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**DERMATOGLYPHICS IN DENTISTRY –A REVIEW**

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**ABSTRACT**

Dermatoglyphics deals with the study of fine patterned dermal ridges on volar surfaces of soles, palms and ridges. The volar pads are mound shaped elevations on each finger above the proximal end on the distal metacarpal bone. It is unique for each person, and is not same even in monozygotic twins, studying them can be helpful in diagnosing certain genetic disorders, oral diseases and also in forensic science.

**Keywords:** Dermatoglyphics, Palmarglyphics, Oral diseases, Genetic disorders

**INTRODUCTION**

The palms of the hands and the soles of the feet are covered with two totally distinct classes of marks. The most conspicuous are the creases or folds of the skin which interest the followers of palmistry. These folds or creases could be an indicator of certain congenital abnormalities. Scientifically the term palmistry means dermatoglyphics (derma-skin; glyphics-carvings).<sup>1</sup> The term was coined in 1926 by Cummins and Midlo,<sup>2</sup> although Harold Cummins is considered to be the father of dermatoglyphics.<sup>1</sup>

Dermatoglyphics deals with the study of fine patterned dermal ridges on volar surfaces of soles, palms and ridges. The volar pads are mound shaped elevations on each finger above the proximal end on the distal metacarpal bone. The size and position of these pads are responsible for the ridge patterns to an extent.<sup>3,4</sup> Towards the end of the 19th century, Galton put forth a rule called 'proof of no change', which states that an individual's dermatoglyphics remain unchanged throughout his/her lifetime. Since it is unique for each person, and is not same even in monozygotic twins, studying them can determine a number of parameters which could be helpful in diagnosing

and treatment of examined individuals. Thus, it is considered to be an important tool in assessing the genetic trait, evaluation of children with suspected genetic disorders and also in forensics. It is noted that subjects with chromosomal abnormalities had unusual ridge formations.<sup>5</sup> The ridges are influenced by blood vessel-nerve pairs at the border between the dermis and epidermis during prenatal development and factors, such as inadequate oxygen supply, unusual distribution of sweat glands and alterations of epithelial growths could influence the ridge patterns.<sup>6</sup> The ridged skin is considered to be a sensitive indicator of intrauterine dental anomalies because it originates from the foetal volar pads as the teeth which also originates from the same ectodermal layer in the 6<sup>th</sup>-7<sup>th</sup> week of embryonic life. Hence, when an intra-uterine dermal damage occurs, a tooth anomaly can be expected.<sup>7</sup> In a similar way development of dermal ridges and congenital deafness seems to be interlinked as they develop at around the same time.<sup>8</sup>

**CLASSIFICATION OF FINGERPRINTS**

The basic characteristic pattern of finger print was classified in 1892 by Sir Francis Galton.<sup>9</sup> He

classified the patterns into three types: arches, loops and whorls, based on the degree of curvature of the ridges. This classification enables almost any pattern to be sorted under one or other of the above three heads. There are a few patterns, which are nondescript and rare. Arches are formed when the ridges run from one side to the other of the bulb of the digit without making any backward turn or twist. Loops, when there is a single backward turn, but no twist. Loops can be further subdivided according to ridge opening as radial (towards the thumb on the radial side) and ulnar (away from the thumb on ulnar side).<sup>1</sup> Whorls are said to be present, when there is a turn through at least one complete circle; they are also considered to include all duplex spirals.<sup>10</sup> The whole of the human palm shows certain other features such as ATD angle [This angle is formed by lines drawn from the digital triradius (a) to the axial triradius (t) and from this triradius to the digital triradius (d)], H-loop, IV loop, and triradius. (Triradii is a point of convergence for three regions that separate almost parallel ridges)<sup>11</sup>

### ADVANTAGES

The major advantages of dermatoglyphics is that scanning or recording is cost effective, rapid and can be done in the clinics without hospitalisation and without causing any trauma. It also requires minimum equipments and data collected can be preserved for lifelong.<sup>12</sup>

### INDICATIONS

Clinically, dermatoglyphics is used in diagnosing various conditions like mental retardation, autism, schizophrenia, Alzheimer disease and even in predicting appearances of addiction diseases such as alcoholism. It can also be used to determine genetic predispositions for dyslexia or hyperactivity and also as clinical markers for various types of trisomy.<sup>4</sup> It is also used as a Biometric identifier.<sup>13</sup> Many researchers have investigated dermatoglyphics in various fields

such as forensic medicine, genetics and anthropology.<sup>14</sup>

### DERMATOGLYPHICS IN DENTISTRY

Dermatoglyphics has drawn attention in the field of dentistry and has been used to unveil oral diseases like dental caries, oral cancer, bruxism, malocclusion, anomalies of teeth, cleft lip, cleft palate, periodontal disease, dental fluorosis and also in unveiling truth with forensic odontology.

#### Periodontal disease

M. Atasu *et. al.* (2005)<sup>15</sup> In their comparative study between periodontally healthy and patients suffering from periodontitis, noticed that there was decreased frequency of twinned and transversal ulnar loops on all fingers of the patients with juvenile periodontitis (JP), 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 progressing periodontitis (RPP), and the increased frequencies of concentric whorls and transversal ulnar loops on all fingers of the patients with adult periodontitis (AP), an increased frequency of t' triradii on the palms of the patients with JP, the increased frequencies of IV and H loops and tbtriradii on the palms of the patients with RPP and an increased frequency of e triradii on the soles of the patients with JP were found.

#### Dental caries

Padma *et. al.* (2011)<sup>8</sup> in their study evaluated the dermatoglyphic peculiarities and caries experience of deaf and mute children and found an increased frequency of whorl pattern in caries group and the frequency of loops were more in caries free group. Sharma A and Somani R (2009)<sup>16</sup> found highly significant difference in loops between the subject (Caries) and control groups, and also observed significant difference between subject and control groups for microbial growth.

#### Malocclusion

Tikare S *et. al.* (2010)<sup>17</sup> assessed the relationship between fingerprints and malocclusion among a group of 696 high school children aged 12-16

years and it revealed a statistical association between whorl patterns and classes 1 and 2 malocclusion.

### **Squamous cell carcinoma, Leukoplakia**

ElluruVenkatesh *et.al.*(2008)<sup>2</sup> in their study to determine the dermatoglyphic pattern in subjects with leukoplakia and oral squamous cell carcinoma found that among 30 patients diagnosed with leukoplakia, 30.70% had whorls, 6.30% had loop and arch type of finger print respectively and in oral squamous cell carcinoma patients it was found that 60.70% had loop, 32.30% had whorl, and 7.0% had arch pattern of fingerprints.

### **Bruxism**

Increased frequency of whorls and a decrease in frequency of ulnar loops were seen in patients with bruxism than the controls. They also demonstrated a lower frequency of angle than controls.<sup>18</sup>

### **Cleft lip and palate**

R.S Balgir (1992)<sup>19</sup> in his study among 69 cases with cleft lip with or without cleft palate observed, that there was an increased frequency of ulnar and radial loops than arches and whorls.

### **Oral Tumors**

Polat HM *et al.* (2004)<sup>20</sup> Among 29 patients with oral tumors who were investigated for their dermatoglyphic patterns found that there was an increased frequency of arch pattern on their fingertips.<sup>20</sup>

### **Forensic odontology**

In a comparative study among 100 children (50-healthy, 50-mentally challenged) an increased frequency of loops and transverse palmar crease line among the mentally challenged children were observed.<sup>12</sup>

### **CONCLUSION**

Dermatoglyphics is an upcoming integral part of medicine and forensic science. The correlation of dermatoglyphics with dental abnormalities is still in its nascent stages and presently it is safe to say that the various finger print patterns can be

considered as an indicator for the occurrence of congenital abnormalities. Dermatoglyphics has moved from obscurity to acceptability as a diagnostic tool. In the future it may serve as an important tool that can predict the future health of a person.

### **REFERENCES**

1. Nidhi Madan, Arun Rathnam, Neeti Bajaj. Palmistry: A tool for dental caries predilection. *IJDR* 2011;22(2):213-218.
2. ElluruVenkatesh, AnjanaBagewadi, Vaishali K and Arvind S. Palmar dermatoglyphics in oral leukoplakia and oral squamous cell carcinoma patients. *JIAOMR* July-Sept 2008; 20 (3):94-99.
3. Kimura S. Embryologic development of flexion creases. *Birth defects Orig Artic Ser* 1991; 27:113-29.
4. MiodragStošljevi, MilosavAdamovi. Dermatoglyphic characteristics of digito-palmar complex in autistic Boys in Serbia. *Vojnosanit Pregl* 2013; 70(4): 386-390.
5. Kamboj. Dermatoglyphics, letter to editor. *British Dental Journal*.2008; 204 (2),51.
6. ImeneNamouchi. Anthropological significance of dermatoglyphic trait variation: an intra-Tunisian population analysis. *Int. J. Mod. Anthropol.* 2011, 4: 12 – 27.
7. Atasu M, Akyuz S. Congenital hypodontia: a pedigree and dermatoglyphic study. *J. Clin.Pediatr. Dent.* 1995; 19(3): 215-24.
8. Padma K. Bhat, Bhumika Kamal Badiyani, Aruna C.N., SandhyaChengappa, NithinN.Bhaskar. Dermatoglyphics-A New Diagnostic Tool in Detection of Dental Caries among Deaf and Mute Children. *IJCDS* • 2011,2(4):80-84.
9. Galton F. *Finger prints* London;McMillan:1982.
10. <http://www.BiometricBits.htm>.
11. Vineet Gupta, Puneet Kumar, RoshniDupare, Sonia SoodDatta. Dermatoglyphics and dental

- caries: A review Indian Journal of Forensic Odontology.2011e 4 (3-4):33-37.
12. Kiran.K, KavithaRai, Amitha M Hegde.Dermatoglyphics as a noninvasivediagnostic tool in predicting mental retardation J. Int Oral Health 2010, 2 (1):95-100.
  13. Maltoni D., Maio D., Jain A.K., Prabhakar S., 2003. Handbook of Fingerprint Recognition. Springer Verlag. New York.
  14. Matsuyama N, Ito Y. The frequency of fingerprint type in parents of children with trisomy 21 in Japan.J PhysiolAnthropol2006 25: 15-21.
  15. M. Atasu, B. Kuru, E. Firatli, H. Meriç.Dermatoglyphic findings in periodontal diseases International Journal of Anthropology January – June 2005, 20(1-2): 63-75
  16. Sharma A andSomani R.Dermatoglyphic interpretation of dental caries and its correlation to salivary bacteria interactions: an in vivo study. J Indian SocPedodPrev Dent. 2009 Jan-Mar;27(1):17-21.
  17. S Tikare, G Rajesh, KVV Prasad, V Thippeswamy and SB Javali. Dermatoglyphics – A marker for malocclusion? International Dental Journal (2010) 60(4):300-304.
  18. Polat MH, Azak A, Evlioglu G, et al. The relation of bruxism and dermatoglyphicsJ ClinPediater Dent 2000; 24(3) :191-4.
  19. BalgirRS. Dermatoglyphics in cleft lip and cleft palate anomalies.IndianPediater. 1993;30(3):341-6.
  20. PolatHakan M., EvlioğluGülümser, KarayazganBanu.Dermatoglyphic findings in patients with oral cancers.Balkan Journal of Stomatology.2004, 8 (2): 105-108.