Fourteen- and six-per-second positive spikes in a nonclinical male population

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Fourteen- and six-per-second positive spikes were first described by Gibbs and Gibbs in a paper entitled "Electroencephalographic evidence of thalamic and hypothalamic epilepsy." Since then, this interesting and distinctive electroencephalographic pattern has been the subject of great deal of thought, work, and discussion. Hughes lists no less than 30 clinical conditions with which positive spikes have been associated. The most frequently associated symptoms are those of so-called autonomic dysfunctions such as peptic ulcer, abdominal pain, and headache; behavioral abnormalities including aggressive acts, even murder; and convulsive disorders. Some recent papers, however, deny that there are clinical differences between groups with and without this pattern.

There have also been conflicting reports concerning the prevalence of this EEG pattern in control subjects. Figures from less than 1 to 58% of controls (normals) have appeared in the literature and the possibility of an age relationship has been raised.

The purpose of the present study was to ascertain the prevalence of fourteen- and six-per-second positive spikes in a nonclinical population and to determine whether significant differences could be found between the subjects with positive spikes and those without this pattern with respect to age, General Classification Test (GCT) scores, Minnesota Multiphasic Personality Inventory (MMPI) responses, Cornell Medical Index (CMI) scores, and history of head trauma, headache, seizures, behavioral abnormalities, abdominal pain, vertigo, nausea, psychiatric illness, temper tantrums, and altercations with authority.

The prevalence of fourteen- and six-per-second positive spikes for each of the age groups in our sample was also determined. In addition, we analyzed our data to determine if the appearance of the fourteen- and six-per-second positive spikes was relatively specific for wakefulness or stage one or stage two sleep. The consistency of the pattern appearing in repeat EEGs was also investigated.

METHOD

One hundred twenty-six male volunteers from the Hospital Corps School at the Naval Hospital, San Diego, served as subjects. A daytime EEG was recorded using an Offner Dynograph Type R with 8 channels for EEG and 4 channels for autonomic activity: heart rate, galvanic skin response, finger pulse amplitude, and respiration. Grass silver-silver chloride disk electrodes were used for the EEG. We used the 10-20 electrode placement system with 2 montages. Montage 1 included C3-A1, P3-A1, T3-A1, T5-A1, C4-A2, P4-A2, T4-A2, and T6-A2. Montage 2 included O1-A1, O2-A2, T3-A2, T4-A1, T5-A2, T6-A1, T3-T4, and T5-T6. The first montage is the one used by Lombroso and associates. The second montage was used to record any low amplitude activity by utilizing...
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The subject lay on a cot in a darkened quiet room and was asked to go to sleep. The Dement-Kleitman criteria were used to classify the records with respect to stage of sleep. While both stage 1 and stage 2 sleep was obtained on all subjects who slept, an attempt was made to maximize the time in stage 1 sleep by presenting a sound after a period of stage 2 sleep was recorded.

After the EEG record, each subject was asked to complete the MMPI, CMI, and the 20-item personal history questionnaire. Twenty-five of the individuals with positive spikes appearing in their initial EEGs and one subject with a negative EEG initially were seen from one to ten weeks later for a second record. All records were evaluated by one electroencephalographer (Dr. Long).

Twenty records, 10 previously read as positive and 10 as negative, were independently reviewed by a second electroencephalographer. There was 95% agreement between the 2 electroencephalographers on these 20 records as to the presence or absence of fourteen- and six-per-second positive spikes.

RESULTS

Of the 126 subjects, 119 were able to sleep in the laboratory. The average sleep time was 26.9 minutes of sleep with a range from twenty-two to sixty-five minutes. Of the 119 with sleep tracings, 30 manifested fourteen- and six-per-second positive spikes for a prevalence of 25.2%. The mean sleep time for those with positive spikes was 27.5 minutes and for those without positive spikes the mean sleep time was twenty-six minutes. The number of fourteen- and six-per-second positive spikes varied from subject to subject with a range from 1 positive spike during fifty-seven minutes of sleep to 34 during fifty-one minutes of sleep. For the 30 subjects the average rate of fourteen- and six-per-second positive spikes per minute was 0.18.

Table 1 shows the prevalence by age. The group 21 years and older included subjects up to age 25. These data show no decreasing prevalence with increasing age of the subjects.

When the subjects with positive spikes were compared to subjects without positive spikes with respect to their mean ages, GCT, CMI responses, Taylor Anxiety Scale, and clinical scale scores from the MMPI, no statistically significant differences were found. Statistical significance was not obtained for any of the questions on the personal history questionnaire.

In Table 2 the number of fourteen- and six-per-second positive spikes per minute during sleep are compared for the 2 montages used and for the stages of sleep in the 2 groups. Montage 2 was significantly better for recording fourteen- and six-per-second positive spikes than montage 1 for both stage 1 and stage 2 sleep. All 30 subjects with fourteen- and six-per-second positive spikes had positive spikes during run 2, but positive spikes were present in only 4 subjects during run 1. No positive spikes were seen when the subjects were awake. The rate for stage 2 sleep was not significantly different from that for stage 1 sleep in either run.

Twenty-five subjects in whom fourteen- and six-per-second positive spikes appeared on their first records were restudied and 20 slept. Only 11 of these 20 showed the fourteen- and six-per-second positive spike pattern. The 1 subject without positive spikes in his initial state who was rerun had a positive EEG the second time. Administrative difficulties unfortunately made it impossible for us to answer the obvious question of how many initially

<table>
<thead>
<tr>
<th>Table 1</th>
<th>DISTRIBUTION OF FOURTEEN- AND SIX-PER-SECOND POSITIVE SPIKES BY AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>No. positive</td>
</tr>
<tr>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>19</td>
<td>7</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>21</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>NUMBER OF FOURTEEN- AND SIX-PER-SECOND POSITIVE SPIKES PER MINUTE FOR MONTAGE 1 AND MONTAGE 2 AND FOR SLEEP STAGES 1 AND 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runs</td>
<td>Sleep stage</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>.009</td>
</tr>
<tr>
<td>2</td>
<td>.274</td>
</tr>
<tr>
<td>Totals</td>
<td>.147</td>
</tr>
</tbody>
</table>
negative subjects would have positive spikes on a second record.

There were no changes in any of the recorded autonomic variables before, during, or after the fourteen- and six-per-second positive spikes.

DISCUSSION

Fourteen- and six-per-second positive spikes occurred in 25.2% of our nonclinical population of 17- to 25-year-old men. This is less than one-half the prevalence rate reported by Lombroso and co-workers for his 13- to 16-year-old healthy boys. While these data suggest that there may be a decreasing prevalence with increasing age, the difference in length of recording may also be a factor. In our study the average recording time ranged from twenty-two to sixty-five minutes while in the study of Lombroso and associates the recording time varied from "between three-fourths hour and two hours." It is possible that the percentage of a population who show fourteen- and six-per-second positive spikes in their EEGs will increase as the time allowed for natural stage 1 and stage 2 sleep is lengthened and by recording more than one EEG record from each subject. Fourteen- and six-per-second positive spikes were seen in both stage 1 and stage 2 sleep, and there was no significant difference between the burst rate for two stages. Our study further shows, however, that fourteen- and six-per-second positive spikes do not consistently appear in repeat records from the same subject.

We were unable to differentiate those subjects with fourteen- and six-per-second positive spikes from those without by history, number of somatic or psychological complaints on the CMI and MMPI, age, GCT, autonomic variables, or performance in school.

SUMMARY

1. Fourteen- and six-per-second positive spikes occurred in 25.2% of our sample of a nonclinical population of 119 17- to 25-year-old men.

2. The 2 groups could not be differentiated by means of GCT scores, MMPI responses, CMI scores, age, or responses to questions on a personal history questionnaire.

3. Fourteen- and six-per-second positive spikes were not consistently found from one recording time to another in the same individual.

4. Fourteen- and six-per-second positive spikes are seen in both stage 1 and stage 2 sleep.

5. It is proposed that a higher prevalence rate would be found if the recording times were prolonged and if several records were obtained from each subject.

The opinions or assertions contained herein are the private ones of the authors and are not to be construed as official or as necessarily reflecting the views of the Department of the Navy.

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REFERENCES


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