CEREBRAL LATERALITY IN SCHIZOPHRENIA

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SUMMARY

Electroencephalographic (E.E.G.) pattern of 35 drug free schizophrenic patients was studied. 15 cases (42.86%) had abnormal EEG records. 9 records out of 15 abnormal records showed effect of laterality. Laterality of abnormality to left hemisphere was present in 7 cases while laterality to right hemisphere was present only in 2 cases. Cortical locations of abnormalities were also studied. The most common cortical area found to be involved was temporal lobe.

It has been confirmed by the investigators that the two hemispheres of the brain differ anatomically as well as functionally from each other. In most right handed persons the left hemisphere is specialized for the performance of verbal, analytic, linear and logical tasks, while the right hemisphere appears to be specialized for spatial, geometric and synthetic tasks (Sperry 1968, Levy & Sperry 1968). Investigators have tried to investigate the hemispheric laterализation in psychiatric patients with the goal of obtaining new information on the brain processes involved in the manifestation of illnesses.

Left hemispheric dysfunction in schizophrenic patients have been reported in various studies (Flor-Henry 1969; 1976; Beaumont & Dimond 1973; Gruzelier and Venables 1974; Roemer et al 1978; Abrams & Taylor 1979 and Charlcs et al 1981). On the other hand, d’Elia and Perris (1973, 1974) have reported left hemispheric dysfunction in depressed but not in schizophrenic patients. They have found that in depressed patients EEG mean integrated amplitude variability and average evoked response amplitude before treatment were significantly less over the left hemisphere than over the right. After treatment on recovery no difference on the two sides were apparent.

The dysfunction of interhemispheric interaction has also been reported in schizophrenic patients. Rosenthal and Bigelow (1972) did post mortem examination of brain of schizophrenic and normal control subjects, they showed thickening of corpus callosum in schizophrenics. Green (1978); Green et al. (1979) and Gareth et. al. (1981) also suggest the possibility of defective inter-hemispheric transfer in schizophrenic patients.

Review of the literature on cerebral laterality and schizophrenia does not show any consistent report. Hence, keeping in view the disagreement and absence of such studies on Indian psychotic patients, we decided to carry out this study.

Material and Methods

35 patients of schizophrenia were taken from the Psychiatry Out Patient Department of University Hospital, Institute of Medical Sciences, Banaras Hindu University. Patients were selected according to Research Diagnostic Criteria (Spitzer et al. 1978). All the selected patients were drug
free and within the age group of 16 to 60 years (It was done to avoid the complexities of EEG which are encountered due to drugs and early or late age). The patients who were having any sign or symptom of neurological disorders or not co-operating for EEG, were excluded from the study. Total 35 patients (30 male and 5 females) who full filled the inclusion criteria were selected for study.

Patients were instructed not to take medicine before the date of EEG and to come with clean and dry head.

**Electro-Encephalography**

The EEG of each selected patient was recorded on "Grass Model 8" 16 channel EEG Machine in the department of Psychiatry, Institute of Medical Sciences, Banaras Hindu University. The electrodes were placed according to Jasper's international 10-20 system and tracing were taken at a time constant of 1 second with the paper speed of 30 mm. per second. The Voltage was kept 50 µv/7mm. For each patient one unipolar and two bipolar montages were used as follow:

**Montage I (Bipolar)**

FP2 - F4, F4 - C4, C4 - P1, P1 - O2,
FP1 - F3, F3 - T3, T3 - T5, T5 - O1,
FP1 - F2, F2 - C2, C2 - P2, P2 - O1,
FP2 - F3, F3 - T3, T3 - T5, T5 - O1.

**Montage II (Bipolar)**

F8 - F4, F4 - F2, F2 - F3, F3 - F7, A2 - T4,
T4 - C4, C4 - C2, C2 - C3, C3 - T3,
T3 - A1, T6 - P4, P4 - P2, P2 - P3, P3 - P5,
FP3 - FP1, O2 - O1.

**Montage III (Unipolar)**

FP2, F4, C4, P4, O1, F8, T4, T6, FP1, F3,
C3, P3, O1, F7, T3, T5.

All connected to reference electrode no.26 (Nasion).

Scalp recording of EEG was taken for sufficient length of time, to provide minimum of 15 minutes of artifacte free awake record and 5 minutes of sleep record. All recording included two periods of eye opening and closed and 2 minutes of hyperventilation. Records were coded by numbers and read by a "blind examiner" who did not have access to the patients age, sex and diagnosis of the same.

Each record was rated for the presence of one or more of the following abnormalities, by using the descriptive criteria of Gibbs and Gibbs.

- Slowing
- Spike or sharp wave
- Slow burst
- Suppression
- Assymetry
- Sharp slow wave
- Abnormal fast activity
- Any other.

When present, abnormalities were further characterized to as their predominant cortical location and lateralization by using the criteria of amplitude for unipolar montage and phase reversal for bipolar montages. The records with no abnormalities were classified as normal and abnormal records were further classified according to severity of abnormality by using Kugler's (1964) classification in 4 group, (1) Border line (2) slightly abnormal (3) Moderately abnormal and (4) severely abnormal.

**Results**

**General Data**

The study comprise of 35 patients (30 male and 5 females) of schizophrenia. The mean age was 26.37 years with standard
deviation of \( \pm 7.57 \) years. Maximum number of patients have less than 3 months duration of illness. Past history of mental disorders and family history of mental disorders were present in 9 and 11 cases respectively.

**EEG Pattern**

15 cases (42.86\%) showed abnormal EEG records. The nature of EEG abnormality was predominantly slow wave (60\%) followed by spike or sharp wave (13.33\%), slow burst (13.33\%) and abnormal fast activity (13.33\%) and Fig. 1-3. There was no significant correlation between different sub types of schizophrenia and EEG abnormalities. Patients age, sex, chronicity, past attack and family history of mental illness do not show any significant correlation with E.E.G. abnormality.

*Cortical location and lateralization of abnormality*
Most commonly involved cortical area was temporal lobe, 6 cases showed predominant abnormality in Temporal region, 3 cases in Parieto-occipital region and 1 case in Frontal region. Rest of the abnormal records have generalized abnormalities. 9 records out of 15 abnormal records showed the lateralized abnormality. Left hemispheric lateralization of EEG abnormality was more prevalent, the Left/Right (L/R) distribution of abnormality was 7/2.

| Cortical Area        | No. | Percentage |
|----------------------|-----|------------|
| Temporal             | 6   | 40         |
| Parieto-accipital    | 2   | 13.33      |
| Frontal              | 1   | 6.7        |
| Generalized          | 6   | 40         |

**Discussion**

In this study patients' age, sex chronicity, past attack and family history of mental illness do not show any significant correlation with EEG abnormality. Although the importance of 'immaturity' as well as 'involution' both have been reported by various authors. This study is free from the effect of 'immaturity' and 'involution', because we have not taken very young or old patients for study. The incidence of abnormal EEG records and the nature of abnormality is almost similar to finding of Abrams and Taylor (1979) and Stevenson et al (1979). Abrams & Taylor (1979) have reported 48% of abnormal EEG records among 27 cases of schizophrenia and Stevenson et al (1979) have shown 39.47% of abnormal records in their sample.

Occurrence of higher percentage of abnormality in left temporal region in schizophrenic patients is supported by Flor-Henry (1976); Gur (1977, 1978) and Abram & Taylor (1979). Right hemispheric abnormalities in schizophrenia have been reported by d'Elia & Perris do not have good support from recent studies, recent investigators have reported right hemispheric abnormalities in patients of affective disorder. In the study of Serafetinides (1973) it was not clear, whether it was drug induced asymmetry or lateralized pathology. Excess of left hemisphere abnormality in schizophrenic patients may be, because the left hemisphere is more strongly involved than its counterpart in the process of abstract and sympolic thinking while the right hemisphere shows greater efficiency in the processing of affective (emotional) materials.

This study has limitation of small sample size and having used only one measure of brain functions. Further study in this field by taking larger sample size and using more than one measure of brain function may prove beneficial.

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