Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online)
An Online International Journal Available at http://www.cibtech.org/jls.htm
2013 Vol. 3 (3) July-September, pp.536-539/Batra and Kaur
Review Article

ROLE OF DERMATOGLYPHICS IN MEDICAL DISORDERS

Jeewandeep Kaur[1] and *Arvinder Pal Singh Batra[2]
[1]Department of Physiology, BPS GMC for Women Khanpur Kalan Sonepat
[2]Department of Anatomy, BPS GMC for Women Khanpur Kalan Sonepat
**Author for Correspondence*

ABSTRACT
Study of the patterns of the epidermal ridges of finger, palm, and sole can serve as an aid to the diagnosis of many diseases particularly those caused by chromosomal aberrations which are frequently accompanied by distortion of patterns but also in other diseases both genetically and non-genetically determined. In early pregnancy an intrauterine growth disturbance affecting the extremities whether due to hereditary or environmental factors, will be accompanied by abnormal dermatoglyphics. A clinical diagnosis should not be based on dermatoglyphic features alone because of the great natural variation found in print patterns, no single feature being specific to a particular disease. However a complete examination of the patient with skin disease particularly if the latter has a genetic component should include observation of the epidermal ridges of hands and feet. Dermatoglyphics – the study of pattern of fine ridges on fingers, palm and sole have been a useful tool for personal identification and determination of paternity for some time. It has proved important due to the fact that (1) unlike most human traits; dermal ridges and the configurations formed by them are not affected by age. (2) Detailed structure of individual ridges is extremely variable and (3) throughout postnatal life they are not affected by environment.

Key Words: *Epidermal, Chromosomal, Dermatoglyphics, Genetic*

INTRODUCTION
Although the term "dermatoglyphics" was coined by Cummins and Midlo, 1960 dermatoglyphics as a scientific discipline began with the publication of Galton's classic book, "Fingerprints" (Galton, 1892). Even though the primary object of Galton's studies was to develop a personal identification system, he investigated the biological variation as shown by fingerprints, the unchangeable characteristics of the fingerprint patterns through longitudinal examinations, the inheritance as well as the racial variation of fingerprint patterns. In spite of the fact that interest in dermatoglyphic research continued unabated from the beginning of the twentieth century, dermatoglyphics entered into a phase of rapid expansion attracting a great number of scientists from all segments of biology, medicine and biological anthropology during the second half of this century. The epidermal ridges are usually laid down between the tenth and eighteenth weeks of gestation. Once laid down, they remain unchanged except for an increase in size in parallel with general growth (Mulvihill and Smith, 1969; Lacroix *et al.*, 1984).

Dermatoglyphics and Various Diseases
In clinical medicine, chromosomal anomalies such as the trisomies 13–15 (Patau's syndrome), 18 (Edwards' syndrome), 21 (Down's syndrome) and the sex chromosomes (Turner's syndrome X0 and Kleinfelter's syndrome 47, XXY) and deletion of the short arm of chromosome 5 (Cri du Chat syndrome) are recognized as having abnormal dermatoglyphic patterns (Stough and Seely, 1969).

Differences in fingerprint pattern frequencies from normal controls have also been found in leukaemia (Verbov, 1970), early onset diabetes mellitus (Verbov, 1971; Ziegler *et al.*, 1993; Shield *et al.*, 1995), alopecia areata, atopic dermatitis (Vera *et al.*, 1995), rubella embryopathy (Achs *et al.*, 1966; Purvis-Smith, 1968) and chronic intestinal pseudo obstruction (Pulliam and Schuster, 1995). These observations suggested that hereditary or environmental factors acting in early gestation may have played a role in the genesis of the disease. An examination of dermatoglyphic patterns and blood pressure in an adult population concluded that fingertip whorls and a narrow palmar angle are important markers of impaired

fetal development at different stages of pregnancy and that both were associated with raised blood pressure in adult life (Godfrey *et al.,* 1993).

Patients with breast cancer and ovarian carcinoma are compared with the healthy women; the sick women present an increase in whorls and a decrease in a-b ridge count. The results obtained seem to demonstrate that dermatoglyphics are not a good diagnostic tool in the study of these two types of cancer (Floris *et al.,* 1990). In hypospadias patients there is a significant decrease of patterns in the hypothenar area and an increase of radial arches in hypothenar area, while for other characteristics the differences are always not significant (Floris, 1993). Some significant distortions inducing deep clinical implications were found in epileptics (Tarca, 1993; Tarca and Barabolski, 2002).

Abnormalities in the growth process which are liable to distort the alignment of dermal ridges may result from the action of abnormal genes, chromosomal aberrations, even from poisoning by a drug or from a viral infection. In some cases the cause remains unknown (Holt and Penrose, 1968).

The characteristic patterns in an individual that deviate from the norm must be caused by the changes occurring before the completion of the fourth fetal month. Since epidermal ridge patterns form early in fetal development and remain unchanged throughout life, unusual dermatoglyphic may indicate gene or chromosomal abnormalities consistent with a disease such as rheumatoid arthritis (Sayee *et al.,* 2008). On the right digits of males there was no significant difference in the digital patterns between idiopathic dilated cardiomyopathy (IDC) and normal subjects while on the left hand, the IDC patients showed a significantly higher whorl pattern on the first digit than that found in the normal subjects (Oladipo *et al.,* 2007).

The finger-tip patterns of the patients of periodontitis were compared with those of healthy individuals. There was decreased frequencies of twinned and transversal ulnar loops on all fingers of the patients with juvenile periodontitis (JP) and a decreased frequency of double loops on all fingers and an increased frequency of radial loops on the right second digits of the patients with rapidly progressive periodontitis (RPP). There were increased frequencies of concentric whorls and transversal ulnar loops on all fingers of the patients with adult periodontitis and an increased frequency of t″ triradii on the palms of the patients with JP. There was an increased frequency of IV and H loops and tb triradii on the palms of the patients with RPP and an increased frequency of triradii on the soles of the patients with JP were found (Atasu *et al.,* 2005).

True palmar patterns were increased significantly in both the sexes on all palmer areas except interdigital areas in males and thenar areas in females in autoimmune disease. The distal displacement of axial triradii was increased in both the sexes. The total finger ridge counts were increased significantly in both the sexes (Singh *et al.,* 1987). No significant quantitative or qualitative differences were found between the dermatoglyphic features of asthmatic patients and those of a healthy population, except for punctate interruptions of the skin ridges that indicate pitting, a well-known manifestation of Darier's disease (Lubovitz *et al.,* 2007). Whorls are highly significant statistically in both generations Bronchial Asthma patients as compared to control (Gupta and Prakash, 2003). Characteristic dermatoglyphic changes rank high in frequency among the variable stigmata which go to make up the syndrome of mongolism. Though they are not diagnostic alone, it is believed that these objectives, measurable and unchanging evidences of mongolism seen in hand prints should be helpful in establishing an early diagnosis (Cummins *et al.,* 1950). Higher frequency of low endings of line A on both hands, and–on the left hand–significantly more patterns in the fourth interdigital area and fewer patterns in the third interdigital area. There was no association between these dermatoglyphic features and the HLA antigens (B8 and DRw3) which occurred most frequently in our SLE patients (Vormittag *et al.,* 1981). Higher frequency of whorls and a lower frequency of ulnar loops in the dermatoglyphic pattern in celiac disease (Tahan *et al.,* 1979).

CONCLUSION

Dermal palmer and plantar ridges are highly useful in biological studies. Their notably variable characteristics are not duplicated in other people, even in monozygotic twins or even in the same person

from location to location. What makes dermatoglyphics important as markers for disease and traits is the fact that they develop at specific times in the fetus. Abnormalities in the growth process which are liable to distort the alignment of dermal ridges may result from the action of abnormal genes, chromosomal aberrations and even from poisoning. Therefore dermatoglyphics is helpful in making first step towards the diagnosis of various medical disorders.

REFERENCES

Achs R, Harper RG and Siegel M (1966). Unusual dermatoglyphic findings associated with rubella embryopathy. *New England Journal of Medicine* **274** 148–50.

Atasu M, Kuru B, Firatli E and Meric H (2005). Dermatoglyphic findings in periodontal diseases, *International Journal of Anthropology* **20**(1-2) 63-75.

Cummins C and Midlo C Fingerprints, Palms and Soles (1961). Finger prints, palms and soles: An introduction to dermatoglyphics. Dover Publications, New York.

Cummins H, Talley C and Platou RV (1950). Palmar Dermatoglyphics in Mongolisms. *Pediatrics* **5**(2) 241-248.

Floris MG, Sanciu G and Sanna E (1990). Dermatoglyphics in pathology with emphasis on breast cancer and cervix carcinoma: Some results, *International Journal of Anthropology* **5**(2) 125-128.

Floris G (1993). Dermatoglyphics in cases of hypospadias: New data. *International Journal of Anthropology* **8**(1) 39-41.

Galton F (1892). Finger prints. London: Macmillan.

Godfrey KM, Barker DJP, Peace J, Cloke J and Osmond C (1993). Relation of fingerprints and shape of the palm to fetal growth and adult blood pressure. *BMJ* **307** 405–8.

Gupta UK and Prakash S (2003). Dermatoglyphics: a study of finger tip patterns in bronchial asthma and its genetic disposition. *Kathmandu University Medical Journal* **1**(4) 267-271.

Holt SB and Penrose LS (1968). The genetics of dermal ridges. Springfield, IL: Charles C Thomas.

Lacroix B, Wolff-Quenot MJ and Haffen K (1984). Early human hand morphology: an estimation of fetal age. *Early Human Development* **9** 127–36.

Lubovitz OS, Trattner A, Katznelson MBM and Sandbank M (2007). Dermatoglyphics in Darters disease. *International Journal of Dermatology* **33**(9) 626 – 627.

Mulvihill JJ and Smith DW (1969). The genesis of dermatoglyphics. *Journal of Pediatrics* **75** 579–89.

Oladipo GS, Olotu EJ, Fawehinmi HB, Okoh PD and Iboroma AD (2007). Dermatoglyphics in idiopathic (primary) dilated cardiomyopathy in South, Southern Nigeria Scientific Research and Essay **2**(10) 416-420.

Purvis-Smith SG (1968). Dermatoglyphics in adults with congenital rubella. *Lancet* **2** 141–3.

Pulliam TJ and Schuster MM (1995). Congenital markers for chronic intestinal obstruction. *American Journal of Gastroenterology* **90** 922–6.

Sayee Rajangam, Roopa Ravindranth, Shubha RS, Nagesh HV and Job Johnson (2008). Dermatoglyphics-Quantitative Analysis in Rheumatoid Arthritis. Kamla-Raj, *Anthropologist* **10**(3) 233-235.

Singh PK, Pandey SS and Singh G (1987). Dermatoglyphics in auto-immune dermatoses. *Indian Journal of Dermatology* **32**(1) 15-8.

Stough TR and Seely JR (1969). Dermatoglyphics in medicine. *Clinical Pediatrics* **8** 32–41.

Shield JPH, Wadsworth EJK, Hobbs K and Baum JD (1995). Dermatoglyphics, fetal growth, and insulin-dependent diabetes in children under 5 years. *Archives of Disease in Childhood* **72** 159–60.

Tahan S, Medeiros EH and Wehba J (1997). Dermatoglyphic patterns in celiac disease [Article in Portuguese] *Arquivos de Gastroenterologia* **34**(3) 196-204.

Ţarca Ana (1993). A Comparative Study of Palmar Dermatoglyphics on the Populations of Moldova and Maramureş. *Annuaire Roumain d'Anthropologie* **30** 57–64.

Ţarca1 A and Barabolski C (2002). Contribution to dermatoglyphic diagnosis of epilepsy. *The Journal of Preventive Medicine* **10**(2) 28-34.
Verbov JL (1970). Dermatoglyphs in leukaemia. *Journal of Medical Genetics* **7** 125–31.
Verbov JL (1971). Dermatoglyphic and other findings in health and disease. University of Liverpool MD Thesis.
Vera M, Cabrera E and Guell R (1995). Dermatoglyphics in insulin dependent diabetic patients with limited joint mobility. *Acta Diabetologica* **32** 78–81.
Vormittag W, Weninger M, Scherak O and Kolarz G (1981). Dermatoglyphics and Systemic Lupus Erythematosus. *Scandinavian Journal of Rheumatology* **10**(4) 296-298.
Ziegler AG, Mathies R and Ziegelmayer G *et al.*, (1993). Dermatoglyphics in type-1 diabetes-mellitus. *Diabetic Medicine* **10** 720–4.