ORIGINAL ARTICLE

PALMAR DERMATOGLYPHICS IN PATIENTS OF THALASSEMIA MAJOR

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ABSTRACT

Introduction: Dermatoglyphics have proven to be a helpful tool in identifying specific syndromes of genetic origins. Any epidermal ridge alterations in individuals may have a distinctive dermatoglyphic feature. An attempt has been made to find out any significant variation in-patient of Thalassemia major, so it can be highlighted with a view to assess its value as a diagnostic marker.

Methodology: Palm prints of 100 diagnosed patients of Thalassemia were studied and study matched with 100 healthy subjects.

Results: The preset study shows autosomal recessive inheritance caused by a single mutant gene. The chain is coded by gene on chromosome no-16 &gene on chromosome No-11; unusual dermatoglyphics are reported in-patient with single gene disorders. Thalassemia is also a single gene disorder so it too can be added to this list. Parameters studied were 'atd' angle, 'a-b' ridge count and main line index. It was observed that the 'atd' angle wider in patients in comparison to control group, which indicates distal displacement of axial tri-radius. It was also found that more number of patients fell under the group of high ridge count. The difference was significant statistically for right hand. Low main line index was observed in patients which indicates vertical alignment of ridges.

Conclusion: The deviation of the different dermatoglyphic features in patients of Thalassemia major provides a single, inexpensive method of clinical observation and adds another new diagnostic tool to the clinicians.

Key words: Thalassemia Major, 'atd' angle, a-b ridge count, Main-line index.

INTRODUCTION

Dermatoglyphics [derma-skin; glyphics-curving] is a term applied to the study of naturally occurring markings on the surface of the hands. The importance of these markings to the geneticist was not realized until recent years, but they have proven to be a helpful tool in identifying specific syndromes of genetic origins.

Every human being carries with him from his cradle to his grave – certain physical marks which do not change their character & by which he/she can always be identified .These marks are his physiological autographs, which neither can be counterfeited nor can be disguised. The study of dermatoglyphics has been useful in the investigation and identification of certain disorders and syndromes. In recent years, interest in the medical application of dermatoglyphic analysis has increased among the clinicians. It has been evaluated in various diseases such as Down syndrome, leukemia, Mental retardation, Epilepsy, diabetes etc. Abnormalities in the epidermal ridges may result from genetic alteration occurring around the first trimester of pregnancy during orgenogenetic period. On this it has been opined that any epidermal ridge alterations in individuals may have a distinctive dermatoglyphic feature which remain unchanged throughout life (schaumann and Alter 1976). An attempt has been made to find out any significant variation in-patient of Thalassemia major, so it can be highlighted with a view to assess its value as a diagnostic marker.

The main –line index is based on the sum of the two numbers defining the exist of main-line A & D. The index was introduced by Cummins (1936) as an indication of the generalized ridge direction over the pal. High value of the index indicates a transverse arrangement of ridges, while low values are associated with the longitudinal alignment.

MATERIAL AND METHOD

Palm prints of 100 diagnosed patients of Thalassemia were studied and study matched with 100 healthy subjects. Finger prints and palm prints were taken with the help of printers on white paper by ink method. After that these prints were studied for 'atd' angle, a-b ridge count and main-line index with the help of a hand lens.

The palm of the hand contains five tri-radii. Four of them are found at the base of the second to fifth fingers and are called respectively a, b, c, and d triradii. The fifth tri radius is located near the base of the 4th metacarpal & is called axial tri-radius or 't' tri-radius. An angle is drawn between a, t & d point called 'atd' angle, which is under strong genetic control.

'a-b ridge' count is obtained by counting the number of ridges between 'a' & 'b' tri-radius is called a-b ridge count. The main lines corresponding to as a, b, c and d are indicated by the capital letters A, B, C and D. These lines flow towards the margin of the palm. The margin of the palm is numbered counter clock-wise from 1 to 13" beginning in thenar area and ending in the digital area No. 1.

Main-line exit numbers on palms have been formulated at the 1967 London Symposium on Dermatoglyhic Nomenclature as follows:

1. Proximal radial border of the thenar area and interval between this and t.
2. Triradius t.
3. Interval between t and the midpoint of the ulnar border of the hand from the distal wrist crease to the proximal crease of digit V.
4. Midpoint between the distal wrist crease and the proximal crease of digit V on the ulnar border.
5. Interval between midpoint of ulnar border and the ulnar termination of the distal transverse crease.
6. (5") Interval between the ulnar termination of the distal transverse creae and that of the proximal crease of digit V.
7. Triradius d.
8. Distal edge of interdigital area IV
9. Triradius c.
10. Distal edge of interdigital area IV.
11. Triradius b.
12. Distal edge of interdigital area II
13. Triradius a.
14. Interval between distal edge of interdigital area I and radial termination of the radial longitudinal crease (thumb crease).

OBSERVATION

Palm prints were obtained for all five digits of both hands in each subject 9i.e 100 cases & 100 controls) palm prints were analyzed according to the methods of Cummins and Midlo (1926). To find out any distal displacement of axial tri-radius, the values of 'atd' angles were arranged in different groups starting from 25 at the interval of 10. (i.e 25 degree to 34 degree , 35 degree to 44 degree etc)

It was observed that more number of patients had 'atd' angle that fell under high category i.e 35 degree to 54 degree , while more number of control group had 'atd' angle that fell under lower category i.e 25 degree to 44 degree. This indicates that the 'atd' angle is wider in patients in comparison to control group as a result of distal displacement of axial tri-radius. The difference was significant statistically with X2 value 29.17 & 'P' value 0.000 for the right hand. X2 value is 11.64 & 'P' value is 0.006 (table-1)

Table 1: Percentage distribution of 'atd' angle with 'p' value

'atd' Angle in Degree	Right hand				Left hand			
	Cases	Control	X^2	p value	Cases	Controls	X^2	p value
25-34	02	30	29.17	0.000*	00	11	11.64	0.06*
35-44	55	57	0.08	0.77	58	71	3.69	0.05
45-54	21	12	2.94	0.08	22	14	2.17	0.14
55-64	07	05	0.35	0.55	01	01	0.12	0.73
Mean	43.78	38.11			44.31	39.74		
SD	6.73	5.54			6.73	6.14		

*** Significant at 95% Confidence level3**

'a-b Ridge' count

'a – b ridge' counts in patients as well as controls was done for the right & left hand separately & was tabulated. To derive the 'P' value for a-bridge count, it was arranged in 4 groups at the interval of 10 i.e. 20 to 29, 30 to 39 etc.

It was found that more number of patients fell under the group of high ridge count (Between 30 and 39) The difference was significant statistically for right hand with X2 value 8.49 and 'P' valve 0.003. More numbers of controls fell under the low ridge group (Between 20 & 29). No such difference was found in the ridge count of the left hand. (Table-2)

Main-line index for both hands was recorded separately. To derive the 'p' value for main-line index, the index was arranged in to two categories, 5 to 15 and 16 to 25 at the interval of 10 (Table 3). It was found that out 100 patients 77 patients had low main-line index for right hand which indicates that in patients, there is a vertical alignment of ridges and in controls there is a horizontal alignment of ridges. For left hand no such difference was found.

Difference in right hand was significant statistically with x2 value 21-52 and p value 0.000 (Table No. 3) Mean value and S.D also were obtained.

Table.2: Percentage distribution of 'a–b ridge' count with 'p' value

Ridge Count	Right hand				Left hand			
	Cases	Control	X^2	'p' value	Cases	Control	X^2	'p' value
20-29	25	39	4.5	0.03*	23	25	0.11	0.7
30-39	72	52	8.49	0.003*	64	60	0.34	0.56
40-49	03	09	3.19	0.07	12	15	0.39	0.53
50-59	00	00	--	--	01	00	1.01	0.31
Mean	32.16	31.35			33.38	33.48		
S.D.	4.71	5.51			5.11	5.11		

* Significant at 95% Confidence level

Table 3: Percentage distribution of 'p' value of main line index

Main Line Index	Right hand				Left hand			
	Cases	Control	X^2	'p' Value	Cases	Control	X^2	'p' Value
5to15	77	45	21.52	<0.001*	96	94	0.42	0.51
16to25	23	55	21.52	<0.001*	04	66	0.42	0.51
Mean	13.78	14.96			12.26	12.76		
S.D.	1.95	1.81			1.94	2.16		

* Highly significant

DISCUSSION

A tri-radius is characteristically present in the longitudinal axis of the palm between the thenar & hypothenar eminence, it is called axial tri-radius 'y' and is usually found proximally near the wrist margin. However the axial tri-radius may be displaced distally and classified as t' more marked distal displacement is designated as t". the displacement if axial tri-radius indicates a possibility of abnormal condition. The displacement of axial tri-radius is expressed by 'atd' angle formed with the 'a' and 'd' tri-radii of the interdigital areas. The a-b ridge count is one of the quantative method since the tri-radii 'a' and 'b' are almost clearly defined and ridge formation between them is usually an open field. The ridges, which cross a straight line joining them, may be counted easily. The a-b ridge count is genetically controlled.

The main-line index was derived from numbers assigned to the positions on the palmar border in which the most important main line (A and D) terminates. The numbering of these positions is such that the index is higher when the lines are transversely oriented and index is lower when the lines run longitudinally. Various reports have appeared which implicate chromosome 21 in the determination of position of the axial tri-radius 't' other chromosomal loci of the genes influences dermatoglyphics include the 'X' chromosome & chromosome 18. Dermatoglyohics represents a useful clinical and research tool patients with certain illness particularly those associated with chromosomal aberrations can frequently be diagnosed with reasonable certainty on the basis of the dermatoglyphic features. The ridges area of the skin is readily accessible and can be studied without any trauma to the patient. Although no one dermatoglyphic feature can be considered alone in making a diagnostic but several dermatoglyphic features when combined have been used more successfully. The deviation of the different dermatoglyphic features in-patient of Thalassemia major provides a simple, inexpensive method of clinical observation and adds another useful new diagnostic tool to the clinicians.

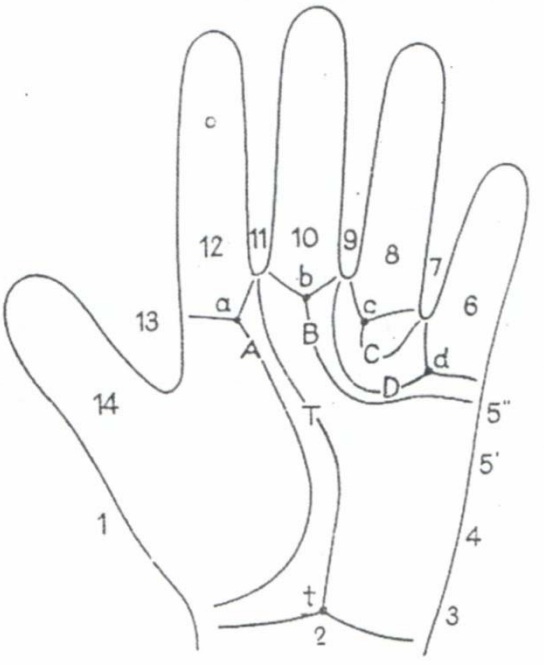


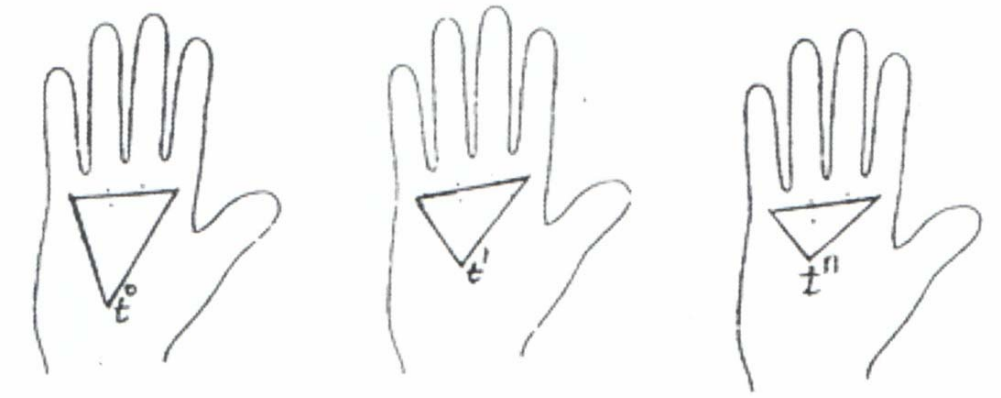
Fig 1: Numbering of Palm

CONCLUSION

'atd' angle is wide in patients in comparison to controls, which indicates distal displacement of axial tri-radius. a-b ridge count is increased in right hand of patients.

Main line index is low in patients which indicates vertical alignment of ridges.

The study can be extended to establish co-relation between dermatoglyphics and other inherited disease.



(t^0 - Angle atd 45^0 or less) (t^I - Angle atd between 46^0 - 47^0) (t^{II} - Angle atd 71^0 or more)

Fig 2: Variations of 'atd' angle

Fig 3: 'a-b' Ridge Count

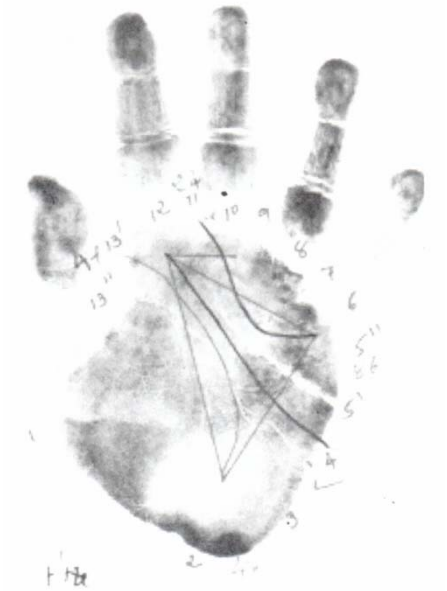


Fig 4: Main Line Index

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