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Review

Epileptic seizures and headache–migraine: A review on types of association and terminology

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ABSTRACT

Purpose: There are different possible temporal associations between epileptic seizures and headache attacks which have given rise to unclear or controversial terminologies. The classification of the International League Against Epilepsy does not refer to this type of disorder, while the International Classification of Headache Disorders (ICHD-2) defines three kinds of association: 1. migraine-triggered seizure (“migrralepsy”), 2. hemicrania epileptica, and 3. post-ictal headache.

Methods: We performed an extensive review of the literature, not including “post-ictal” and “inter-ictal” headaches.

Results: On the basis of well-documented reports, the following clinical entities may be identified: (A) “epileptic headache (EH)” or “ictal epileptic headache (IEH)”: in this condition headache (with or without migrainous features) is an epileptic manifestation *per se*, with onset, and cessation if isolated, coinciding with the scalp or deep EEG pattern of an epileptic seizure. EH maybe followed by other epileptic manifestations (motor/sensory/autonomic); this condition should be differentiated from “pure” or “isolated” EH, in which headache/migraine is the sole epileptic manifestation (requiring differential diagnosis from other headache forms). “Hemicrania epileptica” (if confirmed) is a very rare variant of EH, characterized by ipsilateral location of headache and ictal EEG paroxysms. (B) “Pre-ictal migraine” and “pre-ictal headache”: when a headache attack is followed during, or shortly after, by a typical epileptic seizure. The migraine attack may be with or without aura, and its seizure-triggering role (“migraine-triggered seizure”) is still a subject of debate. A differentiation from occipital epilepsy is mandatory. The term “migrralepsy” has not been used univocally, and may therefore led to misinterpretation.

Conclusions: On the basis of this review we suggest definitions and a terminology which may become the basis of a forthcoming classification of headaches associated with epileptic seizures.

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The temporal association between a headache attack and an epileptic seizure is an interesting phenomenon, which may occur in various ways, and has recently been the subject of debate^{1–5} and revisitation.⁶ The classification of the International League Against Epilepsy does not refer to this type of disorder, while the International Classification of Headache Disorders, 2nd edition (ICHD-2)⁷ defines three kinds of association, synthetically reported in [Table 1](#).

According to their temporal occurrence, four types of association between headache and epileptic seizure are recognized: 1.

pre-ictal headache, 2. headache as the expression of an epileptic manifestation, 3. post-ictal headache, and 4. inter-ictal headache.

Apart from *post-ictal headache*, which has recently been reviewed by Ekstein and Schachter⁸, and from *inter-ictal headache*, the patterns of expression of the other two associations is complex, and terminology has been widely discussed. The aim of this review is therefore to update information reported in the literature on pre-ictal and ictal epileptic headache, searching for unification or differentiation criteria, and suggesting relative terminology.

1. Pain as an epileptic phenomenon

Although infrequently, ictal pain may be the initial symptom of an epileptic seizure; it can be distinguished as lateralized peripheral, abdominal and cephalic.^{9,10} The parietal lobes appear to be involved in most cases of *cephalic ictal pain*, while in other cases epileptic activity occurs in a different location, as there are multiple site representation of pain in the brain.^{11,12} Cephalic pain

Abbreviations: GTC, generalized tonic-clonic; MA, migraine with aura; MO, migraine without aura.

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may assume the characteristics of migraine or of other types of headache; it may involve the face alone, or facial pain may be followed by other epileptic manifestations⁹ (case no. 10) or be isolated.¹³

The literature reports episodes of headache, sometimes with migrainous features, not followed or accompanied by other manifestations of a clear epileptic nature, with paroxysmal EEG features beginning simultaneously with the headache, and ceasing with it if not followed by other epileptic manifestations. This is a true epileptic seizure manifesting itself with headache, therefore an “epileptic headache”.

2. Epileptic headache (ictal epileptic headache^a, ictal headache^b)

2.1. Not followed by other epileptic manifestations (pure epileptic headache)

In this condition a cephalic pain (headache), with or without migrainous features, with concomitant EEG paroxysms, is not followed by other epileptic phenomena.

We recently described¹⁵ a new case with video-EEG report, and briefly illustrated the cases available in the literature regarding this condition, for which we suggested the term of “pure (or “isolated”) epileptic headache”. To meet the criteria for this condition, at least some of the headache episodes experienced by the patients should be isolated episodes, without other manifestations of a clearly epileptic nature, and in particular should not be immediately followed by motor and/or sensory and/or autonomic manifestations. This is relevant, since it may pose the problem of a differential diagnosis with headaches due to other causes.

The main features of 15 published cases affected by “pure epileptic headache”^{15–25} are reported in Table 2. In the table, no data are provided for the first patients reported with epileptic headaches,^{26–29} as the full text articles are unavailable. Among the cases described by Isler et al.¹⁷ and by Beauvais et al.¹⁸, due to the paucity of data available, only those more likely to be “pure epileptic headache” have been included.

In the cases reported in Table 2, head pain lasted from seconds to days. Headache was reported as having the characteristics of migraine without aura (MO) in 4 cases, migraine with aura (MA) in 3 (one both), “tension-type” in one and not defined or not classifiable in the other cases. Pain location varied: frontal, temporal, vertex, hemicranial. In some cases, mild symptoms accompanying headache were reported: agitation, dyspnea, confusion, difficulty to talk, hypersensitivity to noise. EEG abnormalities contemporary with pain were of various types (spikes, spike-and-waves, sharp-waves) and location: in 2 cases generalized, in 4 (3 MO, 1 both MO and MA) monolateral occipital, and temporal or frontal or central or parietal in the others. Occasionally, as may occur for seizure of deep origin, a scalp EEG did not show paroxysmal activity during the headache episode, which revealed its epileptic origin only on performing a deep-electrode EEG: Laplante et al.¹⁶ (case 2), Isler et al.¹⁷ (case 2) and Dainese et al.²³ (case 1). As shown in the table, neuroimaging findings and etiologies varied widely, with location of the probable causative focus in different brain areas, although prevalently in the occipital and temporal.

Thus, all cases listed in Table 2 represent examples of pure (or isolated) epileptic headache: only head pain, sometimes accom-

^a “Ictal epileptic headache”, used for the first time by Parisi,¹ appears repetitive, since *per se* ictal signifies “relating to a seizure” (Oxford dictionary), “relating to a seizure or convulsion” (Farlex dictionary), “relating to or caused by a stroke or seizure” (The American Heritage® Medical Dictionary). Moreover, an “epileptic headache” is “*per se*” ictal.

^b “Ictal headache”, first used by Piccioli et al.,¹⁴ could be confused with headache due to an “ictus”.

panied by with minor manifestations. However, in some cases, episodes of pure epileptic headache alternate with episodes of headache followed by other epileptic manifestations, as illustrated in the variant described in Section 2.2.

2.2. Followed by other epileptic manifestations (epileptic seizure beginning with headache)

Headache with concomitant EEG paroxysms, with or without migrainous features, developing along with other epileptic manifestations, was reported by Isler et al.¹⁷, Marks and Ehrenberg³⁰ (MA, cases 1, 2, 5), Walker et al.³¹ (migraine with visual aura), Velioglu and Ozmenoglu³² (migraine with visual aura, cases 1, 2, 4, 6), and possibly some cases by Verrotti et al.³³. These situations are clearly *epileptic seizures beginning with (epileptic) headache*, which is actually an “aura”.

Epileptic headaches followed by other more habitual epileptic manifestations, particularly the motor ones, are probably underdiagnosed, since both the physician and the patient tend to emphasize the latter, not giving importance to the initial headache. On the other hand, it should be considered that only the episodes of “pure” epileptic headache have a clinical relevance, requiring a diagnostic differentiation from other types of headache, particularly when no other types of seizures occur and no epileptic abnormalities are present in the interictal EEG.

Isler et al.¹⁷ used the term “*hemicrania epileptica*” to describe the occurrence, in 5 of their patients, of unilateral migraine attacks coinciding with EEG (scalp and/or deep) epileptic activity, localized homolaterally to migraine pain. The term “*hemicrania epileptica*” has been accepted by the ICHD-2, as shown in Table 1. Apart from the peculiar characteristic of homolaterality between the epileptic focus and hemicranial pain location (also reported by others although referring only to interictal EEG^{6,34–36}) Isler’s cases clearly appear to be epileptic headaches. Data from the report by Isler et al.¹⁷ are not sufficiently detailed to establish whether headache episodes are isolated or not. At least 2 patients (cases 1, 2, reported in Table 2) appear to have had “pure” epileptic headache, while in the other cases headache appears to be part of or followed by other epileptic manifestations.

Although interictal EEG abnormalities may be ipsilateral to periictal headache, particularly in temporal lobe epilepsy,^{6,34–36} in the literature no other cases have been reported in relation to the ictal EEG. In any case, this correlation does not seem to bear any speculative interest in relation to headache mechanisms, since the causative foci in the reported cases of epileptic headaches were all located in different brain areas.

On the basis of the aforementioned data, the following suggestions for terms and definitions in view of a new classification may be put forward:

“**Epileptic headache (EH)**” (or “**Ictal epileptic headache**”, or “**Ictal headache**” – see note ^a). *Headache (whether migraine or not) with onset, and cessation if isolated, coinciding with an EEG pattern of epileptic seizure (rarely EEG alterations may only be detectable using deep electrodes), featuring two variants: A) “Pure” or “isolated”, e.g. “Isolated epileptic headache” (IEH), or B) headache followed without discontinuity by other epileptic manifestations thus actually being an epileptic seizure beginning with headache (as an “aura”).*

To this definition a comment could be added, that this form is usually of short duration (seconds to minutes, like epileptic seizures), although comprising a long-duration variant (more similar to migraine attack or tension-type headache), considered as a status epilepticus. When lacking an ictal EEG, the immediate stopping of headache by intravenous benzodiazepine is diagnostic. In the condition B) headache actually is to be considered an “aura”

Table 1

Kind of associations (synthetically reported) between epilepsy and headache–migraine according to the International Classification of Headache Disorders, 2nd edition (ICHD-2) (International Headache Society, 2004).

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- 1.5.5 *Migraine-triggered seizure*. Diagnostic criteria: (A) migraine-fulfilling criteria for 1.2 migraine with aura; (B) A seizure fulfilling diagnostic criteria for one type of epileptic attack occurs during or within 1 h after migraine aura (Comment: sometimes referred as *migralsepsy*).
- 7.6 Headache attributed to epileptic seizure.
- 7.6.1 *Hemicrania epileptica*. Diagnostic criteria: (A) headache lasting seconds to minutes, with features of migraine, fulfilling criteria C and D; (B) the patient is having a partial epileptic seizure; (C) headache develops synchronously with the seizure and is ipsilateral to ictal discharge; (D) headache disappears immediately after the seizure.
- 7.6.2 *Post-ictal headache*. Diagnostic criteria: (A) Headache with features of tension-type headache or, in a patient with migraine, of migraine headache, fulfilling criteria C and D; (B) the patient has had a partial or generalized epileptic seizure; (C) headache develops within 3 h after the seizure; (D) headache disappears within 72 h after the seizure.
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with respect to the subsequent epileptic manifestation. Different brain areas may give origin to this epileptic headache.

In our opinion⁴, the use of the term “hemicrania epileptica” is no longer justified. If indeed the condition exists, it should be included in the “epileptic headache”. The use of the term in case of hemicranial location of pain in an episode of epileptic headache appears to be an useless terminological complication.

Some authors define epileptic headache as an *autonomic seizure*. In the classification of seizures, autonomic manifestations do not include headache, and somatic pain is not due to autonomic system involvement. However, the head pain manifested in primary headaches appears to differ from somatic pain. Headache of epileptic nature should be kept separate from classical autonomic presentations of seizures; it could originate from a particular section of the autonomic nervous system. Data suggesting a role of nociceptive perivascular (that is, non-“somatic”) fibers have been reported in literature.³⁷

A special condition arises in cases where a migraine-type headache, particularly when preceded by visual aura, is followed by other epileptic manifestations.

3. Migraine/headache followed by an epileptic seizure (pre-ictal migraine/headache; migraine-triggered seizure)

Lennox and Lennox³⁸ used the term “*migralsepsy*” in referring to a condition of “ophthalmic migraine ... followed by symptoms characteristic of epilepsy” (ophthalmic migraine, according to the terminology used in 1960, must be understood as a migraine with visual aura). It should be underlined that this term was proposed more than 50 years ago in a generic form compatible with that period. Migralsepsy therefore may be translated as: “visual symptoms followed by migraine and subsequently by symptoms characteristic of epilepsy”.

The relevant issue is to determine whether visual symptoms and headache are epileptic phenomena or not.

In similar cases, it should first established whether or not the aura and pain phases present EEG characteristics suggestive of an epileptic seizure. If with onset of the visual aura the interictal EEG changes, assuming epileptic features or significantly increasing intercritical epileptic features, and this persists during the headache phase and evolves into a seizure with other types of manifestations, this is clearly an epileptic seizure starting from the occipital lobe.

In the absence of EEG epileptic features during aura and migrainous headache, we should consider the manifestation as an epileptic seizure preceded (“*pre-ictal migraine*”) and possibly triggered by migraine (“*migraine-triggered seizure*”).

As reported in Table 1, the ICHD-2 classification⁷ includes 1.5.5 “migraine-triggered seizure”, defined as a migraine attack with aura [note: not specified whether only visual or aura in general, e.g. sensory or speech] during which or within an hour after the aura, a typical epileptic seizure occurs.

The ICHD-2 classification⁷ states that this condition is “sometimes referred to as *migralsepsy*”.

Under heading 7.6 of the ICHD-2⁷ “Headache attributed to epileptic seizure”, varying with respect to 1.5.5 it is stated that “*migralsepsy* has been used to denote epileptic seizures occurring between the migrainous aura and the headache phase of migraine”. This definition probably refers to the only case with these characteristics reported in the literature, termed *intercalated migraine* by the authors,³⁹ in which, however, a clear differentiation from childhood occipital epilepsy of Gastaut type is rather difficult, with the headache probably being a post-ictal headache.

3.1. Migraine with aura followed by an epileptic seizure

A review of the literature reports of “*migralsepsy*”, defined as “*migraine attack followed in a short time by an epileptic seizure*”, was undertaken by Sances et al.⁴⁰ These authors reviewed 50 cases of “potential *migralsepsy*” reported in the literature, the majority of which ($n = 43$) suffering from migraine attack with aura and 7 without aura. In their opinion, 15 cases did not meet current ICHD-2⁷ criteria (most were post-ictal headache or non-migraine headache), and 14 were “highly suggestive of genuine epileptic seizures, particularly occipital”, while 19 were “uncertain, due to insufficient information”. Sances et al.⁴⁰ stated that only two of the cases reported presented features supporting a diagnosis of *migralsepsy*, i.e. case no. 4 by Andermann⁴¹ and case no. 8 by Niedermeyer.⁴² The opinion expressed by the authors probably referred to the migrainous characteristics of the visual aura, usually different from the visual symptoms of an epileptic seizure of occipital origin, as clearly delineated by Panayotopoulos.^{43,44}

However, other possible cases of *migraine (with visual aura)-triggered seizures* are reported by De Romanis et al.^{45,46} and by Marks and Ehrenberg³⁰ in their case no. 2. Case nos. 3 and 5 by Velioglu and Ozmenoglu³² had migraine with visual aura and normal EEG, immediately followed by complex partial seizure in one patient and generalized tonic-clonic seizure in the other. Mateo et al.⁴⁷ reported 1 case of MA followed by partial or generalized tonic-clonic seizure (GTCs) (while occasionally MO, lasting 2 days, followed by partial motor then GTCs). In case 3 by Maggioni et al.⁴⁸ a GTC occurred 3 h after a migraine attack with visual aura. In the case by Labate et al.⁴⁹ typical visual aura and migraine were followed in a short time by a GTC. The case by Milligan and Bromfield,⁵⁰ featuring “seizure... immediately following a migraine aura” and the case by Barré et al.⁵¹, both diagnosed as *migralsepsy* by the authors, were questioned by Sances et al.⁴⁰ as possible occipital lobe epilepsy.

Verrotti et al.³³ collected 16 cases (aged 5–18 years) in which an attack of MA (9 cases) or MO (7 cases) was followed by an epileptic seizure “within 1 h of the migraine attack” (presumably within 1 h of onset of a migraine attack), and at least one EEG was recorded during a migraine attack (not specified whether during an attack followed by a seizure). In 3 cases (nos. 2, 3 and 16), they found a difference between the interictal EEG (normal in cases 2 and 3) and

Table 2
Main features of 15 cases of epileptic headache.

Authors	Age/sex	Headache characteristics-location/duration	HA accompanying symptoms	Manifestations occasionally following HA	Ictal EEG	Interictal EEG	Other seizures	MRI	Etiology
Laplante et al. ¹⁶ , case 1	17/F	vertex/1 min	Dyspnea, headedness, sometimes could not talk	Sometimes automatisms, confusion, agitation	Scalp: "bitemporal"/deep: r.hippocampus and amygdale	n.r.	Drop attacks	n.r. (CT normal)	Temporal focal malformation?
Laplante et al. ¹⁶ , case 2	28/M	Temporal/30–60 s	n.r.	Sometimes chewing, head-version, agitation, rarely generalized seizure	Scalp: normal or 3–4 Hz or raps/deep: spikes r.hippocampus	(Normal)	No	n.r.	Early encephalopathy
Isler et al. ¹⁷ , case 1	22/F	MA visual and auditory, monolateral/sec–min?	n.r.	n.r.	Stereo-EEG: r. temporal, limbic discharges	n.r.	"Complex partial"	n.r.	n.r.
Isler et al. ¹⁷ , case 2	29/M	MA (not visual)/sec–min?	n.r.	n.r.	Stereo-EEG: l. medial fronto-basal, supplementary motor (?)	n.r.	"Complex partial"	n.r.	Ischemic lesion
Beauvais et al. ¹⁸ , case 1	16/F	Bitemporal/n.r.	Speech arrest, fear of falling	Sometimes focal motor	Spikes l.fronto-central	?	Focal motor	n.r.	n.r.
Beauvais et al. ¹⁸ , case 2	20/M	r.frontal/minutes	n.r.	Sometimes focal motor	Spikes l.parietal	Spikes l. parietal	Focal motor	n.r.	Cortical dysplasia
Ghofrani et al. ¹⁹	9/M	Bilateral/more than 24 h	Agitation, irritability, cry, moaning	No	Continuous GSW	normal	No	Brain atrophy	(Histiocytosis)
Parisi et al. ²⁰	14/F	MO r.backside/3 days	Phono-photophobia, nausea, vomit	l.arm tonic, head version, then GTC	Theta and sharp waves r.occipital	IPS r.sharp-waves parieto-temporal	Reported as "GTC" (focal then GTC?)	Normal	Occipital epilepsy Gastaut-type
Perucca et al. ²¹	56/F	(1) r.MA/<1 min, (2) l.MO/hours (status)	(1) l. hemivisual; (2) phono-photophobia, nausea	(1) Sometimes head deviation; (2) no	r.temporo-occipital rhythmic 11–12 Hz spikes, then slow-waves	n.r.	Visual/automatisms/GTC	Bilateral occipital cortex swelling, hyperintensity	Perinatal hypoxic-ischemic encephalopathy
Belcastro et al. ²²	20/F	MO r.hemicranial/3 days	Phono-photophobia, nausea, vomit	No	r.occipital rhythmic 11–12 Hz spikes	n.r.	No	r.parieto-occipital scar/ictal DWI: r.occipital diffusion r.occipital (lingual) dysplasia	Post-trauma
Dainese et al. ²³ , case 1	11/M	Left side and vertex/seconds	n.r.	Sometimes visual hallucinations, oculoversion, loss contact	Scalp EEG normal/stereo-EEG spikes r.occipito-parietal	Normal	No	No	Malformation
Dainese et al. ²³ , case 2	47/F	r.frontal/few seconds	n.r.	Sometimes tonic posture r.arm	Spikes l.central	n.r.	No	l.inferior parietal tuber	Tuberous sclerosis
Fusco et al. ²⁴	18/M	MO/minutes – 1–2 days	Phono-photophobia; sometimes nausea, vomit	No	No	Rare focal discharges	Focal	Partial hemispherectomy; ictal SPECT seizure B: r.occipital hyperperfusion	Rasmussen's encephalitis
Fanella et al. ²⁵	37/F	Tension-type headache/1 h	No	No	Subcontinuous GSW and GPSW	GSW and GPSW	Absences and tonic-clonic	Normal	Idiopathic generalized epilepsy
Cianchetti et al. ¹⁵	9/F	Frontal/1–3 min	Hypersensitivity to noises	No	r.temporal spikes and slow-waves, then diffuse	Normal	No	Dysplasia r. temporal cortex	Dysplasia type IIa

Abbreviations: CT, computerized tomography; DWI, diffusion weighted MRI; GPSW, generalized polyspikes and waves; GSW, generalized spikes and waves; GTC, generalized tonic-clonic; HA, headache; IPS, intermittent photostimulation; l, left; MRI, magnetic resonance imaging; MO, migraine without aura; r, right; ?, lacking datum.

the EEG during migraine, which showed spike-wave discharges. However, it is not specified whether these abnormalities were first manifested concomitantly with the headache attack. Moreover, the time interval between the onset of headache and/or visual symptoms and the following epileptic manifestation is particularly relevant, since they should follow immediately in the case of an epileptic seizure beginning with headache. Some of the cases reported appear to be migraine-triggered seizures, whilst others (cases with EEG paroxysms beginning with headache) appear to be an “epileptic migraine–headache (MA or MO) followed by other epileptic manifestations” or, in other words, “epileptic seizures beginning with migraine–headache (MA or MO)”.

3.2. Migraine without aura followed by an epileptic seizure

Migraine attacks without aura, during or shortly after which a typical manifestation of epileptic seizure occurred, have been reported: Friedenbergs and Dodick⁵² (1 case with GTCs in sleep on the 4th day of an MO attack), Mateo et al.⁴⁷ (as reported above: 1 case MO lasting 2 days followed by partial motor then GTCs, while on other occasions MA followed by partial or GTCs), Yankovsky et al.³⁵ (4 cases, all symptomatic: MO followed within 30 min by complex partial seizures); Merlino et al.⁵³ (1 case: GTCs during MO, in a patient with no history of epilepsy); Maggioni et al.⁴⁸ (2 cases of GTCs during MO). Conversely, in the 2 cases by Forderreuther et al.⁵⁴, headache preceded seizure by “several hours”.

3.3. Headache followed by an epileptic seizure (pre-ictal headache)

has been reported in studies of seizure-associated headache: 11 of 100 cases of refractory focal epilepsy,³⁴ “headache beginning within the hour before...the [epileptic] seizure” in 4 of 115 patients, 64 of whom had migraine-like headache⁵⁴; “headache that had lasted more than 10 min before the onset of overt seizure” in 26 of 169 patients, not less than 10 with migrainous features⁵⁶; “headache occurring during the 30 min or longer prior to a seizure and lasted until the onset of seizure” in 33 of 39 children and adolescents with features of migraine without aura (and in 3 with migraine with aura).⁵⁷ These cases were collected in interviews, without ictal EEG, therefore we cannot know if in some cases headache was the first sign of the epileptic seizure, that is an “epileptic headache followed by other seizure manifestations”, as in Section 2.2.

It might be noted that, in the migraine–epileptic seizure sequence, no cases of migraine preceded by types other than visual aura have been reported: it should, however, be underlined that other types of aura are not frequent in migraine.

In opposition to the previous conditions, the occurrence of headache with seizures of occipital origin, beginning with visual symptoms, followed by headache and consecutively by other epileptic manifestations, is well known and has been reported both in the idiopathic form, the “benign occipital epilepsy”^{58–60} and in symptomatic cases with occipital lobe lesion⁶¹ or transitory abnormalities inside the occipital lobe.⁶² In these cases, apart from the fact that EEG epileptic features are present from the onset of symptoms, aura and headache are both of short duration, with other epileptic manifestations following headache without interruption. It is to be maintained that events with this rapid sequence “visual symptoms–migraine–other epileptic manifestations” are seizures having occipital origin, even when ictal EEG is not available.

However, the above-cited data from the literature show that a non-epileptic headache or a migraine attack beginning with or without visual aura, may occasionally be followed by an epileptic seizure. Conventionally, the epileptic seizure must occur after an interval of less than 1 h from the onset of the aura or of the

headache, although some seem to also include 1 h after cessation of headache. In the case of the migraine with visual aura (the most frequent), we might hypothesize that activation of the occipital lobe during the aura, under favorable structural and/or occasional conditions, could trigger an epileptic seizure. A triggering action appears less probable, although still possible, if a delay of several hours occurs. Migraine with aura is associated with increased risk of developing seizures and epilepsy, while migraine without aura is not, according to Ludvigsson et al.⁶³. A triggering effect of migraine, rather than an occasional association, is particularly suggested in cases lacking a history of epilepsy.

Migraine with visual aura and occipital epileptic seizures share a common site of origin with probably partially similar electrophysiological mechanisms. The several cases reported seem to confirm the possible presence of epileptic seizures triggered by migraine attacks without aura. This suggests two possibilities: (1) in some subjects, other areas are activated by migraine and (2) sometimes migrainous occipital activation does not evoke the perception of visual symptoms by the patient.

The relationships between migraine and epilepsy are also shown by the reverse condition: *migraine attack triggered by an occipital-lobe seizure*. This is a *post-ictal* headache with symptoms similar to spontaneous migraine. It has been reported in 2 patients following occipital lobe seizures,⁶⁴ and the literature available for post-ictal headache indicates a not-infrequent activation of a migraine attack after an epileptic seizure in epileptic patients also suffering from inter-critical migraine.^{54–57,65}

The aforementioned data may give rise to suggestions with regard to denominations and definitions to be applied in view of a new classification:

Pre-ictal migraine, migraine-triggered seizure. *Diagnostic criteria:* A) *migraine attack fulfilling criteria for migraine with or without aura;* B) *a seizure fulfilling diagnostic criteria for one type of epileptic attack, occurring during or within (conventionally) 1 hour after cessation of the migraine attack.*

Pre-ictal headache is to be used when the criteria for migraine are not met.

It should be stated, however, that if the seizure occurs during or immediately after a migraine with aura, the probability of an occipital-lobe seizure is very high, and that the presence or absence of EEG abnormalities concomitant with headache remains the main criterion of differentiation.

The preferential use of the terms “migraine-triggered seizure” or “pre-ictal migraine” depends on the possibility of actually demonstrating whether or not migraine plays a role in precipitating an epileptic seizure.

4. Conclusions

Aside from the “post-ictal” headache and the comorbidity with “interictal” headache, the relationship between headache (including migraine) and epilepsy comprises (1) *epileptic headache*, in an isolated (pure) form or as the first symptom of an epileptic seizure, frequently of occipital origin in the case of migraine with visual aura, and (2) *pre-ictal migraine or headache*, whose role in triggering an epileptic seizure remains to be defined.

The condition known as “hemicrania epileptica” appears to be a rare expression of epileptic headache. The term “migralepsy” has not been used univocally and should probably be abandoned.

We hope the aforesaid definitions we inferred from the analysis of the cases reported in the literature may serve as a guide for an up-to-date of the terminology concerning this topic.

Conflict of interest

None of the authors has any conflict of interest to disclose.

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