

ALTERATIONS IN FREQUENCY OF ULNAR LOOPS AND 'ATD' ANGLE IN CONGENITAL HEART DISEASE

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ABSTRACT

INTRODUCTION

Dermatoglyphics is a scientific study of epidermal ridge configuration on palm, soles and fingertips valuable for medico legal and genetic investigations. Dermatoglyphics form in utero during early gestation and may be influenced by genetic and environmental factors operating at that time. Present investigation was undertaken to study alterations in dermatoglyphic patterns with special reference to various congenital heart diseases (CHD). The study involved 102 cases of CHD and 100 cases of normal individuals. It was observed that percent frequency of ulnar loops significantly increased in CHD group as compared to control group. Mean 'atd' angle was also increased in CHD group as compared to control group indicating distal displacement of palmar axial triradius (t). Thus, rise in frequency of ulnar loops and increase in 'atd' angle can be considered as one of the diagnostic criteria for CHD.

KEYWORDS

Dermatoglyphics, CHD, Ulnar loops, 'atd' angle, Axial triradius.

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INTRODUCTION: 'Dermatoglyphics' a scientific and valuable method for medico-legal and genetic investigations involves the study epidermal ridge configuration on palms, soles and finger tips (Saha K. C., 1970).¹ The significance of Dermatoglyphics science is based on the facts that i) the ridges are slightly different for each finger and differ from person to person and ii) the ridges remain throughout the life and are age and environment stable after 21st week of intrauterine life (Penrose L. S. and Ohara P. T., 1973).² Ridges develop in relation to volar pads which are evident from 6th week of gestation and reach to maximum size by 12th to 13th week. The epidermal ridges are developed by 4th month which continues up to 6th month of gestation (Alter M., 1967).³ As ridge differentiation takes place in early fetal life resulting ridge patterns are genetically determined and influenced by environmental factors. In a normal individual the ridge pattern once established never changes throughout the life span except size. Being genetically inherited this pattern is highly susceptible to insult during intra uterine life and hence a number of genetic disorders associated with chromosomes, single genes and those disorders whose genetic basis is not clear may be studied with the help of Dermatoglyphics.

Changes in ridge pattern are also reported to be indicators of CVS disorders (Rashid, 1964),⁴ Diabetes (Barta, 1978),⁵ Schizophrenia (Mellor CS 1992)⁶ and ABO blood

groups (Mahajan AA, 1986, Kshirsagar SV, 2003)^{7,8} which are thought to have genetic influence.

A significantly more frequent distal location of axial tri-radius was observed in the group of congenital heart disease (Alfred Hale, 1961).⁹ Sanchez Cascos (1964)¹⁰ reported a very frequent appearance of arches in case of pulmonary stenosis which otherwise was very rare in case of aortic stenosis. In the same study, higher frequency of Ulnar loops was observed in subjects with ventricular septal defect. Whorls were observed with higher frequency in aortic stenosis, aortic contraction and Fallot's tetralogy.

In the light of these, present Dermatoglyphics investigation was undertaken involving 102 individuals with congenital heart disease and 100 normal individuals.

AIMS AND OBJECTIVES:

1. To find out various Dermatoglyphics features in patients suffering from congenital heart disease.
2. To compare Dermatoglyphics features in normal and congenital heart disease patients.
3. To find clinical usefulness of this study.

MATERIALS AND METHOD: Present study was carried out in one hundred and two (102) diagnosed cases of congenital heart diseases (CHD) and one hundred (100) normal individuals. Out of one hundred and two congenital heart disease cases fifty three were males and forty nine were females. The normal cases studied were sixty four males and forty six females. Prints of congenital heart diseases were collected from Cardio-Vascular Thoracic Surgery (C.V.T.S.) Centre, Kolhapur; Wanless Hospital, Miraj and private hospitals from Kolhapur region. The prints of normal individuals were obtained from students of schools and RCSI Government Medical College, Kolhapur. The age

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group of CHD patient's and a normal individual were ranging from six to thirty years.

Material used was:

- Printer's ink.
- Rubber roller.
- Glass slab.
- Century board.
- White paper with glazed surface on one side.
- Pressure pad made of foam.
- Magnifying lens.
- Cotton puffs.
- Scale.
- Pencil pen.
- Protractor.
- Needle with a sharp point.

Dermatoglyphic prints were taken by the 'INK METHOD' described by Cummins and Midlo (1943).¹¹

Prints of left as well as right hand palms of the subjects under study were taken and were analyzed qualitatively and quantitatively. Findings of each case were recorded separately.

Qualitative parameters:

1. Fingertip patterns.
 - a) Arches.
 - b) Whorls.
 - c) Radial loops.
 - d) Ulnar loops.
2. Palmar flexor creases.
3. Thenar, Hypothenar and four inter digital areas.

Quantitative parameters:

1. 'atd' angle.
2. "a-b" ridge count.

RESULTS AND DISCUSSION: Dermatoglyphics prints of 102 cases (Age group 6-30 years) of various Congenital heart diseases (CHD) were taken and diagnosed as congenital heart diseases. These patients were diagnosed as ASD, VSD, PS, AS, PDA and FT. For present investigations all these cases were grouped under the title "Congenital heart diseases (CHD)". Among 102 individuals with CHD, 53 were males and 49 were females.

In qualitative analysis of the prints, frequency of arches in right hand, left hand and both the hands was recorded. There were only two tented arches in males of CHD group while only one tented arch was observed in females of control group, remaining individuals showed simple arches. The percentage of arches in right hand was 3.33% in CHD group whereas it was 4.8% in control group (Table 1). In case of left hand percentage of arches was observed to be 3.13% in CHD group whereas it was 4.8 % in control group. It can be noted here that there was decrease in frequencies of arches in individuals with CHD (both hands taken together) as compared to controls (Table 1).

Similarly, frequency of whorls in right hand, left hand and both the hands together was also determined and it was found that percent frequency of whorls in right hand in CHD group was 36.07% whereas it was 39.6% in control group. In case of left hand percent frequency of whorls in CHD group was 35.09% and the control group showed 38.2%. Whorls frequency in individuals with CHD (both hands taken together) was 35.58% and 38.9% in case of controls (Table 1).

Radial loops frequency in right hand, left hand and both the hands was also recorded. In case of CHD group frequency of radial loops in right hand was 2.35% whereas it was 3.8% in control group. In case of left hand, percent frequency of radial loops in CHD group was 2.74% while it was 4.2% in control group. When frequency of radial loop formation was considered in case of both the hands together it was observed that CHD group showed 2.54% and control group showed 4% (Table 1).

Ulnar loop frequency of CHD group and control individuals was recorded and it was found that frequency of ulnar loop in left hand in CHD group was 59.01% whereas it was 52.4% in control group. In case of right hand CHD group showed 58.23% frequency of ulnar loop as compared to 51.8% in control group. When frequency of ulnar loop for both hands was recorded, it was observed that CHD group showed higher frequencies (58.62%) as compared to control group (52.1%) (Table 1) (Fig. 1). In present study it was observed that CHD is characterized by higher frequency of ulnar loops when compared with control. Our findings are in total agreement with the findings of previous workers who also showed higher frequency of ulnar loops in CHD patients as compared to normal (Sanchez Cascos, 1964, Kulkarni, 2001, Wanjari and Pise, 2014).^{10,12,13} Thus, rise in ulnar loop frequency can be considered as one of the diagnostic criteria for CHD.

Among the quantitative parameters 'atd' angle and 'a-b' ridge count were analysed and it was found that 'atd' angle altered as function of CHD. Mean 'atd' angle in right hand for CHD group was 42.66 and that for control was 40.54. In case of left hand the mean 'atd' angle for CHD group was found to be 43.58 and that for control was 40.83. When mean 'atd' angle for both the hands taken together was noted for CHD group, it was found to be 43.12 and in case of control 'atd' angle was 40.68 (Table 2) (Fig. 2). These finding indicated that there was significant increase in mean 'atd' angle of CHD group as compared to control group indicating distal displacement of palmar axial triradius.

Mean 'a-b' ridge count for CHD group and control group for both the hands separately and together was recorded. Mean 'a-b' ridge count in right hand of CHD group was 29.49 while it was 30.53 in control group. In case of left hand mean 'a-b' ridge count it was found to be 30.71 in CHD group and 31.34 in cases of control group. When 'a-b' ridge count of both the hands taken together was noted, it was observed to be 30.10 for CHD group and 30.93 for control group (Table 2) (Fig. 2).

Qualitative Parameters	Control (100)			Percentage			CHD (102)			Percentage		
	R	L	R + L	R	L	R + L	R	L	R + L	R	L	R + L
Arches (500/510)	24	24	48	4.8	4.8	4.8	17	16	33	3.33	3.13	3.23
Whorls (500/510)	198	191	389	39.6	38.2	38.9	184	179	363	36.07	35.09	35.58
Radial loop (500/510)	19	21	40	3.8	4.2	4	12	14	26	2.35	2.74	2.54
Ulnar loop (500/510)	259	262	521	51.8	52.4	52.1	297	301	598	58.23	59.01	58.62

Table 1: Table showing frequency of various qualitative parameters in control and CHD cases

Quantitative Parameter	CHD			Control		
	R	L	R + L	R	L	R + L
'atd' angle	42.66	43.58	43.12	40.54	40.82	40.68
'a-b' ridge count	29.49	30.71	30.10	30.53	31.34	30.93

Table 2: Table showing frequency of various quantitative parameters in control and CHD cases

CONCLUSION: Dermatoglyphic studies on 102 CHD patients and 100 control individuals was carried out. Various dermatoglyphic parameters in right hand, left hand and both hands together were documented. Our findings suggested that CHD shows significantly higher percent frequencies of ulnar loops as compared to control group. Similarly mean 'atd' angle was also found to be increased in CHD group as compared to control group indicating shifting of palmar axial triradius distally in CHD group as compared to control group. There was no significant difference observed in 'a-b' ridge count of CHD group and control group.

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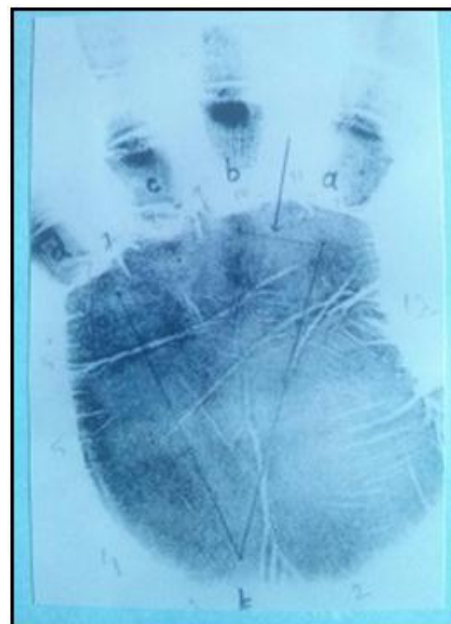


Fig. 2: Left hand prints showing 'atd' angle and 'a-b' ridge count as quantitative parameters

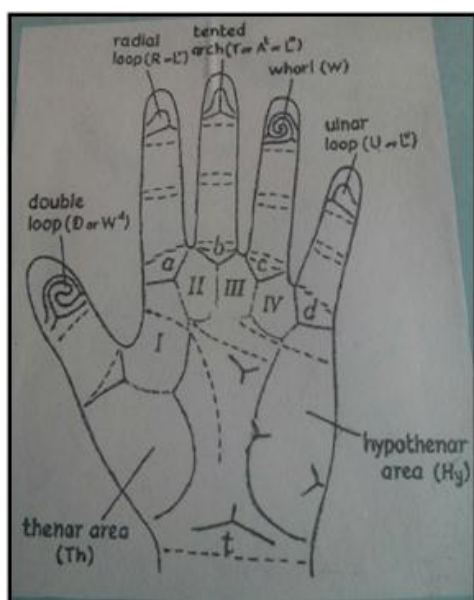


Fig. 1: Schematic representation of various qualitative parameters such as arches, whorl, radial loop, ulnar loop

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