Video-EEG monitoring in childhood and juvenile absence seizures

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ABSTRACT

Absence seizures are episodes of temporary loss of consciousness that may be accompanied by automatisms, changes in postural tone, mild clonic components or autonomic phenomena. The aim of our study is to correlate between clinical events and EEG finding during video-EEG monitoring. Patients and Methods: Our study was done on a series of 25 patients with typical AS. They were all neurologically normal. We classified them into two groups: Group I: CAE included 17 patients, 4 (23.5%) were controlled or asymptomatic for at least one year at the time of the study and 13 (76.5%) uncontrolled (suffering from absences at the time of the study). Group II: JAE included 8 patients, 5 (62.5%) controlled, and 3 (37.5%) uncontrolled. All patients underwent a detailed clinical history, together with general and neurological examination. The Video-EEG/EMG monitoring was done for 4 hours during daytime. Results: It was found that there is a significant difference between the type of absence described by the patients or relatives and that obtained with Video-EEG monitoring. Also EEG was abnormal in 20 (80%) patients and normal in 5 (20%) remaining which belonged to the controlled group with a significant difference between controlled and uncontrolled group. Conclusion: We conclude that video-EEG study can reveal the exact clinical characteristics and the frequency of the AS and compare it with the EEG data, which can help for proper diagnosis and follow up. (Egypt J. Neurol. Psychiat. Neurosurg., 2004, 41(1): 115-132).

INTRODUCTION

Absence seizures (AS) are classically defined as episodes of temporary loss of consciousness that may be accompanied by automatisms, changes in postural tone, myoclonic jerks or autonomic phenomena. The attacks are neither associated with auras nor post-ictal abnormalities characteristic of other types of seizures.1,2

Absence seizures may be seen in a variety of epileptic syndromes in childhood. Identification of the specific syndrome is important to determine medical prognosis.3

The typical electroencephalogram (EEG) feature consists of generalized, high amplitude, anteriorly predominant 3Hz spike and wave discharges2. The etiology of the AS at a biochemical level is unknown, but there is evidence of a genetic predisposition. Some animal studies suggest that an abnormality in the GABAergic activity may underlie the absence epilepsy.4,5,6,7

Efforts to further specify the nature of the AS have been intertwined with the concurrent effort to define epileptic syndromes in which the AS is an integral part. The Commission on Classification and Terminology of the International League Against Epilepsy (ILAE) recognizes four epileptic syndromes with typical AS8.
Each of the various syndromes has its own special variant on the EEG characteristics of the classic form. It is the syndrome classification that is most meaningful in diagnosis, treatment and prognosis.9,2,10

Despite its clear clinical and EEG characteristics, AS are frequently unrecognized or misdiagnosed with other types of seizures specially the complex partial seizures or with other causes of loss of consciousness.9,11,12,13

The use of video-EEG in the diagnosis of epileptic syndromes, especially absence epileptic syndromes, is an invaluable tool.14,2,15

The differentiation between typical and atypical absence attacks clinically and electrophysiologically, the description in some studies of sustained focal discharges associated to AS or the different responses to the treatment of patients classified under the same syndrome, are some of the points that keep the debate still open in many aspects of the diagnosis and classification of the AS.16,17,18,19,20

**PATIENTS AND METHODS**

**Patients**

This study was carried out on a 25 patients with typical absence seizures as defined by the Commission on the Classification and Terminology of the International League Against Epilepsy 8. These patients were diagnosed as having CAE and JAE.

**Inclusion criteria** (criteria were chosen according to the International League Against Epilepsy Proposal for Revised Classification of Epilepsies and Epileptic Syndromes, as reviewed by Loiseau21 and Wolf22):

1. A form of epilepsy with an onset between 4 and 10 years (CAE), or between 9 and 17 (JAE).
2. Occurring in previously mentally and neurologically normal children.
3. Absence Seizures as the initial type of seizure.
4. Very frequent absence seizures.
5. The presence of GTC seizures were accepted only if they developed later in the course of the disease.
6. Absence Seizures associated in the EEG with bilateral, symmetric, and synchronous discharge of regular 3 per second spike and wave complex on a normal background activity for age. Less regular spike-wave activity was possible, when compatible with a diagnosis of typical absence.

**Exclusion criteria:**

1. The presence of absence seizures associated with slow spike and wave complexes (less than 3 Hz/sec)
2. Patients with delayed development or retardation
3. Patients with structural brain abnormalities evidenced by CT or MRI
4. The presence of other seizure types such as GTC seizures prior to the onset of the absences.
5. Abnormal background activity.

Patients were classified into two groups based on clinical grounds:

**Group 1:** CAE included 17 patients, 4 (23.5%) were Controlled or asymptomatic for at least one year at the time of the study and 13(76.5%) uncontrolled
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(suffering from absences at the time of the study).

**Group II:** JAE included 8 patients, 5 (62.5%) controlled, and 3 (37.5%) uncontrolled.

**Methods:**

**a) Clinical history and examination:**

All patients underwent a detailed clinical history. The interview with their relatives was especially useful, as the patient is unable to describe the event.

We stressed on several points including the age at onset of the symptoms, its frequency, the associated symptoms and signs, the presence of other seizure types, precipitating factors, treatment and in the controlled group how long the patient was free of seizures.

The frequency of the seizures was classified in three groups: not daily, frequent (>10/day) and intermediate. A general and neurological examination was carried out in all patients.

**b) I.Q.:**

Neuropsychological assessment was performed by means of an I.Q. (Intelligence quotient) assessment using Wechsler Mental Measurement and Weschler Intelligence Scale for Children.

**c) Electrophysiological studies:**

Video-EEG/EMG monitoring was done for 4 hours during daytime. During this period provocations were done by means of hyperventilation for 3 minutes and photic stimulation with increasing frequency from 5 to 25 Hz.

During hyperventilation the patients were instructed to do breath counting in order to test cognitive impairment.

Patients were requested to keep their eyes closed all through the study to properly assess the oculomotor phenomena occurring during the absences.

To be able to perform sleep records the patients were instructed to come to the study following sleep deprivation.

Dantec paperless EEG equipment version 5.1, a Panasonic video and a digital video-camera were used for the video-EEG/EMG monitoring. EEG/EMG signals and patient’s picture were both time-locked and simultaneously recorded.

EEG electrodes were placed on the patient’s head according to the international 10-20 system using a cap to which the electrodes are adherent. EMG electrodes were placed on both orbicularis oculi in order to monitor the eye movements during the absence attack and an additional one on the cervical paraspinal muscles to assess possible retropulsive movements.

**EEG signals were analyzed throughout to study:**

* Background activity
* Presence of focalities
* Presence of subcortical discharges

**We further analyzed the subcortical discharges looking for:**

* Presence of the subcortical discharges spontaneously, during hyperventilation, during photic stimulation and during sleep.
* Type of the discharge (formed of spike and wave, polyspike and wave complexes or polyspike)
* Duration
* Frequency of the s-w complexes, specifying the frequency in the beginning of the discharge and at the end (intradischarge frequency variation)
* Amplitude of the discharge comparing its value in the anterior and posterior regions and over both hemispheres.
We carefully monitored all the clinical changes associated with the EEG discharges. According to them the absence seizures were classified as:

1. **Simple typical absence**: with impairment of consciousness, with speech arrest or slowing speech, and with or without oculomotor phenomena.
2. **Complex typical absence**: accompanied by automatisms, changes in postural tone, myoclonic jerks, autonomic phenomena or behavioral changes.

**d) Statistical Methodology:**

An IBM compatible PC was used to store and analyze the data and to produce graphic presentation of important results. Calculations were done by means of statistical software package namely SPSS windows (V8).

Data were tabulated and statistically analyzed to evaluate the difference between the groups under study as regard the various parameters. Together, correlations and associations were tried in between the essential studied parameters.

**RESULTS**

This study included 25 patients with typical absence seizures. Seventeen were diagnosed as having CAE (68%) and 8 had JAE (32%). Fourteen patients slept during the recording.

Descriptive data, comparative study between the patients with CAE and JAE was done regarding clinical data and electrophysiological studies.

Descriptive data and comparative study between the sleep and awake EEG record of those patients who slept during the study.

**Clinical data**

1. **Age of the patients**:
   The age of the patients ranged from 4 to 25 years with a mean age of 12±6.4. The age of the patients diagnosed as having CAE ranged from 4 to 25, with a mean age of 11±6.2, and those diagnosed as JAE it ranged from 10 to 25 with a mean age of 15.9±4.6, there was a significant difference between these two groups (p<0.05).

2. **Sex of patients**:
   Among those patients diagnosed as having CAE 9 were females and 8 were males; of those diagnosed as JAE 6 were female and 2 male there were no significant difference between males and females (p>0.05).

3. **Educational level**:
   Nineteen of our patients were still attending school, completed primary school or going to the nursery, 3 were in college, and 3 were illiterate, with no significant difference between the two groups.

4. **Age at onset of the absence seizures**:
   The age at onset of the patients with CAE range from 4 to 8, with JAE it ranged from 9 to 14.

5. **Duration of the symptoms**:
   The duration of the symptoms in those patients with CAE ranged from 3 months to 17 years with a mean of 3.7±5.6 and in those diagnosed as having JAE from 1 to 3 years with a mean of 1.97±0.8. There was no significant difference between the two groups.

6. **Family history and consanguinity**:
   Positive family history of epilepsy was found in 5 of the 25 patient (20%). Of those patients 2 had CAE and 3 had JAE. Positive consanguinity was found in 5 cases, 4 of these patients had CAE and 1 JAE, with no statistical significant difference.

7. **Frequency of absence per day**:
   Nine patients had frequent (>10/day) absences, 5 not daily and 2 intermediate frequency. There was not significant difference between the patients with CAE and JAE.
8. Presence of GTC seizures:
History of GTC seizures was positive in four patients (16%). One of them had CAE and the other 3 had JAE with a significant difference between the patients with CAE and JAE (p<0.05).

9. Age at onset of the GTC seizures:
Patient (5): 8 years
Patient (9): 13 years
Patient (18): 16 years
Patient (22): 14 years
In the four patients the GTC seizures were controlled at the time of the study.

10. I.Q.
The I.Q. level of the patients ranged from 86 to 106 with mean of 97.2±5.3 SD. There was no significant difference between the patients with CAE and JAE.

11. Precipitating factors:
Six patients stated the presence of precipitating factors, these were either fatigue in 5 patient or menses in 1 patient.

12. Neurological examination:
All patients had normal neurological examination

13. CT scan:
CT scan was performed in one patient who has a focal discharge on the EEG. The neuroimaging study was normal.

14. Treatment:
Twenty one patients (84%) were receiving treatment, 11 (44%) were having Depakine, 8 (32%) Convulex, and 2 (8%) Tegretol. Four patients (16%) were not receiving any treatment.

15. Type of absence (tables 1, 2, 3, 4)
The absence seizures were described by the patients or their relatives as episodes of sudden onset of blank stare, unresponsiveness and motionless, as if the patient was “disconnected”.
In those patients with CAE complex absence was more common than simple absence while the opposite applied to the patients with JAE, but there was no statistically significant difference.
The difference between the type of absence described by the patients or relatives and that obtained with the video-EEG monitoring study was statistically significant.

Electrophysiological study:

1. EEG abnormalities
EEG was abnormal in 20 (80%) patients and normal in the 5 (20%) remaining. There was a significant difference between the controlled and uncontrolled group.

2. Background
Background activity was considered normal for age in all the cases

3. Presence of focalities
A focal discharge was present in one of the patients who belonged to the CAE group.

4. Presence and type of subcortical discharges (table 5)
Eighteen patients (72%) had subcortical discharges while awake spontaneously as well as during hyperventilation and 2 patients 8(%) during hyperventilation only. One patient had subcortical discharges during photic stimulation as well as spontaneously and during hyperventilation. The discharges during photic stimulation were not associated with clinical seizures. It was found a significant difference between the controlled and uncontrolled group.
Nineteen patients (76%) had subcortical discharges in the form of spike-and-wave complexes and one (4%) as polyspike-and-wave complexes, this last patient belonged to the controlled group.

5. Number of discharges per hour
The number of discharges per hour during the recording while the patient was awake ranged from 3 to 28, there
was no significant difference between those patients with CAE and those with JAE.

6. **Symmetry of the discharges (table 6)**
   Among the patients who had subcortical discharges sixteen (64%) had discharges with similar amplitude in both hemispheres and 4 (16%) were asymmetric. There was a significant difference between the controlled and uncontrolled group.

7. **Frequency of the s-w complexes (table 7)**
   The frequency ranged from 3 to 4 Hz, the most common being those discharges with a frequency of 3Hz, followed by 3.5 Hz.
   All discharges showed a gradual decrease in the frequency of the s-w complexes towards the end of the discharge. This frequency ranged from 2-3 Hz.

8. **Duration of the discharges**
   The duration of the discharges in the patients with CAE ranged from 1 to 27 seconds and in the JAE group, from 1 to 33 seconds, there was no significant difference between these two groups.

9. **Amplitude of the s-w complexes (table 8)**
   Maximal amplitude was in the frontal region and the minimal in the posterior regions in all the discharges studied.

10. **EMG findings**
    EMG electrodes placed on the neck of the patients did not record any activity during the ictal EEG paroxysms to evidence the presence of retropulsive movements.
    The EMG activity recorded from the electrodes applied to monitor the eye movements was obscured by the presence the high amplitude s-w complexes displayed during the paroxysms.

**Sleep record:**
Fourteen patients slept during the recording and we compared their sleep records with those during wakefulness as regard the following data:

1. **Presence and type of subcortical discharges**
   All patients had subcortical discharges during sleep in the form of s-w complexes, ps-w complexes or polyspikes. During NREM sleep the discharges were repeated in a periodic or quasiperiodic manner.
   There was a statistically high significant difference (p<0.01) between these two groups (awake and sleep records) as regard the presence of ps-w complexes and ps discharges.

2. **Frequency of the discharges**
   The number of discharges per hour during the sleep record was higher than while the patient was awake with a statistically significant difference (P<0.05).

3. **Duration of the discharges**
   The duration of the discharges was longer while the patient was awake with a highly statistically significant difference (p<0.01).

4. **Amplitude of the s-w complexes**
   As in the awake record the maximal amplitude was frontal. Both in the anterior and posterior regions the amplitude was higher in the awake record than during sleep but with no statistically significant difference.

5. **Frequency of the s-w complexes (table 9)**
   The frequency of the spike and wave complexes ranged from 2 to 4 Hz and the most prevalent one was that of 3 Hz.
Correlation between different clinical and EEG parameters:
1. There was not association between age, sex, family history of epilepsy, consanguinity, I.Q., treatment or the presence of G.T.C. seizures with the frequency of absence per day, the type of absence, the duration of the discharge, or the amplitude of the discharge.
2. There was no association between the I.Q. and duration of symptoms and the frequency of the absences per day or the type of absence.
3. Table 10 shows that there was a statistically significant association between the duration of the discharges and the presence of simple or complex absences.
4. Table (11) demonstrates the association between the duration of the discharges and the presence of absences. All the discharges longer than 5 seconds were always associated with absence attacks whereas only 25.5% of the discharges shorter than 5 second were associated clinically with absences.

Table 1. Types of absence among the symptomatic patients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symptomatic patients No. = 18</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Simple absence</td>
<td>7</td>
</tr>
<tr>
<td>Complex absence</td>
<td>11</td>
</tr>
</tbody>
</table>

Fisher’s exact test (p) >0.05 not significant

Table 2. Difference between symptomatic CAE and JAE as regard type of absence

<table>
<thead>
<tr>
<th>Type of absence</th>
<th>CAE N = 14</th>
<th>JAE N = 4</th>
<th>X2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>4 (28.6%)</td>
<td>3 (75%)</td>
<td>1.1</td>
<td>&gt;0.05 not significant</td>
</tr>
<tr>
<td>Complex</td>
<td>10 (71.4%)</td>
<td>1 (25%)</td>
<td>2.2</td>
<td>&gt;0.05 not significant</td>
</tr>
</tbody>
</table>

Table 3. Types of absence among the symptomatic patients.

<table>
<thead>
<tr>
<th>Types of absence</th>
<th>Symptomatic patients No. = 18</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Simple absence with oculomotor phenomena</td>
<td>4</td>
</tr>
<tr>
<td>Simple absence without oculomotor phenomena</td>
<td>3</td>
</tr>
<tr>
<td>Absence with automatism</td>
<td>8</td>
</tr>
<tr>
<td>Absence with mild clonic components</td>
<td>7</td>
</tr>
<tr>
<td>Absence with autonomic phenomena (micturation)</td>
<td>1</td>
</tr>
<tr>
<td>Absence with decrease postural tone</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 4. Types of absences obtained from clinical history and documented by video-EEG monitoring.

<table>
<thead>
<tr>
<th>Type of absence</th>
<th>Clinical history</th>
<th>Video-EEG monitoring</th>
<th>X2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.A. with oculomotor phenomena</td>
<td>7</td>
<td>4</td>
<td>12.89</td>
<td>P &lt; 0.05 (significant)</td>
</tr>
<tr>
<td>S.A. without oculomotor phenomena</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.A. with automatism</td>
<td>2</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.A. with mild clonic components</td>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.A with autonomic phenomena</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.A with decrease postural tone</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No absences</td>
<td>9</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Distribution of subcortical discharges among the uncontrolled and controlled groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Uncontrolled N = 16</th>
<th>Controlled N = 9</th>
<th>X2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>S-W spontaneous</td>
<td>16</td>
<td>100%</td>
<td>3</td>
<td>33.3%</td>
</tr>
<tr>
<td>S-W H.V</td>
<td>16</td>
<td>100%</td>
<td>4</td>
<td>44.2%</td>
</tr>
<tr>
<td>S-W Ph.S</td>
<td>1</td>
<td>6.3%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Ps-W Spontaneous</td>
<td>0</td>
<td>0%</td>
<td>1</td>
<td>11.1%</td>
</tr>
</tbody>
</table>

Table 6. Difference between the uncontrolled and controlled groups as regard the symmetry of the discharges

<table>
<thead>
<tr>
<th>Variable</th>
<th>Uncontrolled N = 16</th>
<th>Controlled N = 9</th>
<th>X2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Symmetry:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symmetric</td>
<td>13</td>
<td>81.25%</td>
<td>3</td>
<td>33.3%</td>
</tr>
<tr>
<td>Asymmetric</td>
<td>3</td>
<td>18.75%</td>
<td>1</td>
<td>11.1%</td>
</tr>
</tbody>
</table>
Table 7. Distribution of the frequencies of the S-W complex among the CAE and JAE groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>CAE</th>
<th>JAE</th>
<th>X2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 17</td>
<td>N = 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of the S-W complex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>14 (82.4%)</td>
<td>4 (50%)</td>
<td>2.8</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Absent</td>
<td>3 (17.6%)</td>
<td>4 (50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>9 (52.9%)</td>
<td>4 (50%)</td>
<td>9.4</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Absent</td>
<td>8 (47.1%)</td>
<td>4 (50%)</td>
<td></td>
<td>highly significant</td>
</tr>
<tr>
<td>4 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>2 (11.8%)</td>
<td>0 (100%)</td>
<td>1.02</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Absent</td>
<td>15 (88.2%)</td>
<td>8 (100%)</td>
<td></td>
<td>not significant</td>
</tr>
</tbody>
</table>

Table 8. Distribution of the amplitude of the S-W complex among the CAE and JAE groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>CAE Mean ± SD</th>
<th>JAE Mean ± SD</th>
<th>Z*</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior amplitude (μV)</td>
<td>830.5 ± 364.4</td>
<td>498 ± 128.5</td>
<td>3.2</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>highly significant</td>
</tr>
<tr>
<td>Posterior amplitude (μV)</td>
<td>408 ± 172.5</td>
<td>279 ± 96.2</td>
<td>2.01</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>significant</td>
</tr>
</tbody>
</table>

Mann Whitney Wilcoxon test was used instead of t-student test because of non parametric character of data (SD>25% of mean)

Table 9. Difference in the frequency of the S-W complex between the awake and sleep record.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Awake record No. 14</th>
<th>Sleep record No. 14</th>
<th>X2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-W at 2 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>--</td>
<td>2 (14.3%)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Absent</td>
<td>--</td>
<td>12 (85.7%)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>S-W at 2.5 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>--</td>
<td>5 (35.7%)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>Absent</td>
<td>--</td>
<td>9 (64.3%)</td>
<td></td>
<td>--</td>
</tr>
<tr>
<td>S-W at 3 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>13 (92.9%)</td>
<td>13 (92.9%)</td>
<td>0.08</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Absent</td>
<td>1 (7.1%)</td>
<td>1 (7.1%)</td>
<td></td>
<td>not significant</td>
</tr>
<tr>
<td>S-W at 3.5 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>8 (57.1%)</td>
<td>4 (28.6%)</td>
<td>0.7</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Absent</td>
<td>6 (42.9%)</td>
<td>10 (71.4%)</td>
<td></td>
<td>not significant</td>
</tr>
<tr>
<td>S-W at 4 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>1 (7.1%)</td>
<td>2 (14.3%)</td>
<td>6.5</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Absent</td>
<td>13 (92.9%)</td>
<td>12 (85.7%)</td>
<td></td>
<td>significant</td>
</tr>
</tbody>
</table>
Table 10. Correlation between duration of the discharges and the presence of simple and complex absence.

<table>
<thead>
<tr>
<th>Types of absence</th>
<th>Duration Mean ±SD</th>
<th>T value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>5.7 ± 1.2</td>
<td>15</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Complex</td>
<td>9.7 ± 4.7</td>
<td></td>
<td>highly significant</td>
</tr>
</tbody>
</table>

Table 11. Correlation between the duration of the discharges and the presence of absences.

<table>
<thead>
<tr>
<th>Absence</th>
<th>Duration of the discharge &gt;5 sec</th>
<th>Duration of the discharge &lt;5 sec</th>
<th>T value</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence positive</td>
<td>206</td>
<td>44</td>
<td>11.1</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Absence negative</td>
<td>0</td>
<td>128</td>
<td>15.6</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

DISCUSSION

Our work was carried out in series of patients with AS to further understand the clinical and EEG characteristics of this seizure type in order to establish a proper syndromic classification of the patient and so to adequately treat him and to predict the outcome. The sex distribution among the patients showed a female preponderance in agreement with the general view that absence seizures are more common in females. The ILAE states that males and females are equally affected in JAE but in some studies they have found a female preponderance whereas in others the incidence was higher in males.

The majority, 56.25%, of our uncontrolled patients had frequent absence seizures whereas 12.5% had an intermediate frequency and 31.25% not daily. Of the 3 patients with JAE only one had not daily absences in contrast to the opinion that in JAE the frequency of the absences is lower than that in CAE. Although the sporadic nature of AS in JAE has been stressed by the ILAE, several investigators have seen patients with frequent absence documented by video-EEG. According to Loiseau pyknoleptic AS does not exclude a diagnosis of JAE.

As it is seen in our series, the incidence of GTC seizures in JAE is higher than in CAE. Many studies state that the development of GTC seizures is related to the patient’s age at onset of the AS, being more frequent when the absence start at older age. Loiseau in 1995 reported in a series of 52...
patients with CAE and JAE, that only 16% of patients with age at onset <9 had generalized GTC versus 44% of those patients whose age at onset of the AS was >9. In contrast, other authors found no significant correlation between the age at onset of absence epilepsy and the eventual development of GTC seizures, instead they have pointed out the high proportion of patients with late onset of AS and without GTC seizures.

Family history of absence, GTC seizures or myoclonic seizures in first degree relatives has been associated with a lower rate of terminal remission. In a follow up study by Wirrell on 81 children with CAE found that 39% of those patients with a positive family history of epilepsy versus 74% of those without a positive family history outgrowing their epilepsy.

All the patients of our study had a normal neurological examination. The definition of the CAE and JAE syndromes states that the patients should be neurologically normal. I.Q. examination among our patients was average, patients with a deficient I.Q. were excluded from our study for the same reason stated above. A long term follow-up study of AS showed that normal I.Q. was a significant prognostic factor associated with cessation of absence seizures as well as other type of seizures.

There was not a significant difference between the uncontrolled and controlled group as regard the educational level. The majority of our patients was still in the school, with good or average performance, or completed their studies, three of them being in college. This is in agreement with several follow up studies that have shown that the patients “cope” with their attacks and continue having a normal life. In contrast others have stated that poor school performance due to inattentiveness was frequent in children with absence epilepsies.

And the psychosocial outcome is often poor, even in patients with more benign forms of absence epilepsy. Gastaut et al. in 1986 reported late onset psychomotor slowing with intellectual deterioration has been described to happen in up to one third of patients which seems to be related to the long term use of AED rather than the frequency of AS or presence of GTC.

In the present study C.T. scan was done in the patient who showed a focality in her EEG record, and it was normal. The presence of focalities with primary generalized epilepsies, including absence epilepsies have been reported and can not be explained by the presence of brain structural lesions. EEG focalities have been reported to range from low, 0.9%, to high, 4%, but we can not omit that studies done in normal population have notice the presence of focalities in up to 6%.

The response to the treatment within the first year of use of AEDs seems to be an important predictor for a favorable outcome. In a study done on 86 patients with CAE and JAE it was found that 81% of the group that had a good control of their seizures within the first year of AED treatment versus 30% of those not achieving seizure control in the first year experienced eventual remission. However Wirrel in 2003 stated that with childhood absence epilepsy, approximately two thirds of children can be expected to enter long-term remission, while in juvenile absence epilepsy, seizure control is often achieved, however, lifelong treatment is usually required.

Precipitating factors were only stated by 20% of our patients, the most common being fatigue. Several authors have described various precipitating factors such as anger, fear, lack of interest, hypoglycemia, school time among others. The lack of
recognition of precipitating factors can be explained because in most instances the patient or their relatives were not aware of the episode so they don’t associate it to any concomitant circumstance.

It is very interesting to compare the frequency of seizures as stated by the patients or their relatives and the frequency of the absence attacks that we documented in our video-EEG study, being an average of 5.6 per hour which is much higher than what the patients estimate. This difference can be explained first of all, by the fact that many absence attacks are not detected because the patient is not aware of the event and he does not recall it, and because many attacks are not noticed or at least not considered as an epileptic seizure by those who may be with the patient. Secondly, lack of concentration, drowsiness as well as times of transition to or from sleep have been described as increasing the number of absences, and our patients during the study were lying in a bed quietly and with their eyes closed.

During the video-EEG monitoring the patients were requested to keep their eyes closed in order to estimate the tonic opening of the eyes, which is present in most absences. As provocative measures we used photic stimulation and H.V. with the patient counting his breaths. All the patients of the uncontrolled group exhibited AS during hyperventilation. The breath counting at this time permitted us to assess the degree of impairment of consciousness.

Hyperventilation is described as the single most important provocative measure to induce absence seizures. Panayiotopoulos et al in 1992 proposed that patients with s-w paroxysms should be asked to count their breaths during hyperventilation. This may show slowing, discontinuity, errors, repetition or other sings of impairment of consciousness and speech which otherwise would escape recognition with the current practice established in EEG departments.

This method is sensitive (involves concentration, memory, recollection of learned experience, expressive speech and other cognitive functions), practical (easy to perform by the patient and easy to evaluate by the observer) and is clinically relevant (reflects impairment of day life performance).

EEG was abnormal in all uncontrolled patients and in four of the controlled group, which confirms that the control of seizures does not mean remission.

Seizure freedom has been defined as being seizure free with or without AED for > 1 year, and terminal remission was defined as being seizure free with normal EEG without AEDs > 1 year.

EEG registration shows substantially more typical AS paroxysms than patient express clinical seizures. The clinical relevance of possible EEG paroxysms in otherwise seizure free AS patients is not established. There are no pertinent data on the influence or outcome of these factors.

Background was normal in all the patients of our study. Some studies have included patients that showed abnormal background activity (defined as excessive slowing during the awake record), and they found that normal background was one of the most significant predictor factors for cessation of absence seizures.

Subcortical discharges in the form of bilateral, synchronous and symmetric spike and wave complexes were present in all our patients except in four, which had asymmetric discharges. Asymmetries of ictal or interictal discharges are frequent, mainly in treated patients.

We calculated the number of discharges per hour in each patient and we found that it...
ranged from 3 to 28. Among the uncontrolled group we compared the number of discharges per hour between the CAE and JAE patients and although it was lower in the group of JAE this difference was not statistically significant.

The amplitude of the discharges appeared to be always maximal in the frontal regions which is in accordance with all definitions of the paroxysmal discharges associated with generalized AS. When we compared the amplitude between the controlled and uncontrolled group we found that it was higher in the later group with a statistically significant difference. There was also a statistically significant difference in the amplitude of the discharges between the patients with CAE and JAE being higher among those patients with CAE. Despite the difference found in the amplitude among each patient, this parameter seemed to be stable in each patient without interdischarges differences unless we compared the paroxysms during hyperventilation and those occurring spontaneously. The amplitude was higher during hyperventilation although the difference was no statistically significant.

There was not available data in the literature as regard the amplitude of the s-w complexes to contrast with our findings. More stress should be made for further evaluation of this parameter.

The frequency of the discharges per hour was also significantly lower in the patients of the controlled group that still presented paroxysmal discharges of the EEG. This could signify the gradual remission. In 2 cases the paroxysms appeared only during hyperventilation in the other 2 the paroxysms also appeared spontaneously.

The frequency of the s-w complexes ranged from 3 to 4 Hz, being the most common 3 Hz in the controlled group as well as in the uncontrolled. Those with CEA exhibited more often a frequency of 3 Hz but in the JAE patients we found equally discharges with a frequency of 3 and 3.5 Hz. Some studies have shown s-w patterns with higher than 2.5-3.5 Hz in the non-pyknoleptic group but without statistically significant difference.

As regard the duration of the discharges it ranged from 1 to 33 seconds. The duration was longer during hyperventilation. When we compared the uncontrolled and controlled group there was a significant difference in the duration being shorter in the controlled group. There was not a significant difference in the duration when we considered the CAE and JAE patients. Some studies have shown that the discharges in those patients with JAE are longer but it has also been reported that ictal EEG discharges are shorter.

In our study it was found that AS detection and description obtained by video-EEG monitoring was superior than that obtained from the clinical history. Simple absence was less common than complex absences in our study. Since the advent of the video-EEG monitoring systems it was demonstrated that complex type of absences are more the rule than the exception. Janz in 1997 stated that complex type of absences were more common in pyknolepsy whereas simple absences were more common in the non-pyknoleptic group.

In our study those patients with CAE had more frequently complex absence than simple absence while those with JAE had more episodes of simple absence, but without a statistically significant difference. The two patients of the controlled group who experience absence seizures during the study these happened during hyperventilation and were simple absences.

The most frequent type of complex absence in our study was absence with
automatisms (44%) followed by absences with mild clonic components (38.9%) in the form of eye lid rhythmic blinking. In a simultaneous video-EEG recording of 374 seizures in 48 patients by Penry et al in 1975 it was found that almost 90% of the patients showed automatisms in at least one attack, 23% have automatisms in every absence and 71% have some type of mild clonic component.

We reported a relation between the duration of the discharges and the presence of simple and complex absences. The longer the duration of the discharge the higher the chance of the absence to be complex. This data fits with the findings of Penry et al.\textsuperscript{1}.

Fourteen of our patients slept during the study. This fact has allowed us to study the characteristics of their EEG record during sleep. We found a definite difference between the sleep and awaken record. First of all the discharges appeared more frequently, were of shorter duration and at times they appeared repeated in a periodic manner. The morphology of the s-w complexes was also different being more irregular and also ps-w complexes and ps discharges were present although they were not in the awake record of the same patient.

The frequency of the s-w complex was more variable with discharges with a s-w complex frequency that ranged from 2 to 4 Hz. The amplitude of the discharges was smaller than that of the awake record but the difference was not statistically significant.

All these findings are in agreement with the available data in the literature. It is well recognized that the frequency of the discharges increase during the NREM sleep and that the interdischarge interval decreases\textsuperscript{43}.

Also polyspike-wave and polyspike pattern replace the spike and wave pattern in the NREM sleep and the frequency of the waveform vary from 2 to 5Hz\textsuperscript{43,44}.

We did not record any clinical change associated with the discharges that happened during sleep.

There was not statistically significant association between: age, sex, family history of epilepsy, consanguinity, I.Q., treatment, the presence of GTC seizures or the duration of the symptoms, with the frequency of absences per day, type of absences, the duration of the discharges or the amplitude of the spike and wave complex.

The duration of the discharges was related to the presence of absence seizures clinically. All the discharges of 5 seconds or longer were associated with absences seizures clinically, whereas only 25% of the discharges lasting less than 5 seconds were associated with absences. Similar observations were reported by Niedermeyer in 1999\textsuperscript{45}.

The prognosis for remission of AS is a controversial subject because of differences in the selection of patients and duration of follow-up in different studies.\textsuperscript{23} The outcome of JAE has not been studied as it has been CAE. The assumption that CAE is a self limited, benign nature in contrast with JAE, which is a long life affliction is not supported by available data\textsuperscript{24}.

In our study 5 out of 9 patients of the controlled group had JAE and two of them still had subcortical discharges, of those one still experience AS during hyperventilation.

Outcome studies differ in the study populations, designs, seizure types and diagnostic criteria. This heterogeneity among studies limits the identification of prognostic factors\textsuperscript{38}.

There have been also reports that confirmed the presence of relapses in patients that have been controlled for sometime\textsuperscript{23,46}.
Several predictors of lack of remission have been pointed out, namely: cognitive difficulties, history of absence status, GTC seizures or myoclonic seizures after starting therapy, abnormal EEG background or family history of epilepsy in first degree relatives. The current prognostic concept about AE is not well defined but lies between the somewhat pessimistic view that the condition is not necessarily benign and not simple to treat and the optimistic but guarded view that AE is a relative benign disorder.

The use of long term video-EEG is the single most important diagnostic procedure in diagnosing typical absence seizures and related syndromes. It permits us to carefully study the clinical and EEG characteristics of the absence seizure. With this method we could objectively assess the frequency and the clinical characteristics of these attacks. As we have seen along the study neither the frequency of the episodes nor the clinical description is accurately perceived by the patients or their relatives.

The duration of the study, longer than a conventional EEG has increased the chances of appearance of any paroxysmal discharges with or without accompanying clinical manifestations. In this way, in four of the patients that were considered to be controlled it was proved the presence of paroxysmal discharges and even in two of them absence attacks were manifested during hyperventilation. Hyperventilation with breath counting permitted us to objectively assess the impairment of consciousness of the attack as it has been mentioned above.

With the long term video-EEG monitoring the chances of a patient to fall asleep are higher so that the sleep record could be analyzed to complete the information about the EEG characteristics of this type of seizures.

**REFERENCES**


الملخص العربي

الأنواع الغيبية هي حالات فقد مؤقت للوعي قد تصاحب بالقلق أو تغير في التوتر الوعائي أو مركب
أرججى بسيط أو ظواهر عادية.
يمكن تقسيم النوبات الغيبية إلى مجموعتين رئيسيتين نموذجية وغير نموذجية وتختلف المجموعتان في
المواطن الإكلينيكية وخصائص رسم المخ الكهربائي.
شملت هذه الدراسة خمسة وعشرون مريضا بالنوبات الغيبية النموذجية وكانوا جميعا معايقين من الناحية
العصبية وقد تم تقسيمهم إلى مجموعتين مجموعة النوبات الغيبية الصبانية وتشمل سبعة عشر مريضا
ومجموعة النوبات الغيبية الفنية وتشمل ثمان مرضى.
كشف رسم المخ الكهربائي المصورة الخصائص الإكلينيكية ومعدل تكرار النوبات الغيبية في كل مريض
بدقة. كما تمكنا من دراسة خواص رسم المخ الكهربائي ومقارنة كل المعلومات بين المجموعات التي شملتها
دراسة.
معظم النوبات الغيبية لمريضي هذه الدراسة كانت من النوع المركب ومساعدة بالقلق أو مركب
أرججى بسيط على شكل غامرات نسائية وهذه الخصائص لم تكن دائما ملحوظة أو مسجلة بواسطة أقارب
المريض.
أوضحت الدراسة أنه في الوقت الحاضر لا يمكن التنبؤ بالتمييز بالمعامل النهائية لمريض النيوبات الغيبية
بمجرد التشخيص. رغم أنه بصفة عامة يمكن اعتبار النيوبات الغيبية حالة مرضية حميدة يمكن أن تتعالج وتختفي
تماما بالعلاج المناسب.