

Original article:

Study of Finger Print Patterns to Evaluate the Role of Dermatoglyphics in Early Detection of Eczema

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Abstract:

Introduction: The study of the epidermal ridge patterns of the skin of the fingers, palms, toes, and soles is known as ‘Dermatoglyphics’. The resulting ridge patterns are genetically determined. The patterns which are once established never change throughout life. Susceptibility to eczema has been related to Multiple foci linked on chromosomes, such as 1q21, 3p24, 22,3q21,3q14,4p15,5q,13q14. As the dermatoglyphic patterns and eczema both are genetically determined, these two have a correlation. So this study was planned to prepare the data to establish the correlation between fingerprint patterns and eczema. In the present study, the dermatoglyphics parameters in the patients with eczema as well as in normal healthy individuals were studied to see whether these parameters have any diagnostic value in eczema.

Methodology: The study was carried out in Out-Patient Department (OPD) of dermatology. Eczema was confirmed in patients by pre-defined clinical criterion. The following parameters were studied and analysed: Whorls, b) Arches, c) Radial loops, d) Ulnar loops, e) The Absolute Finger Ridge Count (AFRC), f) Total Finger Ridge Count (TFRC).

Observations and Results: There was highly significant decrease in the mean value of the arches and increase in mean value of the TFRC and AFRC in patients than in the controls.

Conclusion: Dermatoglyphics patterns are useful as early diagnostic tool in eczema.

Key words: Dermatoglyphics, fingerprints, arches, whorls, loops, TFRC, AFRC, eczema

Introduction:

The study of the epidermal ridge patterns of the skin of the fingers, palms, toes, and soles is known as ‘Dermatoglyphics’¹. Harold Cummins coined the term ‘Dermatoglyphics’ in 1926 (Greek derma-skin, Greek Glyphein- to carve)². The dermatoglyphic science is based upon 2 major facts; firstly, the ridges are slightly different for different fingers and no two persons, not even monozygotic twins, show exactly similar finger print patterns and secondly, the ridges are permanent throughout life and they survive superficial injuries and also environmental changes after the 21st week of the intra-uterine life. Fingerprint patterns of dermal ridges can be classified into three major groups²:

1. Arches,

2. Loops and

3. Whorls

The arches are the simplest and least frequent pattern which passes across the finger with slight bow distally. They may be subclassified as "plain" when the ridges rise slightly over the middle of the finger or "tented" when the ridges rise to a point. The loop pattern has a triradius and a core. A triradius is a point at which three groups of ridges coming from three directions meet at angles of about 120 degrees. The core is essentially a ridge that is surrounded by fields of ridges which turn back on themselves at 180 degrees. Loops can be either radial or ulnar. A finger possesses a radial loop if its triradius is on the side of the little finger for the hand in question and the loop opens toward the thumb.

A finger has an ulnar loop if its triradius is on the side of the thumb for that hand and the loop opens toward the little finger. The whorls are the patterns so constructed that the characteristic ridge courses follow circuits around the core. The shape of the pattern area may be either circular or elliptical. This pattern has two triradii with the ridges forming various patterns inside. Traditionally, the ridge count is defined as the number of ridges that intersect or touch the line drawn from the easily recognized triradius (where three ridges meet) to the center of the pattern³. The a simple loop characterized by a single triradius, whorls have two triradii yielding two counts, while simple arches have no true triradii, resulting in a zero count. When the ridge count is used as a measure of a maximum pattern size on fingers, only the largest count from each finger is scored, and their sum is defined as the total finger ridge count (TFRC). Alternatively, the sum of all possible counts on all ten fingers can be calculated yielding an absolute finger ridge count (AFRC) a measure of the total pattern size. Both TFRC and AFRC are highly heritable.

The resulting ridge patterns are genetically determined⁴. The patterns which are once established never change throughout life. Palmar creases start to develop during the 2nd and 3rd month of intrauterine life and are not influenced by movement of hand in utero⁵. They are of considerable clinical interest because they are affected by certain abnormalities of early development including genetic disorders. Simian lines have been noted by Davis on rudimentary palms of infants whose limb development is affected by thalidomide teratogen. Abnormal Dermatoglyphic patterns have been observed in several non-chromosomal genetic disorders and other diseases whose etiology may be influenced directly or indirectly, by genetic inheritance^{5,6}.

Eczema is a pattern of inflammatory responses of the skin, which can be defined either histological or clinically. Clinically, acute eczema is associated with marked erythema, superficial papules and vesicles which easily excoriate and lead to crusts. Chronic eczema is composed of rather faint erythema, infiltration and scaling (6). Eczema is not a hereditary disease however twin studies indicate that susceptibility is an important risk factor. Susceptibility to eczema has been related to Multiple foci linked on chromosomes are identified, such as 1q21, 3p24, 22,3q21,3q14,4p15,5q,13q14⁷. A significant link has been established by pioneer workers between finger print pattern and eczema^{8,9,10,11} which could be of help in predicting the occurrence of eczema among relatives of patients suffering from the disease. However the studies on correlation between dermatoglyphic patterns in eczema patients are but a few. So this study intends to prepare the data to establish the correlation between fingerprint pattern and eczema. So this study was conducted to find out a

dermatoglyphic parameters in the patients with eczema and to see whether these parameters have any diagnostic value in eczema.

Methodology:

Study Design: Hospital based Cross-sectional study.

Study Settings: Out-Patient Department (OPD) of Dermatology, Malabar Medical College Hospital and Research Center, Modakkallur, Kerala.

Study Period: Five months

Sample Size: Outcome measures in dermatoglyphic study are discrete numbers like number of loops, number of arches etc. Therefore its comparison to be done by ANOVA or Kruskal Wallis Test. There is scarcity of studies in this area and very less previous data is available. These tests could be used on assumptions of normal distribution and if number in each group is more than 30 then normal distribution is assumed. Therefore we planned to recruit 50 participants in each group which will ensure adequate power for sub-group analysis.

Study participants, Inclusion and Exclusion Criterion: The study was planned to be conducted on the clinically diagnosed patients of eczema. Patients of all age groups were selected. Participants not having any kind of skin problem were considered as controls and were selected from among the OPD visitors and residents around health facility. The study subjects were planned to be divided into three groups; group A (eczema patients), and group B (participants not having any kind of skin problem). 50 participants were included in each group. Informed consent was taken from all of them.

The objectives of the study were explained to all participants. They were asked to relax and to cooperate to achieve the required movement of the fingers. Their fingers were cleaned with soap, water and spirit to remove any oily dirt and sweat. Nontoxic Kores Ink was applied to the tips of the fingers and then the tips were pressed and rolled against white glossy paper. The fingers were cleaned after taking the prints. The finger prints from both hands of group A, and group C were obtained for present study. The thumb was placed with ulnar edge downward and rolled toward body and other digits were placed with radial edge downward and rolled away from body. The prints were analysed with the help of the hand lens.

The following parameters were studied and analysed:

- a) Whorls
- b) Arches
- c) Total loops
- c) Radial loops
- d) Ulnar loops
- e) The Absolute Finger Ridge Count (AFRC)
- f) Total Finger Ridge Count (TFRC).

These parameters were compared with previous study values to confirm if there is any correlation between control and study group. The data was also analysed for any abnormal new pattern particular to the study group.

Observations and Results:

Fingerprints of 100 participants were taken using kores ink (Figure 1). Various fingerprint patterns (Figure 2) were counted with the help of hand lens. The data was tabulated and analysed by using open epi software (Table 1). Statistical difference between patients and controls was found with the help of 't' test. A highly significant decrease in the mean value of the arches was observed in eczema patients compared to the control group. The mean values of TFRC and AFRC were significantly higher in patients as compared with control group. There was decrease in mean value of whorls in eczema patients as compared to controls but it was not statistically significant. While the mean values of radial loops and ulnar loops were similar in both groups.



Figure 1. Fingerprints taken with the help of Kores ink

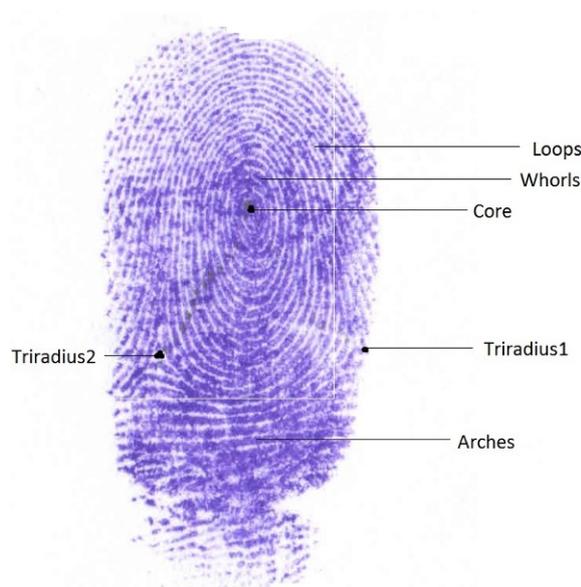


Figure 2. Fingerprint patterns of dermal ridges

Table no.1: *Fingerprint pattern among the study subjects*

Pattern	Patients		Control		P alue by ‘t’ test
	Mean	S.D.	Mean	S.D.	
Arches	77.5	8.74	104.5	12.25	0.0000001
Radial loops	30.5	3.85	47.5	5.58	0.9811
Ulnar loops	321.25	28.84	307.26	21.18	0.006912
Whorls	83	9.85	87	11.25	0.06156
TFRC	147.5	7.44	129.5	13.72	0.0004405
AFRC	189	12.70	180	11.74	0.0003837

Discussion:

The present study was aimed to evaluate the dermatoglyphic changes in fingertip patterns in Eczema patients. In the recent past, much work was done in finding out an association between the morphological and the genetic characters in a number of diseases, with the help of certain investigations. Dermatoglyphics is determined by the polygenic inheritance and it is one of such tools which are frequently used in scientific studies. Many workers have demonstrated that dermatoglyphics is an important aid in the diagnosis of and for understanding the genetics of many diseases.

In the study done by Vatsala et al⁹ there was significant decrease in arches and whorls. In the present study, a highly significant decrease in the mean value of the arches was found and also the mean value of whorls was decreased in eczema patients as compared to controls but it was not statistically significant. A quantitative on qualitative study on dermatoglyphics of eczema patients was done by Deshpande et al.¹⁰ Similar to present study, they too found significant increase in the mean values of TFRC and AFRC in patients as compared with control group. Pour-Jafari H et al¹¹ found in their study that arches were very much reduced in study group. In present study, also arches were less in patients compared with controls and the difference was statistically very significant.

Conclusion: From the present study we can make following conclusions:

- The decreased number of arches, increased number of TFRC and AFRC and some skin ailments can be used as the early diagnostic criteria for eczema.

Implications:

- This study will be helpful to evaluate the role of dermatoglyphics in early detection of eczema.
- After more elaborate studies, fingerprint pattern in early childhood can be used as non-invasive anatomical markers for eczema in adulthood.
- This study can show the familial tendency and genetic predisposition of eczema.

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References:

1. Fuller I. C. Dermatoglyphics: A diagnostic aid? *Journal of Medical Genetics* 1973; 10:165- 169.
2. Cummins H, Midlow C, The palmar and plantar epidermal ridge configuration in European Americans. *Am J Phy Anthropol* 1926; 9:471.
3. Gordon Mendenhall, Thomas Mertens, John Hendrix, Fingerprint ridge count a polygenic trait useful in classroom instruction. *The american biology teacher*, 1989; 51(4) : 203-207.
4. Sandeep V. Pakhale, Bharat S. Borole, Megha A. Doshi, and Vijay P. More , Study of the Fingertip Pattern as a Tool for the Identification of the Dermatoglyphic Trait in Bronchial Asthma *J Clin Diagn Res.* 2012 October; 6(8): 1397–1400.
5. Bhanu. Simian Crease in man. Same methodological consideration. *Journal of human evaluation* edition-2nd pp 153 – 160, 1973.
6. Alter m. et al: Variation of palmar creases. *Am. J. Dis. Child* vol. 120, pp. 421-431, 1970.
7. Holgate ST, Church MK, Lichenstein LM. *Monogram on Allergy.* 3rd ed. New Delhi: Elsevier; 2008: pp 107
8. Lewis-Jones S, Quality of life and childhood atopic dermatitis: the misery of living with childhood eczema. *International Journal of clinical practice* 2006;60:984-992.
9. Vatsala A R, Mangala H C , Ajay K T , Naseema B , Mr Sangame *Int J Biol Med Res.* 2013; 4(4): 3565-3569.
10. Sulabha Hanumant Deshpande, Ashwini Balasaheb Nuchhi, Vikas Ramesh Yatagiri, Vijayendra Narayan Rao Kulkarni. Study of palmar dermatoglyphics in patients with eczema in the age group between 20-50 years in both sexes. *Int J Anat Res* 2016;4(4):3227-3231.
11. Pour-Jafari H, Farhed DD, Yazdani A, Hashemzadeh CM. Dermatoglyphics in patients with eczema, psoriasis and alopecia areata. *Skin Res Technol* 2003;9:240-44.