Indian J. Psychiat., 1997, 39 (3), 205-211

DERMATOGLYPHIC FLUCTUATING ASYMMETRY AND SYMMETRY IN FAMILIAL AND NON FAMILIAL SCHIZOPHRENIA

R. PONNUDURAI, M. SARADA MENON & M. MUTHU

ABSTRACT

Three dermatoglyphic traits, viz; finger patterns, finger ridge counts, and palmer a -b ridge counts of 57 (M-29; F-28) and 64 (M-29; F-35). Schizophrenics with and without positive family history respectively, and 65 controls (M-30, F-35), were analysed to determine their level of fluctuating asymmetry.

Uniformly higher fluctuating asymmetry was observed in the loop ridge counts of second digits of males and females of both the groups of schizophrenics. Significantly increased symmetry in the right and left loop ridge counts in the fifth digits of the family history positive female patients was noted. Barring the family history positive female schizophrenics, the rest of the patient groups manifested higher fluctuating asymmetry in their right and left whorl ridge counts of fourth digits. Family history positive patients of both sexes and female patients with negative family history displayed higher fluctuating asymmetry in the right and left palmer a-b ridge counts.

Key words : Schizophrenia, dermatoglyphics, asymmetry, family history

In the recent decades several studies on dermatoglyphic parameters such as finger and palm patterns, ridge counts and mainlines, have been undertaken in schizophrenia which were the subject matter of review by Balgir & Srinivasamurthy (1982). Dermatoglyphic studies of schizophrenia support the usefulness of these morphologic traits in detecting a biologic and genetic background in schizophrenia, although the evidence is still controversial (Plato et al., 1987). The use of dermatoglyphic traits to measure the degree of fluctuating asymmetry provides a new approach to this problem (Mellor, 1992).

Fluctuating asymmetry can be defined as the random differences between corresponding morphometric characters on each side of the plane of symmetry and is estimated from the differences between corresponding right and left sided structures. These differences are zero if each side is a perfect mirror image of the other. The degree of fluctuating asymmetry is indicative of an organism's susceptibility to developmental noise (Van Valen, 1962).

The first investigation of dermatoglyphic fluctuating asymmetry in schizophrenia by Markow and Wandler (1986) revealed significantly higher fluctuating asymmetry for palmar a-b ridge count and finger ridge count. Markow and Gottesman (1989) subsequently found that twins concordant for schizophrenia had higher levels of finger ridge count fluctuating asymmetry than discordant twin pairs. More recently, Mellor (1992) showed similar findings in a group of schizophrenics. Evidently, studies on dermatoglyphic fluctuating asymmetry are relatively few. Also, further improvements in the methods of this investigation will be helpful.

MATERIAL AND METHOD

The schizophrenic patients who reported to the psychiatric outpatient department of Government General Hospital, Madras from January 1981 to April, 1982 and fulfilled the Feighner's criteria for schizophrenia (Feighner et al., 1972) were selected. Cases whose first or second degree relatives had schizophrenia or schizophrenia like psychosis or atypical psychosis were grouped as family history positive cases. Thus 64 (M-29, F-35) family history negative and 57(M-29, F-28) family history positive schizophrenia patients entered into this study.

Inpatients of the same hospital who were admitted for various physical ailments like pyrexia of unknown origin, bronchitis and gastroenteritis were taken as control cases. Going by the Indian studies of psychiatric morbidity, (Verghese et al., 1973; Nandi et al., 1975) it was assumed that the prevalence rate of schizophrenia is about 3 per 1000 (0.3%). Hence, the selection of control group was evenly distributed by every 300th case irrespective of the sex, but, matched to the age of the patients sample group. After excluding those with history of any kind of psychiatric ailment either in them or in their first and second degree relatives, and those who suffered from illnesses presumed to be due to genetic predisposition, 65 (M-30, F-35) psychiatric ailment free normal patients were selected as control cases.

In view of the population variations observed in dermatoglyphics, the samples were chosen only from the south Indians.

The parameters analysed were, finger patterns, absolute finger ridge counts of whorls, ridge counts of loops and palmar a :b ridge counts. The methods employed for taking the rolled prints of the fingers and palm was ink and pad method. The classification and analysis of the parameters were done as per the guidelines laid down by Cummins and Midlo (1961). The parameters of the family history positive and family history negative patients were separately compared with the controls. Wherever difficulty was encountered in analysing a finger pattern, that particular finger pair was discarded from the study.

These samples and their prints were subjected to a different method of analysis elsewhere (Ponnudurai, 1987). The retrospective analysis of the history and clinical findings of the patients indicated that all the subject would have fulfilled the D.S.M. -III R criteria for schizophrenia (American Psychiatric Association 1987).

The methods adopted in this study were as outlined below -

Fingerprint patterns : The types of pattern tend to be identical on homologous fingers. Therefore, the frequency of pattern discordance can be used as a measure of fluctuating asymmetry. The number of right-left finger pairs that did not have the same type of pattern on each finger are considered as discordant finger pairs and the rest as concordant.

Finger ridge counts : The modified methods adopted in this investigation is as follows: The ridge counts on the homologous fingers which had the same type of patterns were compared. Since comparison of ridge counts of basically, two different types of patterns could be misleading, the discordant finger pairs were excluded for this type of analysis. Further, the correlations (r) of the ridgecounts of the loop patterns on homologous fingers of right and left hands were measured separately. Similarly, the correlations of the absolute ridge counts of the whorl patterns on homologous fingers were assessed. The square of the correlation Coefficient (r^2) of the two variables (right and left finger ridge counts of identical patterns) is a measure of their common variance and $1-r^2$, sometimes known as the coefficient of indetermination (Sokal & Rohlf, 1981), is an estimate of their unshared variance and thus of fluctuating asymmetry.

Palmar a-b ridge count : The number of ridge lying between the 'a' and 'b' triradii of the right and left palms were counted. The correlations of these two variables and the fluctuating asymmetry were estimated.

RESULTS

Finger patterns : the frequency distribution of discordant finger pairs in the patient's group did not to differ from the control group. (table 1)

Finger ridge counts : analysis of the ridge counts of the loop patterns revealed higher fluctuating asymmetry in the second digits of all groups of patients. But the difference between the 'r' values did not reach the level of significance. The maximum fluctuating asymmetry measure obtained in the loop ridge counts of the male and female patients group respectively was .965 and .774. Also, this was witnessed in the family history negative group only. In the respective control groups these values were .559 and .713. Another noteworthy observation was significantly increased symmetry in the right and left loop ridge counts in the fifth digits of the family history positive female patients (tables 2 & 3).

Finger pairs with a frequency of less than four whorls were omitted in this investigation for statistical purpose. At any rate when the fourth digit was analysed, barring the family history positive female schizophrenics the rest of the patient groups manifested higher fluctuating asymmetry in their right and left whorl ridge counts (table 4).

Palmar a-b ridge counts : Family history positive patients of both sexes and female patients with negative family history displayed higher fluctuating asymmetry in the right the left palmar a-b ridge count. But, here again the difference between the 'r' values was not statistically significant. Further more, the highest fluctuating asymmetry measure noted in the male and female schizophrenics was .439 and .830, whereas the same for the respective control group was .326 and .517. Additionally, this highest asymmetry measure were obtained in the family history positive groups only (table 5).

TABLE 1
FREQUENCY DISTRIBUTION OF DISCORDANT FINGER PAIRS

	DISCORDANT FINGER PAIRS									
	Males (M-29)					Females (F-28)				
FH+ve patients	I 11	II 9	III 8	IV 7	V 2	I 10	II 14	III 11	IV 9	V 2
Controls (M-30, F-35)	10	11	11	9	7	9	16	7	9	4
Chi-square values	.137	.130	.557	.256	3.082	.600	.114	2.835	.315	.332
FH-ve patients	8	9	12	6	5	12	12	11	10	5
Controls	10	11	11	9	7	9	16	7	9	4
Chi-square values	.229	.209	.137	.674	.338	.747	.613	1.551	.251	.163

All values not significant

TABLE 2
CORRELATIONS (r) AND FLUCTUATING ASYMMETARY MEASURE ($1-r^2$) OF RIGHT & LEFT RIDGE COUNTS OF LOOP PATTERNS

FINGER PAIRS ANALYSED	F.H.+VE SCHIZOPHRENICS			CONTROLS			difference of $1-r^2$
	N	r	$1-r^2$	N	r	$1-r^2$	
			MALES				
I	10	.617	.619	12	.664	.559	+ .060
II	9	.398	.842	15	.819	.329	+ .513
III	16	.580	.664	6	.690	.524	+ .140
IV	8	.769	.409	19	.732	.464	- .055
V	23	.877	.231		.807	.349	- .118
			FEMALES				
I	16	.623	.612	18	.536	.713	- .101
II	16	.695	.517	10	.838	.298	+ .219
III	16	.752	.434	25	.562	.684	- .250
IV	7	.836	.301	10	.752	.434	- .133
V	21	.931*	.133	29	.789*	.377	- .244

*Difference between r, $p < .05$.
'N' indicates the total number of samples in whom the finger pairs were analysed.

TABLE 3
CORRELATIONS (r) AND FLUCTUATING ASYMMETARY MEASURE ($1-r^2$) OF RIGHT & LEFT RIDGE COUNTS OF LOOP PATTERNS

FINGER PAIRS ANALYSED	F.H.-VE SCHIZOPHRENICS			CONTROLS			difference of $1-r^2$
	N	r	$1-r^2$	N	r	$1-r^2$	
			MALES				
I	18	.186	.965	12	.664	.559	+ .406
II	14	.706	.502	7	.819	.329	+ .173
III	15	.820	.328	15	.690	.524	- .196
IV	10	.798	.363	6	.732	.464	- .101
V	19	.857	.266	19	.807	.349	- .083
			FEMALES				
I	13	.579	.665	18	.536	.713	- .048
II	14	.475	.774	10	.838	.298	+ .476
III	20	.622	.613	25	.562	.684	- .071
IV	11	.825	.319	10	.752	.434	- .115
V	25	.760	.422	29	.789	.377	+ .045

'N' indicates the total number of samples in whom the finger pairs were analysed

TABLE 4
CORRELATIONS (r) AND FLUCTUATING ASYMMETARY MEASURE ($1-r^2$) OF RIGHT & LEFT RIDGE COUNTS OF WHORL PATTERNS

FINGER PAIRS ANALYSED	F.H.+VE SCHIZOPHRENICS N	r	$1-r^2$	CONTROLS N	r	$1-r^2$	difference of $1-r^2$
			MALES				
I	7	.821	.326	7	.780	.392	- . 066
II	6	.904	.183	9	.922	.150	+ . 033
III	13	.685	.531	15	.860	.260	+ . 271
			FEMALES				
II	6	.694	.518	7	.669	.552	- . 034
IV	12	.916	.161	15	.879	.227	- . 066
	F.H. - VE SCHIZOPHRENICS			CONTROLS			
			MALES				
IV	11	.635	.597	15	.860	.260	+ . 337
			FEMALES				
I	7	.815	.336	6	.984	.032	+ . 304
II	6	.853	.272	7	.669	.552	- . 280
IV	11	.738	.455	15	.879	.227	+ . 228

Finger pairs with inadequate frequency of whorls are omitted. 'N' indicates the total number of samples in whom the finger pairs were analysed.

TABLE 5
CORRELATIONS (r) AND FLUCTUATING ASYMMETARY MEASURE ($1-r^2$) OF RIGHT & LEFT PLAMAR "A-B" RIDGE COUNTS

	F.H.+VE SCHIZOPHRENICS N	r	$1-r^2$	CONTROLS N	r	$1-r^2$	difference of $1-r^2$
Males	27	.749	.439	30	.821	.326	+ . 113
Female	28	.412	.830	32	.695	.517	+ . 313
	F.H. - VE SCHIZOPHRENICS			CONTROLS			
Males	27	.821	.326	30	.821	.326	. 000
Females	31	.496	.754	32	.695	.517	+ . 237

'N' indicates the total number of samples in whom the palmer a-b ridge count was analysed

DISCUSSION

A high level of fluctuating asymmetry signifies that the organism has a low capacity for buffering adverse environmental effects that could deflect the course of its genetically determined programme of development (Van Valen, 1962). An association between fluctuating asymmetry and a particular disorder probably suggests that the same multiple alleles play a part in the etiology of both. In the case of dermatoglyphics, different alleles may perhaps play a role for the different traits and their varying types of manifestations. Further, of all the dermatoglyphic traits, the possibility of only a few being associated with schizophrenia can not be ruled out. Not with standing, an adverse intrauterine factor may also be contributory.

Contrary to the reports of Markow & Wandler (1986) and Mellor (1992), in this study the frequency of the discordant finger pairs in either of the schizophrenic groups failed to differ from the controls.

Even as the highest fluctuating asymmetry measures were witnessed in the loop ridge count and palmar a-b ridge counts of the patients, the occurrence of increased symmetry in the fifth digits of some patients has become difficult to explain. Perhaps, this could be an independent finding or a process of compensation for the higher asymmetry in other digits.

Despite the emergence of a few findings in the family history positive group, by and large grouping the patients based on presence or absence of family history has not pointed towards any definite trend. But, the small sample size should signal caution in the interpretation of these results. Additionally, the methods employed for the analysis, particularly for the finger ridged counts, have inevitably reduced the original sample size. At any rate, this limitation should serve as a pointer to involve larger samples in future studies for drawing better conclusions.

ACKNOWLEDGEMENTS

The statistical assistance rendered by Mr. R. Kumar, Statistician, Institute of Mental Health, Madras, is recorded with thanks. The secretarial services offered by Mrs. T.Vimala Rani, Steno typist, Govt. General Hospital, Madras, is highly appreciated.

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*R. PONNUDURAI *, MNAMS (Psychiatry), DPM., Ph.D.,Professor of Psychiatry, Stanley Medical College ,Madras 600 001, M. SARDA MENON, MD, DPM, FRC Psych., Former Superintendent, Institute of Mental Health, Madras & Professor of Psychiatry, Madras Medical College, Madras & M. MATHU, MBBS, B.Sc, Ph.D., Former Director & Professor, Institute of Anatomy, Madras Medical College, Madras.*

Correspondence