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Research Article

Dermatoglyphic Patterns in Epilepsy

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Abstract

Introduction: Genetic etiology has been proposed for both idiopathic epilepsy and dermatoglyphics. Hence, the present study has been undertaken to find out the existence of any correlation between dermatoglyphics and idiopathic generalized epilepsy.

Aim and Objectives: To analyse dermatoglyphic patterns of hands in idiopathic generalized epilepsy.

Materials and Methods: The study was conducted in the Department of Anatomy and Department of Neurology, Himalayan Institute of medical Sciences, Swami Ram Nagar, Dehradun. Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), Angles; 'atd', 'adt' and 'dat' were analysed by utilizing finger and palmar prints.

Results: TFRC and AFRC were significantly decreased when both the hands were taken together. A non-significant difference in angles ('atd', 'adt' and 'dat') was noted in both the hands.

Conclusion: Decrease in the TFRC and AFRC in persons may be a high risk of idiopathic generalized epilepsy.

Keywords: *Dermatoglyphics; Idiopathic Generalized Epilepsy; TFRC; AFRC Angles ('atd', 'adt' and 'dat')*

Introduction

Dr. Cummins, the father of American fingerprint analysis, coined the term "Dermatoglyphics". The term dermatoglyphics is derived from the ancient Greek words 'derma' means skin and 'glyph' meaning carving. Dermatoglyphics is the scientific study of patterns of epidermal ridges present on fingers, palms, toes and soles [1].

Although Cummins and Midlo coined the term dermatoglyphics, dermatoglyphics as a scientific discipline began with the publication of Purkinje's thesis and Galton's classic book "Fingerprints" [2]. Dermatoglyphic patterns are constant and individualistic. Abnormalities in the epidermal ridges may result from genetic alterations occurring around the first trimester, during the period of organogenesis and between the 13th to 60th days after fertilization [3].

Epilepsy is a major health problem in developing countries including India. India has the second largest population in the world with almost more than one billion inhabitants and 70% of them living in rural communities [4].

According to World Health Organization (WHO) and the International League Against Epilepsy (ILAE), epilepsy has been defined as a recurrent paroxysmal disorder of cerebral function characterized by sudden brief attacks of altered consciousness, motor activity, sensory phenomenon, or inappropriate behaviour caused by abnormal excessive discharge of cerebral neurons [5].

The nervous system and the epidermal papillary ridges of the skin are developed from the ectoderm [6]. The present study was carried out to identify an association between idiopathic generalized epilepsy and the dermatoglyphic patterns present in their hand.

Materials and Methods

The present study was conducted in the Department of Anatomy, Himalayan Institute of Medical Sciences, Swami Ram Nagar, Dehradun. Fifty confirmed cases of idiopathic generalized epilepsy were taken as cases who reported to the neuromedicine outpatient department (OPD). Prior approval of institutional ethical committee was obtained. A descriptive study was performed on 100 subjects. The study was performed on 50 normal individuals (26 males and 24 females) as control group and 50 patients taken as epilepsy group (32 males and 18 females). Thus 250 fingers and 50 hands of controls and cases each were analyzed in both right and left hands separately. The age groups of the subjects were between 15 - 50 years of either sex.

The control subjects were selected from the patients attending the neuromedicine OPD. Patients with history of epilepsy, convulsions or seizures in the past were excluded from the control group.

Selection of epilepsy group consists of patients clinically confirmed as cases of idiopathic generalized epilepsy who were attending the OPD. Patients with history of epilepsy in the past associated with a variety of cerebral or systemic disorders in the form of chronic infantile encephalopathy, severe mental deficiency, spastic or flaccid paraplegia or tetraplegia, cardiac, ocular or other diseases were excluded from epilepsy group. Epileptic patients with history of previous trauma over the head or meningeal infections were also excluded from epilepsy group.

Case recording forms were used to generate the data. A written informed consent was taken from all the subjects before taking the finger and palmar prints.

The materials used for the study were quick drying duplicating ink, rubber roller, inking slab-thick glass sheet, white paper with a glazed surface on one side of A3 size, pressure pad made up of foam, diluent and hand lens. Printing of the digits and palm were obtained using the ink method. Parameters analyzed by utilizing finger and palmar prints were Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), Angles 'atd', 'adt' and 'dat'. The data were analyzed by using statistical software SPSS-22. The collected data were represented in the form of mean and standard deviation. The significance of differences between cases and controls was assessed by the Student's t-test at 5% level of significance.

Results

The data obtained were compiled and tabulated. Table 1 showed that there was a non-significant decrease in TFRC in cases when taken for right and left hands separately (p values were 0.19 and 0.42 respectively). However, when TFRC was compared between control and epilepsy group for both hands taken together the p value was 0.049 suggesting a significant decrease in the mean value of TFRC.

Table 2 showed that there was a non-significant decrease in AFRC in cases when taken for right and left hands separately (p values were 0.18 and 0.31 respectively). However, when AFRC was compared between controls and epilepsy group for both hands taken together the p value was 0.041 suggesting a significant decrease in the mean value of AFRC.

There was a non-significant increase in angle 'atd' and angle 'adt' in right hands ($p > 0.05$) and non-significant decrease in the angles in left hands ($p > 0.05$) of cases when compared with respective hands of controls. However, angle 'dat' showed a non-significant decrease

Parameters		Control (n = 50)	Epilepsy (n = 50)	p value
Right Hand	Mean	72.38	70.54	0.19
	SD	19.58	19.06	
	SEM	2.77	2.696	
Left Hand	Mean	75.28	68.98	0.42
	SD	16.77	21.92	
	SEM	2.372	4.82	
Total	Mean	147.66	139.52	0.049
	SD	36.35	40.98	
	SEM	5.142	7.516	

Table 1: *Comparison of total finger ridge count (TFRC) between control and epilepsy group.*

Parameters		Control (n = 50)	Epilepsy (n = 50)	p value
Right Hand	Mean	113.36	101.62	0.18
	SD	45.77	40.9	
	SEM	6.47	5.78	
Left Hand	Mean	109.36	100.06	0.31
	SD	44.69	46.04	
	SEM	6.32	6.51	
Total	Mean	222.72	201.68	0.041
	SD	90.46	86.94	
	SEM	12.79	12.29	

Table 2: *Comparison of absolute finger ridge count (AFRC) between control and epilepsy group.*

Parameters		Control (n = 50)	Epilepsy (n = 50)	p value
Right Hand	Mean	41.6	42.04	0.14
	SD	4.5	3.79	
	SEM	0.636	0.535	
Left Hand	Mean	42.56	42.14	0.4
	SD	5.39	4.47	
	SEM	0.762	0.632	

Table 3a: *Comparison of angle 'atd' between control and epilepsy group.*

Parameters		Control (n = 50)	Epilepsy (n = 50)	p value
Right Hand	Mean	59.38	58.82	0.4
	SD	6.44	4.72	
	SEM	0.911	0.667	
Left Hand	Mean	58.34	59.38	0.3
	SD	4.29	6.12	
	SEM	0.607	0.865	

Table 3b: *Comparison of angle 'dat' between control and epilepsy group.*

Parameters		Control (n = 50)	Epilepsy (n = 50)	p value
Right Hand	Mean	79.1	79.66	0.6
	SD	5	4.525	
	SEM	0.848	0.64	
Left Hand	Mean	78.72	78.58	0.91
	SD	5.718	6.854	
	SEM	0.809	0.969	

Table 3c: *Comparison of angle 'adt' between control and epilepsy group.*

in right hand and a non-significant increase in the angle in left hand of epilepsy group when compared with respective hands of control group. (Figure 1a and 1b).

Figure 1a: *Palmar print of left hand of male control showing < adt (80°), < dat (60°) and < atd (40°).*

Figure 1b: *Palmar print of left hand of male case showing < adt (65°), < dat (75°) and < atd (40°).*

Discussion

In the present study there was a significant decrease in the mean values of TFRC (139.52 ± 40.98) and AFRC (201.68 ± 86.94) in cases when compared with both hands of controls taken together. There was a non-significant decrease in TFRC (70.54 ± 19.06) and AFRC (101.62 ± 40.9) in right hand fingers of cases when compared with their respective controls having TFRC (75.28 ± 16.77) and AFRC (113.36 ± 45.77). There was also a non-significant decrease in TFRC (68.98 ± 21.92) and AFRC (100.06 ± 46.04) in left hand fingers of cases when compared with their respective controls having TFRC (72.38 ± 19.58) and AFRC (109.36 ± 44.69) (Table 1and 2).

Shawky., *et al.* found significantly reduced TFRC in both the hands of epileptic patients in the Egyptian population [7]. Mattos- Fiore MAB and Saldanha PH observed similar decrease in TFRC in female epileptic patients but increased values in cases of male epileptics [8].

Contradictory findings were observed by many scientists. Mulage SK found increased TFRC and AFRC in male and female epileptics [9]. Lal N and Sureka RK and Filho., *et al.* found increased incidence of TFRC and AFRC in epileptic patients [10,11]. Rivera did not observe any difference in TFRC and AFRC of epileptic patients when compared with their controls [12].

In the present study there was an increase in the mean value of angle 'atd' in right hand $(42.04 \pm 3.79)^0$ while there was a decrease in mean value of the angle in left hand $(42.14 \pm 4.47)^0$ of epilepsy group when compared with their respective controls i.e. 41.6 ± 4.5^0 and 42.56 ± 5.39^0 respectively ($p > 0.05$) (Figure 1a and 1b). On observing the angle 'dat', a decrease in right hand $(58.82 \pm 4.72)^0$ and an increase in left hand $(59.38 \pm 6.12)^0$ of cases were found when compared with their respective controls i.e. 59.38 ± 6.44^0 and 58.34 ± 4.29^0 respectively ($p > 0.05$) (Figure 1a and 1b). Measurement in angle 'adt' revealed increased mean value of the angle in right hand $(79.66 \pm 4.53)^0$ but a decrease in the value in left hand $(78.58 \pm 6.85)^0$ of cases when compared with their respective controls i.e. 79.10 ± 5.00^0 and 78.72 ± 5.72^0 respectively ($p>0.05$) (Figure 1a and 1b).

Ranganath P., *et al*. observed an increase in the mean values of angles 'atd' and 'dat' but a decrease values of angle 'adt' in both the hands of male and female epileptic patients [5]. Lal and Sureka noticed a decreased mean value of angles 'atd' and 'dat' but an increase in the value of angle 'adt' in right and left hands of epileptic patients [10]. Goshi RC., *et al*. concluded a significant increase in 'dat' angle in

the right and decrease in 'adt' angle in both hands of male epileptics [13]. In the study conducted by Filho., *et al.* reference has been made to the study of Rosner., *et al*. who observed higher values of angle 'atd' in left hand of male epileptics but smaller values of the angle in both hands of female epileptics when compared with their respective controls. In the same study, Ravazi found no statistical differences in angle 'atd' in both hands and genders of epileptics when compared with their respective controls [11].

Review of Literature

Schaumann B., *et al*. observed significant increase in the main line index on the right palm ($p < 0.01$) and decreased a-b ridge counts on both left and right palms ($p < 0.001$).

Shawky., *et al*. undertook a study on the Dermatoglyphic patterns in patients with idiopathic epilepsy in Egypt. Results showed a significantly reduced total finger ridge count on both palms in epileptic patients (66.5) as compared to the controls (136.48) and a significantly increased main line index in the epileptic children (11.5 in males and 10.6 in females), as compared to the controls (8.6 in males, and 9.4 in females).

Goshi RC., *et al*. observed main line index (left hand 8.02 and right hand 8.2) was significantly increased in female epileptics. There was significant increase in 'dat' angle in the right and decrease in 'adt' angle in both hands of male epileptics.

Mulage SK found out various dermatoglyphic features in patients suffering from epilepsy and to compare the dermatoglyphic features in normal and epileptic patients. Significant findings in quantitative analysis of epileptic patients included increase of total finger ridge count in male and female epileptics.

Bansal IJS., *et al*. took palmar prints of 50 epileptic patients (33 males and 17 females) and age and sex matched controls. The data of epileptic patients were collected from Government Rajendra Hospital, Patiala and from nearby villages of Patiala District. They observed that the termination of mainline D was mostly confined to position 11, 9 and 7 in both males and females of the patients and control series.

Filho., *et al*. reviewed articles on dermatoglyphics in patients with epilepsy published between the years 1960 - 2008.

Ravazi found significant decrease in total finger ridge count ($p \leq 0.20$) in right hand but increased total finger ridge count in left hand ($p \leq 0.50$) in both male and female cases of epilepsy.

In Russia, Kharitonov and Kozlova studied 51 adult (men and women) epileptic patients and found increased finger ridge counts.

Schaumann., *et al*. noted reduction of finger ridge count in 197 adult men but Denny found increased finger ridge count in girls.

Ranganath., *et al*. did not observe any difference in finger ridge counts. Rosner., *et al*. studied 223 epileptic patients (109 men and 114 women) and found increased value of 'atd' angles in left hand in cases of male epileptic patients while it was decreased in cases of women in both hands.

Ravazi and Ranganath., *et al*. found no differences in 'atd' angles in either hands or genders of epileptic patients.

Schaumann and Kimura noticed an increase main line index in right palm in cases of male epileptic patients. Nair observed significant differences in main line terminations in both hands and sexes but Ranganath., *et al*. observed the significant difference only in women.

Brown M and Paskind HA compared fingerprints of 146 mentally deteriorated institutionalized epileptic patients with those of 115 mentally normal epileptic clinic patients. Prints of the deteriorated group had more arch patterns, interruption of ridges and occasional replacement of ridges by papillae. They had fewer whorl and radial patterns, less furrowing and smaller dermatoglyphic indices.

Conclusion

Therefore, these parameters of significantly decreased TFRC and AFRC may be of immense help not only in identifying pre-epileptics but can be helpful in preventing serious complications of epilepsy, which is a leading problem of the world.

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Conflict of Interest

None declared.

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