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Palmar dermatoglyphic profile in *Jatyaandh* - A Pilot Study

Research Article

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Abstract

Background: Appreciable progress has been made to study and understand the associations between dermatoglyphics and numerous medical disorders, as a result of which dermatoglyphic analysis has been accepted as a useful diagnostic tool in many diseases particularly those are caused by chromosomal aberrations, which are frequently accompanied by distortion of patterns. Materials and Methods: The aim of this present work is to study the association between characteristic dermatoglyphic features in probands with *jatyaandh* due to congenital glaucoma compared with age sex matched control. Palmar dermatoglyphic analysis on 20 subjects was carried out. Dermatoglyphics prints were taken by 'Ink method' described by Cummins and Mildo, examined for Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), (a-b) ridge count, atd, dat and adt angle (quantitative parameter) and Finger ridge patterns and their frequency (qualitative parameter). Further, statistical analysis is done to find the variations in the dermatoglyphic feature in both groups. Result: The mean values of TFRC, AFRC & atd angle were higher in case group than in controls. The mean value of a-b ridge count is lower in cases as compared to controls. The mean values of dat and adt angle of case group were almost same to that of control group. The highest pattern of distribution of whorls was found in cases whereas radial and ulnar loops are found in controls.

Keywords: *Jatyaandh, Congenital glaucoma, Chakshurindriya, Jnanendriya, Dauhrudaya-apchar, Janmabala-pravruta vyadhi.*

Introduction

"Chakshurindriya", occupies the key position among the *panch-inanendriyas* (sense organs). The term *Chakshu* is derived from the root *"chaksh"* denoting *darshna* (sight) and *karana* (organ responsible for sight) (1). *Netra* occupies utmost importance in *sharira*. Without them, the whole world will be dark and life will be meaningless. *Agni mahabhuta* is present predominantly in them which is responsible for "*Roopagrahana*"(2). If *Agni mahabhuta* does not enter *dristi* during *garbha-kala*, then the child will have *jatyaandh* (3).

The word "*Jatyaandh*" is derived from two words "*jata"* means born or become and "*andh*" means blind i.e. which is born blind or become blind after birth (4). *Jatyaandh* is a *janmabala-pravruta vyadhi* which is caused by *dauhrudaya-apchar* (5). The Genetic factors play a role in many kinds of eye disease, including those diseases that are the leading cause of blindness among infants, children and adults. About 60 percent of cases of blindness among infants are caused by inherited eye diseases such as congenital glaucoma, congenital cataracts, optic atrophy, retinal degeneration and ocular malformations i.e. anophthalmia, microphthalmia, microcornea, coloboma, leukocoria etc. (6)

In *Kashyapa Samhita* and in the *Hastarekha Shastra*, it is said that the study of different shapes like *Chakra* (wheel), *Shankha* (Conch), *Padma* (Lotus) and lines of our palms and soles indicate the lifespan, well-being, prosperity, abilities, talents and weakness of an individual (7). In today's era, these different skin ridge patterns present on palms and soles are studied as dermatoglyphic patterns.

Dermatoglyphics (from Greek: derma= skin, glyph= carving) is the scientific study of the skin ridge patterns on the fingers, toes, hands and feet. All configurations are laid down permanently from the 3rd month of the intra-uterine life and they remain unchanged throughout the life except in dimensions in proportion to the growth of an individual (8). Each individual has a unique finger prints. This uniqueness is based on the genetic characteristics of each individual which are transferred genetically from one generation to other**.** If there is any abnormality present in the genetic makeup of parents, it is acceding to the children and is reflected in dermatoglyphic pattern (9).

There are three basic finger ridge patterns a) Arches b) Loops c) Whorls (10). In the arches, the ridges enter from one side and flow to the other side, making the background turn to form simple and tented arches. These arches have a zero ridge count. A loop includes a triradius, at least one recurving ridge and a ridge count of at least one across a recurving ridge. If any one of these features is lacking, the pattern is classified as a tented arch and not a loop. The ridges of

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a loop enter from one side, recurve and exit on the same side of the finger. When the ridges leave from the ulnar side, they are known as an ulnar loop and when they leave from the radial side, a radial loop is formed. A loop possesses only one triradius. The whorl is the most complex type of pattern which is continuously circumscribed by the type lines. These type lines are an extension from the two triradii. The area which is enclosed by these type lines is called the pattern area (11). The palmer area is also divided into various zones with in which a pattern may or may not be present. It includes four interdigital areas (I1, I2, I3 and I4 from the radial to the ulnar side), the axial triradius (t, t', t'' according to the position of the triradius), the hypothenar eminence and the thenar eminence.

Chakshu and *twak* are one among the *panch-jnanendriyas* which develops during the third month of *Garbhavakranti* (12). According to modern science, both are developed from ectoderm at same time during 3rd to 8th week of intrauterine period (13). If there is any developmental anomaly found in ectoderm, it should be reflected in both of its derivatives. By keeping this concept in mind an effort is being put to understand this topic from the aspect of dermatoglyphics. The aim of the present was to evaluate the dermatoglyphic features and the specific variations which were to be used in screening inexpensively populations at risk so that anticipation and early detection of symptoms can help in averting the disease or complications associated with the disease.

Materials and methods

The present study is an observational, case control pilot study. The study was carried out in Department of Rachana Shareera, Parul Institute of Ayurveda and Research, Parul University, Limda, Waghodiya, Gujarat. A total 20 subjects between the age group of 0-16 years irrespective of sex are present in the study; 10 subjects having *jatyaandh* due to congenital glaucoma and 10 subjects as control. All the cases were clinically diagnosed and confirmed by complete ophthalmic examination includes Intra-ocular pressure (IOP) measurement, Gonioscopy, inspection of optic nerve and refraction in Shalakya Tantra department of Parul Sevasharam Hospital, Limda, Waghodiya, Gujarat. Healthy first degree relatives of each proband will be interviewed to determine family history of any ocular malformation. It is a case control study where the control group will consist of 10 subjects of same age group and same region, without family history of ocular malformation.

The ethical clearance obtained from the institutional ethics committee prior to this study. CTRI registration number for this trial is CTRI/2021/10/037152 is taken before collecting the dermatoglyphic imprints. Both the patients and their relatives gave informed consent. In case of patient, verbal consent is given and signed consent is taken from the first degree relative.

Materials used

Duplicating ink, white paper, ink pad, paper towel, washing bowl, cleansing fluid, magnifying hand lens, needle with a sharp point- for ridge counting, cotton puffs, scale, pencil pen, protractor.

Procedure

Dermatoglyphics prints were taken by the 'Ink Method' described by Cummins and Mildo (1961) (14). Patients were informed about the procedure in detail and verbal consent is taken from them, while signed consent is taken from their first degree relative. Subjects were asked to wash their hands with soap water and dried with a soft cotton cloth, so as to remove any oil or dirt. Blue duplicating ink was smeared on their hands uniformly by taking care that hollow of the palm and flexor creases of the wrist was uniformly inked. The hands of the patient were then placed on the bond paper from proximal to distal end. The palm was gently pressed between inter-metacarpal grooves at the root of fingers and on the dorsal side corresponding to the thenar and hypothenar regions. The finger ridges were printed starting from thumb to little finger in the same order. The palm was then lifted from the paper in reverse order, from distal to proximal end. Then, the palm was cleaned, washed and dried with a hand towel. The same procedure was adopted for controls. The printed sheet was coded with name, age, sex and for case group and control group. The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens and ridge counting was done with the help of a sharp needle.

Statistical analysis

The data obtained was analyzed statistically using SPSS (statistical programme for social sciences, version 18.0) computer software package. Descriptive statistics analysis of variance two way was applied and p-value <0.05 was consider as significant.

Parameters observed

Qualitative
- Finger ridge patterns

Quantitative
- Finger ridge count
- Total finger ridge count (T.F.R.C)
- Absolute finger ridge count (A.F.R.C)
- a-b ridge count
- atd, adt and dat angles. (Axial triradius angles)

Method of Calculating Dermatoglyphic Parameters (15)

- Finger ridge patterns: The distal phalanx of each finger is inspected for the ridge pattern and it is named as arch, loop or whorl.
- Finger Ridge Count: The ridge count is being given by counting the total ridges intersected when a line is drawn from the central point of a pattern to its nearest triradius. The counting of a ridge begins from the center of core of the pattern to the triradius. In a loop, line was drawn from the core to the triradius and the ridges crossing the line were counted. In a whorl, there was two triradii and hence the counting was

done with both triradii. From the core a line was drawn to one triradius and in the same manner to other triradius and counting was done. In an arch, the triradius is the core and hence the count is zero.

- Total finger ridge count: A total finger ridge count (TFRC) represents the sum of the ridge counts of all ten fingers, where only the larger count is used on those digits with more than one ridge count.
- Absolute finger ridge count: The AFRC is obtained by adding ridge count of whorls on both sides as well as the count on the loops of all ten fingers. Since the whorl contains two triradii, two counts are made one from each triradius to get the value. The value for all the ten fingers is summed up to get the AFRC.
- a-b Ridge count: Ridges are often counted between two digital triradii. The ridge counts most frequently obtained is between triradii a and b and is referred to as the a-b ridge count. Counting is carried out along a straight line connecting both triradial points. The count excludes the ridges forming the triradii.
- atd, adt and dat angles: A line was drawn from axial triradius 't' to the digital triradii 'a' and 'd' and all the three angles in the triangle were measured using a protractor.

Image 1: Showing Loop, Arch and Whorl respectively

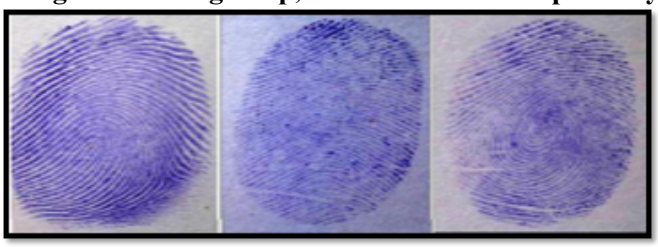


Image 2: Google image showing Core and Tri-radial point

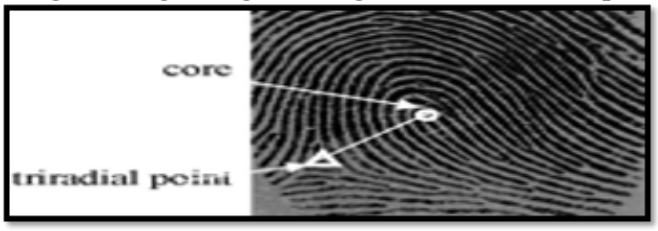
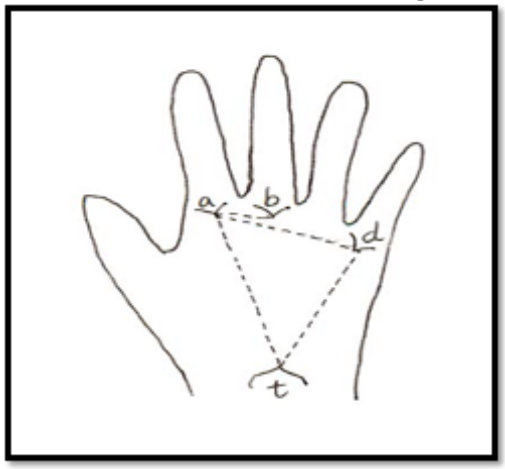


Image 3: Google image showing method of a-b ridge count and atd, dat and adt angles



Observations and Results

The observations were recorded to get the quantitative and qualitative dermatoglyphic features from the hand prints of 10 probands of *Jatyaandh* due to congenital glaucoma and 10 controls.

The mean value of TFRC (Total finger ridge count) of case group is 147.9 and that of control group is 126.6 which differ significantly. The mean of AFRC (Absolute finger ridge count) in case and control is 199.9 and 160.6 respectively and the differences in their mean are statistically significant. (Table 1)

The mean values of the a-b ridge count of the cases and the controls showed a significant difference. In cases, the mean value is 31.7 whereas in controls it is 43.1. (Table 2)

The 'atd' angle mean values of the cases (49.7) and the controls (42.7) differed significantly ($p<.05$) but mean values of adt angle and dat angle of case group were almost same to that of control group and no statistical significant difference was found. (Table 3)

Table 4 & 5 shows the frequency of fingertip patterns and its comparison in case and control group. The highest pattern of distribution of whorls was found in case group and loops are found in controls and the difference between two groups is statistically significant.

Table 1: Showing Comparison between Total Finger Ridge Count and Absolute Finger Ridge Count of Case and Control

	T.F.R.C		A.F.R.C	
	Case	Control	Case	Control
N	10	10	10	10
MEAN	147.9	126.6	199.9	160.6
S.D	11.34	18.25	19.27	21.69
S.E	3.58	5.77	6.09	6.86
t-value	3.13		4.28	
p-value	0.006 ($p<0.05$)		0.001 ($p<0.05$)	
Significance	S		S	

Table 2: Showing Comparison between a-b Ridge Count of Case and Control

	a-b Ridge	
	Case	Control
N	10	10
MEAN	31.7	43.1
S.D	4.42	5.68526
S.E	1.39	1.79784
t-value	-5.005	
p-value	0.001	
Significance	S	

Table 3: Showing Comparison between atd, adt and dat Angles of Case and Control

	atd Angle		adt Angle		dat Angle	
	Case	Control	Case	Control	Case	Control
N	10	10	10	10	10	10
MEAN	49.7	42.7	74.5	74.5	56	56
S.D	3.83116	1.76698	2.50555	2.50555	3.55903	3.55903
S.E	1.21152	0.55877	0.79232	0.79232	1.12546	1.12546
t-value	5.247		0		0	
p-value	0 (p<0.05)		1 (p>0.05)		1 (p>0.05)	
Significance	S		NS		NS	

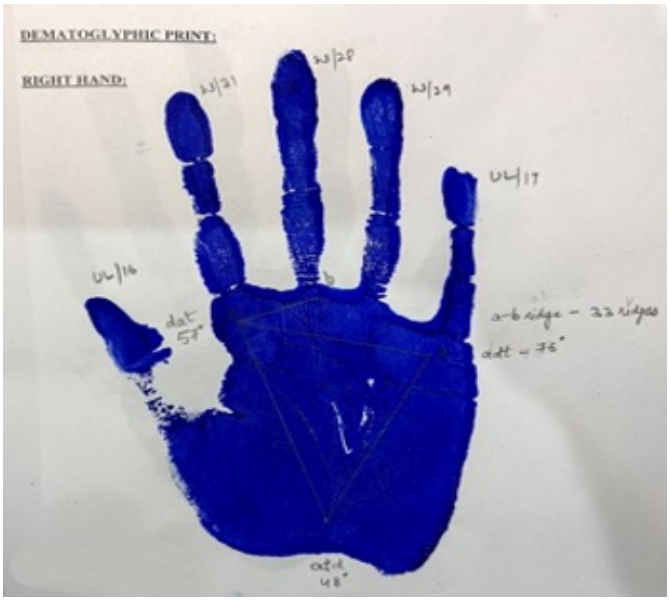
Table 4: Showing Difference in Frequency in Finger Ridge Pattern of Case and Control

Ridge Patterns	Case	Control
	Frequency	Frequency
R. Loop	16	31
U. Loop	17	36
Whorl	56	23
S. Arch	5	6
T. Arch	6	4
Mean	2.29	2.29
S.E	0.09	0.10
S.D	0.99	1.09

Table 5: Showing Comparison between Finger Ridge Pattern of Case and Control

	Simple arch		Tented arch		Whorl		Radial loop		Ulnar loop	
	Case	Control	Case	Control	Case	Control	Case	Control	Case	Control
N	10	10	10	10	10	10	10	10	10	10
Mean	0.5	0.6	0.6	0.4	5.6	2.3	1.6	3.1	1.7	3.6
S.D	0.52	0.69	0.51	0.51	0.84	0.48	0.51	0.73	0.48	0.69
S.E	0.16	0.22	0.16	0.16	0.26	0.15	0.16	0.23	0.15	0.22
t-value	-0.36		0.86		10.73		-5.26		-7.07	
p-value	0.72 (p>0.05)		0.39 (p>0.05)		0 (p<0.05)		0 (p<0.05)		0.01 (p<0.05)	
Significance	NS		NS		S		S		S	

Image 5: Showing the Dermatoglyphic print of Right hand of Case



Discussion

Keeping in mind that the trabecular meshwork of eye and the epidermis originate from surface ectoderm, dermatoglyphic patterns were studied. Also the differentiation of both of these structures occurs almost during same period. So any aetiological insult causing glaucoma might influence the dermal ridge pattern during their critical stage of development in first trimester. By keeping this concept in mind, 10 cases of jatya-andh due to congenital glaucoma and 10 subjects as control are taken and their palmer dermatoglyphic patterns were investigated and analysis in the present study showed significant difference between dermatoglyphic palmer patterns of both the groups.

The highest patterns of distribution of whorls are found on the digits of cases, more than 5 whorls are found out of 10 digits whereas in control group highest distribution of radial and ulnar loops are present. The mean values of total finger ridge count (TFRC) and absolute finger ridge count (AFRC) and atd angles in both hands were higher in cases when compared to controls and the differences in their mean are statistically significant but there is no difference found between the mean values of adt and dat angles. The mean value of a-b ridges is lower in case group as compared to controls and statistical difference found between their mean values.

Conclusion

The present attempt is to study whether there is a set of pattern of dermatoglyphics in patients with blindness. The relevance of dermatoglyphics is not to the definition of existing disease, but to the identification of people with genetic predisposition to develop certain diseases.

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