SOFT NEUROLOGICAL SIGNS AND MINOR PHYSICAL ANOMALIES IN SCHIZOPHRENIA

S. HAQUE NIZAMIE[1], ALKA NIZAMIE[2], M. W. SANGMA[3], P. L. SHARMA,[4]

SUMMARY

The soft neurological signs (SNS) and minor physical anomalies (MPA) were studied in 107 adult schizophrenics. The sample consisted chronic (N=60) and acute (N=47) schizophrenic subtypes. The SNS were found more in chronic patients (p<.01). The most prevalent abnormalities in SNS were related to the sensory integration and motor co-ordination. The release reflexes were rare though they were encountered more in the chronic group. The mean MPA score in comparison to the reported scores in normal population was higher in the schizophrenic patients. The chronic schizophrenics had higher MPA score than the acute group though the difference was statistically not significant. The male acute schizophrenic patients had higher mean MPA score and more of SNS. There was positive correlation between MPA and SNS. The nature and etiological implication of these findings are discussed.

In recent years the neurological basis of schizophrenia is being extensively explored. There is growing evidence for neurodeficits in some subtypes of schizophrenia. The soft neurological signs (SNS) and minor physical anomalies (MPA) as markers of neurodeficits are being studied in schizophrenia.

SNS are defined as the neurological signs of no localizing value. They suggest abnormalities of various functional systems e.g. sensory integration, co-ordination and sequencing of complex motor acts. The release (primitive) reflexes are also included under SNS. Earlier studies have shown some types of signs to be more frequent, than others. The abnormalities of integrative sensory functions have been reported by Tucker et al. (1975), Cox et al. (1979) and Walker (1981). Others have found more difficulties in the area of motor co-ordination (Woods et al. 1986; Rochford et al., 1970) and motor sequencing (Cox et al., 1979; Nasrallah et al., 1982). The release reflexes (in adults) are reported to suggest diffuse cerebral dysfunc-

tion (Jenkyn et al., 1977; Moylan et al., 1979; Tweedy et al., 1982). Though some of these reflexes e.g. grasp, tonic foot response, palmomental, sucking, snout and corneomandibular are also found in frontal lobe pathology (Paulson, 1971). The glabellar tap, snout and sucking reflexes may result from basal ganglia lesion. Primitive release reflexes have been reported to be present more in schizophrenic patients having tardive dyskinesia (Youssef et al., 1988).

The presence of SNS as an index for cognitive and behavioural dysfunction have been studied by many workers (Rochford et al., 1970; Hertzig et al., 1966; Quitkin et al., 1976; Kolakowska et al., 1985). Various aspects of schizophrenic disorder vis-a-vis SNS have been studied. For example Hertzig et al. (1966) reported 4-8 times more incidence of SNS in the schizophrenic patients in comparison to the normal control. Cadet et al. (1986) reported that 29-80% of patients with major psychoses have SNS. Manschreck and Ames (1984) found SNS in 92% of schizophrenic patients, but in only

1. Assistant Professor of Psychiatry, Central Institute of Psychiatry, P. O. Kanke, Ranchi-834 006.
2. Consultant Clinical Psychologist, Deep-Shikha, Ranchi-834 001.
3. Psychiatrist, Civil Hospital, Nongstoin-793 119 (Meghalaya).
4. Psychiatrist, Amguri, Sibsngar, Assam.

52% of affective disorders and in 5% of normal controls. The frequency for such signs increases as the criteria for a diagnosis of schizophrenia become more stringent (Tucker et al., 1975). Such neurological signs have also been found to correlate with the severity and chronicity of psychotic illness (Tucker et al., 1975). They are more characteristic of chronic schizophrenia (Kolakowska et al., 1985; Weller et al., 1979; Torrey, 1980). It is also reported on longitudinal studies of these signs that they appear and disappear in synchrony with the onset and termination of the schizophrenic illness (Lohr, 1985). The schizophrenic patients with SNS have been found to have poor social adjustment (Rochford et al., 1970), and poor premorbid sociability (Quitkin et al., 1976). The SNS in schizophrenia has also been studied in reference to various cerebral lobe functions (Cox et al., 1979), cognitive impairment and ventricular size (Kolakowska et al., 1985).

Influence of sex on SNS is not well studied. However, some workers reported more SNS in males (Cadet et al., 1986; Manschreck et al., 1984). The available literature suggest a trend toward more neurological signs in men (Heinrichs et al., 1988).

The neuroleptic medications do not alter the manifestation of SNS (Cox et al., 1979; Kolakowska et al., 1985; Weller et al., 1979; Mosher et al., 1971; Cox et al., 1979). Heinrichs and Buchanan (1988) on reviewing the literature also concluded that medication does not alter neurological signs.

The presence of MPA has been described as an indicator of congenital neuro-integrative defect. The MPAs are defined as a slight physical defect, a deviation in appearance from essential physical characteristics (Evans et al., 1973). Marcus et al. (1985) describes the MPAs as a particular group of human morphological variations resulting from abnormal development during the first foetal trimester. They are believed to be due to

genetic cause or foetal insult. It is assumed that these anomalies are indicators of CNS abnormalities that developed during the same period from the same causes. The MPAs have also been studied in schizophrenia. It has been hypothesized that some subtypes of schizophrenia may be due to a congenital defect in neurointegrative system (Meehl, 1962; Rosanthal et al., 1968; Fish et al., 1973; Kestenbaum, 1981; Guy et al., 1983).

There have been studies on the relationship between MPA and SNS. The findings have been equivocal. Quinn & Rapoport (1974) did not find any relationship between SNS and MPA in a group of hyperactive boys. However, on repeating Quinn and Rapoport's test (but eliminating "gross motor co-ordination" item) Paulsen and O'Donnel (1979) found a positive relationship between the SNS and MPA. Waldrop and Halverson (1971) and Marcus et al. (1985) reported a slight positive relationship between the two sets of parameter.

The schizophrenias, on the basis of descriptive dissimilarities, causes, outcome, and treatment response have been divided into acute and chronic groups. Various biological markers have been studied to delineate these two subtypes (Kolakowska et al., 1985). Neurological abnormalities have been found to be more characteristics of chronic schizophrenia (Weller et al., 1979; Torrey, 1980).

The present study was conducted with a aim to find out the prevalence of SNS & MPA in chronic and acute sub-groups, and to see the relationship if any, between MPA and SNS.

MATERIALS AND METHOD

Subject : A total of 107, ambulatory, schizophrenic inpatients of the Central Institute of Psychiatry (CIP), Ranchi, were included in the study. An informed consent was obtained either from the patient or his/her close relation. Out of them 60 were

chronic schizophrenics (30 males and 30 females) and 47 acute schizophrenics (30 males and 17 females). The Research Diagnostic Criteria (Spitzer et al., 1978) were used to diagnose and group the cases. For chronic schizophrenia the patients with history of illness for atleast 2 years were included while in the acute group, the duration of ill ness was less than 3 months.

The age range of patients was 15-55 years. Upper range of 55 was kept to exclude age related SNS findings. The mean age of the acute schizophrenic group was 23.87 ± 6.12 years, with a mean duration of illness of 39.19 ± 19.62 days (range 2 weeks to 3 months). The mean age of chronic schizophrenic group was 42.89 ± 11.06 years. The mean duration of illness was 18.52 ± 8.77 years (range 5-37 years). The mean duration of hospitalization in this group was 12.93 ± 8.07 years.

The patients belonging to mongoloid race were not included in the study in order to eliminate bias due to racial difference while recording the MPA. The patients having tardive dyskinesia, any neurological or medical diseases were also excluded from the study.

Tools and Procedure

To assess MPA the Waldrop Scale (Waldrop et al., 1968) was administered. It is a standardized system and it has been used in Indian set up (Lal et al., 1987). In this scale there are 17 MPA. Each MPA is given certain weightage ranging from 0-2. The total Waldrop score would give an indication as to the number and severity of MPA present in a subject.

The acute schizophrenic patients were assessed for SNS within 24-36 hours of admission. Only those cases were included in the study who were on no antipsychotic drug for atleast two weeks. The patients on depot antipsychotic (Fluphenazine decanoate) were excluded from the study. In the chro-

nic group, the patients who were on antipsychotic medication, were given a drug free, washout period for 2 weeks before they were assessed for SNS. This precaution was taken in order to control the drug induced extrapyramidal side-effects. The need to assess the glabellar tap reflex made this step necessary.

To assess SNS, a set of operationally defined neurological signs were administered. The SNS were recorded either to be present or absent. Equivocal responses were rejected. The SNS, were recorded present only when definitely elicited. The battery used in this study comprised 17 items. There were 8 release reflexes namely grasp, groping, palmomental, tonic foot response, sucking, snout, corneomandibular and glabellar tap response. The glabellar tap reflex was recorded present if there was continued blinking following 10 consecutive taps to the glabella. Other reflexes were assessed by standard neurological examination procedure (Paulson, 1971; Rickerstaff, 1980; Swash et al., 1984).

Rest 9 items of SNS battery were taken from Close (1973). They included finger-nose, heel-knee, finger tapping, foot tapping, finger and foot synchronization, face-hand, face-noise, graphesthesia, and two-point discrimination tests. The finger-nose and heel-knee tests were done on either side with eyes open and closed. The finger tapping, foot tapping, finger and foot synchronizations, face-hand and face-noise tests were also performed on either side. Deep tendon reflexes (biceps, triceps, supinator, knee and ankle) were also examined. The SNS were assessed by an examiner (MWS) who was unaware of the Waldrop score of the concerned patient.

RESULTS

The SNS were found in 53.33% of the chronic and 17.32% of the acute schizophrenic patients (Table 1). This difference was

statistically significant (p < .01). When the SNS were analysed individually (Table 1)

TABLE 1. *Comparison of SNS in acute and chronic schizophrenic patients*

	Acute Schizophrenia (N=47)		Chronic Schizophrenia (N=60)	
	No.	%	No.	%
A. *Release Reflexes*				
1. Grasp reflexes	—	—	—	—
2. Groping reflex	—	—	—	—
3. Palmomental reflex	—	—	2	3.3
4. Sucking reflex	—	—	—	—
5. Snout reflex	—	—	1	1.7
6. Tonic foot response	—	—	—	—
7. Corncomandibular reflex	—	—	—	—
8. Glabellar tap reflex	1	2.1	7	11.7
B. *Motor Coordination*				
9. Heel-knee test	—	—	1	1.7
10. Finger-nose test	2	4.2	2	3.3
11. Finger tapping test	—	—	6	10.0
12. Foot tapping test	—	—	3	5.0
13. Finger & Foot synchronization	3	6.4	18	30.0
C. *Sensory Integration*				
14. Graphesthesia	3	6.4	5	8.3
15. Two-point discrimination	—	—	6	10.0
16. Face-hand test	3	6.4	22	36.7
17. Face-noise test	2	4.2	9	15.0
D. Total number of patients with SNS	8	17.0	32	53.3

an interesting finding emerged. The release reflexes on the whole were rare. In the acute schizophrenic group except for one patient these reflexes were not found. This patient had a positive glabellar tap response. In the chronic schizophrenic patients the glabellar tap response was found in 7 cases (male 4, female 3), palmomental in two and snout reflex in one patient only. No other

release reflexes could be elicited. On the whole the glabellar tap response was most often encountered.

The rest of the SNS (finger-nose, heel-knee, finger-tapping, foot-tapping, finger and foot synchronization, graphesthesia, two-point discrimination, face-hand and face-noise tests) were more frequent. All of these neurological signs were found in the chronic schizophrenic group. There were at least four of the above tests not scored at all (see Table 1) in the acute schizophrenic patients. When SNS representing disturbances of various functional system were analysed the abnormalities of integrative sensory function were most prevalent. In comparison to other SNS these dysfunctions were seen more often even in the acute schizophrenics. The signs of motor in-coordination were next prevalent disturbances.

The mean score for MPA in the chronic schizophrenic group was 6.6 ± 3.24. It was 5.7 ± 2.2 in the acute group (Table 2).

TABLE 2. *"t" value between chronic and acute schizophrenic for MPA*

	Mean	S.D.
Chronic Schizophrenia (N=60)	6.6	3.24
Acute Schizophrenia (N=47)	5.7	2.2

t=1.7, d.f.=105, N.S.

There was no statistically significant difference between the chronic and acute schizophrenic patients on the mean MPA score. But when the sex difference was considered, the MPA scores showed statistically significant difference (p < .01) between the male and the female acute schizophrenic patients. The male patients had mean MPA score of 6.53 ± 2.18 while it was 4.24 ± 1.44 for the females (Table 3). A similar sex distribution for the prevalence of SNS was seen in the acute schizophrenic patients. Twenty percent of the males against 11.76% of the

TABLE 3. *"t" value between male and female in both groups for MPA*

	Mean	S.D.
A. Chronic Schizophrenia		
Male (N=30)	6.90	2.35
Female (N=30)	6.23	3.95
t=0.77, d.f.=58, N.S.		
B. Acute Schizophrenia		
Male (N=30)	6.53	2.81
Female (N=17)	4.24	1.44
t=4.32, d.f.=45, p<.01		

females in the acute group were having SNS. This sex difference vanished in the chronic schizophrenic group. Here both the sexes were equally affected. Similarly no sex difference was found when the SNS from both the groups (acute and chronic) were combined (Table 4).

TABLE 4. *Sex distribution of SNS in acute and chronic schizophrenic groups*

	N	%
Acute Schizophrenia (N=47)		
Male (N=30)	6	20.0
Female (N=17)	2	11.8
Chronic Schizo. (N=60)		
Male (N=30)	16	53.3
Female (N=30)	16	53.3
Acute Chronic Schizo. (N=107)		
Male (N=60)	22	36.7
Female (N=47)	17	36.2

TABLE 5. *Correlation value of MPA and SNS in both the groups*

	Chronic Schizophrenic (N=60)	Acute Schizophrenic (N=47)
SNS		
(% value)	53.33	17.02
MPA		
(Mean value)	6.6	5.7
(Value)	.55**	.34*

*p<.001, **p<.05

There was a positive correlation between the MPA and SNS in both the sub groups (Table 5). This correlation was more significant in the chronic schizophrenic patient (p<.001) than the acute sub group (p<.05).

DISCUSSION

The chronic schizophrenic patients had more SNS. Other workers have reported similar findings (Torrey, 1980; Weller et al., 1979; Kolakowska et al., 1985). Neurological abnormalities are more characteristic of chronic schizophrenia. They may be an indicator of non-specific brain damage and their presence may predict a chronic, debilitating course. In contrast, fewer acute schizophrenic patients had SNS. Whether the acute schizophrenic patients with SNS will develop a chronic illness or the acute psychotics without SNS will also acquire SNS overtime is a question unanswered. Torrey (1980) and Kolakowska et al. (1985) reported an increase in neurological signs overtime. However, in the former study this association disappeared when more stringent criteria of abnormality were employed. Wood et al. (1986) and Weller et al. (1979) found no such association. Also, the review of available literature suggests temporal stability for SNS (Heinrichs et al., 1988). They are rather believed to be stable trait characteristics. None-the-less, it will be interesting to follow acute schizophrenic over long periods to see if they acquire more SNS.

Paucity of release reflexes in this study is interesting. Youssef and Waddington (1988) studied five release reflexes (grasp, palmomental, snout, corneomandibular and glabellar) in a group of schizophrenic patients. In their study, patients without tardive dyskinesia showed a release reflex profile somewhat similar to ours except that the palmomental reflex was present in 29% of their patients. It may be due to higher age range (50-86 years) in their study.

The release reflexes are frequently studied as part of SNS in schizophrenia. Their study does not seem to be a profitable endeavor. It has been suggested that these "forgotten" signs are not worth testing (Lancet, 1987). The degree of damage to the brain in order to release these reflexes may be lacking in schizophrenia. Luria (1966) believed that there has to be significant damage to the subcortical formation of the frontal lobe in order to release some of these reflexses (grasping, sucking etc.). However, Lohr (1985) reported transient grasp reflexes appearing and disappearing in synchrony with the onset and termination of the episodes of schizophrenia. Yet, it seems, that the focus of studies of SNS in schizophrenia in future should be more on abnormalities of sensory integration, motor co-ordination and sequencing of complex motor acts rather than release reflexes.

The MPA score was uniformly high in both chronic and acute schizophrenics. It was higher in the chronic (6.6 ± 3.26) than in the acute psychotic patients (5.7 ± 2.2). Lal and Sharma (1987) reported a score of 6.8 ± 2.00 in schizophrenic patients against a score of 2.9 ± 1.76 in normal controls. Higher MPA scores in schizophrenia have been reported by other workers (Guy et al., 1983, Lal et al., 1987, Goldfarb, 1977, Gualtieri et al., 1982) also. The MPA results from developmental aberration in the foetus in the first trimester of its intrauterine life. This developmental aberration in early life may predispose one to develop schizophrenia in later life.

Regarding sex difference, males have been reported to have more genetic and teratogenic abnormalities (Halverson et al., 1976) as well as a greater incidence of MPA (Waldrop, 1979). Rochford et al. (1970) and Manschreck and Ames (1984) reported a trend toward neurological impairment in man. Marcus et al. (1985) reported similar sex distribution in the off-springs of schiz-

ophrenic patients. However, other workers have reported no sex difference for neurological signs (Hertzig et al., 1966). In our study the male acute schizophrenic patients had significantly more of MPA and SNS while no such sex difference was found in the chronic group. Thus a clear cut sex difference when both the groups were considered was lacking.

The SNS were positively correlated with the MPA in acute $(p < .05)$ and chronic $(p < .001)$ schizophrenic patients. Waldrop et al. (1971) and Paulsen et al. (1979) reported similar findings. Marcus et al. (1985) found a slight positive correlation between the SNS and MPA in a group of offsprings of schizophrenic patients. The neurological impairment in chronic schizophrenic patients has been found to be greater than the acute schizophrenics (Goldstein, 1978, Heaton et al., 1978). The incidence of MPA has been found to be related to the neurological impairment. However, it will be erroneous to conclude that MPA and SNS may have a common origin. The nature of their relationship merits further exploration.

In conclusion, it may be said that the chronic schizophrenia has higher number of MPA and SNS. The MPA and SNS are often present together in chronic schizophrenics. These patients represent a group of schizophrenia who may have neurological basis for their psychopathology. However, there is a need to study cognitive functions in these patients and neuro-imaging techniques (e.g. PET, NMR) may be used to see if there is any metabolic or structural correlate in the brain.

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