruciating” emerging as the most common adjective used by sufferers (11-15). Yet various attempts to establish whether the pain was a vascular- or neuralgic-type pain gave mixed results. In 1983, in their sample of 180 CH cases, Manzoni et al. (13) found “vascular” pain – throbbing, pulsating – in 75 patients, “neuralgic” pain – boring, sharp, burning, stabbing, piercing – in 29, a mixed type of pain in 53, and an indescribable type of pain in 23. Ultimately, Kudrow (7) defined his own pain as “boring and non throbbing in character”. His opinion was shared by Ekbohm (12), who found, predominantly, a type of pain that could be described as “boring, pressing or burning in character” in his observation of 33 patients with attacks that were spontaneous in a minority of cases and induced by nitroglycerin in the other cases; only in a few cases did he find “pulsating or throbbing” pain.

In our study we described the clinical features reported by 42 patients soon after experiencing a spontaneous CH attack that could be defined as “typical” and not modified in any way by the effects of symptomatic or preventive treatment. Our data analysis shows that the nature of the pain was basically the same as that reported in the literature. In fact, the academic distinction between “neuralgic-” and “vascular-” type pain often does not hold true in practice, because the same patient may experience both types of pain at the same time in the same attack. In 57.1% of our cases, the words used, such as “drill”, “point”, “stab wound” or “knife wound”, are suggestive of the first type of pain, while in 52.4%, the symptoms reported were throbbing and pulsating, compatible with the second type. Most patients in our sample provided elaborate, detailed descriptions of their symptoms, and in 81.1% of cases they even replaced or reinforced simple adjectives with sometimes fanciful analogies: “like a painful fluid running down in waves”, or “like a bee stinging me inside the eyeball”, “like repeated razor-sharp strokes”, or “like stinging blows”.

As regards CH and migraine, the terms that recur in the diagnostic criteria of the IHS classification are “severe pain” and “moderate or severe intensity” (1), respectively. Literature reports and clinical practice suggest that

the adjective “severe” is inappropriate to describe the intensity of pain in CH, which cannot be compared to that of migraine either in quality or quantity (10,16). In spite of the fact that we had asked our patients to describe only pain *type*, 33.3% of them also provided indications about its intensity, describing it as “devilish”,

“gruelling”, “unbearable” or “so violent that it is utterly intolerable”. Most of the studies conducted so far fail to provide more accurate descriptions of pain intensity in CH attacks. A more accurate quantification of the clinical features of pain is now possible through the use of a simple, validated instrument: the VAS (17,18). To our

Table II - Prodromes – signs and/or symptoms preceding the pain of typical and spontaneous cluster headache attacks.

Prodromes	Females		Males		Total	
	n.	%	n.	%	n.	%
i) Local and painful						
Aches - mild pain in the areas affected by the subsequent headache or in other cranial regions	3	50.0	18	50.0	21	50.0
ii) Local and painless						
<i>IHS</i> (accompanying symptoms for cluster headache)						
Nasal congestion	3	50.0	10	27.8	13	31.0
Lacrimation	2	33.3	2	5.6	4	9.5
Rhinorrhoea	–	–	4	11.1	4	9.5
Conjunctival injection	–	–	3	8.3	3	7.1
Forehead and facial sweating	–	–	3	8.3	3	7.1
Ptosis	–	–	2	5.6	2	4.8
Eyelid oedema	–	–	2	5.6	2	4.8
<i>NON-IHS</i>						
Buzzing - itching - movement sensation paraesthesia - scalp hyperalgesia sand in the eye	2	33.3	8	22.2	10	23.8
Tenderness of neck - eye muscles	–	–	4	11.1	4	9.5
Dryness - burning in the nostril	–	–	4	11.1	4	9.5
Pressure - heaviness	–	–	3	8.3	3	7.1
Dilatation of the superficial temporal artery	–	–	2	5.6	2	4.8
General head sweating	–	–	1	2.8	1	2.4
iii) General						
Anxiety - irritability - abnormal mood unconscious rubbing of the eye	1	16.7	9	25.0	10	23.8
Nausea	–	–	3	8.3	3	7.1
Phonophobia	–	–	3	8.3	3	7.1
Coughing	–	–	2	5.6	2	4.8
Drowsiness	–	–	2	5.6	2	4.8
Yawning	–	–	2	5.6	2	4.8
Hot sensation	–	–	2	5.6	2	4.8
Polyuria	–	–	1	2.8	1	2.4
Bilateral blurred vision	–	–	1	2.8	1	2.4
iv) Metaphoric						
“Like a stone passing through my temple”	–	–	1	2.8	1	2.4
“As if blood were flowing faster to my brain”	–	–	1	2.8	1	2.4
“Dreaming about carrying through a repetitive action that follows the rhythm of the pain”	–	–	1	2.8	1	2.4
“Like a scarf choking my neck”	–	–	1	2.8	1	2.4
“Like a red-hot cable running from my ear to the sternum”	–	–	1	2.8	1	2.4

knowledge, this instrument has seldom been used in reference to CH attacks. Yet, its application enabled us to rate the maximum pain intensity of a spontaneous CH attack between 8 and 10 cm in 85.7% of cases, the average rating being 9.17 cm. This finding is not entirely in agreement with that of Russell (19), who, using a five-item scale (0=no pain, 1=very slight, 2=slight, 3=moderate, 4=severe, 5=extremely severe headache), found that in 78% of attacks, peak pain intensity corresponded to the "moderate", "severe" and "very severe" degrees and that no differences emerged in relation to different times (of day) of attack onset. Albeit using a different instrument, we found that in our patients all "typical" attacks appeared to be characterized by a higher degree of pain severity. The VAS scale provides a subjective interpretation of pain severity. Hopefully, objective methods will be developed in the future that, by directly measuring the intensity of pain, will create new research opportunities in this field.

According to the current classification, a CH attack may last 15 to 180 minutes. Most studies report a sudden, abrupt onset (4,7,12, 20-22), but very few authors have been able so far to provide an objective prospective description of how the attack develops without relying entirely on the sufferer's recollections. Russell, for one (19), had his patients use a small timer during attacks and could therefore demonstrate that in most cases pain intensity peaked within less than 5 minutes of onset of the attack, the average being 10.5 minutes during the day and 9.5 minutes at night. In our study, peak pain intensity was reached in a shorter time, 8.9 min-

utes. However, this difference could be the result of our survey, still one of the few prospective studies ever conducted on CH pain, being less accurate than Russell's. In 38.1% of our sample, the maximum severity of symptoms was experienced within 3 minutes of onset of the attack, which explains its peculiar pattern; only in 13.9% of cases was pain intensity reported to increase gradually, over more than 15 minutes.

In the past, there have been sporadic reports of CH attacks preceded by symptoms comparable with migraine aura (5,13,21,23,24). Recently, Silberstein et al. (25) reported six cases of "CH with aura" in a series of 101 CH patients and Bahra et al. found aura symptoms in association with the acute CH attack in at least 6% of a group of 230 CH patients (26). However, this is, in our considerable experience, a rare occurrence and in this study we found no patient reporting a migraine aura preceding headache onset. By contrast, premonitory signs and/or symptoms occurring a few minutes before the attack, according to the definition of Blau et al. (6), were reported frequently by our patients. Most of them (97.6%) "sensed" the imminent onset of an attack with an average latency of 6.3 minutes. The attack was preceded by symptoms and/or signs that could be described as "local and painful" and "general" in 50% of cases respectively and by some of the accompanying autonomic phenomena listed in the IHS classification (1) in 42.9%. These data are not easily compared to those reported by Blau et al. (6) in a retrospective survey of 150 CH patients, because the latter categorized differently the symptoms reported by patients. In particular,

Table III - Behaviour during typical and spontaneous cluster headache attacks.

Behaviours	Female		Male		Total	
	n.	%	n.	%	n.	%
<i>Behaviours related to motion</i>						
Rubbing or pressing the aching part or other parts of the head – laying the aching part on a flat surface – putting something on the aching part	4	66.7	23	63.9	27	64.3
Walking back and forth – moving along stereotypical paths – turning round and round – rocking	3	50.0	13	36.1	16	38.1
Generic movements – rolling on the ground hitting head against the wall – punching knees	4	66.7	14	38.9	18	42.9
Lying down but unable to keep still	2	33.3	4	11.1	6	14.3
Sitting but unable to keep still	2	33.3	3	8.3	5	11.9
<i>Actions</i>						
Application of cold substances (water, ice) or cold air	2	33.3	11	30.6	13	31.0
Application of hot substances	1	16.7	5	13.9	6	14.3
Voluntarily changing breathing rate or depth	2	33.3	6	16.7	8	19.0
Crying – screaming	1	16.7	4	11.1	5	11.9
Smoking – eating	–	–	1	2.8	1	2.4
<i>Conditions</i>						
Darkness	5	83.3	11	30.6	16	38.1
Isolation	4	66.7	7	19.4	11	26.2
Silence	1	16.7	2	5.6	3	7.1

they claimed that 38.7% of their sample did not report any "alerting" symptoms, but in processing their results they omitted the local symptoms, which they called "minor sensations", reported by 50 patients (30%).

In their case series of 150 patients, Blau et al. (6) reported the presence of premonitory symptoms preceding onset of the cluster period in 8% of cases – a lower rate than in our case series. The presence of typical symptoms preceding onset of the cluster period was also described by Raimondi (27) in four CH clinical reports. Among the patients studied at our centre, 40.8% claimed that onset of the cluster period was preceded (by an average of 23.5 days) by well-defined, stereotyped symptoms.

Compulsive movement during a CH attack is reported as a typical feature by several authors (28,29) And this sign is not present in other forms of "short-lasting" headache, like hypnic headache and paroxysmal hemicrania (30,31). The detailed descriptions that we were able to obtain from our 42 patients point to a complex picture: 88.1% of CH sufferers could not keep still. In most cases, patients performed, sequentially, complex, sometimes stereotypical actions, repeating the same manoeuvres, such as pressing the aching part or voluntarily altering their breathing rate. Often, patients tended to isolate themselves during an attack.

Blau (32) reported patients exhibiting behaviours just as varied. After asking 50 CH sufferers to mimic the behaviours they typically displayed during an attack, he was able to identify six different categories: "walking", "sitting", "kneeling", "lying", "standing", "wanting to be left alone".

It is not easy to advance hypotheses on the possible pathophysiological bases of a patient's behaviour during an attack. It might be determined by activation of certain brain areas responsible for movement control, as evidence from recent trials seems to suggest (33), or by the desire to perform actions that might relieve the pain, even only temporarily. In the latter case, patients' behaviours might be dictated by their presumably unconscious perception of the transient benefits possibly derived from them.

Undoubtedly, the inability to keep still, which can be defined in general terms as restlessness/agitation, is not only a typical, but also a distinctive feature of CH, and as such it should be included among the diagnostic criteria for this form of headache. A prompt and accurate description of the symptoms and signs preceding attacks and onset of the cluster period might help physicians determine best type of early treatment to be given to CH patients.

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