

# Aura in temporal lobe epilepsy: clinical and electroencephalographic correlation

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**SUMMARY** Patients with temporal lobe epilepsy were evaluated for their aura and the site of EEG abnormality. Autonomic and psychic auras were more frequently associated with right-sided temporal lobe lesions in 290 patients.

Several reports in the literature have emphasised the importance of the aura in the clinical diagnosis of temporal lobe epilepsy. Gowers<sup>1</sup> and Lennox and Cobb<sup>2</sup> reported that more than 50% of their patients had an aura, the most common being abdominal in origin. Similar observations have also been made by other workers.<sup>3–6</sup> Recently, there have been reports where the temporal lobe lesion has been associated with ictal water drinking behaviour,<sup>7</sup> psychoses,<sup>8–13</sup> neuroses,<sup>14,15</sup> hypergraphia,<sup>16</sup> memory and language impairment.<sup>17–19</sup> Other reports have failed to demonstrate any correlation between the site of the temporal lobe lesion and the symptomatology of temporal lobe epilepsy.<sup>20–22</sup> Most of these reports have been either observations based on a psychiatric population or isolated cases. Furthermore, none of these studies have correlated the type of aura with the lateralisation or localisation of the electroencephalographic abnormality. The present communication describes the types of auras seen in patients with temporal lobe epilepsy and their correlation with the site of the EEG abnormality.

## Patients and methods

Evaluation of the aura in relation to the site of the EEG abnormality has been made in 290 patients with complex partial seizures. They all had attended the Epilepsy Clinic or Neurology Clinic between the years 1978–1981 and were seen by one of us. Each patient had a detailed clinical and neurological examination at the time of the first visit.

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The clinical case notes were later reviewed by one of us (AKG).

Auras were grouped according to the guidelines recommended by the Commission of the International League Against Epilepsy.<sup>23</sup> There were 154 females and 136 males and the age range was 12–67 years. Most patients had a long history of epilepsy, the mean duration being 13.5 years. EEGs were taken on 16 channel machines using the International 10/20 electrode placement system, and the records were examined visually. The lateralisation of EEG abnormalities was based on the finding of localised spikes, sharp waves, or slow waves, alone or in combination.

## Results

Details of the aura and the lateralisation of the EEG abnormality in the 290 patients are shown in table 1. The EEG abnormality was clearly lateralised in 250 patients, being right-sided in 56% and left-sided in 44%. Of the 140 patients with right-sided abnormality, 36% had a psychic aura, 34% an autonomic aura, 16% a sensory aura, 1% a motor aura and 13% did not have an aura. Of the 110 patients with left temporal abnormality, the aura was motor in 14%, psychic in 10%, sensory in 10%, autonomic in 8% and there was no aura in 58%. In 105 (36%) patients there was no aura and of these 105, the EEG abnormality was most commonly on the left (61%), less common on the right (17%) and 10% had bilateral abnormality. The EEG was normal in 12%.

## Discussion

According to the commission on classification and terminology of the International League Against Epilepsy<sup>23</sup> “aura is that portion of the seizure which occurs before consciousness is lost and for which memory is retained afterwards. It may be that, as in

Table 1 Distribution of aura related to EEG lateralisation

Group of auras	Right	Left	Bilateral	Normal	Total
<i>With motor signs</i>	2	15	2		19
<i>Special sensory symptoms:</i>					
visual	5				5
auditory	4	1			5
olfactory	2	2		1	5
gustatory	5	1			6
vertiginous	4	6	1		11
somato-sensory	2	1	2		5
Total	22	11	3	1	37
<i>With psychic symptoms:</i>					
dysmnestic (e.g. <i>déjà vu</i> )	11	2	1	3	17
cognitive	6				6
affective	29	7	1	2	39
illusions	1	1	1		3
structure hallucination	3	1			4
Total	50	11	3	5	69
<i>Autonomic symptoms:</i>					
epigastric	47	6	2	1	56
cardiovascular	1	2			3
genito-urinary		1			1
Total	48	9	2	1	60
<i>No aura</i>	18	64	10	13	105
<i>All cases</i>	140	110	20	20	290

simple partial seizures, the aura is the whole seizure. When consciousness is subsequently lost, the aura is in fact the signal symptom of a complex partial seizure". Using this guideline, we found that 64% of our patients had a definite aura. Gowers, in 1901, reported an incidence of 57%.<sup>1</sup> Lennox and Cobb<sup>2</sup> found an aura in 764 patients out of 1527 cases (56%), practically the same percentage as Gowers. Currie *et al*<sup>6</sup> reported a similar incidence of aura in cases of temporal lobe epilepsy. A slight variation in the percentage of auras in temporal lobe epilepsy reported by other workers and ours may be due to different criteria used for the diagnosis of temporal lobe epilepsy, and the type of sample used for the study of aura. Lennox and Cobb<sup>2</sup> studied aura in 1359 non-institutional patients having seizures as a presenting symptom. Currie *et al*<sup>6</sup> drew patients from different sources and they used different criteria in the diagnosis and classification of a seizure and its components.

There have been conflicting views on the question of hemispheric preference of EEG abnormalities in epileptic patients. Earlier studies have indicated a left preponderance of EEG abnormality in various neurological and psychiatric disorders. Obrist and Henry<sup>24</sup> found a high preponderance of slow waves on the left side in EEGs of aged psychiatric patients. A similar observation in different neurological disorders was also made by Hughes<sup>25</sup> and in cases of vascular disturbances by Earle *et al*.<sup>26</sup> Ajmone-Marsan and Ralston<sup>27</sup> reported that 90% of patients with bitemporal epilepsy showed the initial seizure discharges on the left during metrazol activation.

Mani *et al*<sup>28</sup> reported a significant preponderance of left temporal lobe foci in temporal lobe epilepsy. Their observations, based upon 248 patients, showed that 48% had a left EEG focus, in 31% it was on the right and in 21% it was bilateral.

Currie *et al*<sup>6</sup> surveyed the clinical course and prognosis of temporal lobe epilepsy in 666 patients and found a significant preponderance of left-sided EEG abnormality. However, their sample indicates that 169 patients had various types of neurological disorders, the most common being tumour, head injury, gliosis and cerebrovascular disorders. Many investigators have claimed a left-sided preference for thrombi, emboli and aneurysm because of a presumed more direct blood flow from the aorta to the left carotid artery. We did not find any left preponderance in our sample of temporal lobe epilepsy. Of the 250 patients with a clear EEG lateralisation, 56% had a focus in the right temporal lobe and 44% in the left. There have been a few reports where workers have noticed a slight preponderance of all types of EEG abnormalities on the right, particularly in the posterior temporal and occipital regions. This was more so if the abnormality consisted of a slow wave asymmetry.<sup>29,30</sup>

Amongst the different types of auras as listed in tables 1, 2, we found a significantly greater preponderance of aura referable to the epigastrium (55 of the 59 autonomic aura). This observation agrees well with the findings of earlier workers.<sup>1-6,31</sup> Epigastric aura has often been described either as a "butterfly sensation" or as "unpleasant sensation" which moves up into the throat. The exact mechan-

Table 2 Distribution of groups of aura in patients with temporal lobe epilepsy and site of EEG abnormality

Type of aura	Right*	Left*	Bilateral
Motor	2	15	2
Sensory	22	11	3
Psychic	50	11	11
Autonomic	48†	9†	2†
Total	122	46	18

\* $\chi^2 = 38.7, p < 0.001.$

†Epigastric 47, 6, 2 respectively.

ism and precise cerebral localisation is still uncertain. Earlier studies have suggested that fronto-temporal portion of the limbic system plays a fundamental role in the expression of visceral and emotional activity.<sup>31-33</sup>

Van Buren<sup>5</sup> observed a sensation closely resembling abdominal aura in eight epileptic and six non-epileptic patients on stimulating the mesial temporal region and basal ganglia. In the series published by Van Buren and Ajmone-Marsan,<sup>34</sup> out of eight subjects with epigastric aura, five had a definite abnormality in the right temporal lobe and in three either the abnormality was bilateral or with slight preponderance in the left temporal lobe. A similar preponderance of a right temporal lobe foci and abdominal aura is also evident in the report published by Remillard *et al.*<sup>7</sup> It is surprising that this association was not discussed by these authors.

In the present study, we found that out of 60 patients with an autonomic aura this was epigastric in 56. Of these 56, 47 had definite EEG abnormality in the right temporal lobe and only six had an abnormality in the left temporal lobe and in two cases the abnormality was bilateral (table 1). One patient had a normal EEG. A comprehensive explanation of this association between the right temporal lobe lesion and epigastric aura seems beyond our grasp at the moment. However, our data certainly reflect a possibility that the right hemisphere might have a significant role in the expression of this type of aura in cases of temporal lobe epilepsy.

Penfield and Perot<sup>35</sup> reported that various types of "experiential" responses were more likely to be elicited from right rather than left temporal stimulation. However, Gloor *et al.*<sup>36</sup> failed to confirm their observations, but did report a significant association of fear with an unpleasant visceral sensation in the abdomen. Our study in part agrees with the observations of Penfield and Perot<sup>35</sup> as the majority of our subjects with auras had abnormality in the right temporal lobe rather than in the left.

The second most common type of aura in our patients was a psychic one, most patients in this group presenting either with an aura of *déjà vu* or an affective component. Analysing their EEGs we

found a significantly higher incidence of abnormality in the right temporal lobe (table 1). This supports the hypothesis of earlier workers that the individual with a right temporal lobe lesion is more prone to develop a disorder related to affect or emotion. Flor-Henry<sup>8,9</sup> reported that psychotic depression tended to occur in patients with a right temporal lobe lesion. Gainotti,<sup>37</sup> in a study based upon patients with brain damage to the non-dominant hemisphere, observed a tendency to disinhibition, indifference and elation. Other workers have also noted a disturbance of mood, emotion and behaviour.<sup>9,10,38</sup> Penfield and Perot<sup>35</sup> reported the presence of an aura of *déjà vu* in a patient on stimulating the non-dominant hemisphere.

Slater and Beard<sup>39</sup> found a high preponderance of schizophreniform psychosis in association with temporal lobe epilepsy. Monukhine and Dinabourg<sup>40</sup> reported that epileptic children with a left sided temporal lobe lesion showed more behaviour disturbances than those who had abnormality in the right temporal lobe. A similar view in subjects with organic brain damage was expressed by Lishman.<sup>41</sup> Shukla and Katiyar<sup>15</sup> looked at the relationship between psychotic disorders and sites of temporal lobe EEG abnormality. They found a significant relationship between neurotics and the right temporal lobe EEG focus but no significant lateralising effect on other diagnostic categories of psychotic disorders. Falconer and Taylor<sup>14</sup> also found neurotics to have more dysfunction in the non-dominant hemisphere. A similar conclusion also emerged from the data reported by Taylor.<sup>10</sup>

Recent studies have indicated a significant role of limbic and/or temporal neo-cortical activation in the genesis of various kinds of "experiential" responses which occurred in patients of temporal lobe epilepsy.<sup>35,36</sup>

In the present study we failed to observe any symptoms suggestive of florid-psychosis or schizophreniform reaction. This is not surprising since our data are based upon subjects who have complex partial epilepsy without any apparent psychiatric disorders. However, our results do indicate that the right temporal lobe has a significant influence in the control of autonomic and psychic functions, particularly visceral and affective in nature. Thus, in part, our study supports the views of previous workers<sup>8-10,14,15,38</sup> who attempted to correlate neuroses and affective disorders with a right temporal lobe lesion. Our findings may also assist the clinician in correlating the symptomatology of temporal lobe epilepsy to the site of temporal lobe involvement as well as in understanding psycho-pathology of certain psychiatric disorders which sometimes co-exist with complex partial epilepsy.

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