

## Review Article

### Correlation between Dermatoglyphics and Malocclusion - A Scoping Review

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#### **ABSTRACT:**

Dermatoglyphics is the study of unique lines and patterns on the palms, fingers, soles, and toes of an individual. They have been traditionally used for foretelling the future. Later they were used extensively in forensic medicine. Today, these patterns have found their way in such an emphatic manner in the field of medicine, and are being utilized as a preliminary diagnostic tool for conditions with a genetic base. These patterns are individually unique, permanent and remain unchanged from cradle to grave. These patterns are formed in early weeks of fetal life, after which they remain unaffected by genetic and environmental forces. Thus, they can help in the assessment of intrauterine irregularities and prenatal detection of disorders. However, this branch is still in its infancy and requires further research to validate its role in the field of medicine. This article aims to highlight the correlation between dermatoglyphic features and malocclusion.

**Key words:** Dermatoglyphics, finger prints, malocclusion.

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#### **Introduction**

The scientific study of intricate patterns and fingerprints from palms, fingers, soles, and toes is referred to as "Dermatoglyphics". It was coined by Cummins and Midlo in 1926.<sup>1,2,3</sup> "Derma" means skin and "glyphic" means carvings. These naturally occurring patterns are unique to an individual and remain unchanged from birth until death. The fingerprints are not even similar in monozygotic twins.<sup>4</sup>

These patterns once developed are unaffected by the environment, and this explains their unique role, as a marker for individual identification and study of specific traits in humans for detection of intrauterine abnormalities and defects in initial weeks of pregnancy.<sup>5</sup>

#### **Advantages of dermatoglyphics<sup>6</sup>**

1. The epidermal ridge patterns are fully developed at birth and thereafter, remain unchanged for life. They are individually unique
2. The registration of prints can be accomplished rapidly, is economical, has good patient compliance and does not cause any trauma to the patient.

#### **Limitations of Dermatoglyphics<sup>6</sup>**

1. Interpretation of dermatoglyphic traits requires good quality prints. Ink should be dispensed in adequate quantities to prevent thick or thin prints.
2. Gross malformations of the limbs affect the registration of prints.

### Types of Fingerprint Patterns

In 1892, Sir Francis Galton classified the basic characteristic pattern of a fingerprint. He classified mainly into three types: Arches, loops, and whorls REF. This was mainly based on the degree of curvature of the ridges. Arches may be simple or tented, loops may be described as radial or ulnar, and whorls may be spirals or double loop.<sup>7</sup> There are numerous methods involved in recording dermatoglyphics. These include Ink method, Faurot inkless method, Photographic method, Transparent adhesive tape method, Special methods, and Numerical Methods.<sup>7</sup>

### Dermatoglyphics and malocclusion

Dermatoglyphics as a procedure is simple, economical, and atraumatic. It is linked with dentistry as there is striking similarity in the timing of development between dentition and palate. Both their development is influenced strongly but not exclusively by genetics. Hence, epigenetic factors also play a role, and it might reflect in the dermal patterns.<sup>3</sup> The study of palmar and fingerprints is useful in the field of criminology, anthropology, and cytogenetic studies.<sup>8</sup>

The development of occlusion is a result of the interaction and synergistic effects of genetic and environmental factors. The effect of a particular environmental factor on phenotype varies depending on genetic background, which ultimately determines facial and dental morphology.<sup>9</sup>

Jindal et al found an increased frequency of whorls in subjects having Class II malocclusion and increased the frequency of plain arches in subjects having Class III malocclusion.<sup>10</sup> Ram Mohan Reddy et al found increased twinned loops in class II malocclusions and absence of radial loops in class III malocclusions which are statistically significant.<sup>11</sup> The parameters associated with palmar prints had no statistical significance. Tikare S et al found a statistical association between whorl patterns and classes I and II malocclusion.<sup>12</sup>

Reddy S et al conducted a study to assess the relationship between malocclusion and dermatoglyphics.<sup>13</sup> The dermatoglyphic findings showed an increased frequency of arches and ulnar loops in Class II, div.1 and div. 2 patterns. There was a decreased frequency of whorls. Class III malocclusion showed an increased frequency of arches and radial loops. Ulnar loop frequency was decreased. The predicted values based on the frequency of arches were more sensitive for Class III malocclusion than for Class II, div.1 and div.2 malocclusion. The authors concluded from their study that dermatoglyphics might be an appropriate marker for a malocclusion.

Kharbanda et al. evaluated and compared dermatoglyphics of 25 males of north India with true mandibular excess with Class I occlusions.<sup>5</sup> The authors inferred that in the sample with skeletal Class III base

there was an increased incidence in arches and ulnar loops on all digits, except digit II.<sup>14</sup>

A significant association between dermatoglyphic patterns and sagittal skeletal discrepancies was found in a research done by George et al. They concluded that dermatoglyphics could serve as a cost-effective screening tool of these craniofacial problems.<sup>15</sup> Eslami et al. concluded that palm and fingerprint characteristics did not show any significant differences between different skeletal malocclusions.<sup>16</sup>

As fingerprints are formed during vital stages of fetal development, dermatoglyphic studies are in unique position to evaluate the effect of environment on early growth. Lesser time and cost requirements make Dermatoglyphics an easy alternative for much preferred but expensive DNA tests. Dermatoglyphic studies are reliable, non-invasive investigations which have good patient compliance. Dermatoglyphics is in a position to become the primary means of assessing complex genetic traits in the future. However, discrepancies in these traits suggest the need for further research in this regard to validate the use of dermatoglyphics as a diagnostic tool.<sup>17</sup>

Dermatoglyphic patterns in patients with trisomy 21, congenital heart diseases, breast cancers, autism, rheumatoid arthritis, insulin dependent and non-insulin dependent diabetes mellitus and skeletal abnormalities has been probed. Investigators have also explored the association of dermatoglyphics with CNS disorders like autism, psychosis, epilepsy, alcohol embryopathy and central hypoventilation syndrome, Kabuki syndrome among other disorders.<sup>12</sup>

While the development of the primary and secondary palate is completed by 7th and 12th week of intrauterine life respectively, volar pads related to ridge patterns develop from 6-13th week of intra-uterine life. Hence, the genetic message contained in the genome, normal or abnormal, is deciphered during this crucial period and could be reflected through dermatoglyphics.<sup>3</sup> This might lead to a possible association between dermatoglyphics and oro-facial disorders like cleft lip and/or cleft palate and malocclusion.<sup>12</sup>

Trehan et al. also investigated the dermatoglyphic patterns in 60 malocclusion patients. They observed that Class 1 and Class 3 were associated with increased frequency of whorls and both Class 1 and Class 2 division I were associated with increased frequency of radial loop and arches.<sup>18</sup> The results of the above mentioned studies are in contrast with those observed in a recent study. Overall, no association was observed between dermatoglyphic patterns and malocclusion among study subjects. It was however noted that whorl patterns were significantly associated with classes 1 and 3 malocclusions.<sup>12</sup>

Studies which include recording the ridge patterns on the entire palm of the study subjects and assessment of the Angle on the palmar surface in addition

to the distal phalange dermatoglyphic ridge patterns might also be more informative. In addition, obtaining the total ridge count from the triradial point to the centre of the ridge pattern on the distal phalange of the fingers could also be useful.<sup>12</sup>

A recent study observed no overall asymmetry of dermal traits in the three study groups. These results might be attributed to the lack of examination of parents' dermatoglyphic patterns. There is an established strong correlation of inheritance in the development of malocclusion.<sup>9,10</sup> So, the determination of cross inheritance by studying parent's dermatoglyphic patterns and relating it to asymmetry in children might aid in better analysis. Examination of inheritance and twin studies may be required to establish the types of genetics and inheritance affecting dental malocclusion.

Dermatoglyphics offers many distinct advantages as a screening tool for malocclusion. It could be used as an easily accessible, economical and non-invasive marker for the aforementioned conditions. Findings from such studies might offer important practical and/ or clinical implications for preventive and interceptive orthodontics among paediatric patients. Further investigations, particularly longitudinal studies may be required to substantiate the findings presented herein.

## CONCLUSION

Dermatoglyphics is an imminent area of attentiveness. Its use as a marker for various conditions is still in its infancy. Based on the literature, it can be debated that there is an association between various malocclusions and different dermatoglyphic patterns. However, whether dermatoglyphics alone can be considered as a factor to diagnose malocclusion is still dubious. Further studies with larger sample size involving various ethnic and racial backgrounds are required to arrive at a conclusion. If dermatoglyphics are proven to be an acceptable diagnostic tool, it can help in identifying malocclusion at an early age and thus help in preventive and interceptive treatment.

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