

NEUROLOGICAL ABNORMALITIES IN SCHIZOPHRENIC PATIENTS AND THEIR RELATIVES

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SUMMARY

Twenty four schizophrenic patients who met DSM-III criteria, 28 of their nonschizophrenic first degree relatives and a group of 28 normal controls who did not have any personal or family history of major psychiatric illness were assessed by the same investigator for the presence of abnormalities on clinical neurological examination. Patients had significantly greater neurological impairment ($p < .001$) than the normal control group. Nonschizophrenic first degree relatives of patients also had greater impairment ($p < .05$) when compared to the matched control group. Significant excess of neurological abnormalities seen in schizophrenic patients and their close relatives suggest that neurological factors are important in the development of schizophrenia. It was also found that those who had lower education had more neurological abnormalities. The implications of these observations are discussed.

Neurological basis for the syndrome now referred to as schizophrenia had been proposed soon after its description. Kraepelin (1919) suggested that dementia praecox was due to widespread disease of the frontal, motor and temporal cortices. Though it did not receive much attention initially, there had been a steady increase in the studies of the neurologic status of schizophrenia in the last 25 years. Compelling evidence for a neurobiological dimension in schizophrenia has accumulated from neuroanatomical, neuroradiological, neurophysiological and neuropsychological studies (Gruzeliar, 1985). Patients diagnosed as schizophrenics frequently show abnormalities on clinical neurological examination as well. Earlier studies found increase in both 'hard' (localizing) as well as 'soft' (non-localizing) neurological signs in schizophrenic patients (Rochford, 1910; Pollin and Stabenau, 1968; Larsen, 1964; Hertzog & Birch, 1966). Later studies had focussed mainly on neurological soft signs.

These signs are reported in nonschizophrenic psychiatric patients also. The use of the term 'soft signs' had been criticised as unsatisfactory and misleading since most of the abnormalities in question are elicited by standard items of the clinical examination (Torrey, 1980; Henricks & Buchanan, 1988). A recent study by Woods et al. (1987) reported increased prevalence of neurological abnormalities indicating localized dysfunction of corticospinal tracts, basal ganglia and cerebellum in schizophrenic patients when compared to bipolar patients, patients hospitalised for alcohol or drug abuse and normal volunteers. Some workers (Kinney, 1986) found higher prevalence of neurologic abnormalities in nonschizophrenic first relatives of the above patients. They proposed that the neurological signs may be the result of an etiological process that is familial. These may be the secondary contributing factors rather than the primary defect responsible for the disease and any such

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factor that push individuals above the threshold for clinical expression of schizophrenia will be of major epidemiologic significance. Implications of these neurological signs are uncertain. This may be because of the limitations in our knowledge.

This paper describes a study conducted in the Department of Psychiatry, Christian Medical College, Vellore with the objective of looking into the neurological abnormalities in schizophrenic patients and their first degree relatives.

Material & Method

Selection of populations studied :

The patients sample was selected from the outpatients attending the follow up clinics in our centre. Clinicians were requested to refer all schizophrenic patients to the investigators. Patients had to meet DSM-III criteria (APA-1980) for schizophrenia to be taken up for the study. Specific exclusion criteria were epilepsy, mental retardation, organic brain disorder of any type, systemic physical disease, alcohol dependence or drug abuse. Patients who received ECTs in the 6 months prior to testing and uncooperative patients whose attention and concentration were impaired were excluded from the study. 24 patients whose relatives also agreed to participate in the study, were taken up for study. All of them were on neuroleptics at the time of the study.

The biological parents and siblings of these patients were then invited to participate in the study. 29 such relatives who agreed to participate formed the sample of relatives.

The normal control group consisted of 28 subjects without any personal or family history of psychiatric illness. They were selected from the attendance and visitors of the inpatients in our centre

and they were matched on age, sex and education with the group of 28 relatives.

Informed consent was obtained from all subjects after explaining the study procedures.

Assessment of neurological abnormalities :

Demographic and clinical data were collected using a proforma designed for the study. A detailed neurological examination was done based on the standard proforma used for routine neurological examination in the Department of neurosciences of our institution.

A detailed assessment of neurological signs was performed using tests devised by Cox and Ludwig (1979). Its interrater reliability had been established by original authors. Jose Mathews (1985) assessed its test-retest reliability and interrater reliability and was found to be high (0.979 and 0.963 respectively). There are 21 tests arranged into four groups on the basis of presumed lobe functions which they represent. The individual tests were easy to administer. Scoring was done as suggested by Cox and Ludwig. All subjects were assessed by the same investigator.

Statistical Analysis :

Analysis of variance was done to find out the significant differences in the scores of neurological impairment (total as well as sub-scores) between the three groups of subjects, taking age as covariate and sex and education as main effects. The joint effects (interaction) of variables like sex and education with group differences were also studied using the same technique.

The three groups of subjects were then compared with each other using 't' test in order to find out the group differences in neurological impairment. The correlation between the scores of neurolo-

gical impairment of the patients and their relatives was examined using Pearson correlation coefficient.

Results

Patients, relatives and controls were similar in age, sex and education (Table I). Patients had a mean age of 23.3 years at the onset of their illness and the mean duration of the illness was 4.8 years. Only one patient had family history of schizophrenia.

Analysis of variance showed that the three groups of subjects differed significantly on the total score and subscores of

neurological impairment (Table II). Education was found to have significant effects on the total score as well as temporal, parietal, and occipital lobe subscores. Variables like age and sex did not have any significant effects on the scores. The joint effects (interaction) of combination of sex and education with neurological scores were not significant except the combination of group and sex for temporal lobe subscore and the combination of group and education for occipital lobe subscore.

The three groups of subject were than compared with each other using 't' test.

TABLE I—Sociodemographic characteristics of schizophrenic patients, their nonschizophrenic first degree relatives and normal controls

	Patients (n=24)	Relatives (n=28)	Controls (n=28)
Mean age*	27.9	28.6	30.8
Sex*			
Male	17 (71%)	21 (75%)	21 (75%)
Female	7 (29%)	7 (25%)	7 (25%)
Education			
More than 10 years	11 (46%)	16 (57%)	16 (57%)
Ten years & below	13 (54%)	12 (43%)	12 (43%)

* — N.S.

TABLE II—Results of analysis of variance of scores of neurological impairment with the group of the subject, education and sex as main effects and age as co-variate

	F VALUE AND SIGNIFICANCE				
	Total	Frontal	Parietal	Temporal	Occipital
Main effects					
—Group of the subject	12.946***	5.237**	11.831***	8.814***	4.467*
—Education	12.110***	0.691	7.417**	13.326**	6.646*
—Sex	1.155	0.013	0.582	2.236	0.292
Covariate					
—Age	0.546	0.688	0.210	0.236	0.518

*p<0.05; **p<0.01; ***p<0.001

The patients had significantly higher total score as well as subscores when compared to the control group (Table III). The patients had significantly higher total score than the relatives. Patients had higher scores than relatives on all four subscores, although the differences in frontal and occipital lobe scores just miss statistical significance.

The group of relatives had significantly higher total scores when compared with the age, sex, education matched control group. The relatives had higher scores on all four lobes although the differences in the temporal and parietal lobe scores did not reach statistical significance (Table V). There was no correlation between the neurological impair-

TABLE III—Comparison of neurological impairment in schizophrenic patients and normal controls

	Patients (n=24)		Normal controls (n=28)		t	p-value
	Mean	SD	Mean	SD		
Total	11.54	7.21	3.82	2.72	4.64	<.001
Frontal	1.29	1.27	0.11	0.32	4.78	<.001
Parietal	2.96	2.01	0.64	0.83	5.58	<.001
Temporal	6.50	4.14	3.05	2.13	3.85	<.001
Occipital	0.71	1.30	0.04	0.19	2.71	<.05

TABLE IV—Comparison of neurological impairment in schizophrenic patients and their first degree relatives

	Patients (n=28)		Relatives (n=28)		t	p-value
	Mean	SD	Mean	SD		
Total	11.54	7.21	6.39	5.03	3.02	<0.01
Frontal	1.29	1.27	0.79	1.62	1.24	NS
Parietal	2.96	2.01	1.18	1.74	3.42	<0.01
Temporal	6.5	4.14	4.18	2.51	2.48	<0.05
Occipital	0.71	1.30	0.25	0.44	1.75	NS

TABLE V—Comparison of neurological impairment in first degree relatives of schizophrenics and normal controls

	Relatives (n=28)		Normal controls (n=28)		t	p-value
	Mean	SD	Mean	SD		
Total	6.39	5.03	3.82	2.72	2.38	<0.05
Frontal	0.79	1.62	0.11	0.32	2.18	<0.05
Parietal	1.18	1.74	0.64	0.83	1.57	NS
Temporal	4.18	2.51	3.05	2.13	1.81	NS
Occipital	0.25	0.44	0.04	0.19	2.36	<0.05

ment scores of patients and their relatives (Person Correlation Coefficient = 0.20).

Discussion

Schizophrenic patients had more neurological signs than their relatives and normal controls. This is in agreement with earlier studies (Rochford et al., 1970; Tucker et al., 1975; Quitkin et al., 1976; Cox and Ludwig, 1979; Woods et al., 1986). First degree relatives of patients also had higher scores when compared with age, sex and education matched control group. The increased prevalence of neurological signs in nonschizophrenic relatives of patients is in agreement with the findings of Kinney et al (1986) and suggest that these signs are not the result of treatment for schizophrenia. Presence of neurological signs in the absence of schizophrenic symptoms in the group of relatives studied, favours the view that these signs are not sufficient to cause schizophrenia. This together with the observation that all patients with schizophrenia do not show neurological abnormalities, suggest that these signs are not due to the primary abnormality responsible for schizophrenia. Woods et al. (1986) had proposed a disease model of schizophrenia. The specific underlying neurological dysfunction must reach threshold severity and a great variety of secondary brain insults could summate with the specific underlying brain defect responsible for schizophrenia. Neurological abnormalities seen in patients and their relatives may reflect a familially transmitted alteration in the neurological processes that constitute a vulnerability to the development of schizophrenia. Our findings add to the already available evidence that schizophrenic patients as a group have more neurological abnormality and suggest that this may be important in the pathophysiology of schizophrenia.

One useful area to be explored will

be whether those patients with neurological abnormalities differ from those without neurological abnormalities in factors such as outcome. We are at the moment looking into this aspect.

Another interesting observation of this study is that education has significant effects on the neurological scores. Those who have low level of education tend to have more neurological abnormalities even after the effects of age and sex are controlled. Similar findings have been reported by Mautschreck and Ames (1984). An early onset severe illness affecting educational attainment cannot be ruled out in the low education group. It is also possible that the same central nervous system abnormality which underlies the neurological abnormality may also effects the scholastic performance and thus cause lower education attainment in these patients. One can also argue that lower education is an index of lower socioeconomic status which can make these patients more prone to insults such as infections and deficiencies in early childhood. Does this add another dimension to the viral hypothesis of schizophrenia? It is obvious that more studies are required in this area.

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