

Neurological Soft Signs in Schizophrenia: A Cross-sectional Study

Abstract

Context: Soft neurological signs are present more frequently in schizophrenics than other patients suffering from other psychiatric illnesses and normal individuals. **Objectives:** The objective of this study is to find out the causal relationship of neurological soft signs (NSSs) to schizophrenia. **Materials and Methods:** The study was initiated after taking approval of the institute ethics committee. A total of thirty schizophrenic patients and thirty controls were included in the study. Their diagnosis was confirmed by consultant and then were administered Neurological Evaluation Scale developed by Robert Buchanan. The accumulated data were then analyzed statistically. **Results:** This study shows a higher prevalence of NSSs in schizophrenia as compared to controls. **Conclusion:** To ascertain their role in aetiology and pathogenesis of schizophrenia, further research is needed.

Keywords: Neurological Evaluation Scale, pathogenesis, schizophrenia, soft signs

Introduction

The term “soft neurological signs” was first used by Loretta Bender in 1947.^[1] Neurological soft signs (NSSs) are defined as nonnormative performances on a motor or sensory tests, which would be identical to tests of traditional neurological examination but elicited from an individual who shows none of the features of fixed or transient neurological disorder. To consider a sign as a soft neurological sign, it should have features, as discussed below.

There should be no association between observed behavior and a positive history of neurological disease or trauma. It should not be a pathognomic sign of any neurologic disease or encephalopathy. It should not indicate any specific central nervous system pathology.^[2] NSSs are considered a normal occurrence in childhood; however, improve as the child grows older. Therefore they are considered to represent a development phenomenon.^[3] However, in certain clinical populations, these signs persist or re-emerge. Soft neurological signs reflect disturbed cortical-subcortical connectivity and cortical-cortical interneuronal connections, which are also evident from reduced cortical/subcortical volume.^[4]

Soft neurological signs have been extensively studied in schizophrenic

patients. Schizophrenia is characterized by delusions, hallucinations, disorganized speech and behavior, negative symptoms, and prolonged course.^[5] Krapelin described disorders of equilibrium, tremor, and dysdiadochokinesia, which are considered under the domains of soft neurological signs today.^[6] Soft neurological signs are present more frequently in schizophrenics than other patients suffering from other psychiatric illnesses and normal individuals. Torrey observed in 1980 that soft neurological signs are associated with more chronic and severe forms of schizophrenia.^[7]

This study was done to find the prevalence of “soft neurological signs” in patients of schizophrenia and to compare the soft neurological signs in patients of schizophrenia and normal controls.

Materials and Methods

Thirty consecutive patients of schizophrenia disorder presenting in a tertiary hospital in North India in the department of psychiatry were selected for the study. In addition, 30 age- and sex-matched patients, who had no personal or family history of mental illness, admitted in the surgical wards of hospital were selected as controls. All patients were subjected to a detailed psychiatric examination.

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**Pir Dutt Bansal,
Nidhi Gupta¹**

Department of Psychiatry,
Guru Gobind Singh Medical
College and Hospital, Faridkot,
¹Department of Psychiatry, Civil
Hospital, Bathinda, Punjab,
India

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Address for correspondence:

Dr. Pir Dutt Bansal,
Department of Psychiatry, Guru
Gobind Singh Medical College
and Hospital, Faridkot, Punjab,
India.

E-mail: pdbansal71@rediffmail.
com

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Schizophrenia was diagnosed according to the International Classification of Diseases-10 diagnostic criteria. The diagnosis was confirmed by a faculty member to avoid any error. Patients suffering from epilepsy, mental retardation, any organic brain disorder, systemic physical illness (except controls), alcohol dependence or drug abuse, uncooperative patients/patients with severe psychosis whose attention and concentration prevented cooperation were excluded from the study.

All subjects were administered the Neurological Evaluation Scale (NES) devised by Robert W. Buchanan and Douglas W. Heinrichs to record the NSSs present. This consists of a battery of 26 test items. Each item was scored on a three-point scale, i.e., 0: No abnormality, 1 for mild but definitive impairment, 2 for marked impairment (except for snout and suck reflex which were scored 0 or 2).

This instrument included representative items from three functional areas of interest namely-(a) Integrative sensory dysfunction reflected in bilateral extinction, agraphesthesia, astereognosis, right-left confusion, and impaired audio-visual integration; (b) Motor incoordination reflected in the tandem walk, finger to nose, finger to

thumb opposition and dysdiadochokinesia; (c) Impaired sequencing of complex motor acts reflected in fist-ring, fist-edge-palm and Ozeretski tests. In addition cerebral dominance, short-term memory, frontal release signs, and eye movements were also tested.

The accumulated data was then compared separately for differences between patient group and controls. The differences observed were then analyzed for statistical significance by standard methods.

Results

Most of the schizophrenics were 20–30 years old males, studied up to secondary level, Sikhs, urban, unemployed, and married [Table 1].

Most of the NSSs were present in schizophrenic patients as compared to controls [Table 2].

NSS score in subject groups were more in schizophrenic patients as compared to controls [Table 3].

The prevalence rates of individual soft neurological signs were compared between the respective study groups. NSS1 – Tandem walk was positive in 3 schizophrenics.

Table 1: Sociodemographic details of the study participants

Parameter	Category	Schizophrenia (%)	Control (%)	
Age (years)	10-20	3 (10.00)	3 (10.00)	
	20-30	13 (43.33)	3 (10.00)	
	30-40	8 (26.66)	16 (53.33)	
	40-50	1 (3.33)	6 (20)	
	50-60	5 (16.66)	2 (6.66)	
Gender	Male	19 (63.33)	15 (50.00)	
	Female	11 (36.66)	15 (50.00)	
Education level	Illiterate	0 (0.00)	2 (6.66)	
	Primary	7 (23.33)	3 (10.00)	
	Middle	5 (16.66)	5 (16.66)	
	Secondary	15 (50.00)	15 (50.00)	
	Graduate/PG	3 (10.00)	5 (16.66)	
Religion	Hindu	10 (33.33)	12 (40.00)	
	Sikh	20 (66.66)	18 (60.00)	
	Other	0 (0.00)	0 (0.00)	
Residence	Rural	13 (43.33)	16 (53.33)	
	Urban	17 (56.66)	14 (46.66)	
Marital status	Married	14 (46.66)	26 (86.66)	
	Single	14 (46.66)	4 (13.33)	
	Divorcee	2 (6.66)	0 (0.00)	
	Unemployed	10 (33.33)	2 (6.66)	
Occupation	Shopkeeper	3 (10.00)	5 (16.66)	
	Farmer	5 (16.66)	8 (26.66)	
	Office worker	4 (13.33)	4 (13.33)	
	Householder	7 (23.33)	9 (30.00)	
	Student	1 (3.33)	1 (3.33)	
	Family type	Joint	15 (50.00)	18 (60.00)
		Nuclear	15 (50.00)	12 (40.00)

Table 2: Neurological soft signs in subject groups

Neurological soft signs	Schizophrenics	Controls	
Tandem walk	3	0	
Rombergs sign	0	0	
Adventitious overflow	0	0	
Tremors	14	1	
Cerebral dominance			
	Right	26	29
	Left	1	0
Mixed	3	1	
AV integration	8	0	
Stereognosis	2	0	
Graphesthesia	18	1	
Fist ring test	26	6	
Fist edge palm test	13	0	
Ozeretski test	18	3	
Memory	13	2	
Rhythem tapping test	9	1	
Rapid alternating movements	3	0	
Finger thumb opposition	2	0	
Mirror movements	4	2	
Extinction	3	0	
Right left confusion	8	2	
Synkinesis	5	1	
Convergence	0	0	
Gaze impersistence	2	0	
Finger nose test	12	1	
Glabellar reflex	10	2	
Snout reflex	2	0	
Grasp reflex	0	0	
Suck reflex	0	0	

AV: Audio-visual

Table 3: Neurological soft sign score in subject groups

Neurological soft sign	Schizophrenics	Controls	Significance of difference
Tandem walk	3	0	NS
Romberg's sign	0	0	-
Adventitious overflow	0	0	-
Tremors	14	1	HS
AV integration	13	0	HS
Stereognosis	2	0	NS
Graphesthesia	24	1	HS
Fist ring test			
Right	49	5	HS
Left	49	6	
Fist-edge-palm test			
Right	19	0	HS
Left	19	0	
Ozeretski test	33	3	HS
Memory	18	2	HS
Rhythm tapping test	15	1	S
Rapid alternating movement			
Right	1	0	S
Left	4	0	
Finger thumb opposition			
Right	1	0	NS
Left	1	0	
Mirror movements	4	2	NS
Extinction	3	0	NS
Right left confusion	15	2	S
Synkinesis	10	0	S
Convergence	0	0	-
Gaze impersistence			
Right	2	0	NS
Left	2	0	
Finger nose test			
Right	9	1	HS
Left	12	1	
Glabellar reflex	17	2	S
Snout reflex	4	0	NS
Grasp reflex	0	0	-
Suck reflex	0	0	-

AV: Audio-visual

NSS2 and 3, i.e., Romberg's Sign with Adventitious Overflow was not found in any patient. NSS 4-Tremors were shown by 14 schizophrenics and 1 controls and the difference was highly significant. Comparison of other indices is shown in Table 3.

Discussion

An increased prevalence of NSSs has been found in schizophrenia. It has been suggested that in conditions like schizophrenia which run a prolonged course over several years, these signs show stability over time and serve as trait markers.

In the present study, soft neurological signs were studied in 30 schizophrenics and compared with 30 age- and

sex-matched admitted patients in surgical wards of the hospital. All patients were subjected to a comprehensive NES, consisting of a battery of 26 items devised by Buchanan and Heinrichs.

Compared to normal controls, the schizophrenics had a higher prevalence of soft signs. Highly significant differences were found for: Tremors - All positive (46.66%) scored 1 as compared to normal (16.66%) indicating the tremors were always fine ($P < 0.001$); Impaired audio-visual integration existed in 26.66% cases of schizophrenia but not in any control subjects ($P < 0.01$); Agraphesthesia - The prevalence in schizophrenia was 53.33% as against 3.33% in controls ($P < 0.001$); Fist-ring test - Most schizophrenics (86.66%) performed very

poorly in this test with a severity score of 2, whereas only 20% control displayed this abnormality ($P < 0.000001$); Fist-edge–palm test was positive in 43.33% schizophrenics but not in any control subjects ($P < 0.0001$); Ozeretski test was found positive in 53.33% schizophrenics but only 10% controls ($P = 0.0001$); memory defects occurred in 43.33% schizophrenics and 6.66% controls ($P < 0.01$); Finger-nose test was prevalent in 40% schizophrenics and only 3.33% controls ($P < 0.001$). Significant differences were also found for rhythm tapping test, rapid alternating movements, right-left confusion, synkinesis, and glabellar tap.

No significant differences from controls were found for tandem walk, Romberg's sign and adventitious overflow, stereognosis finger-thumb opposition, mirror movements, extinction, convergence, gaze impersistence, snout reflex grasp reflex, and suck reflex. The above results are similar to those of the previous studies done by Rochford *et al.*,^[8] Quitkin *et al.*,^[9] Tripathi *et al.*,^[10] Walker and Shaye,^[11] Nasrallah *et al.* and Buchanan *et al.*,^[12] Krakowaski *et al.*,^[13] Gupta *et al.*,^[14] and Karp and Garvey.^[15]

The present study produced similar results but no laterality was observed. Besides, the present study did not include tests for speech abnormality and hopping on foot. Abnormalities of sequencing of complex motor acts were prominent amongst schizophrenics in the present study. The differences in the prevalence of neurological impairment on individual item may be related to differences in the comprehensiveness of assessment procedures, variability of the control groups or sensitivity of the scoring guidelines. Despite this a consistent agreement exists across all studies in impairment of complex motor acts, motor coordination, integrative sensory function, and memory in schizophrenia.

Limitations

Present study was nonblind, sample size was small. It was not strictly possible to include only drug naïve patients. The effect of medication on soft signs could not be determined and it may be significant. Soft signs could not be studied in grossly psychotic schizophrenics. Therefore, the relation of soft signs to the severity of schizophrenics could not be determined.

Conclusion

The present study concluded that as compared to normal controls the schizophrenics had a higher prevalence of soft signs. The higher prevalence of soft neurological signs in schizophrenia has expanded the evidence for organic basis in the etiology and pathogenesis of schizophrenia, however there is a need for a universally accepted, structured and reliable procedure for rating NSSs so that results as well as comparisons across studies can be done authentically.

Ethical clearance

Study was conducted after approval from the Institutional Ethics Committee.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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