Original Research Article

The Study of Dermatoglyphic Analysis in Coronary Artery Disease Patients

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ABSTRACT

Introduction: Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar aspect of hand and fingers, plantar aspect of foot and toes. Three major patterns in the human fingerprints include-loops, whorls and arches. The knowledge of dermatoglyphics patterns in patients with CAD is an interesting matter and little information is available about this relation. The study was conducted with the aim to measure and analyze quantitative parameters of each hand in patients of Coronary artery disease and controls.

Methods: The present study was carried out in Department of Anatomy, Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan from March 2012 to March 2014. Age group ranging from 21-70 years. Dermatoglyphic prints were taken by ink method and the quantitative patterns like Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), a-b Ridge Count and atd Angle on Palm were analysed.

Observations: In this study, 50 cases of angiographically proven CAD and 50 healthy individuals (controls) were included for comparison of various parameters. The mean age for CAD patients is 47.6 years in male and 48.5 years in female while for controls it is 33.38 years in male and 28 years in females. In CAD cases maximum percentage of TFRC seen in class interval of 126-150 (42 %) and AFRC is seen in three class interval of 126-150, 151-175 and 201-225 (18 %) as compared to the controls. Statistically significant difference in the mean value of a-b ridge count in CAD males (P<0.05) and CAD (M+F) (P<0.05) but no statistically significant difference in CAD females when compared with the controls. Statistically significant difference in the mean value of atd angle in both right and left hand in CAD but no significant in right hand of female when compared with the controls.

Conclusion: The conclusion derived from this study is that there is decrease in the mean value of TFRC, AFRC and atd angle and increase mean value of a-b ridge count in CAD in both sexes and both hands with significant.

Keywords: Dermatoglyphic, CAD, TFRC, AFRC), a-b Ridge Count, atd Angle

INTRODUCTION

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar aspect of hand and fingers, plantar aspect of foot and toes. The term dermatoglyphics was coined by Drs. Harold Cummins and Charles Midlo, Professors of Microscopic Anatomy (Tulane University, United States of America) at "Verbal Introduction" at the 2nd annual session of the American Association of Anatomists, in April 1926 and was derived from Greek words 'derma' meaning skin and 'glyphics' meaning carvings.[1]

The ridge pattern depends upon the cornified layer of epidermis and dermal papillae. The ridges are differentiated in their definitive forms during third and fourth month of foetal life and once formed remain permanent and never change throughout the life except in the dimension in proportion to the growth of an individual[2,3].

Three major patterns in the human fingerprints include-loops, whorls and arches. Their variants exhibit differential

trends among races, sex, twinning, parent to child, sibling to sibling, disputed paternity, personal identification and correlation with disease and genetic traits[3].

Apart from its use in predicting the diagnosis of genetic disease, dermatoglyphics is also used in forensic science for individual identification. It is also a valuable research tool in the field of physical Anthropology, Human Genetics and Medicine[4]. The research findings put forth by some scientists suggest that muzzle prints of animals similar to fingerprints in human being could be used as permanent method of identification of such animal to check fraud particularly in insurance matter[5].

The knowledge of dermatoglyphics patterns in patients with CAD is an interesting matter and little information is available about this relation. Thus, with regard to the high incidence of CAD in the world, the existence of such relation might be important in the screening program for early detection and timely treatment of CAD. This study could be used for screening or to guide future research in this direction.

MATERIAL AND METHODS

The present study was carried out in Department of Anatomy, Mahatma Gandhi Medical College and Hospital, Jaipur, Rajasthan from March 2012 to March 2014. Fifty cases of coronary artery disease were taken for the dermatoglyphic study from the S.M.S. Hospital and Mahatma Gandhi Hosptial, Jaipur. Age group ranging from 21-70 years.

Dermatoglyphic prints were taken by INK METHOD as described by Cummins (1926), Cummins and Midlo (1943). These imprints are studied by scanning and then studying the different dermatoglyphic variables by opening the finger prints in Paint software for observations under different heads. The quantitative patterns like Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), a-b Ridge Count and atd Angle on Palm were

analysed. These observations are compared with those of normal healthy control group of hundred subjects who are not suffering from any malignancy till date.

OBSERVATIONS

In the present study, 50 cases of angiographically proven CAD and 50 healthy individuals (controls) were included for comparison of various parameters. There were 42 males and 8 females in each group. The age ranges from 21-70 years with mean age for CAD patients is 47.6 years in male and 48.5 years in female while for controls it is 33.38 years in male and 28 years in females.

Table 1: Frequency distribution of Total Finger Ridge Count (TFRC) in CAD and control groups.

cl of TFRC	CAD				Controls			
	M	F	T	%	M	F	T	%
0-25	1	0	1	2	0	0	0	0
26-50	0	0	0	0	0	0	0	0
51-75	0	0	0	0	1	0	1	2
76-100	6	0	6	12	2	1	3	6
101-125	13	3	16	32	3	0	3	6
126-150	16	5	21	42	10	3	13	26
151-175	6	0	6	12	16	2	18	36
176-200	0	0	0	0	8	2	10	20
201-225	0	0	0	0	2	0	2	4
Total	42	8	50	100	42	8	50	100

Table 1 shows frequency distribution of Total Finger Ridge Count (TFRC) in CAD and control groups. In CAD cases, maximum percentage of TFRC is seen in class interval of 126-150 (42 %) as compared to the control group where it is seen in the class interval of 151- 175 (36 %).

Table 2: Statistical calculation for TFRC in CAD and control groups

Subject	Sex	Mean	SD
Cases (CAD)	M	125.048	26.962
	F	126.6	10.391
	M+F	125.3	24.981
Controls (normal)	M	155.571	31.738
	F	150.25	27.509
	M+F	154.72	30.901

Table 2 shows statistical calculation for TFRC in CAD and control groups. There is decrease in the mean value of TFRC in CAD males, females and (M+F) as compared to the controls.

Table 3: Test of significance for TFRC for comparison between CAD and control groups.

Comparison with controls	t-value	P value	Remark
Male	4.7501	<0.05	S
Female	2.2723	<0.05	S
Total	5.2354	<0.05	S

Table 3 shows 't' value for TFRC for comparison between CAD and controls with their statistical significance. There is statistical significant difference in the mean value of TFRC between total male, total female and total cases and controls (P<0.05).

Table 4:Frequency distribution of Absolute Finger Ridge Count (AFRC) in CAD and controls

cl of AFRC	CAD				Controls			
	M	F	T	%	M	F	T	%
0-25	1	0	1	2	0	0	0	0
26-50	0	0	0	0	0	0	0	0
51-75	0	0	0	0	0	0	0	0
76-100	1	0	1	2	2	0	2	4
101-125	5	1	6	12	2	1	3	6
126-150	8	1	9	18	2	1	3	6
151-175	6	3	9	18	8	2	10	20
176-200	4	1	5	10	9	1	10	20
201-225	7	2	9	18	3	0	3	6
226-250	4	0	4	8	4	2	6	12
251-275	2	0	2	4	8	1	9	18
276-300	4	0	4	8	0	0	0	0
301-325	0	0	0	0	1	0	1	2
326-350	0	0	0	0	1	0	1	2
351-375	0	0	0	0	2	0	2	4
376-400	0	0	0	0	0	0	0	0
Total	42	8	50	100	42	8	50	100

Table 4 shows frequency distribution of Absolute Finger Ridge Count (AFRC) in CAD and controls. In CAD group, maximum percentage of AFRC is seen in three class interval of 126-150, 151-175 and 201-225 (18 %) as compared to the controls where it is seen in the two class interval; of 151-175 and 176-200(20 %).

Table 5: Statistical calculation for AFRC in CAD and controls

Subject	Sex	Mean	SD
Cases (CAD)	M	181.524	59.999
	F	172.125	35.567
	M+F	180.02	56.613
Controls (normal)	M	208.119	64.986
	F	191	57.825
	M+F	205.38	63.652

Table 5 shows statistical calculation for AFRC in CAD and controls. There is decrease in the mean value of AFRC in CAD males, females and (M+F) when compared with the controls.

Table 6: Test of significance for AFRC for comparison between CAD and controls

Comparison with controls	t-value	P value	Remark
Male	1.9487	0.0548	NS
Female	0.7864	0.4447	NS
Total	2.1051	0.0378	S

Table 6 shows 't' value for AFRC for comparison between CAD and controls with their statistical significance. There is statistically significant difference (P< 0.05) in the mean value of AFRC between total cases and controls but no statistically significant difference in total males and female.

Table 7: Frequency distribution of a-b ridge count in CAD and controls

cl of a-b Ridge Count	Male								Female							
	CAD				Control				CAD				Control			
	R	L	T	%	R	L	T	%	R	L	T	%	R	L	T	%
21-25	0	0	0	0	0	2	2	2.4	0	0	0	0	0	0	0	0
26-30	0	0	0	0	3	2	5	6	0	0	0	0	0	0	0	0
31-35	2	2	4	4.8	9	8	17	20.2	0	1	1	6.25	0	0	0	0
36-40	18	15	33	39.2	8	13	21	25	4	2	6	37.5	4	5	9	56.3
41-45	21	24	45	53.61.2	17	11	28	33.3	4	4	8	50	4	3	7	43.7
46-50	0	1	1		4	5	9	10.7	0	1	1	6.25	0	0	0	0
51-55	1	0	1	1.2	0	0	0	0	0	0	0	0	0	0	0	0
56-60	0	0	0	0	1	1	2	2.4	0	0	0	0	0	0	0	0
Total	42	42	84	100	42	42	84	100	8	8	16	100	8	8	16	100

Table 7 shows Frequency distribution of a-b ridge count in CAD and controls. In CAD males, maximum percentage of a-b ridge count is seen between 41-45 (53.6 %) as compared to males in control groups where it is seen between 41-45 (33.3 %). In CAD females, maximum percentage of a-b ridge count is seen between 36-40 (37.5 %) as compared to control females where it is seen between 36-40 interval 56.3 %).

Table 8: Statistical calculation of a-b ridge count in CAD and controls

Subject	Sex	Side	MEAN	SD
CAD	M	R	40.952	3.561
		L	40.905	2.945
		R+L	40.928	3.248
	F	R	40.25	3.059
		L	41.375	3.378
		R+L	40.813	3.167
	M+F	R	40.84	3.466
		L	40.98	2.986
		R+L	40.91	3.219
CONTROLS	M	R	39.071	6.311
		L	39.1192	7.106
		R+L	39.095	6.679
	F	R	41.125	3.523
		L	40.375	2.387
		R+L	40.75	2.933
	M+F	R	39.4	5.973
		L	39.32	6.579
		R+L	39.36	6.252

Table 8 shows statistical calculation of a-b ridge count in CAD and controls. There is slight increase in the mean value of a-b ridge count in CAD males, females and (M+F) as compared to the controls. There is

also increase in the mean value of a-b ridge count in both right and left hands in CAD as compared to the controls.

Table 9: Test of significance for a-b ridge count for comparison between CAD and control

Sex	Side	t-value	P-value	Remark
M	R	1.6823	0.0963	NS
	L	1.5045	0.1363	NS
	R+L	2.2623	0.0250	S
F	R	0.5305	0.6041	NS
	L	0.6838	0.5052	NS
	R+L	0.0579	0.9542	NS
M+F	R	1.4745	0.1436	NS
	L	1.6246	0.1075	NS
	R+L	2.2043	0.0287	S

Table 9 shows t-value for a-b ridge count for comparison between CAD and controls. There is statistically significant difference in the mean value of a-b ridge count in CAD males ($P<0.05$) and CAD (M+F) ($P<0.05$) but no statistically significant difference in CAD females when compared with the controls.

Table 10: Frequency distribution of atd angle in CAD and controls

cl of atd angle	Male								Female							
	CAD				Control				CAD				Control			
	R	L	T	%	R	L	T	%	R	L	T	%	R	L	T	%
26-30	0	4	4	4.8	2	0	2	2.4	0	0	0	0	0	0	0	0
31-35	9	5	14	16.7	1	4	5	5.9	2	2	4	25	0	0	0	0
36-40	22	19	41	48.7	20	26	46	54.8	4	3	7	43.8	5	3	8	50
41-45	9	13	22	26.2	11	9	20	23.8	1	2	3	18.8	2	3	5	31.2
46-50	2	0	2	2.4	6	1	7	8.3	0	1	1	6.2	0	1	1	6.3
51-55	0	1	1	1.2	2	1	3	3.6	0	0	0	0	0	1	1	6.3
56-60	0	0	0	0	0	1	1	1.2	1	0	1	6.2	0	0	0	0
61-65	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	6.2
Total	42	42	84	100	42	42	84	100	8	8	16	100	8	8	16	100

Table 10 shows frequency distribution of atd angle in CAD and controls. In CAD males, maximum percentage of atd angle is seen between 36-40 (48.7%) as compared to control males where it is seen between 36-40 (54.8 %). In CAD females, maximum percentage of atd angle is seen between 36-40 (43.8%) as compared to control females where it is seen between 36-40 (50%).

Table 11 shows statistical calculation of atd angle in CAD and controls. There is decrease in the mean value of atd angle in CAD males, females and (M+F) as compared to the controls. There is also decrease in the mean value of atd angle in both right and left hand in CAD groups as compared to the controls.

Table 11: Statistical calculation of atd angle in CAD and controls

Subject	Sex	Side	MEAN	SD
CAD	M	R	38.667	3.836
		L	38.928	4.886
		R+L	38.798	4.368
	F	R	40.375	6.717
		L	39.375	5.125
		R+L	39.875	5.795
	M+F	R	38.94	4.377
		L	39.0	4.874
		R+L	38.97	4.609
CONTROLS	M	R	42.857	5.426
		L	41.667	4.771
		R+L	42.262	5.113
	F	R	44.375	8.634
		L	45.0	5.345
		R+L	44.688	6.945
	M+F	R	43.1	5.967
		L	42.2	4.965
		R+L	42.65	5.479

Table 12: Test of significance for atd angle for comparison between CAD and control

Sex	Side	t-value	P-value	Remark
M	R	4.0868	0.0001	S
	L	2.5984	0.0111	S
	R+L	4.7212	0.0001	S
F	R	1.0342	0.3186	NS
	L	2.1484	0.0497	S
	R+L	2.1282	0.0416	S
M+F	R	3.9750	0.0001	S
	L	3.2522	0.0016	S
	R+L	5.1395	0.0001	S

Table 12 shows t-value for atd angle for comparison between CAD and controls. There is statistically significant difference in the mean value of atd angle in CAD males ($P<0.01$), females ($P<0.05$) and (M+F) ($P<0.01$) when compared with the controls. There was statistically significant difference in the mean value of atd angle in both right and left hand in CAD but no significant in right hand of female when compared with the controls.

DISCUSSION

The quantitative dermatoglyphic patterns were analysed under following headings:
a. Total Finger Ridge Count (TFRC)
b. Absolute Finger Ridge Count (AFRC)
c. a-b Ridge Count
d. atd Angle

The observed values in the current study were first subjected to the test of statistical significance done in Epi Info (TM) 3.5.1, Epi info7 software and excel data analysis. The findings were then compared with the available literature of previous workers.

a. Total Finger Ridge Count (TFRC)

In the present study there is decrease in the mean value of TFRC in all CAD cases as compared to the controls which was statistically significant ($P<0.05$). There is decrease in the mean value of TFRC in CAD males (x=125.048), CAD females (x=126.6) and CAD (M+F) (x=125.3) when compared to the controls and was statistically significant male ($P<0.05$), female ($P<0.05$) and (M+F) ($P<0.05$).

b. Absolute Finger Ridge Count (AFRC)

In the present study there is statistically significant decrease in the mean value of AFRC in all CAD cases as compared to the controls. There is also decrease in the mean value of AFRC in CAD males, females and (M+F) when compared with the controls with statistically significant difference in the mean value of AFRC between cases and controls ($P<0.05$).

Rashad and Mi (1975)[6] observed significant increase in TFRC and AFRC in myocardial infarction patients. Rashad *et al.* (1978)[7] also reported significant increase in TFRC and AFRC in MI patients. Total and Absolute ridge count were significantly higher ($P<0.05$) in all digits in favour of MI patients. Anderson MW *et al.* (1981)[8] observed no statistically significant increase in TFRC and AFRC in MI patients. Thus the finding of decreased mean value of TFRC and AFRC in CAD in the present study contrast with the finding of above workers.

c. a-b Ridge Count

In the present study, there is increase in the mean value of a-b ridge count was observed in both sexes of CAD groups. There is also increase in the mean value of a-b Ridge Count in both hands in CAD cases as compared to the controls. As compared to the control group there is increase in mean value of a-b ridge count in CAD males ($P<0.0250$), CAD females ($P<0.9542$) and CAD (M+F) ($P<0.0287$). This present study findings could not be compared as no previous study has been carried out on a-b ridge count in CAD.

d. atd Angle

In the present study there is decrease in the mean value of atd angle was observed in both sexes of CAD groups as compared to controls. There is also decrease in the mean value of atd angle in both hands in CAD cases as compared to the controls. As compared to the control group there is decrease in mean value of atd angle in CAD males ($P<0.0001$), CAD females ($P<0.0416$) and CAD (M+F) ($P<0.0001$). No study has been carried out on atd angle in

CAD, hence present study findings could not be compared.

CONCLUSION

The conclusion derived from present study is that there is decrease in the mean value of TFRC and AFRC in CAD in both sexes and both hands with significant. Mean value of a-b ridge count is significantly increased in both hands and both sexes in CAD group. Mean value of atd angle is significantly decreased in both hands and both sexes.

CAD is most important cause of mortality and morbidity in the world. CAD causes more death and disability and incurs greater economic cost than any other illness in developing world. So, with the help of fingerprint pattern it might be helpful for screening of persons for CAD in rural areas where there are lack of diagnostic facilities.

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