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Study of Palmar Dermatoglyphics in Patients of Coronary Artery Disease in Bidar (North Karnataka)

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Abstract

Introduction: Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hands and fingers. As a diagnostic aid, it is now well established in a number of diseases which have a strong hereditary basis. The aetiology of coronary heart diseases is believed to be multi-factorial with genetics playing an important role. *Objectives:* 1. To study the finger and palmar dermatoglyphics pattern in Coronary Artery Disease(CAD) and its different groups 2. To establish sexual and digital differences in dermatoglyphic patterns of CAD 3.To compare dermatoglyphic configurations of CAD with the controls. *Methodology:* Inking method was used for taking finger and palm prints. The present study includes the dermatoglyphic patterns of CAD and that of Controls. It constitutes 100 CAD patients (60 males, 40 females) and 100 Controls (60 males, 40 females). Qualitative analysis of arches, loops, and whorls was done. *Results:* There was low frequency in arches and loops in CAD group ($p>0.001$) and high frequency in whorls ($p>0.001$) and TFRC ($p>0.05$) in CAD group compared control group. *Conclusion:* There was low percentage in arches in CAD group when compared to controls. There was low percentage in loops in CAD group when compared to controls. There was low percentage in whorls in CAD group when compared to controls.

Keywords: CAD; Dermatoglyphics; Genetic Correlation.

Introduction

Since long ago man is familiar with the patterned traceries of fine ridges on fingers, palms and soles. An aboriginal Indian carving found at the edge of Kejimkoojik Lake in Nova Scotia suggests that these patterned ridges have aroused interest of man long prior to the period of their scientific study. While a Chinese clay seal made before 300 B.C. suggests that the man might be using the epidermal ridge patterns as personal mark [1].

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on the palmar region of hands and fingers. The term dermatoglyphics was coined by Cummins and Midlo in 1926 and was derived from Greek words 'derma' means skin and 'glyphics' means carvings [2].

Dermatoglyphics has long been recognized as a scientific and valuable method for medicolegal, anthropological and genetic studies. 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 [3].

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.

Dermatoglyphics in Coronary Artery Disease

Takashina T et al (1966) studied palmer dermatoglyphic patterns on 44 patients with

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congenital heart disease and compared with patterns on 362 patients with acquired heart disease. Distal displacement (t" or multiple axial triradii) of the palmer axial triradii occurred significantly greater frequency in the patients with congenital heart disease (64%) as compared to acquired heart disease (17%). Significant increase in the loop pattern in hypothenar area in acquired heart disease (33%) as compared to congenital heart disease (21%). However there was increase percentage frequency of palmar / tented arches in congenital heart disease (79%) as compared to acquired heart disease (65%) [4].

Rashad MN and Mi MP (1975) carried out dermatoglyphic studies on 800 Japanese subjects. Individuals with MI had a significantly higher finger of true whorls and a correspondingly lower frequency of ulnar loops than the control group. Total and absolute ridge counts were also significantly higher in MI. However individuals with HT were not significantly different in most dermatoglyphic triats from the controls [5].

Rashad et al (1978) observed that individuals who had had MI were significantly higher in total and absolute ridge counts than other control. There was also an increase frequency of true whorls with a proportional decrease in the frequency of ulnar loops. The MI patients had significantly higher frequency of true whorls, double loops and less ulnar loops and tented arches. Total and absolute ridge counts were significantly higher ($P<0.05$) in all digits in favour of MI patients [6].

Jalali F et al (2002) studied cross sectional study of 900 patients of MI and 900 control group. It was noticed that in MI patients, the distribution of dermatoglyphic pattern was 7.2% arch type, 46.8% loop type and 46% whorl type of fingertip patterns in contrast to 30.7%, 50.7% and 45.5% respectively in control group. Thus the arch type was significantly increased in MI as compared to the control ($P<0.001$) and particularly in left thumb, left index and left ring finger ($P<0.0001$) [8].

Manara et al (2011) studied 30 patients of MI and 30 controls. His observations were that the arches and loops were higher frequency in MI patients compared to controls. The mean TFRC of MI patients was lesser than controls which was not significant ($p>0.05$) [9].

Amit Kumar Saxena et al (2013) studied 100 MI patients and 100 controls. He observed significant higher frequency of arches in Mi patients compared to controls ($p< 0.001$). While there was significant higher frequency of loops in controls compared to MI patients. It was observed that there was insignificant higher frequency of Whorls in CAD compared to controls [10].

After reviewing the above references, Dermatoglyphics is multifactorial in inheritance. CAD has various etiological causes. Various studies have been done correlating dermatoglyphics with CAD. The present study was undertaken at Bidar Institute of Medical Sciences, Bidar with the following objective:*To study the finger and palmar dermatoglyphics pattern in Coronary Artery Disease (CAD) and its different groups.*

Materials and Methods

The data was collected from Cardiac Care Unit, Government Teaching Hospital, Bidar. After taking oral consent of 100 or more patients of myocardial infarction, angina and IHD of the age group 30-65 years, confirmed by clinical findings and ECG report, bilateral rolled finger and palm prints were taken. While the control group data was collected from normal healthy individuals.

The study group includes 100 patients, of which 60 patients were males and 40 patients were females. The control group includes 100 controls, of which 60 were male and 40 were females.

A. Materials

Kore's printers ink

Ink dropper.

Rubber roller

Glass inking slab.

Cotton puff

Executive bond paper

Procedure

The persons were asked to wash their hands with soap and water and to dry them in order to remove sweat, dirt and clean the hands. Small amount of ink was placed on the inking slab with the help of ink dropper and spread with the rubber roller into a thin, even film. The palm and the film will be pressed against the slab, taking care that the whole area to be printed is covered with the ink. The inked hand was placed on paper that was kept on smooth and even surface in such a way that, at first the palmar aspect of the wrist rested firmly over the paper and then gently the palmar aspect of the hand was placed on the paper with all fingers in abducted position. Each

fingertip was gently rolled side to side to get complete print of the pattern. By holding the paper in place, the hand was gently taken off the paper.

The data collected was tabulated separately for male and female in CAD and controls and it was also tabulated for combined male and female in CAD and controls.

The statistical analysis was done as follows:

1. Qualitative analysis of finger prints: (chi-square test is applied)
    i. Loops:
    ii. Arches:
    iii. Whorls:

$\chi^2 = [(n - 1) * s2] / \sigma 2$ Where n = sample size from normal population (Control) having standard deviation is equal to σ, s is the sample to be tested (CAD).

a. ARCH (A)

An arch is the simplest pattern. It consists of more or less parallel ridges. The ridges curve the pattern area. The curve is proximally concave. The curve is gentle in low arch and sharp in high arch.

1. Simple or Plain Arch (Ap): Ridges cross fingertip from one side to the other without recurving. It is not a true pattern.

Fig. 1: Finger Tip pattern: Arch

Triradius

Triradius is the point of confluence of ridges. The ridges usually radiate from this point in three different directions [8].

b. *LOOP (L):* It is the most frequent pattern on fingertip. In this configuration series of ridges enter and leave the pattern area on same side.

1. Ulnar Loop (Lu): In Ulnar Loop ridges opens on the ulnar side.
2. Radial Loop (Lr): In Radial Loop ridges open on the radial side.

Fig. 2: Finger Tip pattern: Loop

Triradius

The triradius is located on the fingertip and on the same side where the loop is crossed.

C. *WHORLS (W):* whorl is a ridge configuration in which ridges actually encircle core and more complex patterns are called as 'Composites'. Whorls are usually classified into Simple / Plain Whorls (Spiral or Concentric) and Double Loop Whorls (Twin loop or Lateral pocket loop).

Types

1. *Concentric Whorl (Wc):* The ridges are arranged as concentric rings or ellipse (around the core).

Fig. 3: Finger Tip pattern: Concentric whorl

2. Spiral Whorl (Ws): The ridges spiral around the core in clockwise or anticlockwise direction.

Fig. 4: Finger Tip pattern: Spiral Whorl

3. Mixed Whorl (Wmix): It contains circles and ellipse or spirals in the same pattern.

Fig. 5: Finger Tip pattern: Mixed whorl

Results

The present study includes the dermatoglyphic patterns of CAD and that of Controls. It constitutes 100 CAD patients (60 males, 40 females) and 100 Controls (60 males, 40 females). Qualitative analysis of arches, loops, and whorls was done.

Table 1: Distribution of Arches in male with CAD and in Control group

Sex	Type of finger print	CAD Cases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Male (n=60)	Arches	47 (7.83%)	0.395±0.491	57 (9.5%)	0.48±0.5009	p>0.001	Not significant

Table 1 shows percentage of arches in Control male is 9.5%, while in CAD male it is 7.83%. However the chi-square value gives insignificance at p>0.001.

Table 2 shows percentage of arches in Control female is 9.75%, while in CAD female it is 32%. However the chi-square value shows insignificance at p>0.001.

Table 3 shows percentage of loops in Control male is 58.67%, while in CAD male it is 51.67%. However the chi-square value shows significance at p<0.001.

Table 2: Distribution of Arches in females between patients (CAD) and Control group

Sex	Type of finger print	CAD Cases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Female (n=40)	Arches	32 (8%)	0.4±0.49	39 (9.75%)	0.48±0.50	p>0.001	Not significant

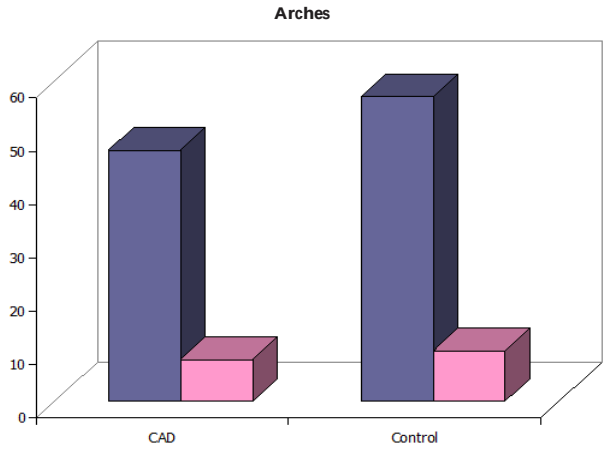
Table 3: Distribution of Loops in male between patients (CAD) and Control group

Sex	Type of finger print	CAD Cases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Male (n=60)	Loops	310 (51.67%)	2.64±2.516	352 (58.67)	3.01±2.779	P<0.001	Significant

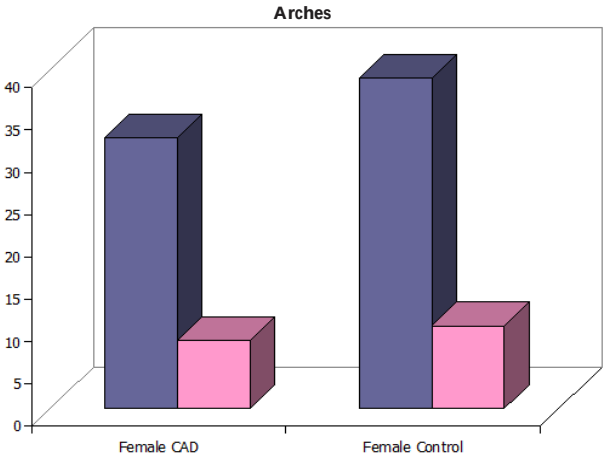
Table 4: Distribution of Loops in female between patients (CAD) and Control group

Sex	Type of finger print	CAD Cases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Female (n=40)	Loops	218 (54.5%)	2.72±2.6	233 (58.25%)	3.14±2.71	P<0.001	Significant

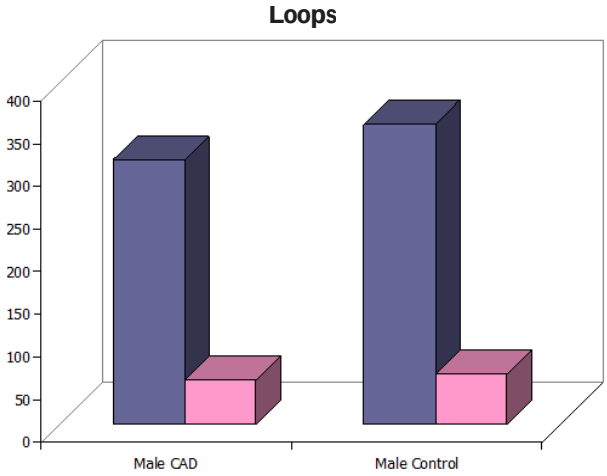
Table 4 shows percentage of loops in Control female is 58.25%, while in CAD female it is 54.5%. However the chi-square value shows significance at p<0.001.



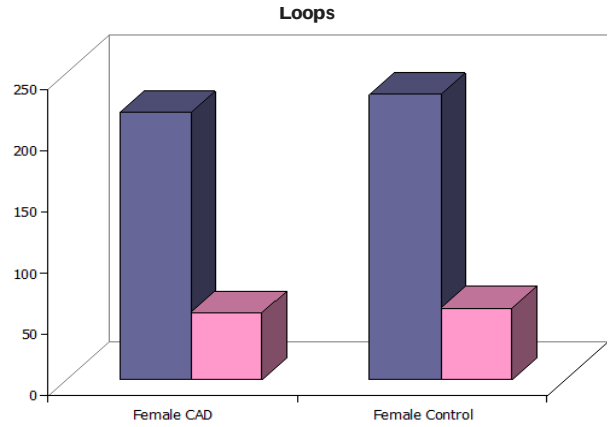
Graph 1: Arches pattern in CAD & Control Males



Graph 2: Arches pattern in CAD & Control Females



Graph 3: Loops pattern in CAD & Control Males



Graph 4: Loops pattern in CAD & Control Females

Table 5 shows percentage of Whorls in CAD male is 40.5%, while in Control male it is 31.83%. However the chi-square value shows significance at p<0.001.

Table 6 shows percentage of whorls in CAD female is 37.5%, while in Control female it is 32%. However the chi-square value shows significance at p<0.001.

In table 7, the percentages of arches, loops and whorls in CAD male+female is 7.9%, 52.8% and 39.3% while the arches, loops and whorls in Control male+female is 9.6%, 58.5% and 31.9% respectively. However the chi-square value shows insignificance at p>0.001.

Table 5: Distribution of Whorls in male between patients (CAD) and Control group

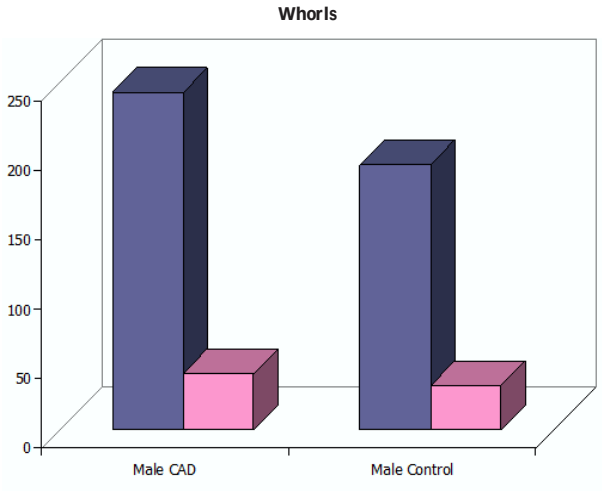
Sex	Type of finger print	CAD Cases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Male (n=60)	Whorls	243 (40.5%)	1.96±0.89	191 (31.83%)	1.59±1.003	P<0.001	Significant

Table 6: Distribution of Whorls in female between patients (CAD) and Control group

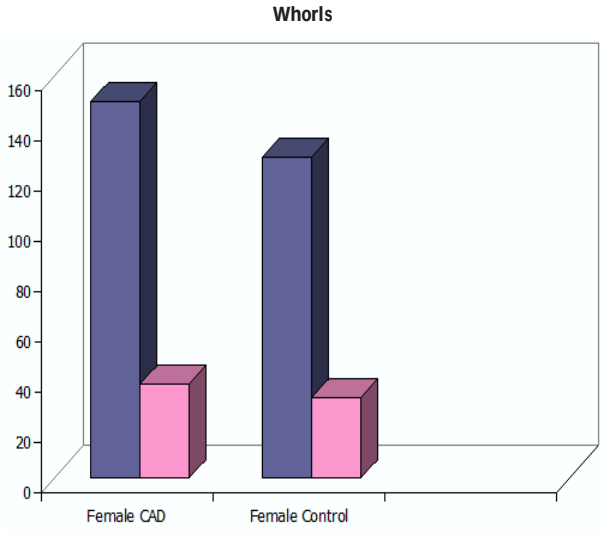
Sex	Type of finger print	CAD ases No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Female (n=40)	Whorls	150 (37.5%)	1.87±0.87	128 (32%)	1.6±1.143	P<0.001	Significant

Table 7: Distribution of finger print patterns in male & female between patients (CAD) and Control group

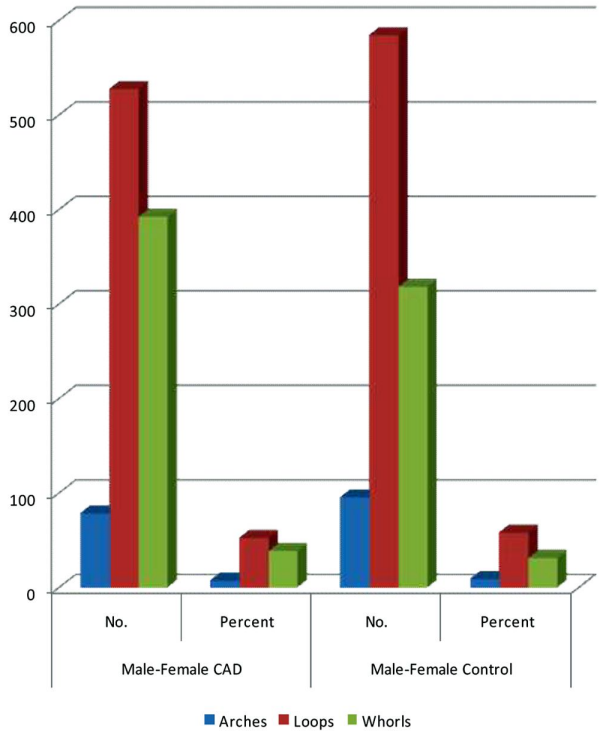
Sex	Type of finger print	CAD Case No. (%)	Mean ± SD	Control No. (%)	Mean ± SD	p-value	Significance
Male+Female (n=100)	Arches	79(7.9%)	0.39±0.49	96 (9.6%)	0.48±0.50	p>0.001	Not significant
	Loops	528(52.8%)	2.66±2.53	585(58.5%)	3.05±2.75	p>0.001	Not significant
	Whorls	393(39.3%)	1.93±0.89	319(31.9%)	1.59±1.04	p>0.001	Not significant



Graph 5: Whorls pattern in CAD & Control Males



Graph 6: Whorls pattern in CAD & Control Females



Graph 7: Distribution of finger print patterns in male & female between patients (CAD) and Control group

Discussion

The present study is carried out to study the correlation between the dermatoglyphic pattern of CAD and that of Controls. It constitutes 100 CAD patients (60 males, 40 females) and 100 Controls (60 males, 40 females). Qualitative analysis of arches, loops, and whorls was done.

Arches:

Table 8: Distribution of Arches in Cases and Controls

Author	Cases	Controls	p-value	Significance
Dhall et al[7] (2000) (n=42)	13 (31%)	10 (24%)	--	Not significant
Jalali et al[8] (2002) (n=329)	240 (7.2)	337 (3.7%)	<0.001	Significant
Manara et al[9] (2011) (n=30)	4 (1.33%)	11 (3.67%)	--	--
Amit Kumar Saxena et al[10] (2013)	39.6%	25.4%	<0.001	Significant
Ashish Rathva et al[11] (n=100)	68 (6.8%)	83 (8.3%)	0.1743	Not significant
Present study	79 (7.9%)	96 (9.6%)	p>0.001	Not significant

Loops:

Table 9: Distribution of Loops in Cases and Controls

Author	Cases	Controls	p-value	Significance
Dhall et al[7] (2000) (n=42)	40 (95%)	42 (100%)	--	Not significant
Jalali et al[8] (2002) (n=329)	1561 (47.5%)	4562 (50.7%)	<0.001	Significant
Manara et al[9] (2011) (n=30)	148 (49.34%)	155 (51.66%)	--	--
Amit Kumar Saxena et al[10] (2013)	51.8%	68%	<0.001	Significant
Ashish Rathva et al[11] (n=100)	412 (41.2%)	337 (33.7%)	0.003	Significant
Present study	528 (52.8%)	585 (58.5%)	p>0.001	Not significant

The present study shows percentage of arches is low in CAD cases (7.9%), while it is high in Controls (9.6%), (p>0.001) not significant.

The findings of present study correlate with Rashad et al [6] (1978), Jalali et al [8] (2002), Manara et al [9] (2011).

This study shows percentage of loops is low in CAD cases (52.8%), while it is high in controls (58.5%) (p>0.001) not significant.

The findings of present study correlate with Rashad MN and Mi MP [5] (1975), Rashad et al [6] (1978), Anderson MW et al [12] (1981) , Manara et al [8] (2011).

This study shows percentage of whorls is high in CAD cases (39.3%), while it is low in controls (31.9%) (p>0.001) not significant.

The findings of present study correlate with Rashad MN and Mi MP [5] (1975), Rashad et al [6] (1978), Anderson MW et al [12] (1981) , Dhall et al [7] (2000) , Manara et al [9] (2011), Amit Kumar Saxena et al [10] (2013), Ashish Rathva et al [11] (2013).

Whorls:

Table 10: Distribution of Whorls in Cases and Controls

Author	Cases	Controls	p-value	Significance
Dhall et al[7] (2000) (n=42)	38 (90%)	30 (71%)	<0.05	Significant
Jalali et al[8] (2002) (n=329)	1489 (45.3%)	4096 (45.5%)	--	--
Manara et al[9] (2011) (n=30)	148 (49.33%)	134 (44.67%)	--	--
Amit Kumar Saxena et al[10] (2013)	8.6%	6.6%	>0.001	Not significant
Ashish Rathva et al[11] (n=100)	412 (41.2%)	337 (33.7%)	0.003	Significant
Present study	393 (39.3%)	319 (31.9%)	p>0.001	Not significant

Conclusion

The following conclusions can be drawn from results of this study:

- There was low percentage in arches in CAD group when compared to controls, though the difference was statistically not significant.
- There was low percentage in loops in CAD group when compared to controls, though the difference was statistically not significant.
- There was high percentage in whorls in CAD group when compared to controls, though the difference was statistically not significant.

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