


A STUDY ON FINGERTIP DERMATOGLYPHIC PATTERN IN PATIENTS WITH MYOCARDIAL INFARCTION IN THE NORTH INDIAN POPULATION

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ABSTRACT

Objectives: Myocardial infarction is one of the rising heart ailments causing mortality and morbidity around the world and especially in the north Indian population. In earlier studies, it has been found that dermatoglyphics and myocardial infarction have a correlation due to genetic disposition. The present study is based on the same hypothesis to find out such a relation and its uses as an economical diagnostic tool.

Methods: The present study was conducted after taking informed consent forms from 150 patients with myocardial infarction as cases, whereas 150 normal health individuals were included in the study as controls. Fingerprints were taken using the method described by Cummin and Mildo.

Result: The study found that the different fingerprints which are whorls, arches, and loops have a specific pattern that differs in myocardial infarction cases and control. In some cases, the loop and whorls have been increasing, whereas the arches were found to be decreasing as compared to controls. The mean total finger ridge count (TFRC) and absolute finger ridge count (AFRC) have been found to decrease in both males and females and the decrease was statistically significant.

Conclusion: Dermatoglyphics and myocardial infarction have shown a close correlation due to genetic association. Thus, it can be used as one of the cost-effective diagnostic tools for myocardial infarction.

Keywords: Myocardial infarction, Dermatoglyphics, Loops, Whorls, Arches, Total finger ridge count, Absolute finger ridge count.

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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 Kejimikujik Lake in Nova Scotia suggests that these patterned ridges have aroused the interest of man long before the period of their scientific study. A Chinese clay seal made before 300 B.C. suggests that the man might be using the epidermal ridge patterns as a personal mark [1]. Dermatoglyphics as the name suggests 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 the 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 myocardial infarction (MI) is multifactorial with strong hereditary bias. Taking into consideration of genetic predisposition of dermatoglyphics and myocardial infarction, the study was undertaken to find out the correlation between them. So dermatoglyphics may be helpful in the diagnosis of predisposition toward this disease at an earlier age [4]. The ridge pattern depends upon the cornified layer of the epidermis and dermal papillae. The typical patterns of epidermal ridges are determined since their formation in the fetus. There is the proliferation of cells in the lower zone of the epidermis which projects into the dermis as 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 as described by Cummins and Midlo [5,6].

The development of dermatoglyphic patterns is under genetic control. This is evident from the clear resemblance of dermatoglyphics among related persons [7]. 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 by the children and is reflected in dermatoglyphic patterns [8].

There has been research going on to find the correlation of palmar dermatoglyphics in myocardial infarction patients. In the present study, we will find out the same in the north Indian population. Any such finding will be helpful as an economic method to identify the prevalence and take precautionary measures accordingly.

METHODS

The present study was carried out in the Department of Anatomy, NC Medical College and Hospital, Panipat, Haryana. After taking permission from the institutional ethical committee the study proceeded. Written informed consent was taken from all the study participants. The participant's identity was kept in anonymity and every aspect of the study was thoroughly explained in the local language before signing the consent form. 150 patients with myocardial infarction, angina, and ischemic heart disease of the age group 30-70 years, confirmed by clinical findings and ECG reports, bilateral rolled fingerprints were taken by ink method as developed by Cummins and Midlo [5,6] considered a case. The control group data were collected from 150 normal healthy individuals by a similar procedure. As it is a non-invasive method, no side effects were there. The following materials were used for the study Duplicating black ink, ink dropper, rubber roller, glass inking slab, cotton puff, and executive bond paper. The participants were advised to clean their hands, dry and also leave moisture on them. On the glass slab, the

appropriate amount of ink daub was applied and spreading it evenly to make a thin even ink film. After that applied to the palm, and the flexor creases of the wrist. The palm was examined for the uniformity of the ink, and if found otherwise, ink was also applied to the hollow of the palm with the help of cotton puffs. The left hand of the subject was then placed on the sheet of paper from the proximal to the distal end. The palm was gently pressed between intermetacarpal grooves at the root of fingers, and on the dorsal side corresponding to thenar and hypothenar regions. The palm was then lifted from the paper in reverse order, from the distal to the proximal end. The rolled fingerprint method was also used to print the fingers below the palmar print. To include all of the designs, the tips of the fingers were rolled from radial to ulnar. For the case group (MI) and control group, the printed sheets were coded with name, age, and gender. The prints were then submitted for detailed dermatoglyphic analysis using a magnifying hand lens and ridge counting using a sharp needle. Details were recorded on the same piece of paper with a pencil. Data were entered in a Microsoft Excel sheet and analyzed using SPSS version 15.0 software. The results were expressed as percentages and mean±S.D. The value of significance was evaluated with a “p-value.”

RESULTS AND DISCUSSION

This study was conducted to find out a correlation of palmar dermatoglyphics in 150 myocardial infarction patients and 150 normal healthy individuals were compared for various parameters in the palmar dermatoglyphics. In our study, we observed the mean age of male and female cases was 57.3 years and 53.7 years respectively. While in the control group, the male was 58 years and the female was 54 years.

In Table 1, the percentage of whorls was 39% in MI compared to 27% in control, respectively. The percentage of loops was 52% in MI and 61% in control, respectively, showing highly significant differences. While the percentage of arches is 9% and 11.3% in cases and control, respectively. Although the arches pattern was also found to be decreasing in patients with myocardial infarction, it was not statistically significant. Among the three types of fingertip patterns seen are loops, arches, and whorls which are describing the qualitative parameters of the study. These findings were quite similar to the other studies done. In the case of the loop pattern, overall the ulnar loop pattern was more dominant. Similar findings were observed by Ashish *et al.* [9].

While considering the sex of the patient loops was significantly increased in males, whereas in the females it was found to be decreasing. The arches were decreased in both males and females, whereas the whorls pattern saw a significant decrease in both males and females, as depicted in Table 2. The incidence of loops in both groups male and female, the study found a significantly lesser incidence of loops in MI Patients [10]. Similar findings were observed by Rashad *et al.*, [11] Bhatt *et al.*, [12] and Dhall *et al.* [13]. In contrast, a study done by Shamsadini *et al.* showed different results where the incidence of loops was statistically higher as compared to the control [14]. Looking at the arches pattern, the present study showed an overall decreased incidence in the MI cases as compared to control, which was significantly lower in female MI cases as compared to control, with similar results reported by this study [11]. A study done by Dhall *et al.* in 2000 [13] also reported a lower frequency of arches in myocardial infarction patients; however the results were statistically significant. In contrast, a study done by Jalali in 2002 [15] found that the arch pattern was increased by double in MI patients. Anderson *et al.* [16] reported no such statistically significant difference in arches pattern in MI cases and control. In addition, the whorls pattern in the dermatoglyphics showed a significant increase in myocardial infarction cases as a study done by Rashad *et al.* [11]. While Anderson in 1981 [16] and Jalali *et al.* in 2002 [15] also found a slight increase in the whorls pattern, but here it was not statistically significant.

Lu *et al.* 2015 [17] did a study on the North Chinese population. They found the frequency of whorls is a characteristic dermatoglyphic

Table 1: Demonstrated the types of fingerprints

Type of Finger Prints	Cases (%)	Control (%)	p value	Significance
Whorls	39	27	<0.001	Significant
Loops	52	61.7	<0.001	Significant
Arches	9	11.3	>0.001	Not significant

Table 2: Distribution of fingertip patterns in MI cases and control

	Sex	Loop	Arches	Whorls
MI Cases	M	55	8.7	36.3
	F	55.3	9	35.7
	M+F	55.2	8.5	36.3
Control	M	64	11.2	24.8
	F	46.9	26.3	26.8
	M+F	60.8	14	25.2

Table 3: TFRC and AFRC in MI cases and control

	Sex	TFRC (Mean±SD)	AFRC (Mean±SD)
MI Cases	M	128.72±43.80	192.51±74.32
	F	121.68±40.47	159.92±72.66
	M+F	126.21±42.11	186.73±75.37
Control	M	105.38±35.11	181.98±69.35
	F	95.02±22.87	123.18±37.83
	M+F	104.91±32.22	170.03±68.44

pattern of CAD which could be very useful in its early diagnosis. In 2011 Arun Kumar *et al.* [18] concluded that the percentage of loop, arch, and whorls is 54.9%, 8.3%, and 36.8%, respectively in myocardial infarction and 59.4%, 13.2%, and 27.4%, respectively, in controls. Thus, there is a decrease in loops and arches with an increase in whorls in most of the digits of both hands in MI. Hemlata in 2010 [19] also worked on the dermatoglyphic pattern in myocardial infarction patients and found that loops are decreased in all digits of CAD in both sexes and both hands.

Table 3 depicts the mean total finger ridge count (TFRC) and absolute finger ridge count (AFRC) and have been found to decrease in both males and females and the decrease was statistically significant. There is an increase in the mean value of AFRC in MI males, MI females, and also in MI (M+F) when compared with the controls. The statistically significant difference in the mean value is seen between MI females and control females than the control group. There is an increase in the mean value of AFRC in MI males and females and also in MI (M+F) when compared with the controls. There is an increased mean value of TFRC in MI males and females in comparison to the control group of males and females which were statistically significant. These ridge count holds greater genetic significance as these are size-related numerical representatives of quantitative characteristics [6]. Brijendra *et al.* [20] found an increase in whorls with a decrease in a loop pattern, a difference in the mean TFRC, a widened mean atd angle, and higher mean ab, mean bc ridge, mean cd ridge, and mean ad ridge counts in patients with various types of congenital cardiac disease compared to controls. The knowledge of dermatoglyphics patterns in patients with MI might be important in the screening program for the prevention of myocardial infarction due to the higher incidence rate of MI.

CONCLUSION

Hence, from the present study, we conclude that there is a significant correlation between the genetic disposition of myocardial infarction and the dermatoglyphic patterns of an individual. This further signifies the use of dermatoglyphics patterns as a non-invasive, accessible, affordable, and cost-effective screening tool for myocardial infarction. It might prove to be a beneficial mass screening program in technically

deprived rural or countryside areas which might further help to rule out the prevalence and advise lifestyle changes.

AUTHOR CONTRIBUTION

Reenu Kumari: Original idea and concept design for the study, acquisition, analysis, and interpretation of the data. Drafting of the research article. Dr. Pawan Kumar Mahato Substantial contribution to the conception and design of the study. Final approval of the version to be published. Dr. Nivedita Pandey helps in the analysis of the data and Revising the work critically for important intellectual content. Amod Kumar Yadav supported Data collection and statistical analysis.

CONFLICT OF INTEREST

The authors affirm no conflicts of interest.

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