**Epileptic seizure prodromes.**

**Clinical studies.**

**Abstracts**

1

**Mood change preceding epileptic seizures; Blanchet, Paulette; Frommer, Gabriel P; 1986**

Mood ratings were obtained for at least 56 days from 27 patients with diverse forms of epilepsy, 13 of whom suffered at least one seizure over the course of the study. For these 13 patients, mean ratings of mood on eight of the 10 scales showed a decline on the day(s) preceding the seizure and an increase after the seizure. Data from six patients accounted for most of the decline. Decline was most prominent on the Depression, Anxiety, Freedom, and Anger Scales. One patient's mood ratings rose significantly before seizures. Comments recorded before the seizures confirmed the decline in mood preceding seizures and showed an increase in negative life events for the patients whose mood declined before seizures. The relations of life events and mood to seizures apparently did not depend on each other.

2

**Seizure prediction and recall; DuBois, J M; Boylan, L S; Shikyo, M; Barr, W B et al; 2010**

Using separate generalized mixed-effects models, we assessed seizure recall and prediction, as well as contributing diagnostic variables, in 83 adult patients with epilepsy undergoing video/EEG monitoring. The model revealed that when participants predicted a seizure, probability equaled 0.320 (95% CI: 0.149–0.558), a significant (P < 0.05) increase over negative predictions (0.151, 95% CI: 0.71–0.228]). With no seizure, the rate of remembering was approximately 0.130 (95% CI: 0.73–0.219), increasing significantly to 0.628 (95% CI: 0.439 to 0.784) when a seizure occurred (P < 0.001). Of the variables analyzed, only inpatient seizure rate influenced predictability (P < 0.001) or recollection (P < 0.001). These models reveal that patients were highly aware of their seizures, and in many cases, were able to make accurate predictions, for which seizure rate may be an important factor.

3

**Multi-Center Study on Migraine and Seizure-Related Headache in Patients with Epilepsy; HELP (Headache in Epilepsy) Work Group; 2010**

Purpose The purpose of this study is to investigate the frequency and characteristics of migraine and seizure-related headache (SRH) according to the criteria of the International Headache Society.

Materials and Methods A questionnaire was undertaken at the initial evaluation of newly referred patients from 32 epilepsy clinics.

Results Of a total of 597 patients, 74 (12.4%) patients had migraine. Age at the onset of epilepsy was lower in patients with migraine than in those without. Twenty-six (4.4%), nine (1.5%), and 146 (24.5%) patients experienced prodromal, ictal, and postictal SRH, respectively (n = 169, 28.3%). A pain intensity of prodromal and postictal SRH was 6.1 ± 1.5 (SD) and 6.3 ± 1.9 (SD) on the visual analogue scale, and their duration was 12.6 ± 26.7 (SD) hours and 9.0 ± 17.4 (SD) hours, respectively. Age at the onset of epilepsy was lower in patients with SRH than in those without, and the risk of occurrence of SRH was significantly greater in patients with longer epilepsy duration. SRH could be classified as a type of migraine in 46.2% of patients with prodromal SRH and in 36.3% of patients with postictal SRH. Prodromal SRH occurred more frequently and was more likely to be a migraine-type in patients with migraine compared with those without. Postictal SRH occurred more frequently and was more likely to be a migraine-type in patients with migraine.

Conclusion This study suggests that SRH is a frequent accompanying symptom of epileptic seizures causing major impairment in daily life, and migraine is an important comorbidity of epilepsy, affecting the incidence and characteristics of SRH.

4

**Clinical features of the pre-ictal state: Mood changes and premonitory symptoms; Haut, Sheryl R; Hall, Charles B; Borkowski, Thomas et al; 2012**

Identifying the pre-ictal state clinically would improve our understanding of seizure onset and suggest opportunities for new treatments. In our previous paper-diary study, increased stress and less sleep predicted seizures. Utilizing electronic diaries, we expanded this investigation. Variables were identified by their association with subsequent seizure using logit-normal random effects models fit by maximum likelihood. Nineteen subjects with localization-related epilepsy kept e-diaries for 12–14 weeks and reported 244 eligible seizures. In univariate models, several mood items and ten premonitory features were associated with increased odds of seizure over 12 h. In multivariate models, a 10-point improvement in total mood decreased seizure risk by 25% (OR 0.75, CI 0.61–0.91, p = 004) while each additional significant premonitory feature increased seizure risk by nearly 25% (OR 1.24, CI 1.13–1.35, p < 001) over 12 h. Pre-ictal changes in mood and premonitory features may predict seizure occurrence and suggest a role for behavioral intervention and pre-emptive therapy in epilepsy.

5

**Modelling seizure self-prediction: An e-diary study; Haut, Sheryl R; Hall, Charles B; Borkowski, Thomas et al; 2013**

Purpose: A subset of patients with epilepsy successfully self-predicted seizures in a paper diary study. We conducted an e-diary study to ensure that prediction precedes seizures, and to characterize the prodromal features and time windows that underlie self-prediction.

Methods: Subjects 18 or older with localization-related epilepsy (LRE) and ≥3 seizures per month maintained an e-diary, reporting a.m./p.m. data daily, including mood, premonitory symptoms, and all seizures. Self-prediction was rated by, “How likely are you to experience a seizure (time frame)?” Five choices ranged from almost certain (>95% chance) to very unlikely. Relative odds of seizure (odds ratio, OR) within time frames was examined using Poisson models with log normal random effects to adjust for multiple observations.

Key Findings: Nineteen subjects reported 244 eligible seizures. OR for prediction choices within 6 h was as high as 9.31 (CI 1.92–45.23) for “almost certain.” Prediction was most robust within 6 h of diary entry, and remained significant up to 12 h. For nine best predictors, average sensitivity was 50%. Older age contributed to successful self-prediction, and self-prediction appeared to be driven by mood and premonitory symptoms. In multivariate modeling of seizure occurrence, self-prediction (2.84; CI 1.68–4.81), favorable change in mood (0.82; CI 0.67–0.99), and number of premonitory symptoms (1.11; CI 1.00–1.24) were significant.

Significance: Some persons with epilepsy can self-predict seizures. In these individuals, the odds of a seizure following a positive prediction are high. Predictions were robust, not attributable to recall bias, and were related to self-awareness of mood and premonitory features. The 6-h prediction window is suitable for the development of preemptive therapy.

6

**Can patients with epilepsy predict their seizures?; Haut, Sheryl R; Hall, Charles B; LeValley, Arron J et al; 2007**

Objective: To examine seizure predictability in a cohort of adult patients using a prospective seizure diary study, to assess the validity of a patient's predictions, and to determine if a subgroup of patients with epilepsy were able to reliably predict their seizures.

Methods: Eligible subjects were 18 or older, had localization-related epilepsy, had ≥1 seizure within 12 months, and were able to self-maintain a seizure diary. Seizure self-prediction was assessed by a rating scale: “Do you think you will have a seizure in the next 24 hours?” Seizure prediction and seizure occurrence were modeled as binary outcomes. OR, positive predictive value, and negative predictive value were calculated for group and individuals, adjusted for the within person correlations.

Results: Seventy-one subjects returned 15,635 diary entries. A positive prediction of seizures was associated with a twofold increased risk of seizure (Cochran-Mantel-Haenszel OR 2.25 (1.91 to 2.65). Overall, the specificity of positive prediction was 83.2% while the sensitivity was 31.9%. Twelve subjects (21% of subjects who had seizures) demonstrated significant within person OR; Cochran-Mantel-Haenszel OR for positive prediction in this predictor subgroup 3.14 (2.53 to 3.89). Predictors were younger (p = 0.026) and had a higher seizure rate (p = 0.003) than nonpredictors.

Conclusions: A significant subgroup of our adult patients with epilepsy were able to self-predict their seizures, which may yield novel therapeutic opportunities.

7

**Seizure occurrence: Precipitants and prediction; Haut, Sheryl R; Hall, Charles B; Masur, Jonathan et al; 2007**

Objective: To explore the relationship of seizure occurrence with candidate seizure precipitants in a prospective diary study, and to determine the relationship of precipitants to seizure self-prediction.

Methods: Eligible subjects were 18 or older, had localization-related epilepsy, at least one seizure within 12 months, and were able to maintain a daily diary. Information collected included the occurrence, time and characteristics of all seizures, hours of sleep, medication compliance, stress, anxiety, alcohol use, menstruation, and seizure self-prediction. Each night, subjects reported their estimate of the likelihood of a seizure the next day (self-prediction). Logit-normal models with a random subject-specific intercept were used to estimate an OR for the association of precipitants with seizure occurrence.

Results: Seventy-one subjects returned 15,179 complete diary days. For each hour of increased sleep on the preceding night, the relative odds of a seizure the following day decreased (OR 0.91, 95% CI 0.82, 0.99). One-unit increments of stress and anxiety (on a 10-point scale) were associated with an increased risk of seizure the following day (OR 1.06, 95% CI 1.01, 1.12 and OR 1.07; 95% CI 1.02, 1.12). With self-prediction included in the model, self-prediction (OR 3.7; 95% CI 1.8, 7.2) and hours of sleep for the night prior to the seizure (OR 0.90; 95% CI 0.82, 0.99) remained significant.

Conclusion: Lack of sleep and higher self-reported stress and anxiety levels were associated with seizure occurrence. In a model that included self-prediction, less sleep, and self-prediction had significant effects, whereas stress and anxiety did not. The psychological and biologic mechanisms which link stress and anxiety to self-prediction of seizures requires further exploration. Ultimately, seizure prediction based on precipitants, premonitory features, and self-prediction may provide a foundation for preemptive treatment.

8

**Periictal and interictal headache including migraine in Dutch patients with epilepsy: A cross-sectional study; Hofstra, W A; Hageman, G; de Weerd, A W; 2015**

As early as in 1898, it was noted that there was a need to find “a plausible explanation of the long recognized affinities of migraine and epilepsy”. However, results of recent studies are clearly conflicting on this matter. In this cross-sectional study, we aimed to define the prevalence and characteristics of both seizure-related and interictal headaches in patients with epilepsy (5–75 years) seeking help in the tertiary epilepsy clinic SEIN in Zwolle. Using a questionnaire, subjects were surveyed on the existence of headaches including characteristics, duration, severity, and accompanying symptoms. Furthermore, details on epilepsy were retrieved from medical records (e.g., syndrome, seizure frequency, and use of drugs). Diagnoses of migraine, tension-type headache, or unclassifiable headache were made based on criteria of the International Classification of Headache Disorders. Between March and December 2013, 29 children and 226 adults were evaluated, 73% of whom indicated having current headaches, which is significantly more often when compared with the general population (p &lt; 0.001). Forty-nine percent indicated having solely interictal headache, while 29% had solely seizure-related headaches and 22% had both. Migraine occurs significantly more often in people with epilepsy in comparison with the general population (p &lt; 0.001), and the occurrence of tension-type headaches conforms to results in the general population. These results show that current headaches are a significantly more frequent problem amongst people with epilepsy than in people without epilepsy. When comparing migraine prevalence, this is significantly higher in the population of patients with epilepsy.

9

**Premonitory symptoms in epilepsy; Hughes, J; Devinsky, O; Feldmann, E; Bromfield, E; 1993**

We studied premonitory symptoms in 128 patients with partial and 20 patients with primary generalized epilepsy. Sixty symptoms were reported by 43 (29%) patients, all of whom had partial seizure disorders (P < .01). Symptoms began at least 30 minutes before seizure onset, lasted 10 minutes to 3 days, and were continuous. Irritability, depression, headache, 'funny feeling', and confusion were the most common symptoms. Premonitory symptoms are a warning system in some patients and may permit therapeutic interventions.

10

**Perceived self-control of seizures in patients with uncontrolled partial epilepsy; Lee, S A; No, Y J; 2005**

Many patients with epilepsy have warning symptoms prior to seizure onset, and some of these individuals report the ability to abort or prevent these seizures. We investigated the clinical characteristics of perceived self-control of seizures in 174 patients with uncontrolled partial epilepsy. The warning symptoms were categorized as premonitory (prodrome) and as initial symptoms of simple partial seizure onset, depending on the relationship between the warning events and the ensuing seizures. About 50% of the patients with simple partial seizure onset and about 70% of those with prodrome or premonitory symptoms reported that they could abort or prevent their seizures by various self-developed techniques. Patients who attempted to abort or prevent their seizures reported success rates as high as 80%. The proportion of patients with secondary generalized seizures was significantly lower in patients who tried to abort their seizures than in those who did not (p<0.05). The ability to prevent seizures was significantly higher in patients with brain lesions on MRI than in those without lesions (p<0.05). These results suggest that spontaneously developed methods are helpful in controlling seizures in some patients with uncontrolled partial epilepsy and that the potential success of self-control methods may be influenced by structural abnormalities on brain MRI.

Are prodromes preictal events: A prospective PDA-based study; Maiwald, Thomas; Blumberg, Julie; Timmer, Jens et al; 2011

Up to 29% of patients with epilepsy report prodromal sensations more than 30minutes prior to seizures. We developed and implemented an objective methodology to prospectively assess the sensitivity and specificity of these subjective experiences using personal digital assistants (PDAs). The key property, in contrast to paper-based diaries, is the internal recording of the patient's entering time of prodromes and seizures. Of 500 patients with epilepsy interviewed, 31 claimed to sense prodromal symptoms at least 30minutes before seizure onset. Eleven of them agreed to participate in a 4-week study to objectively measure their prospective prediction performance. In 9 patients returning data, the majority of prodrome entries were not followed by seizures or were identified only retrospectively. Statistical analysis revealed that no patient could outperform a nonspecific random predictor when predicting seizures based on the occurrence of prodromes, and that the group performance matched precisely the expected result for a by-chance prediction. These results question the predictive value of prodromes and the specificity of their occurrence in the preictal period.

11

**Interictal dysphoric disorder and periictal dysphoric symptoms in patients with epilepsy; Mula, Marco; Jauch, Regina; Cavanna, Andrea et al; 2010**

Purpose:  The issue of phenomenology of mood disorders in epilepsy still remains controversial. It has been suggested that a subgroup of patients may develop an affective syndrome also known as interictal dysphoric disorder (IDD). However, the number of behavioral changes that may occur around the ictus needs to be taken into account for an accurate distinction between “true” psychiatric phenomenology and periictal phenomena. This study aimed at identifying clinical correlates of the IDD, with special attention to the relationship between symptoms and seizures.

Methods:  A sample of 142 consecutive adult outpatients with epilepsy were assessed using the Interictal Dysphoric Disorder Inventory (IDDI), a 38-item, self-report questionnaire specifically developed to evaluate presence and severity of IDD symptoms as well as their habitual association with seizures (coded as before, after, during, or when seizure-free) and their duration.

Results:  IDD was diagnosed in 31 subjects but symptoms showed a clear-cut relationship with epileptic seizures in 54.8% of cases, leading to an operative distinction between true IDD and periictal dysphoric symptoms (PDS). There was no significant difference among patients with IDD, PDS, or those without psychopathology. In the IDD group, symptoms were chronic and unremitting in one-third of cases, with labile affective symptoms being correlated with age at onset of seizures (rho = −0.612, p = 0.020) and duration of the epilepsy (rho = 0.833, p < 0.001).

Discussion:  An operative distinction between IDD and PDS bears the opportunity to identify different clinical endophenotypes that may have different prognoses and require different treatment strategies.

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**Clinical characterization of the pre-ictal state in the pediatric population: A caretaker’s perspective; Patel, P; Ferastraoaru, V; Gold, D; Lipnick, A et al; 2017**

The unpredictability of seizures causes distress to patients with epilepsy and their caretakers. To date, no studies have explored seizure prediction specifically in the pediatric population. If the period of time preceding a seizure can be reliably identified, either by child or caretaker, there may be a role for pre-emptive interventions. The aim of this study was to investigate caretaker seizure prediction. A questionnaire was distributed to caretakers of patients with epilepsy. The patients were 0-21years old and experienced >/=1 seizure within the past year. We excluded patients with non-epileptic seizures or daily seizures. One hundred and fifty of 240 questionnaires met criteria. Of these, 32 (21.6%) caretakers indicated a positive report of seizure prediction. Age of seizure onset was earlier in the positive predictive group (3.3+/-3.3years) than in the non-predictor group (5.3+/-4.8years) (p=0.01). The most common pre-ictal symptoms reported were being tired, hazy look, and sleepiness. A total of 76.6% of caretakers reported at least one seizure precipitant. The prevalence of positive caretaker seizure prediction in this study is similar to that of seizure self-prediction in adult studies. These findings will be used to design prospective online or electronic diary studies to further investigate the caretaker's, as well as children's, perspectives on seizure prediction. We anticipate that this investigation may lead to novel treatments during times of high seizure risk.

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**Seizure anticipation: Are neurophenomenological approaches able to detect preictal symptoms?; Petitmengin, Claire; Baulac, Michel; Navarro, Vincent; 2006**

Analysis of electroencephalographic signals and several brain imaging studies suggest that a preictal state precedes the onset of seizures. In this study, we used phenomenological strategies to detect modifications in patients’ experience before their seizures. We observed that patients with partial epilepsy feeling an aura (n = 9) frequently experienced prodromes (n = 6). Prodromes were subtle preictal symptoms, varying among patients and having common negative features. They were generally continuous before seizures and could last hours, whereas auras were sudden and intermittent. All patients were able to recognize facilitating factors. We also found that patients spontaneously develop cognitive countermeasures to avoid facilitating factors (n = 6), to prevent a seizure (n = 1) or to interrupt a seizure (n = 5). Prodromes are not specific enough for clinical use, but could refine the behavioral strategies used in the treatment of epilepsy and the pathophysiology of the preictal state.

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**The lived experience of initial symptoms of and factors triggering epileptic seizures; Pinikahana, Jaya; Dono, Joanne; 2009**

The aim of this study was to document the self-perception of initial symptoms of and factors triggering epileptic seizures in a sample of people with epilepsy (PWE) and their carers. Among 600 participants, questionnaires were returned by 309 (51.5%), of whom 72.8% were PWE and 27.2% were carers and others. Experiencing at least one symptom prior to a seizure was reported by 86.9% of PWE and 74% of carers. The most common symptoms were a funny feeling, confusion, and anxiety. Experiencing one trigger that resulted in a seizure was reported by 89.8% of PWE and 85.5% of carers. The most common triggers were tiredness, stress, and sleep deprivation. Among PWE and their carers, 63.6% and 51.3%, respectively, indicated that they can tell when a seizure is about to occur, and 26.7% and 15.4%, respectively, indicated that they felt they could stop a seizure. The most common techniques were resting, medication, and relaxation.

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**Initial symptoms, precipitant factors, and techniques to control epileptic seizures: The carer’s perspective; Pinikahana, Jaya; Dono, Joanne; 2009**

Subjective experiences of seizures and events that occur prior to seizures may be useful in assisting health professionals to devise treatment plans tailored to the individual. The aim of this study was to investigate carers? knowledge of their patients? preseizure activity. Of 240 questionnaires mailed out to registrants on an epilepsy research database, 78 were anonymously returned (32.5%). Participants were aged between 18 and 89, with a mean age of 50.94years (SD=17.23), and 82.1% were female. Of 78 participants, 74.4% reported that their patients experienced at least one symptom prior to a seizure, 88.5% reported that their patients experienced at least one seizure as a result of a specific event, and 56.4% reported that their patients had tried at least one technique to stop a seizure. The rates reported are comparable to those reported in other studies measuring responses from people with epilepsy.

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**Hungarian multicentre epidemiologic study of the warning and initial symptoms (prodrome, aura) of epileptic seizures; Rajna, P; Clemens, B; Csibri, E; Dobos, E; Geregely, A et al; 1997**

We carried out a Hungarian multicentre study to assess the frequency of the occurrence of warning symptoms preceding epileptic seizure. The data of 562 patients with epilepsy out of a total of 1124 were analysed on the basis of questionnaires filled in under standard conditions. About 50% of the patients experienced warning symptoms before a smaller or greater part of their seizures . Their appearance was fairly consistent and became mainly manifested in the form of headache, epigastric sensation and dysphoria. In relation to epileptological basic data, it was found that warning symptoms appeared primarily in focal epilepsies and among them they mainly preceded generalized tonic clonic and complex partial seizures. Between the warning symptom and the onset of the seizure there was usually a longer interval during which (and generally also during the warning symptom) the patient remained able to act. About 20% of the patients enrolled in the study tried to inhibit the onset or mitigate the course of the seizure and about 10% judged their spontaneous activity carried out in that direction to be successful. The frequency of the occurrence of independent prognostic symptoms not followed by a seizure was relatively low, and among epileptics with warning symptoms the incidence of seizures occurring without a preceding event was not high either. Based on our experiences, we have drawn the conclusion that, in a significant part of epileptic patients, the warning symptoms render possible the supplementation of the therapy by the development of seizure-inhibiting or seizure-avoiding behaviour or activity.

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**Prodromal symptoms in epileptic patients: Clinical characterization of the pre-ictal phase; Scaramelli, Alejandro; Braga, Patricia; Avellanal, Andrea et al; 2009**

Although recent advances in seizure anticipation have been achieved with the development of several biomathematical electroencephalographic (EEG) methods, pre-ictal clinical phenomena have not been extensively investigated. The aim of the study was to thoroughly analyze premonitory or prodromal symptoms (PS) in a randomly selected sample of 100 adult epileptic patients. A semi-structured protocol was used for in-person interviews to both patients and observers. PS were found in 39% of patients, the most frequent ones being behavioral, cognitive and mood changes. Both patients with focal and generalized epilepsies reported prodromes, although they were more frequently found in the former group. PS were mostly perceived preceding complex partial and generalized tonic?clonic seizures. Prodromal symptoms were reported to have an insidious onset and their duration ranged from 30min to several hours. The potential value of prodromes in seizure anticipation would allow the use of preventive and therapeutic measures, including drugs, neurostimulation procedures and behavioral intervention.

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**Seizure anticipation by patients with focal and generalized epilepsy: A multicentre assessment of premonitory symptoms; Schulze-Bonhage, Andreas; Kurth, Christoph; Carius, Astrid et al; 2006**

Purpose

To assess subjective seizure anticipation in patients with focal and generalized epilepsy.

Methods

Five hundred consecutively recruited out-patients (251 male, 249 female, mean age 38.1 year) from three German tertiary epilepsy referral centres filled out questionnaires regarding subjective anticipation of seizures by at least 30 min and to timing and semiologic characteristics of their premonitory symptoms versus those of ictal phenomena. Patients were not regarded as having prodromi if the semiology of symptoms reported long before a seizure was identical to auras.

Results

6.2% of patients reported that they were able to anticipate seizures. Premonitory symptoms were classified as stereotyped in all but one patient. An intraindividual semiologic analysis showed that the majority of these patients had symptoms, which were distinct from ictal experiences during auras. Seizure anticipation was reported both by patients with focal and idiopathic generalized epilepsy. The median estimated time interval between occurrence of premonitory symptoms and seizure onset was 90 min.

Conclusions

This study gives evidence that both patients with focal and idiopathic generalized epilepsy may subjectively anticipate the occurrence of epileptic seizures. Premonitory symptoms are distinct from auras in terms of semiology and time of occurrence. The lower percentage of patients regarded as having premonitory symptoms as compared to some earlier reports may be related to stricter criteria and to the exclusion of auras, which could directly evolve into seizures, and other ictal events. Premonitory symptoms occur at similar periods prior to seizures as anticipatory EEG-changes have been reported using methods from time series analysis.

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**Subjective and objective premonitory symptoms as epileptic prodromes; Sue, Hironari; Miyamoto, Chikako; Iwasaki, Hiroshi et al; 2009**

To investigate the prevalence of epileptic prodromes, 293 subjects with epilepsy, rang- ing in age from 12 to 72 years, were inter- viewed. Sixty subjects (20.5%) had general- ized epilepsies and 233 (79.5%) had localiza- tion-related epilepsies. Twenty-one subjects (7.2%) were found to have experienced pro- dromes. These prodromes were classified as “subjective” if the subject himself or herself perceived them, or “objective” if the subject’s family or friends noted the symptoms while the subject did not. Although it is necessary to differentiate between a prodrome and a simple partial seizure, it is important to recognize the prodrome as an anticipating factor of an epi- leptic incident.

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**Affect in patients with epilepsy undergoing video/EEG monitoring: Retrospective versus momentary assessment and temporal relationship to seizures; Willard, Kristen S; Licht, Barbera G; Gilmore, Robin L; 2006**

This study was designed to (1) compare retrospective and momentary assessments of mood/affect, and (2) examine the temporal relationship between affect and seizure occurrence. Patients with epilepsy undergoing long-term video/EEG monitoring (LTM) completed an affect rating of how they felt “at that moment” each time a programmed watch beeped (momentary assessment); these ratings were averaged across each patient’s hospital stay. Prior to discharge, patients were asked to think back and rate how they felt “during their hospital stay” using the same rating scale (retrospective assessment). Results indicated that patients retrospectively recalled feeling significantly more positive during their LTM than they reported feeling when they were actually undergoing LTM. Among patients who had EEG-verified seizures, momentary assessments were used to compare affect during the interictal periods with affect during the prodromal and postictal periods. The latter two periods were characterized by significantly less activated positive affect than were the interictal periods.

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**Peri-ictal behavioural change in people with an intellectual disability; York, Jessica; Kerr, Mike; 2014**

The purpose of this article is twofold. Firstly we review the knowledge on peri-ictal behaviour change and its importance in people with an intellectual disability. Secondly we explore methods of identifying peri-ictal behaviour change in people with an intellectual disability through data from a pilot project. The literature search identified a clear association between seizure activity and behaviour change in people with epilepsy and no intellectual disability; but for people with intellectual disability research is scarce and conflicting. The pilot project provided data on three individuals. This showed behavioural inconsistencies from one month to the next independent of seizure activity. There is a sparsity of research on peri-ictal behaviour change pertaining to individuals with intellectual disabilities and epilepsy. Further research into this area is needed to clearly ascertain the presence (or not) of an association between epilepsy and behavioural changes in people with intellectual disabilities. Novel methodology specific to people with an intellectual disability should be considered. One such methodology would be an extended period of descriptive analysis in the form of a prospective single case design.

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**Pre-ictal psychiatric symptoms; Mula, M (2012)**

Pre-ictal psychiatric symptoms usually consist of cluster of symptoms preceding seizures of variable duration, ranging from a few minutes up to three days. Such symptoms, although not characterized by any detectable surface EEG change, probably represent the expression of underlying epileptic activity. Around one third of patients with partial seizures report premonitory symptoms, usually before secondary generalized tonic-clonic seizures. Prodromal moods of depression or irritability may occur hours to days before a seizure and are often relieved by the convulsion.

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**Premonitory features and seizure self-prediction: Artifact or real?; Schluze-Bonhage, Andreas; Haut, Sheryl (2011)**

Seizure prediction is currently largely investigated by means of EEG analyses. We here report on evidence available on the ability of epilepsy patients themselves to predict seizures either by means of subjective experiences (“prodromes”), apparent awareness of precipitants, or a feeling of impending seizure (self-prediction). These data have been collected prospectively by paper or electronic diaries. Whereas evidence for a predictive value of prodromes is missing, some patients nevertheless can forsee impending seizures above chance level. Relevant cues and practical implications are discussed.

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**Ictal and periictal headache in children with epilepsy – Correlation woth type of seizures and EEG-changes; Zawadzka, M; Szmuda, M; Matheisel, A et al; 2015**

Data from the literature show that 34–47% patients with epilepsy suffer from periictal, mainly postictal headache. There are poor information about correlations between type of headache with children's age and sex, type of seizures, type of eeg changes, localization of headaches and differentiation if the headache is preictal, ictal or postictal in children. The aim of the study was to evaluate the frequency of the preictal, ictal and postictal headaches in children with epilepsy and correlation between these symptoms with types of seizures and changes in eeg. The prospective study conducted in the Department of Developmental Neurology in Medical University of Gdańsk, include 30 patients, 6–17 years old, with diagnose of epilepsy (according to ILAE criteria) and periictal headaches. The study group was divided into three subgroups according to the headache: preictal, ictal or postictal. In 76% children focal seizures, in 40% secondary generalized and in 16% primary generalized seizures were observed. 73% patients suffered from postictal headache, ictal headache occurred very rarely (7%). The mean intensity of the pain measured with the VAS scale was 6.5. We found the correlation between lateralization of headache and interictal changes in eeg in patients with focal seizures. The frequency of periictal headaches correlates with type of seizures and type of changes in eeg.

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**Epileptic prodromes: Are they nonconvulsive status epilepticus?; Alving, Jørgen; Beniczky, Sándor; 2013**

Purpose: The aim of this study was to assess how frequently prodromes occur in an adult patient group from a tertiary referral epilepsy centre and to investigate the EEG changes during the prodromes.

Methods: 578 consecutive patients were interviewed on subjective phenomena, experiences heralding the seizures, for at least 30 min before the start of the seizure. EEGs were recorded during the prodromes.

Results: Ten out of 490 included patients had prodromes (2%). We were able to record EEG during prodromes in 6 patients. Three patients had EEG changes corresponding to nonconvulsive status epilepticus. Three patients had unrevealing EEG recordings during prodromes.

Conclusion: Our results suggest that at least in a part of the patients, the prodromes are actually ictal phenomena, and should be treated as nonconvulsive status epilepticus.