



PALMAR PATTERNS IN CONVULSIVE DISORDERS

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ABSTRACT A dermatoglyphic study of 60 Indian children with a confirmed diagnosis of idiopathic epilepsy was carried out in an attempt to ascertain the possible association of the disease with aberrant dermatoglyphic features and to estimate their diagnostic usefulness. The palmar prints were taken using Ink-pad method described by Cummins and Midlo. Inverted T pad, Ink slab made of plain glass, white paper & cyclostyling ink were used for obtaining prints. Various parameters for palm including frequency of patterns in the thenar / 1st interdigital area, hypothenar area and other inter-digital areas were studied and the same was compared with the data obtained from 60 normal children of the same age group. The analysis of dermatoglyphic patterns showed a statistically significant increase in frequency of patterns in the thenar - 1st interdigital area, a slight decrease of patterns in hypothenar area and a decrease in frequency of patterns in most of the inter-digital areas among the patients. Study on cases of mental retardation by earlier authors also showed similar observations.

KEYWORDS : Idiopathic epilepsy, Dermatoglyphics, Palmar patterns

INTRODUCTION

Seizures can be defined as the occurrence of signs and / or symptoms due to abnormal, excessive or synchronous neuronal activity in the brain. The clinical accompaniments of these episodes/ seizures vary in manifestations from brief lapses of awareness to prolonged bouts of unconsciousness, limb jerking and incontinence¹. The incidence of epilepsy is approximately 0.3 to 0.5% in different populations throughout the world and its prevalence has been estimated at 5-30 /10002.

Understanding the etiology of epilepsy is essential both for clinical management of patients and for conducting neurobiological research that will direct future therapies³. Genetic and environmental factors contribute to the etiology of epilepsy. Studies on twins also confirmed the hereditary influence of the disease^{4,5}. Over 140 Mendelian disorders have been found to cause seizures and collectively account for about 1% of all epilepsies⁶. Many authors observed that approximately 70% of the cases belonged to idiopathic (primary) variety and the remaining (30%) are secondary to various causes such as brain trauma, CNS infections, cerebro-vascular diseases and brain tumors^{4,5}.

Since both skin and CNS develop from the same germinal layer (ectoderm), changes may be seen in the palm and ridges in association with epilepsy⁷. The dermal ridge differentiation takes place during third and fourth months of fetal life. The dermatoglyphic configurations once formed remain unchanged throughout life and they are highly heritable⁸. The word "dermatoglyphics", coined by Cummins & Midlo (1926), is derived from the Greek words "Derma" meaning skin and "Glyphae" meaning carve⁹.

The aim of this study is to probe into the palmar dermal features including pattern frequencies which are specific to epileptics, when compared with the controls.

MATERIAL AND METHODS

This case-control study was conducted among 60 children in the age group of 5-12 years, who were known cases of Idiopathic epilepsy attending two tertiary care hospitals of South Maharashtra. They represent any religion or caste group from populations all over India, but residing in this region. Children of both sexes were included in the study and those with mental retardation and epilepsy due to other causes were excluded from the study. Sixty normal children in the same age group of 5-12 yrs belonging to the same population were used as the control. The patients included 42 males and 18 females whereas the controls included 32 males and 28 females.

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Name of the individual, sex, age and other details were recorded. A detailed history of the patients were taken including history of illness, past medical history, antenatal and natal history, immunization, developmental and family history. A thorough physical examination was also carried out and the details were recorded in a proforma.

DERMATOGLYPHIC PRINTING

Palmar prints of both hands were taken using Ink and pad method as described by Cummins and Midlo¹⁰.

The equipment used were :

- Inverted T shaped pad of 7cm diameter made up of a ball of cotton covered by three layers of soft cotton cloth.
- Ink slab (25cm X 15 cm X 5 cm) made of plain glass with smooth surface.
- Black cyclostyling ink
- White paper, slightly glazed.

The prints of both palms were taken after explaining the purpose of the study and the procedure for taking prints to the respondents. The prints were examined and repeat prints were taken for those found unclear. Examination of prints was done with the help of a 3/4 inch diameter-magnifying lens of 5x power for studying the dermatoglyphic patterns. The markings on the pattern areas were made using a sharp HB Pencil.

SYSTEM OF ANALYSIS

The dermatoglyphic pattern gets distributed into 2 major areas; fingers and palmar areas. Galton (1892)¹¹ classified finger pattern into Arch, Loop, and Whorl, based on the morphology of ridge arrangements.

Important landmarks and pattern configuration on palm:

The palmar area is marked anatomically into distal, proximal, ulnar and radial regions. Four inter-digital pads, each lying in proximity to an interdigital interval is distinguished by numbers I1, I2, I3 and I4. The thenar eminence occupies a large share of the proximo-radial quadrant of the palm. The hypothenar eminence is a more elongated elevation lying in the ulnar aspect of the palm (Fig-1). Four major creases viz; wrist crease, Radial longitudinal crease, proximal transverse crease, and distal transverse crease divide the palmar area I1 (Fig-2).

Inter-digital patterns :

The six areas viz. hypothenar (Hy), thenar (Th) and the four interdigitals (I1, I2, I3, I4), each constitute a topographic unit, its individuality being expressed both by the existence in some palms of a discrete pattern and by the characteristic presence of partial boundaries formed by palmar triradii (a, b, c, d and t) and their radiants (Fig-1). The pattern configurations of second, third and fourth inter-digital areas are identified to note the presence of true patterns namely whorl and loop.

Hypothenar pattern configurations are divided into three primary types of true patterns as whorls, loops, and tented arches 12.

The thenar and 1st inter-digital areas are closely related anatomically. The varieties of configurational combinations seen in these areas have been classified by Pisal (1999)13. The patterns present in this area are also like those in the hypothenar area. Since the frequency of pattern percentage at the interdigital areas and on hypothenar and thenar areas are very low, further statistical analysis is done by considering the presence or absence of the pattern.

Analysis of prints and statistical consideration :

The prints were analysed manually and general frequency of all dermatoglyphic patterns for the patients and the controls were calculated. Employing Chi-square test of significance, the observed and the expected values for all the parameters in patients and controls were compared as:

$$\chi^2 = \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

RESULTS

Hypothenar, Thenar/Ist, IInd, IIIrd and IVth inter-digital patterns were studied.

Hypothenar patterns:

The frequency of hypothenar patterns among the patients were less than that of the controls both in right as well as left hands. The patterns on right hand were very low compared to the left hand, among patients as well as controls. But the difference in frequency of patterns between the patients and the controls on left hand ($X^2 = 0.32$; d.f.1) as well as right hand ($X^2 = 3.38$; d.f.1) were statistically non-significant (Table -1)

Considering both the hands together, the patterns present on hypothenar area were 26.6% among the patients and 36.6% among the controls.

Status		Present(%)	Absent(%)	Total No.
Patients	Lh	33.3	66.7	60
	Rh	20.0	80.0	60
	Lh+Rh	26.6	73.4	120
Controls	Lh	38.3	61.7	60
	Rh	35.0	65.0	60
	Lh+Rh	36.6	63.3	120

Thenar/Ist interdigital patterns:

In both patients and controls, the frequency of thenar /Ist interdigital area patterns was almost double on left hand (P- 26.7%, C- 10%) compared to the right hand (P- 13.3%, C- 5%). According to Pissal H (1999)11, significant bilateral differences exist with more patterns on the left hand. There is statistically significant increase in the occurrence of patterns on left hand of patients ($X^2 = 5.56$; d.f.1). There were no sufficient cell values to test the significance of difference on right hand. Considering both hands together, this difference was highly significant ($X^2 = 8.77$; d.f.1) for the presence of patterns among the patients (20.0%), in comparison to the controls (7.5%) (Table -2, Graph 1). Tented Arch, one of the rarest type of pattern was also observed on the left hand of one of the patients.

Status		Present(%)	Absent(%)	Total No.
Patients	Lh	26.7	73.3	60
	Rh	13.3	86.7	60
	Lh+Rh	20.0	80.0	120
Controls	Lh	10.0	90.0	60
	Rh	5.0	95.0	60
	Lh+Rh	7.5	92.5	120

Iind inter-digital patterns :

The frequency of IInd inter-digital area patterns on both hands (Rt + Lt) was 8.3% among the patients and 10.8% among the controls with no significant statistical significance ($X^2 = 0.80$; d.f.1) (table 3). It was

higher on the right hand (Patients-13.3%, Controls-13.3%) in comparison to the left (P-3.3%, C-8.3%).

Status		Present(%)	Absent(%)	Total No
Patient	Lh	3.3	96.7	60
	Rh	13.3	86.7	60
	Lh+Rh	8.3	91.7	120
Control	Lh	8.3	91.7	60
	Rh	13.3	86.7	60
	Lh+Rh	10.8	89.2	120

IIIrd inter-digital patterns:

The frequency of patterns in IIIrd inter-digital area on both hands together was 50.0% among the patients and 59.2% among the controls. The frequency of patterns was higher on right hand (P-61.7%, C-68.3%) than on the left hand (P-38.3%, C-50.0%) among the patients as well as controls. The existing difference is non significant for total hands ($X^2 = 1.08$; d.f.1), left hand ($X^2 = 1.65$; d.f.1) and for right hand ($X^2 = 0.03$; d.f.1) (table -4)

Status		Present(%)	Absent(%)	Total No
Patient	Lh	38.3	61.7	60
	Rh	61.7	38.3	60
	Lh+Rh	50.0	50.0	120
Control	Lh	50.0	50.0	60
	Rh	68.3	31.7	60
	Lh+Rh	59.2	40.8	120

IVth inter-digital patterns :

The frequency of IVth inter-digital area patterns on both hands together was 51.7% among the patients and 50.8% among the controls. It was higher on left hand (P-58.3%, C-58.3%) in comparison to the right hand (P-45.0%, C-41.7%). The existing difference was non significant for total ($X^2 = 1.15$; d.f.1), left hand ($X^2 = 0.00$; d.f.1) and for right hand ($X^2 = 0.13$; d.f.1). (table-5)

Status		Present(%)	Absent(%)	Total No.
Patients	Lh	58.3	41.7	60
	Rh	45.0	55.0	60
	Lh+Rh	51.7	48.3	120
Controls	Lh	58.3	41.7	60
	Rh	41.7	58.3	60
	Lh+Rh	50	50	120

Total inter-digital patterns :

Frequency of total inter-digital patterns on both hands together was 32.5% among the patients and 31.9% among controls. Frequency of patterns for the patients as well as in the controls was almost equal on left hand (P-31.7%, C-31.7%) and on right hand (P-33.3%, C-32.1%). The existing difference was non-significant ($X^2 = 0.04$; d.f.1). It is clear that all differences for individual inter-digital patterns between left and right hand and also between the patients and the controls got nullified when total inter-digital patterns are considered together (table-6). The presence of patterns on palm was almost equal among the patients as well as controls on left hand, right hand and both hands taken together.

Status		Present(%)	Absent(%)	Total No.
Patients	Lh	31.7	68.3	60
	Rh	33.3	66.7	60
	Lh+Rh	32.5	67.5	120
Controls	Lh	31.7	68.3	60
	Rh	32.1	67.9	60
	Lh+Rh	31.9	68.1	120

It is observed that whorl, a rare pattern to be present on palmar areas, occurred in higher numbers among the patients. A total of seven whorls were present among the patients whereas only three whorls were present among the controls.

DISCUSSION

The present study showed that :

1. There is a trend for reduced frequency of hypothenar patterns among the patients though statistically insignificant.
2. There is a statistically significant increase in the occurrence of Thenar - Ist interdigital patterns among the patients and this is more than double as that among the controls. Reddi (1976)¹⁴ observed a high frequency of Thenar-Ist interdigital patterns (Loop/Whorl) among the mentally retarded.
3. The occurrence of interdigital patterns among the patients recorded a decreasing trend in 2nd and 3rd interdigital palmar patterns. But the 4th interdigital area showed same frequency of patterns among patients as well as controls. Rosner et al¹⁵ observed a low frequency of 4th interdigital area patterns among epileptics. A decrease in frequency of patterns in 2nd interdigital area was observed among the mentally retarded by Reddi (1976)¹⁴. Cummins¹⁶ demonstrated an increased frequency of palmar patterns at I2 and I3 with a decreased frequency at I4 and T/I1 in Mongolism.

CONCLUSION :

This study showed a statistically significant increase in the occurrence of Thenar - Ist interdigital patterns among epileptics which is more than double as that among the controls. More studies of this kind with larger sample size are necessary to reach definite conclusions. The data available for comparison was insufficient since there were only very few studies carried out earlier showing the association between palmar patterns and idiopathic epilepsy.

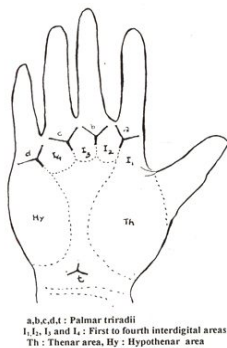


Figure 1 - Palmar areas and triradii

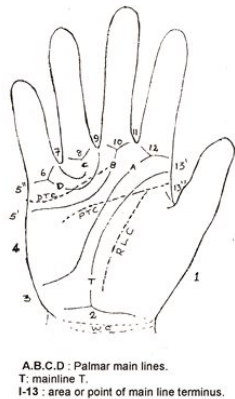
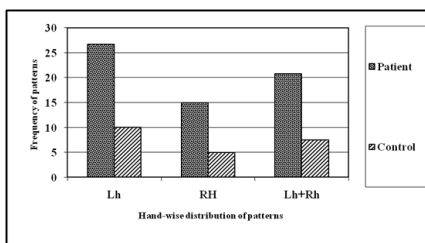


Fig 2 - Palm showing Palmar creases & Main Line Formula

- WC : Wrist crease,
- RLC : Radial longitudinal crease,
- PTC : Proximal transverse crease
- DTC : Distal transverse crease

Graph 1 Frequency of Thenar/Ist interdigital patterns among the patients & controls



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