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ORIGINAL ARTICLE

Assessment of Dermatoglyphic Patterns in Malocclusion

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ABSTRACT

Dermatoglyphics is the study of fingerprints and skin patterns. Dermal configurations appear during the 12th week of intrauterine life and are completely established by the 24th week. These configurations, except the overall size, are said to remain constant throughout an individual's lifetime. **Objective:** To assess the relationship between fingerprint patterns and skeletal malocclusion. **Methods:** Fingerprint patterns were collected using the ink method from 90 subjects who were divided into skeletal class I, II, and III malocclusion groups of 30 subjects each. **Results:** The loop pattern was more frequent in patients with skeletal class I and II malocclusion, and the whorl pattern was more frequent in those with class III malocclusion. **Conclusion:** The present study attempted to assess the relationship between dermatoglyphic patterns with skeletal malocclusion to use as an indicator of developing malocclusion at an early age.

Key words: fingerprint patterns, dermatoglyphics, malocclusion

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INTRODUCTION

Dermatoglyphics is the study of fingerprints and skin patterns. Cummins and Midlo (1929) defined dermatoglyphics as the study of the intricate dermal ridge configuration on the skin covering the palmar and plantar surfaces of the hands and feet.[1] Dermal configurations appear during the 12th week of intrauterine life and are completely established by the 24th week and remain constant throughout life, except for overall size.[2,3] Dermatoglyphics is associated with numerous medical conditions and first gained attention in medicine when abnormal dermal patterns were observed in patients with Down syndrome.[4]

Finger and palm prints and facial structures such as the lip, alveolus, and palate develop during the same embryonic period. Therefore, any factor causing changes in the lip, alveolus, and palate may also cause different patterns in the appearance of finger and palm prints. Genetic expression is reportedly the basis for craniofacial development and thus is responsible for skeletal malocclusions. Genetic or chromosomal abnormalities might be reflected as alterations in dermal ridges; hence, they are an easily accessible tool for use in the study of genetically influenced diseases.[5]

Fingerprint patterns are classified into three main types: arches, loops, and whorls. Arches may be simple or tented, loops may be either ulnar or radial depending on the direction they face, and whorls may be symmetrical, spiral, or double loop.[6] Therefore, fingerprint patterns and other characteristics of dermal ridges offer distinct advantages and may be used as a screening tool to detect early malocclusion.

METHODS

The present observational study used a convenience sample of subjects reporting to the outpatient Department of Oral Medicine and Department of Orthodontics. The study included 90 males and females aged between 21 and 30 years who were subdivided into three groups, with 30 subjects in each group.

Group I comprised subjects with skeletal class I malocclusion where SNA was 82 ± 2 degrees and SNB was 80 ± 2 degrees. Group II subjects had skeletal class II malocclusion where either SNA was >84 degrees with SNB 80 ± 2 degrees or SNB was <78 degrees with SNA 82 ± 2 degrees. Group III subjects had skeletal class III malocclusion where SNA was <80 degrees with SNB 80 ± 2 degrees or SNB was >82 degrees with SNA 82 ± 2 degrees.

Subjects were excluded if they had any one of the following: malformation syndrome of the maxilla and mandible; facial asymmetry; acquired skeletal defects; currently undergoing orthodontic treatment; history of thumb sucking, mouth breathing, tongue thrusting, or lip biting; congenital or acquired deformities of the fingers and palms or amputated fingers; history of trauma or surgical procedures performed in the orofacial region; and skin diseases with wounds or scars on the fingers. We informed the patients about the methodology and purpose of the study and obtained their informed consent. In addition, we received ethical clearance from the university ethics committee. Skeletal malocclusion was assessed on lateral cephalogram. The fingerprints of both hands of each subject were recorded using the ink and roller method described by Cummins and Midlo.[1] First, the subjects' hands were cleaned with soap and water prior to recording their fingerprints to remove dirt, oily secretions, and sweat and then dried with a towel. In taking the rolled impressions of the individual fingers, the finger tip was placed at right angles to the surface of the plate. Next, the finger was rolled or turned until the tip faced the opposite direction. The finger was then placed on white paper and rolled in the same manner to obtain a clean rolled impression of the finger pattern. Data were collected and analyzed for various dermatoglyphic patterns including the arch, loop, and whorl patterns. Data were subjected to statistical analysis.

RESULTS

The study sample comprised 90 subjects with 30 in each group. Group I included 16 males and 14 females, and groups II and III each had 18 males and 12 females. All subjects were aged 21–30 years.

Statistical analysis of the data was performed in which distribution of dermatoglyphic patterns on each hand in each class of malocclusion was calculated using percentages. The association between class of malocclusion and dermatoglyphic patterns was tested using the chi-square statistic where $p < 0.05$ was considered statistically significant. The percentage frequencies of the different dermatoglyphic patterns were calculated, and the frequency of occurrence was separately noted for the right and left hands (Tables 1–3).

Table 1. Skeletal class I malocclusion right hand and left hand

Pattern	Right hand		Left hand	
	N	%	N	%
Loop	26	86.7	21	70.0
Whorl	4	13.3	9	30.0
Total	30	100.0	30	100.0

Table 2. Skeletal class II malocclusion right hand and left hand

Pattern	Right hand		Left hand	
	N	%	N	%
Loop	25	83.3	25	83.3
Whorl	4	13.3	2	6.7
Arch	1	3.3		10.0
Total	30	100.0	30	100.0

Table 3. Skeletal class III malocclusion right hand and left hand

Pattern	Right hand		Left hand	
	N	%	N	%
Loop	5	16.7	5	16.7
Whorl	24	80.0	24	80.0
Arch	1	3.3	1	3.3
Total	30	100.0	30	100.0

The loop pattern was more frequent in skeletal class I malocclusion in both the right and left hands (86.7%, right hand; 70%, left hand), and the frequency of the whorl pattern was decreased in both hands (13.3%, right hand; 30%, left hand); this class did not exhibit the arch pattern (Table 1). The loop pattern was more frequent in skeletal class II malocclusion in both hands (83.3%). The whorl and arch patterns were seen in few subjects (whorl: 13.3%, right hand and 6.7%, left hand; arch: 3.3%, right hand and 10%, left hand) (Table 2). The whorl pattern was more frequent in skeletal class III malocclusion in both hands (80%) with decreased frequency of loop and arch patterns (loop: 16.7% in both hands; arch, 3.3% in both hands) (Table 3).

The results of difference patterns of right hands between groups and left hands between groups were statistically highly significant where p value <0.05 was considered significant. (Table 4).

DISCUSSION

Fingerprint patterns and facial structures develop during the same embryonic period.[5] Skin ridges originate from the fetal volar pads as the teeth, which also originate from the same ectodermal layer in the 6th to 7th week

Table 4.. Comparison of Chi-square test of the patterns of right hand and left hand

Test	Right hand		Left hand	
	Value	*p* (Asymp. Sig. (2-sided)	Value	*p* (Asymp. Sig. (2-sided)
Pearson Chi-Square	41.036[a]	.0001	38.334[a]	.0001
Likelihood Ratio	43.518	.0001	43.108	.0001
Linear-by-Linear Association	28.044	.0001	14.076	.0001
N	90		90	

of embryonic life.[7] Thus, the face and dermal ridges have the same origins and also develop concurrently; the genetic message contained in the genome is deciphered during this period and reflected in dermatoglyphic patterns.[8] Verbov stated that the study of epidermal ridge patterns of the fingerprints, palm, and sole can serve as an important diagnostic aid for many diseases, particularly those due to chromosomal aberrations, which may frequently be associated with distortion of patterns.[6]

In the present study, the loop pattern was predominant with decreased frequency of the whorl pattern in subjects with skeletal class I and II malocclusion, and the arch pattern was absent in group I subjects.
In subjects with skeletal class III malocclusion, the whorl pattern was predominant with an increased frequency while the loop and arch patterns had a decreased frequency.

Other studies have reported contrasting results. Reddy et al conducted a study in which a particular predictive occurrence of patterns was not associated with each group. An increase in twinned loops in class II malocclusions and absence of radial loops in class III malocclusions were statistically significant.[5] Another study by Jindal et al found that no fingerprint pattern was specific to a particular class of occlusion, but there was an increased tendency toward high frequencies of whorls in subjects with class II malocclusion, and plain arches were observed in those with class III malocclusion.[9]

Tikare et al revealed a statistical association between whorl patterns and class I and II malocclusion, but they observed no overall statistical association between fingerprint patterns and malocclusion.[10] Rajput et al conducted a pilot study on 24 subjects in whom whorls were more frequent in class I malocclusion subjects and loops were more frequent in class II and III malocclusion subjects.[11]

Tiwari et al conducted a study on 120 children aged 9–12 years. Malocclusion was based on the Dental Aesthetic Index and graded into four groups. The subjects' left and right fingers and palm prints were recorded and assessed for different types of fingerprint patterns. Malocclusion was then correlated with the frequency of fingerprint patterns. Ridge density count also was assessed and correlated with malocclusion. Loops showed an increased frequency, whereas whorls showed a decreased frequency, with increasing severity of malocclusion.[12]

Previous studies were based on Angle's classification of malocclusion and in the current study skeletal malocclusion was considered. Hence, we attempted to evaluate and compare the various dermatoglyphic patterns with skeletal malocclusions to use as an indicator of developing malocclusion at an early age and thereby aid in preventing and intercepting the developing skeletal malocclusion. Further studies may be required using a larger sample size and involving various ethnic and racial backgrounds to establish dermatoglyphics as a diagnostic tool.

CONCLUSION

Dermatoglyphics can be very helpful for the easy accessible, noninvasive, and economical identification of groups at high risk of developing malocclusion and for timely prevention, especially in developing countries with enormous populations and limited health resources.

CONFLICT OF INTEREST

The authors declare no conflict of interest on the publication of the research.

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