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ORIGINAL ARTICLE

A comparative evaluation of dermatoglyphics in different classes of malocclusion

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Dermatoglyphics;
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Asymmetry

Abstract *Aim:* To study associations of dermatoglyphic features with malocclusion in Indian children.

Materials and methods: A total of 237 children aged 12–16 years, who attended our outpatient clinic in a government medical college, were selected. Finger and palm prints were collected, and fingertip pattern frequencies, total ridge counts (TRCs), and atd angles (formed by the triradii below the first and last digits and that in the hypothenar region of the palm) were calculated. These parameters were analyzed with their Angle's class of malocclusion using appropriate statistical tests. Dermatoglyphic parameters were examined and asymmetry analysis was conducted in subjects with different occlusion patterns.

Results: Although no fingerprint pattern was found to be specific for a particular class of occlusion, increased tendencies toward high frequencies of whorls in subjects with class II malocclusion and plain arches in those with class III malocclusion were observed. Significant differences in atd angle and TRC were observed among malocclusion types ($p = 0.0001$). Asymmetry scores did not differ significantly.

Conclusion: Dermatoglyphic analysis can be used as an indicator of malocclusion at an early age, thereby aiding the development of treatments aiming to establish favorable occlusion. Inheritance and twin studies, as well as those conducted in different ethnic groups, are required to examine these relationships further.

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1. Introduction

Dermatoglyphics is the study of dermal ridge counts and figures on the fingers, palms, and soles (Galton, 1965). The inheritance of dermal traits is considered to follow a classical polygenic model (Holt, 1968). Associations of such traits with orofacial malformations have been studied. Holt (1968) and

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Verbov (1970) strengthened the predictive validity of dermatoglyphics in medical biology, suggesting that it can aid the diagnosis of genetically and non-genetically determined diseases.

Adams and Niswander (1967) postulated that asymmetry in dermatoglyphic and dental patterns was the manifestation of developmental instability in patients with cleft lip and palate, a condition proposed to have a polygenic basis. In dental research, there has been recent trend toward the investigation of genetic factors related to common oral diseases, including congenital hypodontia (Atasu and Akyuz, 1995), microdontia (Atasu et al., 1996), molar relation (Reddy et al., 1997), bruxism (Polat et al., 2000), and oral clefts (Mathew et al., 2005; Neiswanger et al., 2002).

Cummins (1939) first reported association of specific dermatoglyphic patterns in patients with Down's syndrome which is a genetic disorder. In recent decades, considerable improvement has been achieved in the establishing the relationships between dermatoglyphic patterns and some medical disorders.

Fingerprints have three basic patterns: arches, loops, and whorls. Loops may be ulnar or radial. These patterns are characterized by the presence or absence of triradii—confluences of three ridge systems. An arch has no triradius, a loop has one, and a whorl has two or more triradii. The axial triradius, located at the base of the palm, may be displaced distally in patients with certain conditions. The atd angle is formed by drawing lines between the triradii below the first and last digits and that in the hypothenar region of the palm (Cummins and Midlo, 1961).

The present study was conducted to explore associations between dermatoglyphic patterns and malocclusion. Dermatoglyphic parameters (fingertip patterns, atd angle, total ridge count [TRC] were examined and asymmetry analysis was conducted in subjects with different occlusion patterns.

2. Materials and methods

2.1. Sample

The present study was conducted using a convenience sample of 237, 12–16-year-old North Indian children attending our institution's outpatient Department of Pedodontics and Preventive Dentistry between 1 September, 2013 and 28 February, 2014. The institute's ethics committee approved the study and parents or guardians accompanying the children provided written informed consent. Only children with fully erupted permanent second molars were included in the study, and those undergoing or with histories of orthodontic treatment were excluded. Post-hoc power analysis using G Power® 3.0.10, [Faul et al. (2007), Bonn, Germany] indicated that a standard deviation of 1 would be detected with a power of 0.8 in the present sample.

Three examiners independently classified malocclusion in each subject using Angle's criteria (Angle, 1899) and dental models. The type of malocclusion was determined by agreement of at least two examiners.

2.2. Dermatoglyphic analysis

Handprints were obtained using the ink and roller method described by Cummins and Midlo (1961) and studied as per the guidelines of Reed and Meier, 1990. In the present study, asymmetry in three dermatoglyphic features was examined (Table 1, Fig. 1 and 2). Two trained investigators independently evaluated handprints. First, fingerprint patterns were classified as arches, loops, or whorls, with loops classified

Table 1 Description of dermatoglyphic parameters recorded in the study.

Plain arch (Fig. 1)	The plain arch is composed of ridges which pass across the finger with slight bow distally. There are no triradii. Since the pattern has no triradii, the ridge count cannot be done
Whorl (Fig. 1)	These are the patterns so constructed that the characteristic ridge courses follow circuits around the core. The shape of the pattern area may be either circular or elliptical. Whorls have two triradii
Loop (Fig. 1)	It possesses only one triradius. Twist site of ridges is called head of the loop. From the opposite extremity of the pattern, the ridges flow to the margin of digits. If the loop opens to the ulnar side, it is an **ulnar loop** and if to the radial margin, it is called a **radial loop**
Finger ridge count (FRC) (Fig. 1)	It was calculated by joining the triradius present in the pattern to the core of the pattern by a straight line. Total finger ridge count (TRC)- it was calculated by addition of the ridge counts of all ten fingers
Atd angle (Fig. 2)	It is a feature of the palm that captures the relative position of three triradii – a and d, usually located on the distal palm just inferior to the second and fifth fingers, respectively, and t, whose location can vary on the proximal palm from just distal to the wrist up to the center of the palm. Atd angles were measured for each palm print by drawing two straight lines through the a and t triradii and the d and t triradii, and measuring the resulting angle

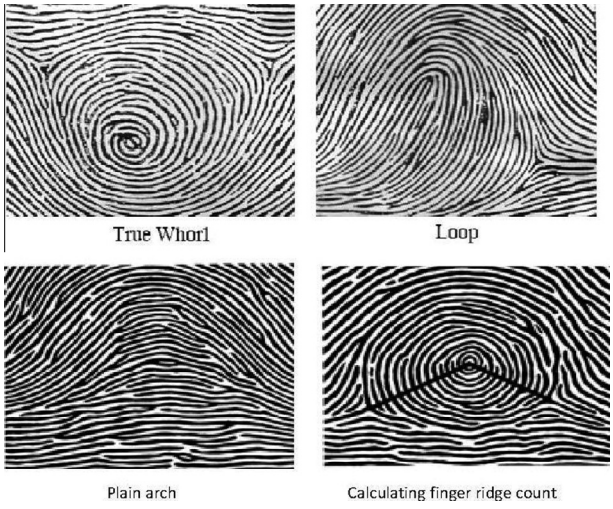

Figure 1 Finger tip dermatoglyphic patterns and calculation of finger ridge count (Galton, 1965).

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