# Revisited - Dermatoglyphics In Dentistry

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## Abstract

Dermatoglyphics is the study of epidermal ridges on the finger & palmer region of the hand and sole. The finger prints are unique characteristic features of an individual and remain unchanged over lifetime. Most dermatoglyphics are correlated with genetic abnormalities and are useful in biomedical studies. This article aims to give brief insight of different aspects of dermatoglyphoic studies highlighting is utility in diagnosing dental & orofacial abnormalities and diseases.

## Introduction

Dermatoglyphics is the art and science of studying the patterns of fingerprints. The term derived from a Greek word derma meaning "skin", glyph meaning "carving".The term was coined by Cummins & Medlow in 1926[1]. However, dermatoglypics as a scientific discipline began with the publication of thesis of Joannes Evangelista Purkinje, a psychologistand biologist in 1823 and classic book, "Fingerprints" of Sir Francis Galton's in year 1892.[2]

It is known that the dermal configurations appear at the 12th week of intra-uterine life and they are established by the 24th week. Thereafter they remain constant except for the change in their sizes. Their variable characteristics are not duplicated in other people not even in monozygotic twins[3,4,5]
Several studies have shown that dermatoglyphic patterns are genetically determined. [6,7,8,9]

The study of dermatoglypics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine anomalies as 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.[10]

Early detection can aid the clinician to anticipate health problems in children and initiate preventive and protective health measures at a very young age.However it is still at infancy in the world of dentistry where the co-relation of dental conditions with that of dermatoglyphic pattern is done.

## The Major Advantages Of The Dermatoglyphics Are[10]

1. The epidermal ridge of the palms fingers are fully developed at birth and thereafter remain unchanged for life.
2. 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 easy in children.

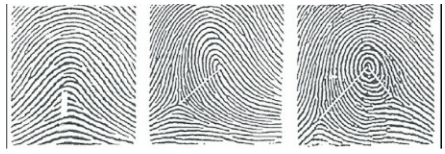
## Dermatoglyphic Landmarks And Pattern Configuration[2]

### Dermatoglyphic Patterns

The three basic dermatoglyphic Patterns on finger tips are:

i) **Triradius:** formed by the confluence of three ridge systems that form angles of approximately 120$^0$ with one another.
ii) **Core:** the approximate center of fingerprint pattern
iii) **Radiant:** which are lines emanating from the tri-radius and enclose the pattern area.

**Fingertip patterns** The ridge patterns on the distal phalanges of the fingertips are divided into the three groups.( fig-1)



i) **Arches:** The Arch pattern is made up of ridges lying one above the other in a general arching formation. Arch can be simple and tented arch
ii) **Loops:**It is the most common pattern with series of ridges entering the pattern area on one side of the digit and leaving the area on the same side. The loop pattern is subdivided into two types: a) Ulnar loop composed of ridges that open on the ulnar side and b) Radial loop composed of ridges that open on the radial side.
iii) **Whorls:** It is any ridge configuration with two or more tri-radii. One tri-radius is on radial and the other on the ulnar side of the pattern. Central pocket whorl is a pattern containing a loop within which a smaller whorl is located. Central pockets are classified as ulnar or radial according to the side on which the outer loop opens.

## Methods Of Recording Dermatoglypics

1. **Ink Method:** Most widely used method. The necessary equipment consists of printers ink, a roller, a glass or metal inking slab, a sponge rubber and a good quality paper with a slightly glazed surface[11].
2. **Inkless Method:** Inkless method uses latent-print powder and transparent vinyl adhesive sheets. It offers advantages over standard methods especially in case of infants [12,13].
3. **Adhesive tape method:** This method incorporates use of a branded transparent tape, colored chalk and white index cart. It offers several advantages over others, because of its flexibility, plastic tape can lift surface features not accessible with finger print fluid and paper. Thus it offers speed, clarity & neatness [14].
4. **Photographic method:** In the photo papermethod, a working solution is prepared by sodiumsulphiide, sodium hydroxide, soluble starch and distilled water. A blotter is moistened with this mixture, which serves as an inking slab. The part which is to be printed is first pressed against the moist blotter for a few second and is then applied against a sheet of photographic paper. But to make it permanent, the prints are fixed in hypo, washed and dried as in the usual photographic process.[15]
5. **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.[16]

## Use Of Dermatoglypics In Dentistry

1. **Cleft Lip and Palate (CL/P):** Mathew L. et al found increased frequency of ulnar and radial loops than the arches and whorls in cleft lip with or without cleft palate patients compared to controls. Interdigital patterns were less frequent in cleft lip and cleft palate patients.[17]Similarly various other studied also reported a significant dermatoglyphic peculiarities in person with CL/P as compared to those without CL/P. [18,19,20]
2. **Dental Caries:** The basis of considering

dermatoglyphic pattern as genetic marker for dental caries is that the epithelium of finger buds as well as enamel which is the most susceptible dental tissue to dental caries have ectodermal origin and both develop at the same time of IU life. So any problem at this particular period will have its effect on both enamel as well as on the dermatoglyphic patterns.[17] Anitha C et al (2014) reported a definite variation in dermatoglyphics between the early childhood caries and caries-free group, indicating that dermatoglyphic patterns can be used as a predictive tool for children with early childhood caries.[21]

Sharma A and Somani R (2009) and Ahmed et al (2010) 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.[22,23]

3. **Oral Cancer:** Various epidemiological studies support the fact that genetic alterations may be involved in the pathogenesis of SCC and OSF. These antenatal disturbances can alter the epithelium to make it susceptible to various carcinogens. Veena HS et al (2006) found a decreased atd angle, increase patterns in Th/I1 area and increased pattern frequency in I4 area in OSF patients as compared to normal gutkha chewers.[24]

   Venkatesh E et al (2008), Gupta A et al (2013) & Ganvir SM et al (2014) in their studies found an increase in frequency of arch and ulnar loop patterns on fingertips in subjects with squamous cell carcinoma .[25,26,27]

   The results of these study revealed that the field of dermatoglyphics holds promising results for determining the genetic susceptibility of individuals to develop oral cancer.

4. **Periodontal diseases:** Atasu M et al. (2005)[28] conducted a study with the aim of finding a finger-tip pattern type that would identify the patients with periodontal diseases. When the finger-tip patterns of the patients were compared with those of Periodontally Healthy (PH) individuals, the decreased frequencies 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 Progressive 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 the tri-radii on the palms and soles of the patients with JP were found. The authors concluded that in the light of these findings dermatoglyphics could be used together with the other diagnostic methods such as clinical and radiologic investigations and in the identifying of the patients from distinct groups of PD's.

5. **Malocclusion :** Tikare S et al.(2010)[29] 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. Reddy B RM et al (2013) concluded that different malocclusions are more prone to have a specific type of ridge pattern.[30]

6. **Bruxism:**Increased frequency of whorls and a decrease in frequency of ulnar loops were seen in patients with bruxism than the controls.[31]

## Limitations

1. Great deal of variations exists in fingerprints of normal non- disease conditions too. Variations do not follow a pattern, even normal may appear abnormal.
2. Misinterpretations of fingerprints are possible.
3. Concurrent DNA testing is advisable which can lead to increased costs of tests and longer waiting periods.
4. Lesser availability of technical specialists for dermatoglyphic studies further limits detailed studies.
5. In patients having gross malformations of the limbs.
6. Knowledge about this subject in detailed manner not available, large amount of data referral is required even for smallest of accurate information making it a tedious time consuming procedure.
7. Abnormal or missing fingerprints are seen in: a) Naegeli Franceschetti Jadassohn Syndrome- The most striking example of dermatoglyphic limitation is clinical feature in NFJ syndrome which is a complete loss of dermatoglyphics (fingerprint lines).

## Conclusion

Dermatoglyphics is a non -invasive diagnostic tool used since ancient time to predict congenital & malignant diseases. It has now become an upcoming part of medicine and forensic science. However, its role in dentistry is not much explored. In the future, it may serve as an important tool to predict dental diseases and help in timely preventing the disease.

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