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Study of Fingerprint Patterns in Myocardial Infarction

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Abstract

Background: Myocardial infarction is the most important cause of mortality and morbidity in the world. The knowledge of major risk factors can be useful in prevention of it. The objective of this study is to investigate the relation between the dermatoglyphic patterns as an indication of genetic susceptibility in the incidence of myocardial infarction. Dermatoglyphics has been well established as a diagnostic aid in a number of diseases having hereditary basis. **Materials & Method:** The method used to collect the dermatoglyphic patterns for the present study was standard ink method. Before taking the print persons asked to wash hands with soap and water to remove oil, sweat and dirt from the skin. Total 180 cases of both sex (90 patients of myocardial infarction & 90 controls normal healthy) were included. **Results:** It was found that patients of myocardial infarction have decrease in ulnar loops & increase in whorls and increase in total finger ridge count. These genetic factors are reflected as changes in dermatoglyphic pattern in patients of ischemic heart disease. Sophisticated investigations may not be possible in all cases. **Conclusion:** Dermatoglyphics may be used as a screening test & preventive measures in development of myocardial infarction.

Keywords: - Dermatoglyphics, Myocardial infarction, Palm print, Loops, Arches, Whorls.

Introduction

Dermatoglyphics is the scientific study of epidermal ridges and their configurations on volar aspect of fingers, palms, toes and soles. The term 'Dermatoglyphics' was first introduced by the Anatomist, Harold Cummins in 1926 [1]. The biologic, embryologic, anthropologic, forensic, clinical and genetic implications of friction ridges have been folded into one scientific discipline called 'Dermatoglyphics'.

The importance of dermatoglyphics is based upon the facts as mentioned below (Penrose and Ohara 1973) [2].

1. Each dermatoglyphic configuration is unique, not same even in monozygotic twins.
2. These remains unchanged throughout life and survive superficial injury.
3. Recording of ridge pattern can be done rapidly, it does not require expensive equipments and procedure is safe & atraumatic.
4. Can be studied immediately after birth.
5. Useful for screening large population.

Ridge differentiation takes place early in fetal life which is genetically determined and influenced by environmental factors. Once they formed, do not change throughout life. Genetically related medical disorders may be, studied with the help of dermatoglyphics. Heart diseases are now considered as number one killer in Western countries. Their diagnosis is often difficult due to scarcity of physical

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signs, specially in rural areas of developing countries where diagnostic facilities are lacking. It is, therefore, important to pay attention to the preventive aspects of the diseases. In the present study a preliminary observation was made of the usefulness of finger tip patterns in serving as predictor for myocardial infarction among individuals living in Sholapur district of Maharashtra [3].

Aims and objectives

1. To study dermatoglyphic pattern in patients suffering from myocardial infarction.

2. To compare the dermatoglyphic patterns in normal and patients with myocardial infarction.

Materials and methods

Materials used are wooden table of suitable height, porcelain tile, Kores duplicating ink, sponge rubber pad, a rubber roller, white bond paper, spirit, soap, water, towel, and magnifying lens.

The method used to collect the data for the present study was standard ink method. First of all selected subjects were asked to wash hands with soap and water to remove oil, sweat and dirt from the skin. The porcelain tile was kept on table. A small amount of ink was placed on the slab and spread with roller into a thin, even film. The area to be printed was pressed against the slab, taking care that, the whole area to be printed was covered with ink.

Palm Prints

A firm surface was used under the sheet of paper on which inked finger is pressed. Pressure is applied on interphalangeal joints, head of metacarpals and dorsum of hand. With the help of fingers or blunt end of the pencil little pressure is applied on the web space between the fingers. Complete palm impression including hallow of space was obtained over the paper. To ensure complete print and also to print the hollow of the palm, a sponge rubber pad was kept under the paper on which prints are made [4]. Thus prints of the both hands were obtained and recorded with care.

Fingertip Prints

The distal phalanges of person's right hand were inked over the tile by firm pressure starting from thumb (ulnar to radial side). White bond paper was kept on the edge of the table for recording the fingerprint pattern. Rolled finger prints were obtained starting from the thumb to little finger. The same procedure was followed for recording the finger prints of the left hand. Thus rolled finger prints of the both hands were obtained and recorded with care.

Collection of data

With the help of standard ink method, prints of 90 diagnosed myocardial infarction patients (45 males and 45 females) were obtained from Dept. of Medicine of Sholapur civil hospital, Maharashtra. Patient's age was between 28-75 years and diagnosis of myocardial infarction was confirmed by electrocardiogram and clinically. The controls (45 males and 45 females) were having age group of 28-75 years. All the data was analyzed qualitatively and quantitatively. Findings of each case were recorded and tabulated.

The following parameters were studied,

A) Finger tip patterns

The ridge patterns on the distal phalanges of the finger tip are divided into following types

1) Arch

It is formed by succession of more or less parallel ridges which traverse the pattern area and form a curve which is concave proximally. (As shown in Photograph No 1)

2) Loop

It is a series of ridges enter the pattern area on one side of the digit, re-curves and leave the pattern area on the same side. If the ridge opens on the ulnar margin, the resulting loop is termed as ulnar loop. If the ridge opens towards the radial margin the resulting loop is termed as radial loop. (As shown in Photograph No 1)

3) Whorl

In this ridges are commonly arranged as a succession of concentric rings. (As shown in Photograph No 1)

B) 'a-b' Ridge Count

Ridges on palms are often counted between two inter digital triradii. The ridge count most frequently obtained is in between triradii 'a' and 'b' which is denoted as 'a-b' ridge count. (As shown in Photograph No 2)

Finger-ridge count

The counting is done along a straight line connecting the triradial point to the point of core (centre of fingertip pattern). As arches do not have any triradius, so no finger ridge can counted. In case of whorl, it has two triradii, so it has two ridge counts, out of which larger one is taken because ridge count expresses pattern size.

The triradius is formed by the confluence of three ridge systems. The digital triradii located in the distal palm in the region of heads of metacarpal bones. These are almost always located proximal to base of digits II, III, IV, V and are labeled as 'a' , 'b' , 'c' , 'd' triradii respectively [5].

The triradius close to palmer axis is termed as axial triradius. It is present normally near to the proximal margin of the palm and separates thenar & hypothenar eminence. It is denoted as't' [5].

C) 'atd' angle is formed by lines drawn from the digital triradius 'a' and 'd' to the axial triradius 't' in the palm. (As shown in Photograph No 2)

D) Total Finger Ridge Count (TFRC)

It presents the sum of the ridge counts of all ten fingers, where only the larger count is used on those digits with more than one ridge count. (As shown in Photograph 1).

The obtained data is tabulated separately for case and controls and for males and females. The data is analyzed and compared statistically by applying 'z' test and then 'p' value is calculated. If 'p' value is less than 0.05, then results are considered significant.

Results and discussion

1) Finger Tip Pattern

As per table-1 in male cases, frequency of ulnar loops is 58.89% in MI cases and 66% in controls, whereas radial loops is 3.55% in MI cases and 2.45% in controls , whorls is 34.88% in MI cases and 27.76% in controls, arches is 2.65% in MI cases and 3.77% in controls. In male cases percentage of ulnar loops & arches are decreased, while radial loops & whorls are seen increased. In this result decreased incidence of ulnar loops & increased incidence of whorls are statistically significant.

In females, frequency of ulnar loops is 57.55% in MI cases and 64.44% in controls , whereas radial loops is 2.65% in MI cases and 2% in controls, whorls is 36.22% in MI cases and 29.55% in controls, arches is 3.56% in MI cases and 4% in controls. In female cases the percentage of ulnar loops & arches are decreased while radial loops & whorls are seen increased. In this decreased incidence of ulnar loops & increased incidence of whorls are statistically significant.

Similar findings are reported by Dhall et al [6].

2) Mean 'ab' ridge count

As depicted in table -2 that the right hand findings in males shows that mean 'ab' ridge count is 32.37± 2.87 in MI cases and 31.26±3.25 in controls. This increase in 'ab' ridge count is

statistically non significant. Left hand finding in males shows that the value of mean 'ab' ridge count is 34.62±2.78 in MI cases and 33.82± 2.69 in controls. This increase in 'ab' ridge count is also statistically non significant. Right hand finding in females shows that the value of mean 'ab' ridge count is 30.53± 2.44 in MI cases and 31.17± 2.20 in controls. This decrease in 'ab' ridge count is statistically non significant. Left hand finding in females shows that the value of mean 'ab' ridge count is 35± 3.21 in MI cases and 34.26± 3.26 in controls. Thus increase in 'ab' ridge count is statistically non significant. However there were no previous studies found to compare this parameter.

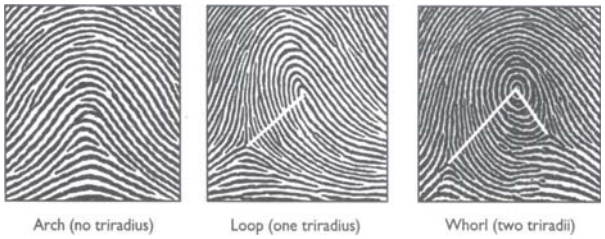
3) Mean 'atd' angle

The right hand finding in males shows that the value of mean 'atd' angle is 41.2±4.15 in MI cases and 40.73±3.24 in controls. This increase in 'atd' angle is statistically non significant. Left hand finding in males shows that the value of mean 'atd' angle is 40.88±3.76 in MI cases and 40.66±3.01 in controls. This increase in mean 'atd' angle is also statistically non significant. Right hand finding in females shows that the value of mean 'atd' angle is 40.04±3.06 in MI cases and 40.24±3.39 in controls. This decrease in mean 'atd' angle is statistically non significant. Left hand finding in females shows that the value of mean 'atd' angle is 41±3.84 in MI cases and 41.06±2.65 in controls. This increase in mean 'atd' angle is statistically non significant. However there were no previous studies found to compare this parameter (Table 2).

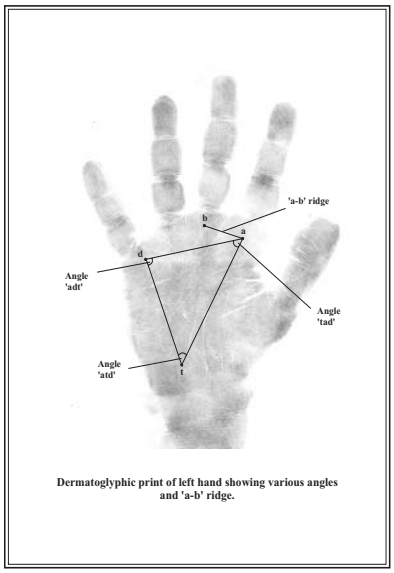
4) Total finger ridge count (TFRC)

Table 2 showed that in male MI cases, mean TFRC is 122.04±10.70 while that of controls is 117.26±9.76. This increase in difference in male cases of MI is statistically significant. In female MI cases the mean TFRC is 109.24±10.25 while that of controls 103.68±10.87. This increase in difference in female cases of MI is also statistically significant. Our study correlates with the study of Rashad M. N. et al [7] & there is no correlation with the study of Anderson M.W. et al [8] due to differences in sample size and racial homogeneity.

Photograph 1. Showing different finger tip patterns & TFRC



Photograph 2. Showing 'ab' ridge count & 'atd' angle



Dermatoglyphic print of left hand showing various angles and 'a-b' ridge.

Z test formula

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$\bar{X}_1$ = Mean (Cases)
$\bar{X}_2$ = Mean (Control)
σ_1 = S.D.Cases
σ_2 = S.D. Control
n_1 = Number of cases
n_2 = Number of Controls

Conclusion

The following conclusions can be drawn on the findings of the study that the following parameters can be used as dermatoglyphic markers in case of myocardial infarction:-

1. Decrease in frequency of ulnar loops in males and females

2. Increase in frequency of whorls in males and females

Increase in Total finger ridge count

Mean 'ab' ridge count and mean 'atd' angle can not be taken as dermatoglyphic markers in case of myocardial infarction as they are not significant in our study. The result of this study establishes the fact that there is a random relation between fingertip pattern and incidence of MI. We recommend for further quantitative study to confirm the findings of present study.

Presence of above dermatoglyphic features can help to predict the chances of development of myocardial infarction, so that the individual can take preventive measures at the earliest.

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Table 1. Finger tip patterns in cases and controls

Finger tip pattern	Male				Female			
	Cases	Controls	Z value	P value	Cases	Controls	Z value	P value
Ulnar loop	265 (58.89 %)	297 (66%)	2.2	**<0.05**	259 (57.55%)	290 (64%)	2.12	**<0.05**
Radial loop	16 (3.55%)	11 (2.45%)	0.98	>0.05	12 (2.65%)	9 (2%)	0.66	>0.05
Whorls	157 (34.88 %)	125 (27.76%)	2.3	**<0.05**	163 (36.22%)	133 (29.55%)	2.13	**<0.05**
Arches	12 (2.65%)	17 (3.77%)	0.94	>0.05	16 (3.56%)	18 (4%)	0.35	>0.05
Total	450 (100%)	450 (100%)			450 (100%)	450 (100%)		

*P value- <0.05 Significant, >0.05 non significant

Table 2. Mean 'ab' ridge count, Mean 'atd' angle, TFRC in cases and controls

Parameters		Male				Female				
		Case	Control	Z value	P value*	Case	Control	Z value	P value*
Mean 'ab' ridge count	Rt hand	32.37 ±2.87	31.26 ±3.25	1.71	>0.05,	30.53 ±2.44	31.17 ±2.20	1.31	>0.05
	Lt hand	34.62 ±2.78	33.82 ±2.69	1.38	>0.05	35 ±3.21	34.26 ±3.26	1.07	>0.05
Mean 'atd' angle	Rt hand	41.2 ±4.15	40.73 ±3.24	0.59	>0.05	40.04 ±3.06	40.24 ±3.39	0.29	>0.05
	Lt hand	40.88 ±3.76	40.66 ±3.01	0.30	>0.05	41 ±3.84	41.06 ±2.64	0.09	>0.05
TFRC		122.04 ±10.70	117.26 ±9.76	2.21	**<0.05**	109.24 ±10.25	103.68 ±10.81	2.5	**<0.05**

*P value- <0.05 Significant, >0.05 non significant