Abstract
Dermatoglyphics, coined by Cummins and Midlo in 1926, is a branch of genetics dealing with the skin ridge system. They have been studied for fortune telling by palmists and as a definitive and unalterable tool for identification by forensic experts. From cradle to grave until the body decomposes finger prints remain unchanged. Modern study of the hand has moved quite far from the popular image of the sooth saying hand reader uttering mysterious incantations in an arcane language. Rather, through decades of scientific research, Dermatoglyphic analysis is now beginning to prove itself as an extremely useful tool for preliminary investigations into conditions with a suspected genetic basis. In many respects, it has been used as an adjunct to other disciplines, serving as a vehicle to resolve broader biomedical problems. This review focuses briefly on the spectrum of development underlying the traditional dermatoglyphics.

Key words: Dermatoglyphics, genetic, biomedical problems

Introduction
Dermatoglyphics is a branch of science, which deals with the study of ridge patterns on finger tips, palms, soles and toes. The skin on the palmar and plantar surfaces of man is not smooth. It is grooved by curious ridges, which form a variety of configurations. The ridge configurations have attracted the attention of laymen for millennia. During the last century, the fact that each individual’s ridge confirmations are unique has been utilized as a means of personal identification especially by law enforcement officials. Widespread medical interest in epidermal ridges developed only in the last few decades when it became apparent that many patients with chromosomal aberrations had unusual ridge patterns. Inspection of skin ridges therefore promised to provide a simple, inexpensive means of information to determine whether a given patient could have a particular chromosomal defect.1

Dermatoglyphics offers at least two major advantages as aid to the diagnosis of medical disorders.
1) The epidermal ridge patterns on the hand and soles are fully developed at birth and thereafter, remain unchanged for life.
2) Scanning of the ridge patterns or recording these permanent impressions can be accomplished rapidly, inexpensively and without any trauma to the patients.

Pattern Configurations
Qualitative Analysis

1) Fingers

Fingertip pattern configurations: Galton (1892) divided the ridge patterns of the distal phalanges of the fingertips into three groups namely Arches, Loops and Whorls.4

(a) Simple Arch  (b) Tented Arch
(c) Loop  (d) Double Whorl
(e) Spiral Whorl

1. Triradius (Figure 2): It is formed by the confluence of three ridge systems. The geometric center of the triradius is designated as a triradial point. The triradial point forms one terminus of the line along which ridges are counted. These are commonly observed in the hypothenar areas of the palms.

2. Core (Figure 3): It is in the approximate center of the pattern. The core may be of different shapes. It may be straight, rod like ridge, as a dot or a short ridge (either straight or bent) or it can be shaped as a circle or an ellipse in the center of the pattern.

Palmar Pattern Configuration

In order to carry out dermatoglyphic analyses that can be compared in different individuals, the palm has been divided into several anatomically designed areas. It includes Thenar areas, first, second, third and fourth interdigital areas and Hypothenar area.

Quantitative Analysis

1. Ridge Counting: It is used to indicate the pattern size. The counting is done along a straight line connecting the triradial point to the point of core. The ridges containing the point of core and triradial point are both excluded from the count (Fig 4A, B, C). Ridges are often counted between two digital triradii. The ridge count most frequently obtained is between triradii a and b, and is referred to as the **a-b ridge count**. (Fig 4D)
2. **atd Angle** (Figure 5): 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). Sometimes accessory ‘a’ or ‘d’ triradii are present on the palm.

![Figure 5](image)

### Studies in Dermatoglyphics

1. **Down’s syndrome**: A marked increase of the ulnar loops on the fingertips is virtually a constant feature of the dermatoglyphics in Down’s syndrome.\(^8\),\(^9\),\(^10\),\(^11\)

2. **Cleft lip and cleft palate**: Increased radial and ulnar loops were observed in Cleft lip and palate patients.\(^12\),\(^13\),\(^14\). Balgir RS (2006) observed increased wider atd angle (more than 30°).\(^14\)

3. **Dental caries**: A Sharma, R Somani (2009)\(^15\) 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.

4. **Cancer studies**: One of the study has found significantly fewer (P<0.05) radial loop patterns on the first, second, third and fourth digits of the left hand, and the second digit of the right hand in squamous cell carcinoma of head and neck cases.\(^16\) Another study reported increased radial loops on the right hand of males and in females, an increased atd angle and a higher frequency of hypothenar patterns of the left palms in acute myelogenous leukemia.\(^17\)

   Menser MA, Pervis-Smith SG have reported an increase of arches and a decrease of ulnar loops in the fingertips of a group of patients with an acute blast cell leukemia.\(^18\)

5. **Diabetes mellitus**: Wider ‘atd’ angle and the additional axial triradii were seen as reliable indicators helpful in scientific screening of populations prone to diabetes mellitus.\(^19\)

### Conclusion

Different diseases have different fingerprint patterns associated with them. This has been verified in thousands of independent studies. Cancer, heart disease and diabetes are just a few of the long list shown to correlate with fingerprint anomalies. As the dermatoglyphics are genetically controlled characteristics, any deviation in dermatoglyphic features indicates a genetic difference between the control and study group population. Dermatoglyphics has moved from obscurity to acceptability as a diagnostic tool.

### References

2. URL:http://www.handanalysis.net/library/derm_history.htm
12. Scott NM. Dermatoglyphic fingerprint heterogeneity among individuals with nonsyndromic cleft lip with or without cleft palate and their unaffected relatives


