



Quantitative Analysis of Dermatoglyphics in Schizophrenic Patients

KEYWORDS

epidermal ridges; dermatoglyphics; TFRC; a-b ridge count; adt angle; atd angle; schizophrenia.

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ABSTRACT

Introduction: Association of dermatoglyphics with innumerable physical, behavioral and pathological traits are studied in recent past. There are many conflicting reports with regard to occurrence and frequencies of various epidermal ridges pattern parameters across the world and within India. In this study, we have attempted to evaluate fingertip pattern in schizophrenic patients belonging to urban area of Andhrapradesh.

Methodology: The rolled finger and palmar prints of 100 schizophrenic patients of both the sexes (50 males and 50 females) clinically diagnosed under DSM –III-R criteria aged between 15-65 years were collected for the study from the Department of Psychiatry, of a Government District General Hospital in Andhra Pradesh from September 2009 to July 2010. These dermatoglyphic patterns were compared with age and sex matched 100 controls selected from teaching and nonteaching staff and students of same teaching hospital.

Results: Schizophrenic patients had higher Total finger ridge count (TFRC) especially male patients with mean value of 104 in males and 112 in females. Lower a-d ridge count especially left hand of male patients was noted with mean count of 30.5. 'adt' angle was higher in patients than controls. Atd angle has not shown any significant difference in compared to controls.

Conclusions: We conclude that there are significant differences in the schizophrenics in various dermatoglyphic features, when compared to normal controls.

Introduction:

Association of dermatoglyphics with innumerable physical, behavioral, pathological traits have been reported in past years. As the epidermal ridge pattern is established early in intrauterine life, it is theorized that it can be an effective tool in determining risk of development of particular trait. In this study we have evaluated dermatoglyphic pattern in schizophrenic patients. Schizophrenia is a clinical syndrome of variable, but profoundly disrupting, psychopathology that involves cognition, emotion, perception and other aspects of behavior. Current epidemiological research into possible environmental causes of schizophrenia focuses on three main areas: pre and perinatal damage, factors affecting early brain development and factors operating at the level of the social and family environment¹. First two factors also influence establishment of dermatoglyphic pattern, which may give a valuable clue for later risk of development of any psychiatric disorders. Epidermal ridges start to develop during 11th gestational week and during 3rd and 4th month they undergo specific differentiation². This coincides with significant phase of neuronal development³.

Many studies have tried to establish the direct link between epidermal ridges and schizophrenia using different features to characterize the configuration of epidermal ridges. In modern day medicine, significance of epidermal ridges association with schizophrenia was noted by Sarah B. Holt⁴. Mellor identified both quantitative and qualitative association of dermatoglyphic pattern with schizophrenia⁵.

Even in India, there are many studies under this concept. Of late, the sequential development of such pattern in schizophrenic patients is reported by Ponnudurai⁶. Studies have tried to establish relation of schizophrenia and bipolar affective disorder after noting similar dermatoglyphic pattern⁷. Studies have checked the reliability of a-b ridge count in development of schizophrenia⁸. Bramonet al after meta-analysis of such studies, concludes that there is significant reduction in a-b ridge count in schizophrenics⁹. Chok et al suggested extralimbaltriradii as a putative marker of schizotypy¹⁰. In our present study, we have attempted to evaluate fingertip pattern in schizophrenic patients in urban areas of Andhrapradesh. This is the first such study in Andhrapradesh to evaluate epidermal ridge patterns in schizophrenic patients.

Methodology:

Study group - The rolled finger and palmar prints of 100 schizophrenic patients of both the sexes (50 males and 50 females) clinically diagnosed under DSM –III-R criteria aged between 15-65 years were collected for the study from the Department of Psychiatry of Government District General Hospital, Andhra Pradesh from September 2009 to July 2010. Institutional ethical clearance was obtained.

Exclusion criteria: Patients suffering from schizophreniform disorders, any other psychiatric disorders and those with associated genetic abnormalities were excluded in this study.

Control group - The rolled finger and palmar prints of 100 normal individuals of both the sexes (50 males and 50 females), aged between 15-65 years who were medically and psychologically healthy were taken from the teaching, non-teaching staff and medicos of a Medical College, matched with age group of patients.

Procedure: The modified Pervis Smith method was employed in our study¹¹. After taking informed consent from the patient they were asked to wash their hands with soap and water to remove any oil or dirt so that quality of dermatoglyphics print is maintained. A small amount of ink is placed on the inking slab, it was spread with the roller into a thin, even film. The area to be printed is pressed against the slab, taking care that the whole area to be printed is covered with ink. A firm surface is used under the sheet of paper at which the inked finger and palm are pressed. The fingerprints were taken starting from thumb to little finger of right hand and similarly repeated for left hand. The prints of both hands right and left were taken on separate clean papers and labeled properly. Dermatoglyphic pattern with regard to total finger ridge count (TFRC), atd angle, adt angle and a-b ridge count (ABRC) were noted and tabulated.

TFRC: Ridge counting is done along a straight line connecting the triradial point to the point of core. The ridges containing the point of core as well as the triradial point are both excluded from the count. Interstitial lines are not counted. A TFRC represents the sum of the ridge counts of all ten fingers. In the computation of TFRC, when two counts are made on a finger, the larger count is utilized.

Atd angle and adt angle: To map the atd angle three points, axial triradius, triradius at the proximal limit of the base of the index finger, named as digital triradius 'a' and triradius at the proximal limit of the base of the little finger, marked as 'd' digital tri radius. A single axial triradius 't' is present at or very near to the proximal palmar margin near the depression between the thenar and hypothenar eminences. It corresponds to the axis of the fourth digit. Usually the axial triradius is single in number. Similarly adt angle is measured.

ABRC: The ridge count in palmar area between point 'a' (triradius at base of forefinger) and point 'b' (triradius at base of middle finger) is referred to as the a-b ridge count. It was taken according to the method given by Holt¹².

Statistical analysis: The qualitative parameter is expressed as number and percentage and the quantitative parameters are expressed as the number of cases and controls in a particular range. All statistical calculations are done by using chisquare test using EpilInfo software. p value of 0.05 or less was set for statistical significance.

Results:

TFRC:

It varied from 31 to 150 and these results were classified into 3 groups, depending on the range of ridge count. TFRC of less than 70 into group 1, more than 70 and less than 110 into group 2 and more than 110 into group 3. Number of cases noted both in patients and controls are tabulated in table 1. TFRC of more than 70 was found in 50 female patients in comparison with 44 age related controls. TFRC of less than 70 was not found in any of schizophrenic females but found in 6 controls. This was of statistical significance (table 1). TFRC in males (mean-104) as well as females (mean -112) was higher than controls

(males- 98.98, females- 90.4). Increase in TFRC in female schizophrenics is statistically significant.

Table 1: Total Finger Ridge Count (TFRC) range of digits in 100 schizophrenic cases and 100 controls. Numbers in parenthesis indicates number of males and females respectively.

(χ^2 chi square value; †p value <0.05, significant)

TRRC range	Schizophrenia patients (n =100)	Control group (n =100)	Significance
31-70	5 (5+0)	12 (6+6)	$\chi^2=1.53$ in males
71-110	46 (23+23)	64 (28+36)	
111-150	49 (22 +27)	24 (16+8)	$\chi^2=19$ in females†

a-b ridge count:

It varied from 21-40 and these results were classified into 2 groups and number of patients and controls in each group is calculated both in right and left hands separately and also in males and females. Mean values of right and left hand a-b ridge counts are taken for grouping and are represented in table 2. Statistically significant difference is seen in males with a-b ridge count 31-40 in both hands between patients and controls (table 2). There is a decrease in the a-b ridge count of both right and left (mean - 30.52) hands of male schizophrenics when compared with male controls (right hand of male controls mean ABRC = 32.1 and left hand is 32.46) and an increase in the a-b ridge count of both the right (30.16) and left (30.90) hands of female schizophrenics when compared with controls (right hand of female controls - 28.76 and left hand - 28.94).

Table 2:a-b ridge count range of hands of 100 cases and 100 controls. Numbers in parenthesis indicate counts in right and left hand respectively.

(χ^2 chi square value; †p value <0.05, significant)

a-b ridge count range	Schizophrenic patients	controls	Significance value
Males			
21-30	57 (28+29)	39 (20+19)	$\chi^2 = 2.562$
31-40	43 (22+21)	61 (30+31)	$\chi^2 = 4.01†$
Females			
21-30	57 (31+26)	70 (35+35)	$\chi^2 = 0.71$
31-40	43 (19+24)	30 (15+15)	$\chi^2 = 3.4$

'atd' angle:

The atd angle varied from 31⁰-50⁰ and these results were classified into 2 groups and the number of cases and controls in each group is calculated both in right and left hand separately and in male and females. There was no statistical difference between patients and controls both in males and females with regard to atd angle (table 3). The mean atd angle in male patients was 41⁰ in female patients was 42⁰.

Table 3: 'atd' angle of hands of 100 cases and 100 controls. Numbers in parenthesis indicate counts in right and left hand respectively.(X²chi square value)

Range of degree	Schizophrenic patients	controls	Significance value
Males			
31-40°	47 (24+23)	45 (19+26)	X ² = 1.02
41-50°	53 (26+27)	55 (31+24)	X ² = 0.36
Females			
31-40°	43 (24+19)	43 (23+20)	X ² = 0.04
41-50°	57 (26+31)	57 (27+30)	X ² = 0.04

adt angle:

The adt angle varied from 70°-90° and these results were classified into 2 groups and the number of cases and controls in each group is calculated both in right hand and left hand separately and in males and females. Mean adt angle in males patients was 81° and in female patients was 80° (table 4).

Table 4: Table 3: 'adt' angle of hands of 100 cases and 100 controls. Numbers in parenthesis indicate counts in right and left hand respectively. (X² chi square value; tp value <0.05, significant)

Range of degree	Schizophrenic patients	Controls	Significant value
Males			
71-80°	49 (24+25)	59 (34+25)	X ² = 4.11†
81-90°	51 (26+25)	41 (16+25)	X ² = 0
Females			
71-80°	42 (23+19)	64 (36+28)	X ² = 6.99†
81-90°	58 (27+31)	36 (14+22)	X ² = 3.25

Discussion:

The scientific value of dermatoglyphics largely derives from the fact that dermal ridges appear in the third to fifth month of fetal development and the patterns once formed never change. Dermatoglyphic traits are genetically determined^{3,13}. Dermatoglyphic abnormalities are due to genetic or other factors that express their effect before the end of fifth month of fetal development¹⁴. The recent evidence from adoption, twin and family studies have proved as a basis for genetic contributions in schizophrenia, hence dermatoglyphic variation is an essential investigation in its early diagnosis¹⁴.

In present study, we observed an increase in mean TFRC in females. This is in accordance with Jhingan et al study¹⁵. Mellor et al have reported a significant decrease in TFRC in male patients and no such differences in female patients⁵. Srinivas Murthy et al have reported a decrease in TFRC in both males and females¹⁶. Fananas et al have not observed any significant variations in TFRC between patients and controls¹⁷. These studies have shown that TFRC cannot be reliably used for determining association of dermatoglyphics with schizophrenia.

Effectively we have observed a lower a-b ridge count in male patients and higher a-b ridge count in female patients. This could again be due to differential perinatal androgen level exposure. But studies show otherwise. There is no uniformity in reported data. There are studies showing uniform decrease in a-b ridge count in both sexes¹⁸; studies showing higher value in male patients¹³ studies showing decrease in male patients¹⁷. But majority of studies say, there is lower a-b ridge count in male schizophrenics^{18,19}. We did not find any statistical difference in atd angle between schizophrenic patients and controls in present study. Similar findings were reported in past²⁰. In contrast previous studies have shown higher angles in both males and females^{5, 21}.

Conclusions:

Schizophrenic patients had higher TFRC (especially males), lower a-d ridge count (especially left hand of male patients) and higher adt angle. Atd angle has not shown any significant difference in compared to controls. We conclude that there are significant differences in the schizophrenics in various dermatoglyphic features, when compared to normal controls.

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