

Original article:

A study of quantitative analysis of dermatoglyphic in Coronary Artery Disease patients.

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ABSTRACT:

Introduction: Coronary artery disease (CAD) is the most important cause of mortality and morbidity in the world. The dermatoglyphic pattern in patients with CAD is an interesting matter and little information is available about this relationship. Present study was planned to investigate the relation between the dermatoglyphic pattern as indication of genetic susceptibility in the incidence of CAD.

Methods: The present study was carried out in the department of Anatomy P.D.U. Medical college Rajkot, Gujrat. It includes 100 patients (80 males and 20 females) of CAD and 100 normal healthy individual were included as controls. The Palmar Prints of the patients and the controls were taken on the Map Litho White paper by ink method.

Results: In CAD case, maximum percentage of TFRC is seen in class interval of 151-175 (28%), maximum percentage of AFRC is seen in class interval of 151-175 (18.0%). In CAD males, maximum percentage of atd angle is seen between 36-40 (42.5%) and in CAD females, maximum percentage of atd angle is seen between 41-45 (33.3%).

Conclusion: There is increase in the mean value of TFRC and AFRC in CAD and in both sexes. No significant differences in the mean value of ab ridge count in CAD in either sexes.

Keywords: Coronary artery disease, Total Finger Ridge Count

INTRODUCTION:

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hand and fingers and plantar region of foot and toes.¹The ridge pattern depends upon the cornified layer of epidermis and dermal papillae. The typical patterns of epidermal ridges are determined since their formation in foetus. There is proliferation of cells in the lower zone of epidermis which projects into the dermis as a regularly spaced thickenings and the dermis subsequently projects upward in the epidermal hollows. This is followed by the appearance of elevations formed by them on the skin surface which gives rise to epidermal ridges.²

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. The original ridge characteristics are not disturbed unless the skin is damaged to a depth of about one millimeter.³Development of dermatoglyphic pattern is under genetic control. This is evident from the

clear resemblance of dermatoglyphics among related person.⁴ There are many diseases known to be caused by abnormal genes. Whenever there is any abnormality in the genetic makeup of parents it is inherited to the children and is reflected in dermatoglyphic pattern.⁵ Dermatoglyphics as a diagnostic aid is now well established in a number of diseases, which have a strong hereditary basis, and is employed as a method of screening abnormal anomalies.⁶ 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.⁷

The etiology of Coronary Artery Disease (CAD) is multifactorial with genetics playing an important role. Taking into consideration of genetic predisposition of dermatoglyphics and coronary artery disease, the study was undertaken to find out correlation between them. So that dermatoglyphics may be helpful in the diagnosis of predisposition towards this disease at an earlier age. 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 prevention of CAD. Coronary Artery Disease is the most important cause of mortality and morbidity in the world. The knowledge of major risk factors can be useful in the prevention of CAD. Few studies has been carried out on dermatoglyphics in myocardial infarction or acquired heart disease, but in spite of extensive scanning of literature no reference was found on dermatoglyphic patterns in known case of CAD. Against this background present study is carried out.

MATERIAL AND METHODS:

The present study was carried out in the department of Anatomy P.D.U. Medical college Rajkot, Gujrat. It includes 100 patients (80 males and 20 females) of Coronary Artery Disease. Similarly equal numbers of normal health individual were included as controls. All the patients were taken from the Government Hospital of the P.D.U Medical College Rajkot. The patients who were diagnosed after ECG, Echocardiography, Angiography were included in the study. The Palmar Prints of the patients and the controls were taken on the Map Litho White paper by ink method. The printed sheets were coded with name, age, sex, and for case group (CAD) and control group. 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. The dermatoglyphic patterns on right and left hand of CAD patients are analysed according to sex and are subjected to statistical tests to evaluate significant pattern of identifiable difference between CAD and Controls. The dermatoglyphic patterns are analysed under following heading : Quantitative analysis of Finger Print (I) Total finger Ridge Count (TFRC) and (II) Absolute Finger Ridge Count (AFRC), a b Ridge Count on Palm and at Angle on Palm.

OBSERVATIONS & RESULTS :

In the present study, 100 cases of known case of CAD and 100 healthy individual (controls) were included for comparison of various parameters. There were 80 males and 20 female in each group. The age ranges from 35-76 years with mean age of male and female is 55.18 years and 53.83 years respectively in CAD. The age ranges from 31-75 years with mean age of male and female is 51.29 years and 53 years respectively in controls.

Frequency distribution of TFRC in total CAD and controls. There is increase in the TFRC in CAD as compared to the control. In CAD case, maximum percentage of TFRC is seen in class interval of 151-175 (28%) as compared to the control where it is seen in the class interval of 126-150 (20%). (Table 1)

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

CI of TFRC	CAD (Cases)				CONTROL			
	M	F	T	%	M	F	T	%
0-25	0	1	1	0.1	0	1	1	0.1
26-25	2	1	3	2.7	4	1	5	5.0
51-75	2	1	3	2.7	2	1	3	3.0
76-100	2	2	4	4.0	7	1	8	8.0
101-125	14	1	15	14.7	11	4	15	15.0
126-150	18	3	21	20.7	14	6	20	20.0
151-175	24	4	28	28.0	15	4	19	18.7
176-200	15	6	21	21.0	18	0	18	18.0
201-225	2	1	3	2.7	7	2	9	9.0
226-250	2	0	2	2.0	1	0	1	0.1
251-275	0	0	0	0	0	0	0	0
76-300	0	0	0	0	0	0	0	0
301-325	0	0	0	0	0	0	0	0
326-350	0	0	0	0	0	0	0	0
351-375	0	0	0	0	0	0	0	0
376-400	0	0	0	0	0	0	0	0
400-425	0	0	0	0	0	0	0	0

There is increase in the mean value of TFRC in CAD male and females, and also in CAD (M+F) when compared with the controls. 't' value of different comparison groups with their statistical significance for TFRC in CAD and controls. There is no statistically significant difference in the mean value of TFRC in all comparison groups. (Table 3& 4) There is increase in the AFRC in CAD as compared to the controls. In CAD, maximum percentage of AFRC is seen in class interval of 151-175 (18.0%) as compared to the controls where it is seen in the class interval of 126-150 (15.0%). (Table 4) There is increase in the mean value of AFRC in CAD males, CAD females and also in CAD (M+F) when compared with the controls.(Table 5)

Table no.6 Shows 't' value of different comparison groups in CAD and controls with their statistical significance for AFRC. There is no statistically significant difference in the mean value of AFRC in all comparison groups.

In CAD males, maximum percentage of atd angle is seen between 36-40 (42.5%) as compared to control males where it is seen between 36-40 (51.3%). Table 7 In CAD females, maximum percentage of atd angle is seen between 41-45 (33.3%) as compared to control females where it is seen between 36-40 (40%). (Table 7) Statistical calculation of atd angle in CAD and controls. There is increase in the mean value of atd angle in CAD males, CAD females and CAD (M+F) as compared the controls. (Table 8)

There is also increase in the mean value of atd angle in both right and left hand in CAD as compared to the controls. t-value for atd angle for comparison between total CAD and controls. There is statistically significant difference in the mean value of atd angle in CAD males (P<0.01) CAD (M+F) (P<0.01) and CAD left hand (P<0.01) when compared with the controls. There is no statistically significant difference in atd angle in CAD females.(Table 9)

Table 10 Shows frequency distribution of ab ridge count in total CAD and controls. In CAD males, maximum percentage of ab ridge count is seen between 36-40 (44.2%) as compared to control males where it is seen between 36-40 (40%). In CAD females, maximum percentage of ab ridge count is seen between 36-40 (30%) as compared to control females where it is seen between 41-45 interval (48.3%)

Table 11 Shows statistical calculation of ab ridge count in CAD and controls. There is slight increase in the mean value of ab ridge count in CAD males and decrease in CAD females and CAD (M+F) as compared to the controls. There is also decrease in the mean value of ab ridge count in both right and left hand in CAD as compared to the control.

Table 2 : Statistical Calculation for TFRC in Total CAD and Control.

SUBJECT	SEX	MEAN	SD	SE-M	CV
CASES	M	148.12	38.51	4.30	20.80
	F	140.00	56.13	12.55	8.01
	M+F	146.10	42.40	4.21	29.15
CONTROL	M	146.25	46.91	5.24	25.66
	F	127.5	50.26	11.23	7.88
	M+F	142.25	48.15	4.81	33.85

Table 3 : Test of Significance for TFRC for comparison between total CAD and Controls.

COMPARISION	T- VALUE	P-VALUE	REMARKS
NM*CM	0.275	0.39	NS
NF*CF	0.741	0.23	NS
N(M+F) * C(M+F)	0.600	0.27	NS



Table 4 : Frequency distribution of Absolute Finger Ridge Count (AFRC) in total CAD control.

CI of TFRC	CAD(Cases)				CONTROL			
	M	F	T	%	M	F	T	%
0-25	0	1	1	0.1	0	1	1	0.1
26-50	2	1	3	2.7	3	1	4	4.0
51-75	2	1	3	2.7	5	1	6	6.0
76-100	3	1	4	3.3	6	1	7	7.0
101-125	7	1	8	8.7	6	3	9	9.0
126-150	7	5	12	12	11	4	15	15.0
151-175	15	3	18	18	7	2	9	9.0
176-200	9	2	11	11	10	1	11	11.0
201-225	7	2	9	9	4	5	9	8.7
226-250	6	1	7	7	5	1	6	6.0
251-275	3	1	4	4	7	0	7	7.0
276-300	6	1	7	7	5	0	5	5.0
301-325	3	1	4	4	5	0	5	5.0
326-350	1	0	1	0.1	1	0	1	0.1
351-375	1	0	1	0.1	1	1	2	2.0
376-400	0	0	0	0.0	0	0	0	0.0
400-425	0	0	0	0	0	0	0	0

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Table 5 : Statistical Calculation for AFRC in Total CAD and Control.

SUBJECT	SEX	MEAN	SD	SE-M	CV
CASES	M	200.15	77.92	8.76	30.92
	F	167.05	84.00	7.90	37.54
	M+F	193.42	79.36	7.89	35.79
+ CONTROL	M	192.12	88.57	9.8	36.41
	F	157.73	77.70	16.95	37.66
	M+F	185.04	87.20	8.63	36.69

Table 6 : TEST OF SIGNIFICANCE

COMPARISON	T VALUE	P-VALUE	REMARKS
NM*CM	0.846	0.19	NS
NF*CF	0.301	0.38	NS
N(M+F)*C(M+F)	2.434	0.01	NS

Table 7 : Frequency distribution of atd angle in total CAD Controls.

atd Angle	MALE								FEMALE							
	CAD				CONTROL				CAD				CONTROL			
	R	L	T	%	R	L	T	%	R	L	T	%	R	L	T	%
23-30	0	1	1	0.6	0	2	2	0.8	0	0	0	0	0	0	0	0
31-35	9	7	16	10	12	11	23	14.6	4	2	6	15.0	3	3	6	15.0
36-40	36	32	68	42.5	42	40	82	51.3	8	4	12	13.0	7	9	16	40.0
41-45	23	30	53	33.3	20	23	43	26.7	4	9	13	33.3	7	5	12	30.0
46-50	8	6	14	8.8	5	2	7	5.4	4	3	7	18.3	3	2	5	11.7
51-55	2	3	5	3.3	1	1	2	0.8	0	2	2	3.3	0	1	1	0.6
56-60	2	1	3	1.7	0	1	1	0.6	0	0	0	0	0	0	0	0

Table 8 : Statistical Calculation for atd angle in total CAD and Controls.

SUBJECT	SEX	Side	MEAN	SD	SE-M	CV
CAD (Cases)	M	R	40.75	5.33	0.53	13.08
		L	40.87	5.08	0.50	12.42
		R+L	40.81	5.19	0.51	12.71
	F	R	40.00	5.23	0.52	13.04
		L	42.75	5.49	0.54	12.85
		R+L	41.37	5.47	0.54	13.23
	M+F	R	40.6	5.29	0.52	13.03
		L	41.25	5.19	0.51	12.58
		R+L	40.92	5.23	0.52	12.80
Controls	M	R	39.31	4.19	0.41	10.65
		L	39.18	4.72	0.47	12.05
		R+L	39.25	4.45	0.44	11.34
	F	R	40.50	4.72	0.47	11.67
		L	40.25	5.25	0.52	13.04
		R+L	40.37	4.93	0.49	12.22
	M+F	R	39.55	4.30	0.43	10.88
		L	39.40	4.82	0.48	12.24
		R+L	39.47	4.56	0.45	11.55

Table 9 : Test of Significance for atd angle for comparison between total CAD and Controls.

COMPARISION	T-VALUE	P-VALUE	REMARKS
NMR x CMR	1.900	0.030	S
NML x CML	2.180	0.015	S
NM(R+L) x CM(R+L)	2.886	0.002	S
NFR x CFR	0.317	0.376	NS
NFL X CFL	1.472	0.074	NS
NF(R+L) x CF (R+L)	0.137	0.446	NS
NTR x CTR	1.540	0.063	NS
NTL x CTL	2.612	0.004	S
NT(R+L) x CT(R+L)	2.955	0.002	S

Table 10 : Frequency distribution of a-b ridge count in total CAD and Controls.

ab Ridge Count	MALE								FEMALE							
	CAD				CONTROL				CAD				CONTROL			
	R	L	T	%	R	L	T	%	R	L	T	%	R	L	T	%
26-30	1	2	3	1.7	3	1	4	2.5	1	1	2	5.0	1	2	3	6.7
31-35	11	11	22	13.8	16	10	26	16.3	5	5	10	25.0	3	1	4	10.0
36-40	35	36	71	44.2	32	32	64	40.0	8	4	12	30.0	4	4	8	20.0
41-45	26	19	45	28.3	21	27	48	30.0	5	3	8	20.0	9	10	19	48.3
46-50	5	11	15	9.6	5	7	12	7.1	1	5	6	16.7	3	3	6	13.3
51-55	2	1	3	1.9	3	2	5	3.3	1	1	2	5.0	1	0	1	0.4
56-60	0	1	1	0.6	0	1	1	0.6	0	0	0	0	0	0	0	0

Table 11 : Statistical Calculation for a-b Ridge Count in total CAD and Controls.

SUBJECT	SEX	Side	MEAN	SD	SE-M	CV
CAD (Cases)	M	R	39.81	4.65	0.46	11.69
		L	40.18	5.26	0.52	13.10
		R+L	39.87	5.00	0.50	12.55
	F	R	39.25	5.34	0.53	13.62
		L	40.25	6.97	0.69	17.32
		R+L	39.50	6.42	0.69	16.26
	M+F	R	39.75	5.24	0.52	13.18
		L	40.20	5.61	0.56	13.95
		R+L	39.86	5.26	0.53	13.21
Controls (Normal_	M	R	39.12	5.39	0.53	13.78
		L	40.43	5.15	0.51	12.74
		R+L	39.72	5.27	0.52	13.28
	F	R	41.09	6.01	0.60	14.63
		L	41.5	4.89	0.48	11.79
		R+L	41.00	5.86	0.58	14.29
	M+F	R	39.6	5.65	0.55	14.00
			40.65	5.09	0.51	12.54
			40.12	5.33	0.33	13.30

DISCUSSION:

Dermatoglyphics as a diagnostic tool is now well established in a number of disease which have strong hereditary basis. Coronary Artery Disease being the hereditary background, certain dermatoglyphic variation is to be expected in it. The present study is carried out in the department of Anatomy. The study consists of 100 patients of know case of coronary artery disease and equal numbers of normal healthy individual were included as controls

for comparison. The prints were obtained by "ink method" on the map litho paper and analysed to find out variations in dermatoglyphic features among CAD and control group.

The dermatoglyphic patterns are analysed under following heading :

1. Quantitative analysis of Finger Print
 - a. Total Finger Ridge Count (TFRC)
 - b. Absolute Finger Ridge Count (AFRC)
2. ab Ridge Count
3. atd Angle

The observed values in the current study were first subjected to the test of statistical significance and the findings were then compared with the available literature of previous workers. In the present study, there were 80 males and 20 females in both CAD and control groups. The mean age of male and female is 55.18 years and 53.83 years respectively in CAD as compared to 51.29 years and 53 respectively in controls.

I. Quantitative analysis of Finger Print : Total Finger Ridge Count (TFRC) : In the present study there is increase in mean value of TFRC in CAD males, CAD females and CAD (M+F) when compared to the controls but not statistically significant. Absolute Finger Ridge Count (AFRC) : In the present study there is increase in the mean value of AFRC in CAD males, CAD females and CAD (M+F) when compared with the controls but not statistically significant. Rashad and Mi (1975)⁸ observed significant increase in TFRC and AFRC in myocardial infarction patients. Rashad et al. (1978)⁹ 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 favors of MI patients. Anderson MW et al. (1981)¹⁰ observed no statistically significant increase in TFRC and AFRC in MI patients. Thus the finding of increased mean value of TFRC and AFRC in CAD in the present study is similar with the finding of above workers.

II. ab Ridge Count : In the present study, there is slight increase in the mean value of ab ridge count if CAD males and decrease in CAD females, CAD (M+F) and in both hands as compared to the controls but not statistically significant. This present study findings could not be compared as no previous study has been carried out on ab ridge count in CAD.

III. atd Angle : In the present study, there is increase in the mean value of atd angle in both sexes and in both hands with significant increase in CAD males ($P < 0.01$), CAD (M+F) ($P < 0.01$) and CAD left hand ($P < 0.01$).

No study has been carried out on atd angle in CAD, hence present study findings could not be compared.

CONCLUSIONS :

Thus from the present study, it appears that there do exist a variation in the dermatoglyphic patterns in CAD 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 the CAD it can be use for mass screening program for prevention of CAD.

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