Review Article

Palmistry in Dentistry

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Abstract:

Palmistry is the art of characterization and foretelling the future through the study of the palm. The scientific study of fingerprints is called dermatoglyphics. Different patterns of lines have their own significance. Dermatoglyphics has relationship with oral cavity, i.e it is associated with various developmental anomalies of teeth & syndromes, dental caries, malocclusion, periodontal diseases & oral cancer. It also plays a role in other malignancies, schizophrenia, deafness, diabetes mellitus, cleft lip & palate & psychology. This paper reviews the role of dermatoglyphics in dentistry.

Key Words: Fingerprints, Palmistry, Dermatoglyphics, Dental diseases

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Introduction:

Sir William Hershel – 1856, may be the first to use fingerprints. An English Chief Magistrate in India who used prints on native contracts Dr. Henry Foulds, notices finger marks on prehistoric pottery. Published an article in “Nature” saying fingerprints could be used for identification. Sir Francis Galton, a British anthropologist and a cousin of Charles Darwin, began his observations of fingerprints as a means of identification in the 1880's. In 1892, he published his book, "Fingerprints", establishing the individuality and permanence of fingerprints. The book included the first classification system for fingerprints.

Dermatoglyphics deals with the study of the epidermal ridges and their configurations on the fingers, palms and soles. The term was coined by Cummins and Midlo in 1961. The word “Dermatoglyphics” is derived from the Greek word “Derma” meaning skin and

"glyphic" meaning carvings. Dermal ridge differentiation takes place early in foetal development. The resulting ridge configurations are genetically determined and influenced or modified by environmental forces.[1]

The study of dermatoglyphics has many practical applications in the study of populations e.g. in genetic and medical research.[2] The study of the ridged skin called dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine dental anomalies.[3]

In a bilaterally symmetrical organism such as man, each half of the body tends to develop as a mirror image of the other. One exception that may occur is called "fluctuating asymmetry". Fluctuating asymmetry is a nondirectional, random asymmetry that may occur for any measurable bilateral feature of an organism such as length of arms or size of feet. Fluctuating asymmetry therefore differs from those directional asymmetries found in all members of a species such as number of lobes in the right or left lung in man. Fluctuating asymmetry occurs when, during the development of an organism, environmental factors interfere with the ability of that organism to execute its developmental program the same way in both sides.[4]

Buffering ability is dependent upon an individual's genotype, in particular, the relative number of heterozygous loci.[5,6] Heterozygous individuals develop more smoothly than homozygotes because they are better able to buffer a range of environmental interferences. The consequence is that high levels of heterozygosity are associated with higher degrees of bilateral symmetry, while homozygosity results in fluctuating asymmetry or increased bilateral differences. This association has been empirically demonstrated in experimental organisms such as Drosophila and the house mouse.[7,8,9,10]

Embryogenesis:

The development of dermatoglyphic patterns begins with the appearance of fetal pads in the 6th week of gestation and ends with the appearance of finished patterns on the surface of the skin in the 24th week of gestation.[11,12,13,14] From this stage onwards, they are unaffected by the environment, and this explains their unique role, as an ideal marker for individual identification and the study of populations, as well as detection of defects due to intra-uterine irregularities in the early weeks of pregnancy. Begin to develop in the 6th-7th week of gestation and are complete by the 20th -24th week of gestation. Genetics &environmental forces, play an important role in the development of an individual's fingerprints.[2]

The dermal ridges develop in relation to the volar pads, which are formed by the 6th week of gestation and reach maximum size between 12th and 13th weeks. This means that the genetic message contained in the genome -normal or abnormal is deciphered during this period and is also reflected by dermatoglyphics.[15] The ectoderm, from which the epidermis is derived from, has a role in the formation of many specialized structures such as the teeth. When an intrauterine dermal damage occurs, naturally a tooth anomaly should be expected.[3]

Significance of left & right hand:

The left hand is the one we are born with, and the right is what we have made of it. The future is shown in the right, the past in the left. The right hand is read for men, while the left is read for women. The left is what god gives you, the right is what you do with it. The left hand is controlled by the right brain (pattern recognition, relationship understanding), reflects the inner person, the natural self, the anima, and the lateral thinking. It could even be considered to be a

part of a person spiritual and personal development. It is the "yin" of personality (feminine and receptive). The right hand is controlled by the left brain (logic, reason, and language), reflects the outer person, objective self, influence of social environment, education, and experience. It represents linear thinking. It also corresponds to the "yang" aspect of personality (masculine and outgoing).[16]

Advantages of Dermatoglyphics

The major advantages of the dermatoglyphics are:

i) The epidermal ridge of the palms fingers are fully developed at birth and thereafter remain unchanged for life.

ii) Scanning or recording of their permanent impressions (i.e., prints) can be accomplished rapidly, inexpensively and without causing any trauma to the patient. The scanning and recording is better in children as they are fine in them.[17]

Anatomy of the Fingerprint

A fingerprint is an individual characteristic, no two have yet been found to possess identical ridge characteristics. Raised ridges of skin on the hairless surfaces of hands and feet (Dermal Ridges). Also found on palms and soles of feet.

Fingerprints are a reproduction of friction skin ridges found on the palm of the fingers and thumbs. Designed for firmer grasp and resistance to slippage. It is the shape and form of skin ridges seen as black lines of an inked fingerprint.

Classification of Fingerprints

Two International Systems:

- Henry System – Used in North America and Europe
- Vucetich System – Used in Central and South America

Identification is based on class and ridge patterns (minutiae) found on each individual print.

Principles of Fingerprints

- A fingerprint is an individual characteristic
  - No two fingers have the same fingerprint
  - Identical twins are similar but not identical
- Fingerprints remain unchanged during a lifetime
- Fingerprints have general ridge patterns that permit them to be classified.

Types of Fingerprints:

Plastic Impressions: Made in soft material like butter, soap, etc.

Visible Prints: Prints made when fingers have been covered in blood, dirt, oil, paint, etc.

Latent Prints: Prints not visible to the human eye, hidden, unseen until treated.

Different Patterns of Ridge Arrangement

Loop
Whorl
Arch

Loop: (Figure 1 and 2)

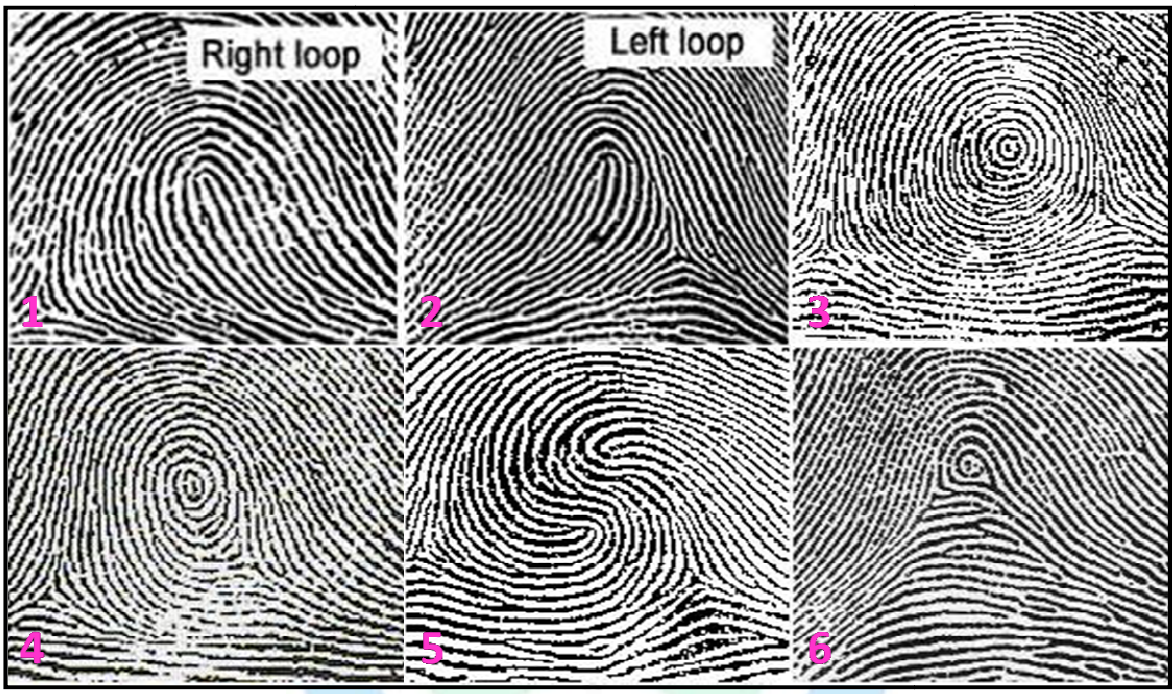
- 60% of the world's population has them.
- Loops have one or more ridges entering from one side of the print, recurring and exiting from the same side.
  - ✓ If loop flows towards the little finger= ulnar loop.
  - ✓ If loop flows towards the thumb= radial loop.
- All loops have one delta, which is triangular in shape.

Whorls:

- 35% of the world's population has them
- Have some ridges that form circles or spirals
- Have 2 deltas
- 4 types of whorls(Figure 3,4,5 and6)
  - Plain whorl
  - Central Pocket whorl
  - Double Loop
  - Accidental whorl

Arches:

- 5% of the world's population has them
- Arches- least common has 2 patterns- plain arches and tented and it do not have:
  - ✓ deltas or
  - ✓ cores



Figures: 1) Right loop; 2) Left loop; 3) Plain whorl; 4) Central pocket whorl; 5) Double loop; 6) Accidental whorl

Methods of Recording

Dermatoglyphic patterns are usually recognizable by the naked eye. A simple magnifying lens, preferably with a light source, helps greatly in scanning dermatoglyphics, especially in infants and small children, whose patterns are very fine. Permanent impressions or prints are necessary for quantitative analysis of dermatoglyphics.[1]

Ink Method

This is the most widely used method. The necessary equipment consists of printer's ink, a roller, a glass or metal inking slab, a sponge rubber, and good quality paper preferably with a slightly glazed surface. It is not suitable for use with uncooperative children and those with very fine ridges. The prints obtained by this method are not always of sufficiently good quality to allow accurate counting of ridges.[1]

Inkless Method

This method makes use of a commercially available patented solution and specially treated sensitized paper. It was described in detail by Walker. It is not popular currently. The method is suitable for printing hands or feet with well-demarcated dermal patterns.[18]

Transparent Adhesive Tape Method:

In this method, the print is produced by applying a dry colouring pigment to the skin, and lifting it off with the transparent

adhesive tape. The colouring agent may be coloured chalk, dust, India ink, standard ink, carbon paper, graphite stick or powdered graphite, common oil pastel crayon, etc. This method is inexpensive rapid and easy to use with all types of patients. Prints are clear and not smudged. They can be preserved for an indefinite period of time.[1]

Photographic Method

This technique is based on the principles of total internal reflection which occurs when an object is pressed against a prism. The magnified image is photographed by a polaroid camera. It needs relatively expensive equipment. Recently, even ordinary photographic method has been tried out.[1]

Special Methods

These methods are not widely used. However, they may have some advantages that the standard methods cannot offer, such as allowing the study of the correlation between the epidermal patterns and the underlying bone structures (radiodermatography), study of sweat pores (hygrophotography), or study of the spatial shape of the ridged skin areas, for example in primates (plastic mold method).[1]

Braganca and Pick have developed a method wherein, the region to be investigated is blackened with graphite smeared on a piece of cardboard. The print is taken by the Tesa film and then adhered to a transparent film strip or photo printing foil. Such a negative could be enlarged five or six times.[19]

An apparatus has been developed by Mull which can take finger and palm prints without any inking and can automatically count ridge numbers between two prints.[20]

Integrated Automated Fingerprint Identification System (IAFIS)

Scans fingerprints into a computer database, which transforms it into digital minutiae. This is then used to identify unknown prints with several possible matches. IAFIS does not make final verification of print identity, but rather flags prints with the closest correlation to the search prints. It allows criminal investigators to spend less time developing suspect lists and more time investigating suspects generated by the computer. The IAFIS maintains the largest biometric database in the world containing the fingerprints and corresponding criminal history information for more than 47 million subjects in the Criminal Master File. The fingerprints and corresponding criminal history information are submitted voluntarily by state, local, and federal law enforcement agencies. In the end, the final ID of the unknown to the known print is made.

Ultraviolet Imaging Systems

Reflected Ultraviolet Imaging System- locates prints on nonabsorbent surfaces without chemical or powder treatment. When UV light strikes the fingerprint, light is reflected back to the viewer- differentiating the print from its background surface.

Chemical Methods for Visualizing Latent Prints

- **Iodine fuming:** Iodine is a solid crystal that when heated, turns into a vapor without passing through a liquid phase. This transformation is called Sublimation. Suspect material is placed in an enclosed cabinet with iodine crystals. Once heated, vapors fill the chamber and combine with latent print to make it visible. Iodine prints are not permanent and begin to fade once fuming is stopped. Can be fixed with 1% solution of starch in water applied by spraying- this will turn blue and last for several weeks or longer.
- **Super Glue fuming:** works great on nonporous surfaces- metals, leather, plastic bags. Created when superglue is placed on cotton and treated with sodium hydroxide. Created when heating- produces toxic

vapors- cyanide. Fumes and object contained within an enclosed chamber for up to 6 hrs. Produces white latent print.

Permanent Record of Print

- If on small surface- transport without destroying the print
- Protect with cellophane bag
- If large surface (door, wall, etc) objects that have been developed with a powder can best be preserved by "lifting".
- Done with broad adhesive tape
- Fingerprint covered with adhesive side and pulled up, the powder will be transferred to the tape.

Digital imaging may be used to enhance contrast, enlarge detail and compare individual points on prints to others in question.

Preservation of Developed Prints

- Once visualized, it must be permanently preserved for future comparison and possible use in court as evidence.
- Camera with close-up lens
- Fixed focus to take photographs on 1:1 scale when lens is held exactly flush against the print surface to avoid distortion. Photograph print's relative location with other evidential items.

Perizigian et al (1977)[22], examined dental metric traits in Indian tribes and found higher fluctuating asymmetry in the teeth of individuals that subsisted on hunting than in those that subsisted on farming; the latter also had better living conditions and suffered less from environmental pressures than the former. The investigation assumed that these inter-tribal differences stemmed from differences in the intensity of environmental pressures exerting an influence on them but did not rule out the possible existence of genetic differences on the influence of different levels of inter-tribal inbreeding.

Soule et al (1979)[23], who studied 15 isolated populations of lizards on various Mexican islands, found an inverse correlation between the fluctuating asymmetry values of the bilateral body organs and their biochemical heterozygosity level. This finding supported the assumption that heterozygous individuals have a higher developmental stability than do homozygous individuals and that the higher the developmental stability the lower the fluctuating asymmetry level.

Shapiro et al(1983)[24], studied development and growth in children suffering from Down's syndrome and conjectured that deleterious genes and chromosomal aberrations can cause decrease in developmental stability and what is even more important, can abrogate or diminish activity of the polygenic checking systems that act against environmental disturbances in the course of development.

Rose et al (1987)[25], investigated dermatoglyphic asymmetry in ridge counts a-b in pairs of identical twins (monozygous) displaying behavioral discord. They found good accord between the level of fluctuating asymmetry in the twin pairs and their success in psychological tests (with the more successful twin showing a higher level of ,actuating asymmetry than his brother).

This and similar studies indicate that genetic, environmental and multifactorial disturbances impair the developmental homeostasis of individuals and act to enhance their level of fluctuating asymmetry.

Reddy et al (1997)[26], studied dermatoglyphic findings in malocclusion which revealed that the craniofacial Class II, div.2 pattern was associated with increased frequency of arches and ulnar loops and decreased frequency of whorls, whereas in Class III, there was an increased frequency of arches and radial loops with decreased frequency of ulnar loops.

Neiswanger et al (2002)[27], determined if Chinese individuals with non-syndromic cleft lip with or without cleft palate (CL/P) display more dermatoglyphic asymmetry than unaffected relatives or controls. probands with a positive family history of clefting showed significantly more asymmetry in their pattern types than either probands without a family history, unaffected relatives or controls.

Hakan et al (2004)[28], found that the dermatoglyphic patterns of finger and palm prints can serve to strengthen a diagnostic impression when combined with other clinical features of patients with oral tumors, oral submucous fibrosis & oral cancer.

M.Atasu et al (2004)[29], found that dermatoglyphics could be used together with the other diagnostic methods such as clinical and radiologic investigations in the identifying of the patients from distinct groups of periodontal diseases.

Natekar et al (2006)[30], determined the fluctuating asymmetry and to predict the occurrence of carcinoma of breast in females & found that fluctuation asymmetry measures were significantly higher in female patients of carcinoma of breast for the thumb, subtotal ridge count and for palmar atd angle. These findings suggest that digital dermatoglyphics may have a future role in identifying women at increased risk for breast cancer.

J-F Wang et al (2008)[31], proposed alternative dermatoglyphic asymmetry measures to differentiate schizophrenic patients from healthy individuals but found no statistically significant association between conventional dermatoglyphic asymmetry measures and schizophrenia was found. In contrast, the sample means of the proposed measures consistently identified the patient group as having a higher degree of asymmetry than the control group. These results suggest that the proposed measures are promising for detecting the dermatoglyphic patterns that can differentiate the patient and control groups.

Sharma et al (2009)[32], studied dermatoglyphic interpretation of dental caries & its relation to Streptococcus mutans growth, which showed that subject group had a decreased frequency of loops & high S. mutans growth, as compared to control group.

Kiran et al (2010)[17], study compares and evaluates the dermatoglyphic peculiarities of mentally challenged children with those of healthy children and found that there was statistical significant correlation between dermatoglyphics and mental retardation in children. An increased frequency of loops and the transverse palmar crease line among the mentally challenged children were detected. The dermatoglyphics, a non-invasive approach can definitely aid the clinician in detecting mental retardation early in children and can also strengthen a diagnostic impression.

Conclusion

Thus, dermatoglyphics can be used not only in the field of medicine but also in dentistry for the early identification or prediction of oral lesions & diseases using various available methods.

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