Dermatoglyphics: Link to Diagnose Periodontal Disease

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Abstract

Background: Periodontitis is a chronic inflammatory disease resulting in progressive loss of connective tissue attachment and supporting alveolar bone. Although periodontal diseases has multifactorial etiology, their genetic determinants that exist which could be suggestive of specific dermatoglyphic patterns for chronic periodontitis and aggressive periodontitis. Hence, the present study is conducted to study the role of palmar dermatoglyphics as a potential indicator and diagnostic tool for periodontal infections.

Objective: The present study compares the palmar dermatoglyphic patterns among healthy controls, chronic generalized periodontitis and aggressive periodontitis.

Materials and Methods: The present study comprised of 60 patients categorized into three groups:

Healthy controls: 20 individuals

Chronic generalized periodontitis: 20 individuals

Aggressive periodontitis: 20 individuals

In whom various palmar patterns were assessed and compared with healthy controls to find a dermatoglyphic as a tool to diagnose periodontal disease.

Results: A statistically significant higher percentage of ulnar loop frequency (75%) was found in chronic periodontitis group as compared to whorls in healthy in individuals (30%) and (50%) in aggressive periodontitis (p < 0.001). Percentage of palmar tri-radii was assessed in all three groups and shown that (p = 0.334).

Conclusion: The present study revealed that dermatoglyphics plays an important role in diagnosing periodontal diseases and can be used as an indicator and diagnostic tool. Further large scale and qualitative analysis using triradius and ATD angle which is formed by the imaginary line drawn between the digital triradius (a) to the axial triradius (t) and from axial triradius to the digital triradius (d) are required to conclude that dermatoglyphics can be used as diagnostic tool.

Keywords: Dermatoglyphic Patterns; Chronic Generalized Periodontitis; Aggressive Periodontitis; Palmar Patterns

Introduction

Dermatoglyphics is the scientific study of finger print patterns. As the finger print patterns are unique to all individuals and remain unchanged over the lifetime, they now provide a firm empirical basis for the study of chirology. Dermatoglyphics is a blend of Greek terms "derma means skin and glyphae means carve" [1]. Term dermatoglyphics was coined by Harold Cummins and Midlo in 1926 and defined as the study of the intricate dermal ridge configurations on the skin covering the palmar and plantar surfaces of the hand and feet [2].

Dermatoglyphic patterns are genetically determined and once on formation remain unchanged throughout the life. William Herschel was the first to use dermatoglyphic patterns for identification for criminals in India [3]. In 1892 renowned biologist of his time Sir Francis Galton published his works on finger prints [4].

Dermatoglyphic patterns initiation occurs at 6 - 7th week of the embryonic period and terminates around the 20th week of gestation. In this duration of development any disturbance or abnormalities will lead to abnormal dermatoglyphic patterns hence considered as "the window of intrauterine and congenital abnormalities [5]. After definite pattern stage these patterns are unaffected and plays an important role in marker and identification of an individual.

The use of dermatoglyphics in dentistry was associated to diagnose several infections and disorders like periodontitis, hereditary fibromatosis, dental caries, cleft lip/palate. Periodontal diseases are a group of infectious/inflammatory diseases involving Gram-negative, anaerobic, and micro-aerophilic bacteria that colonize the subgingival area and cause local and systemic elevations of pro-inflammatory prostaglandins and cytokines, resulting in tissue breakdown which is characterized by gingival inflammation, alveolar bone resorption, and attachment loss. Genetics has been associated with periodontitis in olden days and techniques used to confirm the genetic basis are not available. So, many researchers brought dermatoglyphics in scientific literature which can be used as diagnostic tool. One study was conducted by Yilmaz and Atasu they used dermatoglyphic pattern variations between juvenile periodontitis and rapidly progressive periodontitis [6].

Hence present study was conducted assuming the hypothesis that periodontitis manifest as a prenatal event in formation of dermal ridge pattern. The aim of the present study was to assess the role of dermatoglyphic pattern as a diagnostic tool in periodontal disease and to compare the patterns of generalized chronic periodontitis and generalized aggressive periodontitis with healthy individuals.

Methodology

The study comprised of subjects referred to the Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore. The study received ethical committee approval of the institution. The participants were explained about the study and an informed consent was obtained.

60 patients were enrolled in the study divided into three groups:

- Group I Healthy controls: comprising of 20 healthy individuals.
- Group II Chronic periodontitis: comprising of 20 individuals.
- Group III Aggressive periodontitis: comprising of 20 individuals.

All the three groups were diagnosed clinically and radiographically based on inclusion and exclusion criteria.

Inclusion criteria
Group 1: Healthy controls

1. No sites with probing depth ≥ 4 mm or clinical attachment loss ≥ 1 mm.
2. Patient who do not show any gingival disease with a gingival index score < 1.

Group 2: Chronic Periodontitis

1. Untreated chronic periodontitis with a probing depth ≥ 5 mm.
2. Clinical attachment loss ≥ 3 mm.
3. Radiographic evidence of alveolar bone loss on atleast two teeth per quadrant excluding the third molars.

Group 3: Aggressive Periodontitis

1. Untreated aggressive periodontitis patients with a probing depth ≥ 5 mm.
2. Generalized proximal attachment loss affecting at least 3 teeth other than first molars and incisors.
3. Amount of microbial deposits inconsistent with disease severity.

The mean age of the participants were 30 ± 12 years. Exclusion criteria were patients with history of systemic diseases, smokers and alcoholic patients, patients with history of trauma and burns on palmar region were excluded from the study.

All the patients were asked to wash hands with soap to remove dirt then the finger print and palmar pattern were recorded using kajal roller pen on thick white A4 size paper, for each individual all the ten finger patterns were recorded. The finger print patterns and accessory triradii were obtained and analyzed using standard magnifying lens glass. Parameters assessed were finger print patterns which included loops (ulnar, radial), whorls, arches as shown in figure 1 and figure 2.

Figure 1: Dermatoglyphic pattern of generalized chronic periodontitis. Dermatoglyphic pattern analyzed using magnifying glass.

Figure 2: Dermatoglyphic pattern in aggressive periodontitis using magnifying glass. The finger and palmar prints were analyzed using Cummins, Mildo and Penrose method [8].

Statistical analysis

Fingertip and pattern of all ten fingers of each individual of all three groups followed by comparative evaluation of statistical analysis used spearman correlation test with significance of p value < 0.0001.

Results

Results showed a statistically significant difference among three groups. In healthy group there was a higher percentage of whorls frequency (80%), in chronic periodontitis there was a higher percentage of ulnar frequency (75%) and in aggressive periodontitis more of radial loops were seen (50%) p < 0.0001 which showed a highly statistically significance as depicted in table 1. The percentage of palmar tri-radii was assessed in all three groups and showed p = 0.334 as shown in table 2.

Periodontal status	Finger pattern				
	Whorl Frequency (%)	Loop Frequency (%)	Ulnar loop Frequency (%)	Radial loop Frequency (%)	Total Frequency (%)
Periodontal healthy	14 (80%)	6 (10%)	0 (0%)	0 (0%)	20 (100%)
Chronic Periodontits	0 (0%)	0 (0%)	15 (75%)	5 (25%)	20 (100%)
Aggressive periodontitis	4 (20%)	0 (0%)	6 (30%)	10 (50%)	20 (100%)
Pearson Chi Square value	59.886				
P value	<0.0001**				

Correlation between finger pattern and periodontal condition

Spearman Correlation Value	0.558
P value	< 0.0001**

Table 1: Periodontal status and Finger pattern.

***Statistically high significant at p ≤ 0.01.*

Palmar accessory tri-radii	Healthy (n = 50)	Generalized chronic periodontitis (n = 48)	Generalized aggressive periodontitis (n = 40)
Present (% of tri-radii)	15.3%	22.5%	32.5%
Absent (% of tri-radii)	82.3%	80.4%	75.2%
Total (no. of count in groups)	20	20	20
Total (% of count)	100%	100%	100%

Table 2: Percentage of palmar accessory triradii.

P < 0.001*

Discussion

The role of dermatoglyphics in periodontal disease was first conducted by Yilmaz., *et al.* in 1993 in 70 individuals comprising of 36 early onset periodontitis cases, 20 adult periodontitis and 20 periodontally healthy patients and evaluated the quantitative and qualitative patterns of ridged skin. They confirmed the role of heredity in the etiopathogenesis of periodontal diseases [6].

In a study by Atasu., *et al.* 2005 evaluated the analysis of fingertip, palms and sole patterns of 158 subjects which encompassed 36 Juvenile Periodontitis (JP), 45 Rapidly Progressing Periodontitis (RPP), 38 Adult Periodontitis (AP) cases compared to 39 healthy controls. A decreased frequency of ulnar loops on all digits and increased frequency of i.e. tri- radii on sole pattern was found in the JP group. An increased frequency of radial loops on second digit tri-radii on the palms in RPP group whereas increased frequency of concentric whorls and ulnar loops on all digits was encountered in AP group [7]. In this present study there was increased frequency of ulnar loops in chronic periodontitis was seen.

In a study done by Devishree., *et al.* 2015 evaluating the qualitative parameters on finger tips in 15 aggressive periodontitis as compared to 15 periodontally healthy cases an increased frequency of ulnar loops was found in the test group. A similar finding was seen in the present study in chronic periodontitis group. Hence it can be assumed that increased frequency of ulnar loops is a characteristic feature of periodontal diseases, a higher level of genetic analysis is required to categorize the type of periodontitis [9].

Conclusion

To the best of my knowledge it is the first study to be conducted to analyze the dermatoglyphic patterns among healthy, chronic and aggressive periodontitis and can be concluded that dermatoglyphic patterns can be used as diagnostic tool for diagnosing periodontal diseases. The prevalence of ulnar loops can be used in diagnosing chronic periodontitis and radial loops for diagnosing aggressive periodontitis. Further large scale and qualitative analysis using triradius and ATD angle are required to conclude that dermatoglyphics can be used as diagnostic tool.

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