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Research Article

Study of palmar patterns in diabetic patients

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ABSTRACT

Background: Nowadays study of dermatoglyphics has a great importance in judicial and criminal researches. Similarly its study is related to some genetic diseases has an immense applications. Diabetes Mellitus is the silent killer of mankind and public health problem. Therefore investigators are looking for new methods for its early diagnosis and treatment. Dermatoglyphics is a growing discipline and its ease and ready applicability render it as a useful tool to the clinician. Dermatoglyphics may be effectively employed as a screening procedure in future and may help in the early detection of cases of diabetes mellitus.
Methods: The present study is undertaken with an aim to evaluate the dermatoglyphic features in diabetic patients. The study consists of 150 diabetic patients and 150 normal healthy individuals as controls. They were 75 males and 75 females in each group. Dermatoglyphic prints were taken by "Ink method" described by Cummins and Midlo and further subjected to statistical analysis to find the variations in the dermatoglyphic features among diabetic patients and control groups.
Results: Mean value of a-b ridge count is neither increased nor decreased in diabetic patients (P = 0.852). Mean value of atd angle is slightly decreased in diabetic patients (P = 0.2332). The frequency of t and t' are increased (P = 0.8462, P = 0.6681) and the frequency of t" is decreased (P = 0.757) in diabetic patients but they are not statistically significant.
Conclusion: From the present study, it appears that there do exists a variation in the dermatoglyphic patterns in diabetic patients with an advantage of being simple and economical 'ink' method. As the specific features of dermatoglyphic patterns are present in diabetic patients, it can be used for mass screening program to segregate the predicted diabetic patients.

Keywords: Dermatoglyphics, a-b ridge count, atd angle, Axial triradii

INTRODUCTION

Dermatoglyphics deals with the scientific study of epidermal ridge patterns on the palmar and plantar aspect of finger tips, palms, soles and toes. The term 'Dermatoglyphics was coined by Cummins and Midlo (1926)[7] and was derived from the Greek words 'derma' means skin and 'glyphics' means carvings (Penrose LS, 1963).[15] The skin on the palmar and plantar surfaces of man is not smooth. It is grooved by curious ridges, which form a variety of configurations. The formation of dermal ridges takes place in the fetus during the third week of intrauterine life as a result of physical and topological forces.[7] The dermal ridges and configurations which are once formed are not affected by the age, development and environmental changes in the postnatal life and so it has potential to predict various genetic and acquired disorders with a genetic influence.[5]

Widespread medical interest in epidermal ridges developed only in the last few decades when it became apparent that many patients with chromosomal

aberrations had unusual ridge pattern. Inspection of skin ridges, therefore promised to provide a simple, inexpensive means of information to determine whether a given patient could have a particular chromosomal defect.

Dermatoglyphics offers atleast two major advantages.[17]

1) The epidermal ridge patterns on the hand and sole are fully developed at birth and therefore, remain unchanged for life.

2) Scanning of the ridge patterns or recordings these permanent impressions can be accomplished rapidly, inexpensively and without any trauma to the patient.

3) Finally, the relevance of dermatoglyphics is not to diagnose, but it is preventive by predicting a disease. Similarly it is not for defining an existing disease, but for identifications of people with the genetic predisposition to develop certain diseases.

Diabetes Mellitus is the silent killer of mankind and public health problem. Therefore investigators are looking for new methods for its early diagnosis and treatment. Even before that the early prediction of it may help to take some preventive measures. One of the etiology of Diabetes Mellitus is hereditary. In this study, we are trying to specify the dermatoglyphic characteristics to find out whether some specific trait exists in the Diabetes Mellitus patients.

METHODS

The present study was carried out in the department of anatomy, Karpaga Vinayaga institute of medical sciences & research centre, Maduranthagam from October 2013 to May 2014. The 150 diabetic patients were taken, out of which 75 were males and 75 were females, their age group ranges from 30 to 70 yrs. Similarly equal number of controls in the same age group as that of diabetic patients were taken, out of which 75 were males and 75 were females.

The study population consists of all clinically diagnosed and confirmed by investigations as diabetic and they were from the Maduranthagam and surrounding area.

Method of dermatoglyphic printing

Patients were informed about the procedure in detail and their consent was obtained to conduct the study.

Dermatoglyphic prints were taken by the "Ink method" as described by Cummins (1936)[6] and Cummins and Midlo (1943).[8]

Materials required

1) Black Duplicating ink (Kores)
2) Ink pad
3) Printing cards (White 'Map Litho' paper with a glazed surface on one side)
4) Rubber roller
5) Magnifying hand lens
6) Cotton puffs
7) Scale and pencil pen
8) Protractor- To measure atd angle
9) Needle with a sharp point, for ridge counting.

Steps in the printing method

1) The requisite amount of ink daub was placed on the glass slab. It was uniformly spread by the rubber roller to get a thin even ink film on the glass slab.

2) The thin film of ink was applied on the palm by passing the inked rubber roller uniformly over the palm and digits taking care that the hollow of the palm and the flexor creases of the wrist were uniformly inked.

3) The palm was examined for the uniformity of the ink, and if found otherwise ink was also applied to the hollow of the palm with the help of cotton puffs.

4) Left hand of the subject was then placed on the sheet of paper (kept over the pressure pad) from proximal to distal end. The palm was gently pressed between intermetacarpal grooves at the root of fingers, and on the dorsal side corresponding to thenar and hypothenar regions. The palm was then lifted from the paper in reverse order, from the distal to proximal end. The fingers were also printed below the palmar print by rolled fingerprint method. The tip of the fingers were rolled from the radial to ulnar side to include all the patterns.

5) The same procedure was repeated for right hand on separate paper.

6) The printed sheets were coded with name, age and sex for case group (DM) and control group.

7) The prints were then subjected for detail dermatoglyphic analysis with the help of magnifying hand lens and ridge counting was done with the help of a sharp needle. The details were noted on the same paper with the pencil pen.

In the prepared proforma essential informations were recorded. The data included age, sex, address, family history and other medical history of importance. The palmar prints were analysed qualitatively and quantitatively.

a-b ridge count

The ridge count most frequently obtained is the a-b ridge count. Counting was most carried out along a straight line

connecting the triradii ‘a’ and ‘b’. The count excludes the ridges forming the triradii (Figure 1).

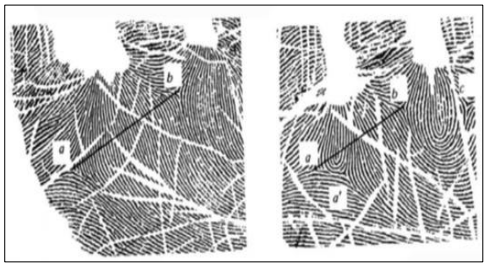

Figure 1: Showing a-b ridge count.

atd angle

The most widely used method to interpret the position of axial triradius in the palm is the atd angle. The atd angle is an indication of the degree of distal displacement of axial triradius. This angle is formed by lines drawn from the digital triradius ‘a’ to axial triradius ‘t’ and to digital triradius ‘d’ (Figure 2). The symbol ‘t’ is reserved for axial triradii found in the proximal region of the palm, near the wrist crease. A triradius situated near the centre of the palm is term ‘t''. An extremely distally placed triradius (distal to proximal transverse crease) is termed as ‘t"’ (Figure 2). The most important one is that the atd angle tends to decrease with age because the palm grows more in length than in breadth. The size of the angle is also affected by the amount of spreading of the fingers when the patterns are printed. The pressure exerted while the palm is printed also can affect the atd angle (Berg JM, 1968).[3]

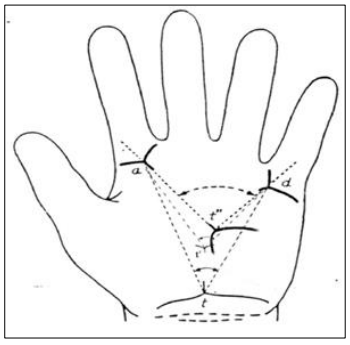

Figure 2: Showing atd, at'd and at"d angles.

Figure 3: Showing palmar print of right and left hand of male patient.

RESULTS

The dermatoglyphic patterns on right and left hands of 150 diabetic patients are analysed according to sex and pattern and are subjected to statistical tests to evaluate significant pattern of identifiable difference between the diabetic patients and the controls.

In our study, out of 150 cases studied, number of males were 75 and females were 75.

Table 1: Frequency distribution of a-b ridge count between cases and controls in males.

a-b ridge count	Male							
	Case				Control			
	R	L	T	%	R	L	T	%
21-25	2	2	4	2.6	5	1	6	4
26-30	15	13	28	18.6	12	11	23	15.3
31-35	22	30	52	34.6	25	26	51	34
36-40	23	21	44	29.3	26	26	52	34.6
41-45	9	7	16	10.6	5	10	15	10
46-50	2	1	3	2	2	1	3	2
51-55	2	1	3	2	0	0	0	0
56-60	0	0	0	0	0	0	0	0
Total	75	75	150	100	75	75	150	100

In diabetic males, the maximum percentage of a-b ridge count is seen between 31-35 (34.6%) as compared to control males where it is seen between 36-40 (34.6%).

Table 2: The frequency distribution of a-b ridge count between cases and controls in females.

a-b ridge count	Female							
	Case				Control			
	R	L	T	%	R	L	T	%
21-25	2	1	3	2	1	3	4	2.6
26-30	13	11	24	16	15	8	23	15.3
31-35	27	27	54	36	23	25	48	32
36-40	22	27	49	32.6	24	29	53	35.3
41-45	10	8	18	12	11	7	18	12
46-50	1	1	2	1.3	1	3	4	2.6
51-55	0	0	0	0	0	0	0	0
56-60	0	0	0	0	0	0	0	0
Total	75	75	150	100	75	75	150	100

In diabetic females, the maximum percentage of a-b ridge count is seen between 31-35 (36%) as compared to control females where it is seen between 36-40 (35.3%).

Table 3: Statistical comparison of a-b ridge count between cases and controls.

Group	Mean±SD	SE	F value	P value	Remark
Case	34.97±5.339	0.436	0.0347	0.852	NS
Control	34.89±5.166	0.422			

There is no statistical significant difference in the mean value of a-b ridge count between cases and controls.

Table 4: Frequency distribution of atd angle between cases and controls in males.

atd angle	Male							
	Cases				Controls			
	R	L	T	%	R	L	T	%
21-25	0	0	0	0	1	0	1	0.6
26-30	0	1	1	0.6	0	0	0	0
31-35	13	9	22	14.6	7	5	12	8
36-40	39	35	74	49.3	34	35	69	46
41-45	13	22	35	23.3	22	27	49	32.6
46-50	7	7	14	9.3	9	6	15	10
51-55	2	0	2	1.3	2	1	3	2
56-60	0	0	0	0	0	1	1	0.6
>60	1	1	2	1.3	0	0	0	0
Total	75	75	150	100	75	75	150	100

In both diabetic and control males, the maximum percentage of atd angle is seen between 36^0-40^0 (49.3% & 46%) but percentagewise it differ.

Table 5: Frequency distribution of atd angle between cases and controls in females.

atd angle	Female							
	Cases				Controls			
	R	L	T	%	R	L	T	%
21-25	0	0	0	0	0	0	0	0
26-30	0	1	1	0.6	0	0	0	0
31-35	8	4	12	8	4	1	5	3.3
36-40	33	30	63	42	29	25	54	36
41-45	22	26	48	32	28	31	59	39.3
46-50	10	12	22	14.6	10	14	24	16
51-55	1	2	3	2	2	2	4	2.6
56-60	1	0	1	0.6	0	1	1	0.6
>60	0	0	0	0	2	1	3	2
Total	75	75	150	100	75	75	150	100

In diabetic females, the maximum percentage of atd angle is seen between 36^0-40^0 (42%) as compared to control females where it is seen between 41^0-45^0 (39.3%).

Table 6: Statistical comparison of atd angle between cases and controls.

Group	Mean±SD	SE	F value	P value	Remark
Case	40.85±5.787	0.472	1.2164	0.2330	NS
Control	41.91±5.247	0.428			

There is slight decrease in the mean value of atd angle in cases as compared to the control groups but it is not statistically significant.

Table 7: Statistical comparison of position of axial triradii between cases and controls.

Position of axial triradii	Cases		Control		X^2	P Value	Remark
	No.	%	No.	%			
t	292	97.3	286	95.3	0.0376	0.8462	NS
t'	20	6.6	17	5.6	0.1838	0.6681	NS
t"	7	2.3	8	2.7	0.0968	0.757	NS

There is an increase in the frequency of both t and t' and slight decrease in the frequency t" in cases as compared to controls but it is not statistically significant**.**

DISCUSSION

Dermatoglyphics as a diagnostic tool is well established in a number of diseases which have strong hereditary basis. Diabetes Mellitus being the hereditary basis, certain dermatoglyphic variation is to be expected in it.

a-b ridge count

In the present study, the maximum percentage of a-b ridge count is seen between 31-35 (34.6%) in diabetic males as compared to control males where it is seen between 36-40 (34.6%). The maximum percentage of a-b ridge count is seen between 31-35 (36%) in diabetic females as compared to control females where it is seen between 36-40 (35.3%).

Previous workers has not considered the frequency distribution of a-b ridge count in class interval, hence our present findings could not be compared.

In the present study, there is no significant difference in the mean value of a-b ridge count between cases and controls.

Ana Tarca (2006),[1] P. K. Dam et al. (2006),[9] Hossein Rezaei Nezhad and Nasser Mahdavi Shah (2010)[10] Shariatzadeh SMA et al. (2002)[18] and Ziegler AG et al. (1993)[22] found decrease a-b ridge count in diabetic patients whereas G. S. Oladipo and M. B. Ogunnowo (2004)[13] found significant increase in the mean value of a-b ridge count in the cases. Thus, the present study finding (no significant difference in the mean value of a-b ridge count) does not coincide with the findings of above workers.

atd angle

In the present study, the maximum percentage of atd angle is seen between 36^0-40^0 (49.3% & 46%) in both diabetic and control males but percentagewise it differ. The maximum percentage of atd angle is seen between 36^0-40^0 (42%) in diabetic females as compared to control females where it is seen between 41^0-45^0 (39%).

Previous workers has not considered the frequency distribution of atd angle in class interval, hence our present findings could not be compared.

Li Yanhua, Wu Shoushan Han et al. (1990)[12] found decrease atd angle in diabetic patients whereas G. S. Oladipo, M. B. Ogunnowo (2004),[13] Vadgaonkar Rajanigandha et al. (2006),[19] A. L. Udoaka and K. Lawyer-Egbe (2009)[19] and M. Pramila Padmini et al. (2011)[16] found an increase atd angle in diabetic patients when compared to controls.

In our present study, the mean value of atd angle is slightly decreased in cases as compared to controls. The findings of decrease atd angle in diabetic patients in the present study does not coincide with the findings of above workers except Li Yanhua Wu Shoushan Han et al. (1990)[12] who found decrease atd angle in the diabetic patients.

Position of axial triradii

In the present study, percentage of t and t' found to be increased whereas the percentage of t" found to be decreased in cases as compared to the controls.

The increase frequency of both t and t' in diabetic patients of our present study are in agreement with Vera M et al. (1995)[21] and Ziegler AG et al. (1993)[22] who has found increase frequency of t and t' in diabetic patients.

CONCLUSIONS

The present study is undertaken with an aim to evaluate the dermatoglyphic features in diabetic patients. The study consists of 150 diabetic patients and 150 normal healthy individuals as controls. They were 75 males and 75 females in each group.

Dermatoglyphic prints were taken by “Ink method” described by Cummins and Midlo (1943)[8] and further subjected to statistical analysis to find the variations in the dermatoglyphic features among diabetic patients and control groups. From the present study, it is concluded that:

1. Mean value of a-b ridge count is neither increased nor decreased in diabetic patients.
2. Mean value of atd angle is slightly decreased in diabetic patients.
3. The frequency of t and t' are increased and the frequency of t" is decreased in diabetic patients but they are not statistically significant.

Thus from the present study, it appears that there do exists a variations in the dermatoglyphic patterns in diabetic patients with an advantage of being simple and economical ‘Ink’ method. Moreover, the materials required for the dermatoglyphic procedure are easily available and portable. As the specific features of dermatoglyphic patterns are present in diabetic patients, it can be used for mass screening program to segregate the predicted diabetic patients.

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