

ORIGINAL ARTICLE

A STUDY OF DERMATOGLYPHIC PATTERN IN CORONARY ARTERY DISEASE PATIENTS

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BACKGROUND: 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. **MATERIALS 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 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. The dermatoglyphic patterns are analysed under following heading: Qualitative analysis of finger Prints in Loops, Arches and Whorl. **RESULTS:** The percentage of loops is 50.7% and 57% in CAD males and CAD females as compared to 57.1% and 62.0% in control males and control females respectively. The percentage of arches is 6.3% and 9% in CAD males and CAD females as compared to 7.8% and 10% in control males and control females respectively. The percentage of whorls in 43.1% and 34% in CAD males and CAD females as compared to 35.1% and 28.3% in control males and control females respectively. The percentage of loop, arch and whorls in 51.9%, 6.8% and 41.2% respectively in CAD (M+F) as compared to 58%, 8.3% and 33.7% respectively in control (M+F). **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 derm. 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. Details are given in discussion part. **CONCLUSION:** The observations shows that, There is decrease in loops and increase in whorls patterns in patients of CAD in both sexes and both hands. There is significant decrease in loops with corresponding increase in whorls in CAD males, CAD (M+F) and CAD left hand as compared to the controls.

Keywords: Coronary artery disease (CAD), Dermatoglyphic, Fingerprint**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. The term dermatoglyphics was coined by cummins and midlo in 1926 and was derived from Greek words 'derma' means skin and 'glyphics' means carvings.¹ The 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. (Cummins and Midlo, 1926)²The 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 millimetre. (Cummins and Midlo, 1943)³

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. (Holt SB, 1961)⁴

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. The research findings put forth by some scientists suggest that muzzle prints of animals similar to fingerprints in human being could be used as

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permanent method of identification of such animal to check fraud particularly in insurance matter. (Tarasiuk SI et al., 1991)⁵

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.

The knowledge of dermatoglyphic pattern 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 prevention of CAD. If an individual with specific pattern of dermatoglyphic is present in CAD, then the person can be screened for prevention by controlling other risk factors in early detection program.

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.

MATERIALS 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 or normal healthy 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. The Palmar Prints of the patients and the controls were taken on the Map Litho White paper by ink method. 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 by ANNOVA 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: Qualitative analysis of finger Prints in Loops, Arches and Whorl.

RESULTS

In the present study, 100 cases of known case of CAD and 100 healthy individual (controls) were included for comparison of various parameters. Out of these, 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.

Thus, there is decrease in the percentage of loops/arches in both sexes with corresponding increase in percentage whorls patterns in CAD as compared to the controls. Table 1

There is a predominance of ulnar loop patterns as compared to radial loop pattern in both sexes in CAD as well as in the controls. Table 2

There is increase in the percentage of tented arch as compared to the plain arch in both sexes of CAD as well as in control males. In control females, the percentage of both tented and plain arches in same. Table 3

Simple whorls (whorls spiral and whorls concentric) are predominantly seen as compared to double loop whorls (twin loop and lateral pocket loop) and other composite whorls in both sexes in CAD as well as controls. Table 4

Frequency distribution of different Finger Tip Patterns in total CAD and controls. Statistical comparison of different Finger Tip Patterns between CAD and controls in Males Females and Right Hand and Left Hand. (Table 5)

Table 1: Shows Percentage wise distribution of total Finger Tip Patterns in CAD and Controls

Subject	Sex	Side	Total % Loops	Total % Arches	Total % Whorls	FH Index	DM Index
CAD	M	R	197 49.3	25 6.3	177 44.3	89.86	14.3
		L	208 52.0	24 6.2	168 41.8	80.45	14.7
		R+L	405 50.7	49 6.3	344 43.1	85.03	14.5
	F	R	60 60	9 9	32 32	53.93	27.1
		L	54 54	9 9	36 36	65.45	25.9
		R+L	114 57	18 9	68 34	59.65	26.5
	M+F	R	257 51.3	34 6.8	209 41.9	81.56	16.2
		L	262 52.5	34 6.8	203 40.7	77.41	16.7
		R+L	519 51.9	68 6.8	412 41.2	79.46	16.5
Control	M	R	216 54	34 8.3	150 37.5	69.23	22.2
		L	240 60	29 7.3	131 32.7	54.44	22.4
		R+L	456 57.1	63 7.8	281 35.1	61.44	22.3
	F	R	64 64	11 10.7	25 25	39.58	42.1
		L	60 60	9 9.3	31 31	52.81	29.8
		R+L	214 62	20 10	56 28.3	45.95	35.3
	M+F	R	280 56.1	45 8.8	175 35.1	62.47	25.1
		L	300 60	38 7.7	162 32.4	54.12	23.9
		R+L	580 58.0	83 8.3	337 33.7	58.16	24.5

Table 2: Frequency Distribution of Loop Patterns on Finger Tips in CAD of Controls

Subject	Sex	Side	ULNAR LOOPS		RADIAL LOOPS		TOTAL LOOPS	
			No	%	No	%	No	%
CAD	M	R	191	47.8	6	1.5	197	49.3
		L	202	50.5	6	1.5	208	52.0
		R+L	393	49.2	12	1.5	405	50.7
	F	R	57	57.0	3	2.0	60	59.3
		L	52	52.0	2	2.0	54	56.7
		R+L	112	56.0	5	2.0	114	58.0
	M+F	R	248	49.7	8	1.8	258	51.3
		L	257	50.9	8	1.8	265	52.5
		R+L	503	50.3	16	1.8	521	52.1
Control	M	R	210	52.5	6	1.7	216	54.2
		L	235	58.7	5	1.3	240	60.0
		R+L	445	55.6	11	1.5	456	57.1
	F	R	63	62.7	1	1.3	64	64
		L	54	54.0	6	5.3	60	60
		R+L	117	58.3	7	3.3	124	61.7
	M+F	R	273	54.5	7	1.6	280	56.1
		L	289	57.7	11	2.1	300	60.0
		R+L	562	56.2	18	1.9	580	58.0

There is decrease in the percentage of loop/arch pattern and increase in the percentage of whorl pattern in CAD males with statistically significant difference is seen in loop pattern (P=0.01) and whorl pattern (P=0.001).

In CAD females, there is decrease in the percentage of loops/arch pattern and increase in the percentage of whorl pattern in CAD females but no statistically significant difference is seen in any Finger Tip Patterns. (Table 6)

In CAD (M+F) combined series, there is overall decrease in the frequency loop and arches; and

significant increase in the frequency of whorls in CAD (M+F) with statistically significant difference is seen in loop pattern (P<0.01) and whorls pattern (P<0.01) (Table 7).

In Right hand and Left hand also, there is decrease in the percentage of loops/arch patterns and increase in the percentage of whorl pattern in CAD as compared to the controls with statistically significant difference is seen in whorl pattern in Right hand (P<0.01) and loop patterns and whorl patterns in Left hand (P<0.01).

Table 3: Frequency Distribution of Arches Patterns on Finger Tips in CAD of Controls

Subject	Sex	Side	PLAIN ARCHES		TENTED ARCHES		TOTAL ARCHES	
			No	%	No	%	No	%
CAD	M	R	11	2.8	14	3.5	25	6.3
		L	7	1.8	17	4.3	24	6.2
		R+L	18	2.3	31	3.9	49	6.3
	F	R	3	3.3	6	3.3	9	8.7
		L	2	2.0	7	7.3	9	9
		R+L	5	2.7	13	6.3	18	9
	M+F	R	14	2.9	20	3.9	34	6.8
		L	9	1.9	24	4.9	34	6.8
		R+L	23	2.3	44	4.4	68	6.8
Control	M	R	7	1.8	24	6.5	34	8.3
		L	10	2.5	19	4.8	29	7.3
		R+L	17	2.2	43	5.7	63	7.8
	F	R	5	4.7	6	6.0	11	11.7
		L	6	5.3	3	4.0	11	9.7
		R+L	11	5.0	9	5.0	20	10.0
	M+F	R	12	2.4	33	6.4	45	8.8
		L	16	3.1	24	4.7	40	7.7
		R+L	28	2.8	57	5.5	85	8.5

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 derm.

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. Qualitative analysis of Finger Prints Loops: In the present study, There is predominance of ulnar loop pattern as compared to radial loop in both sexes in both hands with significant decrease in CAD males (P<0.01), CAD (M+F) (P<0.001) and CAD left hand (P<0.01). Rashad and Mi(1975)⁶ reported significantly lower frequency of ulnar loops in myocardial infarction patients. Rashad et al. (1978)⁷ had observed less frequency of ulnar loops in MI but not statistically significant difference when compared with the controls. Bhatt (1996)⁸ revealed lower incidence of loops in MI. Dhall et al. (2000)⁹ observed that the loop pattern was significantly lower in MI patients as compared to the control group (P<0.001). Jalali et al. (2002)¹⁰ revealed significant decrease in the percentage of loops in MI. Thus the finding of decreased frequency of loops in the present study coincides with the finding of above workers. However, Shamsadini S et al. (1997)¹¹ reported significant increase in the frequency of loops in MI patients (P<0.001).

Arches

In the present study, the percentage of tented arches is almost doubled as compared to the plain arches in both CAD and control groups. The percentage of

arches is decrease in CAD in both sexes and in both hands but not significant.

Rashad et al. (1978)⁷ had observed less frequency of tented arches in MI patients.

Anderson MW et al. (1981)¹² studied an association of dermatoglyphic features and MI but found no statistically significant difference in finger pattern type when compared with the controls.

Dhall et al. (2000)⁹ observed decrease in the frequency of arches in MI patients but not statistically significant.

Jalali et al. (2002)¹⁰ found that arch type of fingerprint was significantly increased roughly two times in MI patients (P<0.0001) as compared to the control.

Thus the finding of decreased frequency of arches in CAD in the present study is similar to the finding of above workers except Jalali et al (2002)¹⁰ who found two fold increase in the frequency of arch pattern in MI patients.

Whorls

In the present study, there is predominance of simple whorls as compared to double loop whorls and other composite whorls in both sexes in CAD and control group. However, there is significant increase in the percentage of total composite whorls in CAD (41.2%) as compared to the controls (33.7%). The percentage of whorls is increase in CAD in both sexes and in both hand with significant increase in CAD males (P<0.001), CAD (M+F) (P<0.01) and CAD left hand (P<0.01). Rashad and Mi (1975)⁶ reported significantly higher frequency of whorls in myocardial infarction patients. Rashad et al. (1978)⁷ also reported significantly higher frequency of true whorls in MI

patients. Anderson MW et al. (1981)¹² found increase in the whorl pattern in MI but not statistically significant difference when compared with the controls. Bhatt (1996)⁸ revealed higher

incidence of whorls in MI. Dhall et al. (2000)⁹ observed that the whorl pattern was significantly higher in MI patients as compared do the control group (P<0.001).

Table 4: Frequency Distribution of Whorls Patterns on Finger Tips in CAD of Controls

Subject	Sex	Side	Simple Whorls			Double Loop Whorls			Other	Total Whorls
			Ws	Wc	Total	Wtl	Wlp	Total	Wcp	
			No %	No %	No %	No %	No %	No %	No %	No %
CAD	M	R	83 20.7	45 11.2	128 31.8	9 2.3	12 3.0	21 5.3	29 7.2	177 44.3
		L	75 18.8	33 8.2	108 27.0	23 5.7	10 2.5	33 8.2	27 6.7	167 41.8
		R+L	151 19.8	78 9.7	236 29.4	32 4.0	22 2.2	54 6.8	56 6.9	344 43.1
	F	R	17 17.3	5 5	22 22.7	1 0.7	3 2.7	4 3.3	6 6.0	32 32.0
		L	18 18.7	10 10	28 28.7	3 2.7	2 2.0	5 4.7	3 2.7	36 36.0
		R+L	35 18.0	15 7.7	50 25.7	4 1.7	5 2.3	9 4.0	9 4.3	68 34.0
	M+F	R	100 20.0	50 10.0	150 30.0	10 2.0	15 2.9	25 4.9	35 6.9	209 41.9
		L	93 18.8	43 8.5	136 27.3	27 5.1	12 2.4	39 7.5	30 5.9	203 40.7
		R+L	193 19.4	93 9.3	286 28.7	37 3.5	27 2.7	64 6.4	65 6.5	412 41.2
Control	M	R	68 17.0	50 12.5	118 29.5	11 2.7	11 2.7	22 5.3	11 2.7	150 37.5
		L	62 15.5	28 7.0	90 22.5	15 3.8	8 2.0	23 5.8	17 4.3	130 32.7
		R+L	130 16.3	78 9.8	208 26.0	26 3.3	19 2.3	45 5.6	28 3.5	282 35.1
	F	R	11 11.0	5 5.0	16 16.0	1 0.7	1 1.0	2 2.0	7 6.7	25 25.0
		L	16 16.0	7 7.0	23 23.0	3 2.0	3 2.7	6 4.7	3 3.3	31 31.0
		R+L	27 13.7	12 6.0	39 20.0	9 1.3	7 2.0	16 3.3	10 5.0	56 28.0
	M+F	R	79 15.9	55 11.1	134 26.9	12 2.3	12 2.4	24 4.7	18 3.5	175 35.1
		L	78 15.6	35 7.1	113 22.7	18 3.5	11 2.1	29 5.6	20 4.1	162 32.4
		R+L	157 15.7	90 9.0	247 24.7	30 2.9	23 2.3	53 5.3	38 3.8	337 33.7

Table 5: Frequency distribution of Different Finger Tip Pattern in CAD and Controls

Subject	Sex	Side	Total % Loops		Total % Arches		Total % Whorls	
			No	%	No	%	No	%
CAD	M	R	197	49.3	25	6.3	177	44.3
		L	208	52.0	24	6.2	168	41.8
		R+L	405	50.7	49	6.3	344	43.1
	F	R	60	60.0	9	9.0	32	32.0
		L	54	54.0	9	9.0	36	36.0
		R+L	114	57.0	18	9.0	68	34.0
	M+F	R	257	51.3	34	6.8	209	41.9
		L	262	52.3	34	6.8	203	40.7
		R+L	519	51.9	68	6.8	412	41.2
Control	M	R	216	54.0	34	8.3	150	37.5
		L	240	60.0	29	7.3	131	32.7
		R+L	456	57.1	63	7.8	281	35.1
	F	R	34	34.0	11	10.7	25	25.0
		L	60	60.0	9	9.3	31	31.0
		R+L	124	62.0	20	10.0	56	28.3
	M+F	R	280	56.1	45	8.8	175	35.1
		L	300	60.0	38	7.7	162	32.4
		R+L	580	58.0	83	8.3	337	33.7

Table 6: Statistical Comparison of different Finger Tip Pattern between CAD and Controls in Males and Females

Sex	Subject	FINGER TIP PATTERNS		
		LOOPS	ARCHES	WHORL
MALE	CAD	405	49	344
	CONTROL	456	63	281
	CHI Sq	6.54	1.62	10.42
	P-VALUE	0.01054161	0.17010701	0.00148834
	REMARKS	S	NS	S
FEMALE	CAD	114	18	68
	CONTROL	124	20	56
	CHI Sq	1.03	0.11	1.68
	P-VALUE	0.30852022	0.73341397	0.1945263
	REMARKS	NS	NS	NS
M+F	CAD	519	67	412
	CONTROL	580	83	337
	CHI Sq	7.51	1.84	8.71
	P-VALUE	0.00611533	0.17436605	0.00315776
	REMARKS	S	NS	S

Table 7: 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

Jalali et al. (2002)¹⁰ also revealed slight increase in the percentage of whorls in MI but not statistically significant. Thus the finding of increased frequency of whorls in the present study is similar with the finding of above workers.

CONCLUSIONS

In the present study, it was concluded that There is decrease in loops and increase in whorls patterns in patients of CAD in both sexes and both hands. There is significant decrease in loops with corresponding increase in whorls in CAD males,

CAD (M+F) and CAD left hand as compared to the controls. Thus from the present study, it appears that there do exists 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. Authors

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