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Visual Symptoms with Headache Mimicking Migraine in Focal Parieto-Occipital Lobe Epilepsy: Case Report and Literature Review

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Abstract

We present a rare case with parieto-occipital lobe epilepsy which might mimic a migraine with aura. The 41-year old patient presented with high frequency unilateral migraine like headaches and a transient right homonymous visual field loss, confirmed by visual field testing, which was filled with bright homogenous red and yellow colors, which changed every 30 to 60s. The EEG showed an ictal pattern starting in the parieto-occipital cortex and the MRI identified a lesion in the left precuneus. The criteria to dissociate parieto-occipital lobe epilepsy and migraine are reviewed in context of the case.

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Introduction

Migraine with aura (classic migraine) is a common paroxysmal disease [1] and presents with positive and negative visual symptoms usually before the headache[2]. The criteria for a migraine are defined by the International Headache Society (ICHD-3 beta)[3]. In contrast, focal parieto-occipital lobe epilepsy is less common but can also presents with very similar visual symptoms and also with migraine like headaches [4]. The aim of this case report is to provide an in depth analysis of the symptoms and a literature review in order to dissociate between the two entities, migraine with aura and partial parieto-occipital lobe epilepsy by clinical means. This is very important to identify such patients which are seen and examined during the asymptomatic interval.

Migraine and epilepsy might even coexist, without being risk factor for each other. In certain forms of epilepsy such as benign occipital epilepsy, benign rolandic epilepsy and cortico-reticular epilepsy the incidence of migraine is increased. Even seizures have been reported to occur during or after a migraineous aura and are often referred to as 'migralepsy' and are classified by the IHS (ICHD-3 beta) [3,5,6]. Those cases, however, are rare and the epilepsy syndromes mentioned above are not considered in this paper.

Medical History

The 41-year old Caucasian male presented in February 2015 with acute intermittent incomplete visual loss lasting for short periods of up to one minute duration, three to five times daily. During the periods he reported a homonymous right visual loss which was filled with homogenous bright red which slowly changed, every 30-60s, to yellow colors and vice versa. There were no other colors, scintillating scotomas, black and white dots or other visual phenomena reported. Just seconds before, during and after the scotomas he reported left occipital severe pounding headache and facial pain. The headache was not improved at rest and there were no light-, sound intolerance or other neurological symptoms. Seizures were treated with antiepileptic drugs and headache by anti-inflammatory drugs, e.g., acetylsalicylic acid and cortical steroids. In the premedical history he had diabetes mellitus type 2 treated with oral antidiabetic medication, with blood glucose levels within normal limits. He was on no other medications. There was no previous history of reduced sleep time, ethanol or other drug consumption.

He had already been admitted to the neurology department five years before, with similar visual symptoms. On the ward he developed focal epileptic seizures, with unilateral focal tonic-clonic convulsions of the right upper limb and also secondarily generalized tonic-clonic convulsion. Magnetic resonance imaging (MRI) showed an tissue defect in the precuneus left, just next to the occipital lobe at the parieto-occipital sulcus (Figure 1A and 1B). He was treated with sodium valproate and afterwards with topiramate which he himself discontinued after dismissal.

Examinations

The current neurologic and to neuro-ophthalmologic examination was unremarkable except of an intermittent homonymous macula-sparing hemianopia to the right on confrontation visual field test. In between and during the seizures he had unremarkable visual acuity (uncorrected right and left eye: 20/20), color vision (Ishiara's tests, Kanehara Trading INC., Tokyo, Japan) and stereo acuity (Stereotest, Stereo Optical Co.Inc., Chicago, USA). The pupil diameter was 4 mm in both eyes.

Routine electroencephalogram (System Plus, Micromed SpA, Italy) showed high frequency, low amplitude oscillations starting over the left parieto-occipital lobe (Figure 1C, arrow) spreading to adjacent cortical areas and to the contralesional hemisphere, while the frequency decreased and the amplitude increased. During this time the patient reported an isolated homonymous hemianopia with bright reddish colors even with the eyes closed. In a follow up examination during a period without visual symptoms or headache electroencephalogram was unremarkable.

A sequence of routine visual field test by a perimeter (Octopus Perimeter 1-2-3, Haag-Streit, Koeniz, Switzerland; program GTX;

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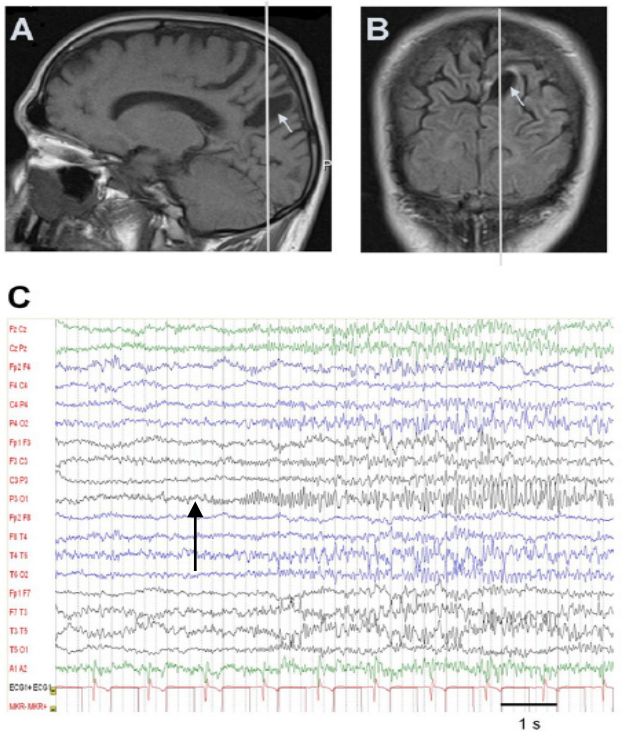

Figure 1: Cranial MRI in a sagittal slice, T1 weighted (A) and a coronar slice, FLAIR, (B) shows a lesion indicated by the arrow within the precuneus with only minor gliosis. White lines in (A) indicate the section of (B) and vice versa. In (C) the EEG traces are presented. A high frequency oscillatory activity (arrow) is observed in P3-O1, which is accompanied by a headache and very bright reddish hemianopia to the right.

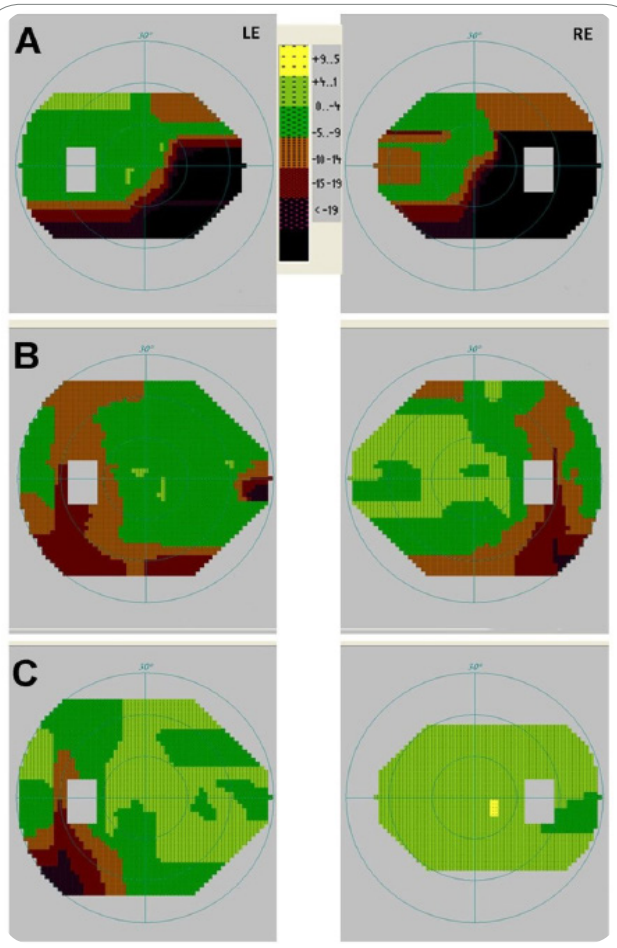

Figure 2: Shown are the visual field testing results by perimeter (color coded, s. legend in A) of the right (RE) and left (LE) eye. A to C present the results during the epileptic seizure which lasted for hours (A), three days after the initiation of a drug therapy with levetiracetam, 500mg two times daily (B) and four weeks after the patient stopped the drug therapy (C). At the time of perimetry shown in Figure 2B and 2C the patient reported no symptoms anymore.

further processed with Peridata Software, GmbH, Huerth, Germany. were performed as the visual symptoms of increased consecutively in duration from 30-60s to hours. During the time of epileptic activity in the EEG we found a homonymous hemianopia to the right and an additional homonymous defect in the left lower quadrant (Figure 2A). 20 minutes after ingestion of 1mg lorazepam, the defect was slightly decreased, and after drug treatment with levetiracetam (500mg two times daily) over a period of three days there was only a small visual field defect found (Figur 2B). A follow up after four weeks, with medication discontinued by the patient himself, showed only minor deficits in the lower temporal quadrant of the left eye (Figur 2C). At this stage the patient did not report any symptoms anymore and the EEG was unremarkable except an intermittent theta-slowing right temporal.

Discussion

We present a rare case of parieto-occipital lobe epilepsy with seizures with positive and negative visual symptoms and headache. The diagnosis of epilepsy was based on the past medical history, the typical ictal electroencephalographic patterns and a defined tissue defect in the MRI. In fact epileptiform discharges had been documented in the other cases of ictal blindness as well. These discharges were located in the occipital, posterior area [7-9] or propagated to the temporal, parietal lobe respectively [9]. There is nearly no other case of such a disease carefully assessed by quantitative visual field testing in a perimeter in literature. In only one of the published cases we have found a reference that a sequence of perimeter visual field testings were used to assess hemianopia during and in between the seizures [10]. They had reported a 34-years old woman with ictal and post-ictal right hemianopia and episodic visual hallucinations eight days after liver transplant surgery as a result of simple partial seizures.

In the following we will discuss the visual symptoms, headaches, time course of the symptoms, treatment and associated symptoms with respect to the literature to better dissociate the symptoms in classic migraine and parieto-occipital lobe epilepsy. Table 1 compares the visual symptoms, headaches and associated symptoms in the two diseases in detail and Table 2 presents a summary of the reported cases of relevant parieto-occipital lobe epilepsy in literature.

Visual symptoms

Two forms of visual symptoms are generally reported in migraine and occipital and parietal lobe epilepsy: negative (scotoma) and positive visual symptoms (colors, light flashes, scintillating scotoma and elementary hallucinations, defined as flashes, colored lights, stars, wheels or triangles [11,12]) which mostly are simultaneously present. Negative and positive visual symptoms are often combined in migraine and in parieto-occipital lobe epilepsy within the scotoma. An overview of the visual symptoms described in literature is summarized in Table 1 and Table 2.

Symptoms Group	Occipital Seizures	Migraine with visual Aura
Positive visual signs	-Multicolored and circular configuration	-Blinking black or bright dots
		-Zigzag lines
Negative visual signs	-Blindness occurring beside hallucinations or as a solitary symptom of the seizure	-Hemianopsia
Duration of visual disorder	-Seconds up to minutes	-Minutes to 1 hour
	-In case of a series or status lasting up to hours or days	
Headache		
Affected side	-Ictal or postictal Headache with ipsilateral seizure pattern on scalp EEG	-Unilateral
		-Side alteration
Quality	-Mild to severe of tension or pounding character	-Often severe of pounding character
Duration	-30 minutes to 1 hour	- 4-72 hours
Associated symptoms	-Other types of aura or seizures as cause of spreading to adjacent cortices	-Unilateral dysesthesia, dysphasia, hemiparesis or other neurologic deficits
	-Impairment of consciousness	- Impairment of consciousness is untypically
	-Vomiting could accompanied headache	-Intolerance of light or noise
		-Vomiting and improvement after laying down

Table 1: Comparison of visual aura and headache regarding occipital seizures respectively migraine (modified after Panayiotopoulos et al., Table 1, p. 256, [20])

Negative symptoms are often hard to test by visual field perimeter testing, as they are too short lived for such measurements. Therefore, negative visual symptoms are not characterized well in the literature. In our patient the symptoms persisted during prolonged seizures and could be monitored by visual field testing as a quantitative measurement of the drug therapy. Muro et al. [8] and Hussain et al.[13] had reported cases of children presenting visual field defects due to epileptic seizures. Similar cases had been described by others [7,14,15]. However, there are a few publications of children as well as adults which predominantly reported on negative visual symptoms in partial epileptic seizures [7-10,13,16,17]. In migraine negative symptoms are better characterized and often occur within the area of the positive symptoms [2].

Positive visual symptoms might dissociate much better between the migraine and the epileptic aura. Panayiotopoulos studied the main characteristics to distinguish between visual auras caused by migraine versus partial occipital seizures [18-20]. A comparison of 50 patients with migraine and 20 patients with occipital epileptic seizures distinguished between both diseases based on visual symptoms [18]. In epileptic seizures, visual phenomena exhibits predominantly multicolored configuration with circular or spherical patterns. When associated with migraine they are often described as black and white linear patterns [18]. In a view of three cases visual hallucinations in migraine are defined as homonymous bright or dark areas or are described as zigzag lines expanding outwards with or without scotoma. Occipital seizures with visual symptoms are characterized as multicolored or circular [20].

Interestingly, in our case we found a negative scotoma ipsi- and contralateral (Figure 2A) to the epileptic focus (EEG and lesion in MRI) which was filled with a homogenous color which slowly changed from bright red to yellow colors every 30s to 60s. Our patient did not report other visual symptoms as multicolored, circular or elementary hallucinations.

The duration of visual auras differ in migraine and in partial seizures. In migraine visual auras last in general about 15 to 60 minutes whereas occipital seizures usually last less than one minute [21]. In the reported cases visual auras lasted for a few seconds to minutes and mainly consisted of positive visual phenomena [20]. In another series of cases reported by the same author the duration was only reported for case 2 lasting for 10-30 seconds [18]. In our case the duration for each attack was from one minute to hours. These criteria did not help to distinguish migraine and occipital lobe epilepsy.

In migraine there is usually a clear sequence of a slowly built up of the visual aura, which moves across the visual field and is followed by the migraine headache immediately or within a short time. However, the aura could evolve fast and only during the headache. To qualify for a aura the visual symptoms should exceed a time duration of 5 minutes [6]. In epilepsy the aura develops much faster within seconds and is usually of shorter duration [4]. As in our patient the aura might also persist for hours.

Headaches

Headache could occur as a typically sign in occipital epilepsy [8,18-20]. In Table 2 the cases in literature with parieto-occipital lobe epilepsy and headache are described. The link between headache and epilepsy had been discussed by others before [21-23] and also occurs in the guidelines of the International Headache Society [3,24]. They differentiate between a pre-ictal, ictal (e.g.,'Hemicrania epileptica'), and post-ictal headaches. Often migraine like headaches are reported in epilepsy [25]. The criteria

Authors	Age at onset/ Sex	Positive visual symptoms	Negative visual symptoms	Headache
Barry et al. 1985 [7] Cases 1-5 Abstract only	• 13-74/ N. m.	• N. m.	• Complete blindness (3/5) • Homonymous hemianopsia (2/5)	• N. o.
Zung et al. 1993 [13] Abstract only	• 7/ M	• N. m.	• Complete blindness	• N. o.
Panayiotopoulos CP. 1994 [9]				
• Case 1	• 9/ F	• Visual hallucinations	• N. m.	• Severe unilateral
				• "pressure behind one eye"
• Case 2	• 10/ M	• Visual hallucinations	• Complete blindness	• N. o.
• Case 3	• 22/ M	• N. s.	• N. s.	• N. o.
• Case 4	• 36/ M	• N. s.	• N. s.	• N. o.
Gilliam et al. 1995 [2] Patients 7	• 4 (mean)	• N. m.	• Amaurosis	• N. o.
Shahar et al. 1996 [12]	• M (7)	• Colorful wandering dots (1)	• Complete blindness (11)	• N. o.
Patients 11	• F (4)		• Status amauroticus (1)	
3/ 11 generalized epilepsy	• 3 months – 12 years		• Recurrent episodes of blindness(7)	
Panayiotopoulos et al. 1997 [11]				
• Case 1	• 8/ M	• Visual hallucinations	• N. m.	• Postictal severe
• Case 2	• 7/ M	• Visual hallucinations	• N. m.	• Postictal
• Case 3	• 17/ M	• Visual hallucinations	• N. m.	• bitemporal
Panayiotopoulos CP 1999 [10]				
Patients 1-9		• Visual hallucinations (9/9)	• Blindness (Patients 1,3, and 5) • Hemianopsia (Patients 3,4 and 8)	• Postictal moderate till severe
• 1	• 11/ M			
• 2	• 9/ F			
• 3	• 10/ M			
• 4	• 8/ M			
• 5	• 7/ M			
• 6	• 12/ F			
• 7	• 14/ M			
• 8	• 12/ M			
• 9	• 25/ M			
Hadjikoutis et al. 2003 [6]	• 61/ M	• N. m.	• Bilateral visual loss	• N. o.
Ghosh et al. 2010 [1]	• 34/ F	• N. m.	• Homonymous hemianopsia with macular sparing	• N. o.
Hussain et al. 2012 [8]	• 4/ F	• N. m.	• Visual loss	• observed
Shaw et al. 2012 [4]				
• Case 1	• 65/ M	• N. m.	• Right homonymous hemianopsia	• N. o.
• Case 2	• 36/ M	• N. m.	• Right homonymous hemianopsia	• N. o.
• Case 3	• 35/ M	• N.m.	• Left homonymous hemianopsia	• N. o.
			• Extension of baseline left quadrantanopsia	
Muro et al. 2013 [3]				
• Case 1	• 15/ M	• N. m.	• Status amauroticus	• Bifrontal
• Case 2	• 10/ F	• N. m.	• Status amauroticus	• Bifrontal

Table 2: Literature review. Legend: N. m. – not mentioned, N.o. – not observed, F – female, M – male, N. s. – not specified.

are mostly based on the presence of other signs and symptoms of epilepsy and the rapid time course of the start of the headache.

Our patient suffered from the same pounding headache and facial pain shortly before during and after the visual symptoms. This led us to differentiate between pre-ictal, ictal and post-ictal headache. According to the International Headache Society the symptoms of the ictal headache did nearly fit the criteria of 'Hemicrania epileptica': headache of pounding quality occurred during the seizure and the affected side correlated with an ipsilateral ictal discharge in scalp electroencephalogram. This kind of headache resolved after seizures stopped or under a medical treatment with antiepileptic drugs.

Post-ictal headache seems to occur most often in occipital lobe epilepsy [26-31]. Studies which compared the phenomenon of headache after focal epileptic seizures in different focal epileptic syndromes suggest that the occurrence depends on the cortical area which is involved in seizure generation. Wang et al. [26] investigated the incidence of post-ictal headache of 854 patients with partial epilepsy using a questionnaire regarding headache. They studied 466 patients with temporal lobe, 82 patients with occipital lobe and 306 patients with frontal lobe epilepsy. Post-ictal headache occurred in 328 of the patients. The incidence of post-ictal headache in occipital lobe epilepsy was higher than in temporal lobe and frontal lobe epilepsy. Also the treatment of the headaches with different medications does not dissociate the disease.

Medication as ASS in the attacks reduced headache in our patient but does not help to distinguish migraine from occipital lobe epilepsy. Headache duration and character of the pain does not really help to dissociate migraine from occipital/ parietal epilepsy (Table 1).

Other parameters

The immediate relief of the symptoms treated with antiepileptic medication, as in our case with lorazepam, sodium valproate and topiramate might indicate an epileptogenic etiology. Furthermore, e.g. sodium valproate as dexamethasone might relief acute migraine aura symptoms [32]. Certain anti-epileptic drugs are used in the in chronic treatment of migraine and could accordingly not dissociate migraine from epilepsy [33]. One way to dissociate classic migraine and occipital lobe epilepsy are accompanying symptoms which are summarized in Table1.

Conclusion

To dissociate the overlapping symptoms of headache and visual aura in focal epilepsy and classic migraine the visual phenomenon itself might be the best choice in addition to the accompanying symptoms, if present at all. In contrast to migraine auras, which are mostly a combination of positive (blinking black or bright dots, expanding Zigzag lines) and negative visual symptoms which evolve slowly over the hemifield over minutes, in parieto-occipital lobe epilepsy the positive symptoms are multicolored and circular configured and elementary hallucinations, which often evolve in seconds to minutes, but might persist for hours. As in our case also slowly oscillating bright red colors are a sign of an epileptic seizure. Perimeter tests are helpful, to monitor symptoms and drug therapeutic effects, if the scotoma persists long enough to be measured. The positive symptoms can't be quantified by this method but on grounds of a good medical history. We conclude that a detailed and careful medical and premedical history of the symptoms might dissociate both diseases if the seizure is not document during an EEG recording.

Competing Interests

The authors have declared that no competing interests exist.

Author Contributions

Both the author substantially contributed to the study conception and design as well as the acquisition and interpretation of the data and drafting the manuscript.

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