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RESEARCH ARTICLE

DERMATOGLYPHICS IN DIFFERENT STAGES OF PERIODONTITIS:AN OBSERVATIONAL STUDY

Shaik Imthiyazuddin[1], Katuri Kishore Kumar[2], Kolaparthy Lakshmi Kanth[3], Adurty Chaitanya[4], Shaik Shazia Begum[5], Boyapati Ramanarayana [6*]

[1.]Undergraduate student, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

[2.]Professor, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

[3.]Professor, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

[4.]Associate Professor, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

[5.]Post graduate student, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

[6.]Professor, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

Correspondence: Dr.Boyapati Ramanarayana, BDS, MDS, Professor, Department of Periodontology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India. E-mail I.D: dr.ramanarayana@gmail.com

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Abstract

Objective:The objective of the study is to determine the relationship between dermatoglyphics and periodontitis and compare the different finger patterns in different stages of periodontitis.

Material and Methods: A hospital-based crosssectional study was conducted, including a total of 80 individuals, divided into study and control groups of 40 each. The study group included clinically diagnosed periodontitis with stage-I, stage-II, stage-III and stage-IV periodontitis patients.

The subjects were evaluated for probing pocket depth, clinical attachment level, oral hygiene index simplified, Russel periodontal index, modified gingival index, and full mouth bleeding score followed by recording of fingerprints and subjected for evaluation.

Results: Intergroup analysis of clinical parameters showed statistically significant differences between all the groups with p value at 0.000. Multiple group comparisons concerning PPD and CAL were analyzed by post-hoc analysis. Regarding probing pocket depth, it showed a statistically significant between all group comparisons with p-value (0.000), whereas clinical attachment loss showed a statistically significant difference between all group comparisons with p-value (0.000). All the clinical indices showed statistically significant differences between all the groups with significant p-values. Inter-group frequency and distribution of fingerprint patterns of the right hand and left hand showed nonsignificant differences with a p-values of 0.18 and 0.24**.** Ulnar loops were found to be the most common pattern irrespective of different groups.

Conclusion: Within the limits of the present study dermatoglyphics may serve as an early predictor in identifying high-risk group individuals of developing diseases like periodontitis.

Keywords: Periodontitis, Dermatoglyphics, Bleeding Scores

Introduction

In the field of medicine and dentistry for the accurate diagnosis of various diseases with conventional methods employed, investigators are still looking forward to a newer approach. Such investigations made our researchers go to past anthropological techniques like palmistry, which was fascinating in ancient times. In our modern era, the field of medicine has shown a greater interest in forensics wherein dentistry techniques such as uroscopy study of rugae and helioscope study of lip prints were investigated. The special branch of scientific studies dealing with skin patterns on fingers, toes, palms of hands & soles of feet called Dermatoglyphics has become an area of interest because of its inherent nature of remaining unchanged from birth to death. Thus, it is considered as a special tool for assessing genetic trait, suspected genetic disorders, and also in forensics.[1]

Dermatoglyphics, the branch of study dealing with dermal ridge patterns is a harmonious blend of two Greek words Derma meaning skin, and Glyph meaning carve which was coined by Harold Cummins in 1926.[2] The finger and palm prints start to form during 6 the sixth and 7th week of embryonic life and are completed after 10 to 20 weeks of gestation. As fingerprint pattern are unique and remains unchanged it can be considered a beneficial tool for the prediction of any congenital, intrauterine anomalies or other diseases which gets influenced by genetic alterations. In recent times, recognition of irregular finger print patterns has become a point of interest and budding area in the field of dentistry.[3,4]

Oral diseases are chronic and progressive in nature among which dental caries and periodontal disease affects young children as well as adulthood. Periodontal disease is highly prevalent affecting about 68.7% of the overall population globally[6.] Periodontitis defined as an inflammatory disease of supporting tissues of teeth caused by specific group of microorganisms resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession or both. Periodontitis is classified in to different stages and grades based on 2017 AAP Classification.

Stage I: Initial periodontitis

Stage II: Moderate periodontitis

Stage III: Severe periodontitis with potential for additional tooth loss

Stage IV: Severe periodontitis with potential for loss of dentition

The basic patterns are whorls, arches, and loops; however, the size, spacing, and shape give them their distinct personality. These factors seem to be influenced by genetic factors. Multiple genes may be involved in this process, and the genes coding for the development of various layers of skin as well as the ones controlling the muscle, fat, and blood vessels beneath the skin may play an important role.[5] As there are paucity of studies regarding the association of finger patterns and periodontal disease, the present study is an attempt to assess the co-relation of dermatoglyphic patterns and various stages of periodontitis.

The purpose of this study was two-fold:To determine the relationship between dermatoglyphics and periodontitis.To compare the fingerprint patterns in STAGE I, STAGE II, STAGE III, and STAGE IV Periodontitis subjects (Figure 1).

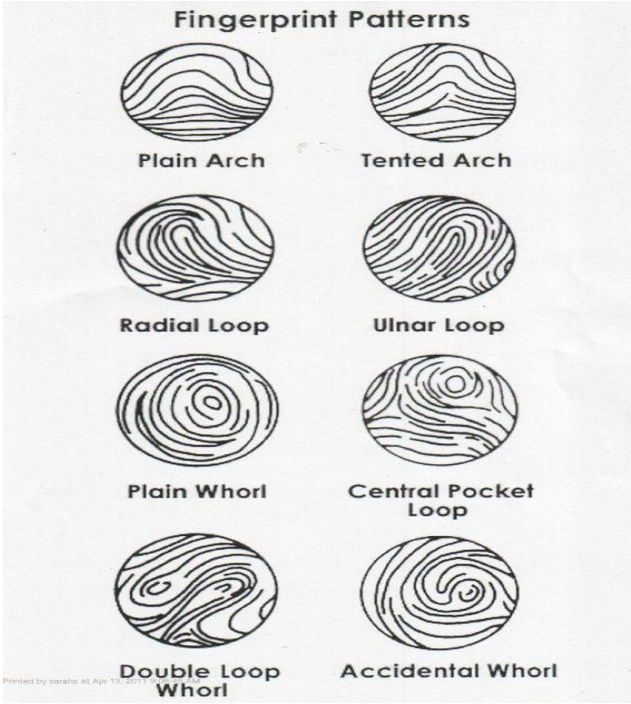


Figure 1: FINGER PRINT PATTERNS

The null hypothesis was that there is no relationship between dermatoglyphics and periodontitis

Materials and Methods

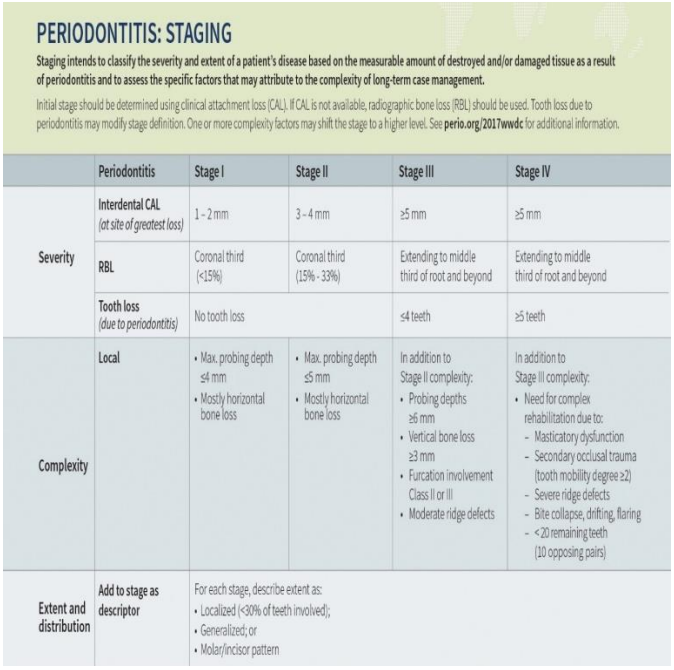
This observational study was conducted on patients from the outpatient department, Department of Periodontics, SIBAR Institute of Dental Sciences, Takkelapadu, Guntur, Andhra Pradesh. Approval of the study was obtained from the institutional review board of Sibar Institute of Dental Sciences.

Study design

This study was designed as an observational study

Subjects

A total of 80 subjects included in the study and were randomly be divided into 4 groups of 20 subjects each as STAGE I, STAGE II, STAGE III and STAGE IV periodontitis.



PERIODONTITIS: STAGING

Staging intends to classify the severity and extent of a patient's disease based on the measurable amount of destroyed and/or damaged tissue as a result of periodontitis and to assess the specific factors that may attribute to the complexity of long-term case management.

Initial stage should be determined using clinical attachment loss (CAL). If CAL is not available, radiographic bone loss (RBL) should be used. Tooth loss due to periodontitis may modify stage definition. One or more complexity factors may shift the stage to a higher level. See **perio.org/2017wwdc** for additional information.

	Periodontitis	Stage I	Stage II	Stage III	Stage IV
Severity	Interdental CAL *(at site of greatest loss)*	1 – 2 mm	3 – 4 mm	≥5 mm	≥5 mm
	RBL	Coronal third (<15%)	Coronal third (15% - 33%)	Extending to middle third of root and beyond	Extending to middle third of root and beyond
	Tooth loss *(due to periodontitis)*	No tooth loss		≤4 teeth	≥5 teeth
Complexity	Local	• Max. probing depth ≤4 mm • Mostly horizontal bone loss	• Max. probing depth ≤5 mm • Mostly horizontal bone loss	In addition to Stage II complexity: • Probing depths ≥6 mm • Vertical bone loss ≥3 mm • Furcation involvement Class II or III • Moderate ridge defects	In addition to Stage III complexity: • Need for complex rehabilitation due to: – Masticatory dysfunction – Secondary occlusal trauma (tooth mobility degree ≥2) – Severe ridge defects – Bite collapse, drifting, flaring – <20 remaining teeth (10 opposing pairs)
Extent and distribution	Add to stage as descriptor	For each stage, describe extent as: • Localized (<30% of teeth involved); • Generalized; or • Molar/incisor pattern			

INCLUSION CRITERIA:

Patients with the age of 18-45 years systemically healthy individuals were included in the present study

EXCLUSION CRITERIA:

Patients with an absence of a digit, conditions /abnormalities that don't allow accurate recording of fingerprints, smokers, pregnant females, and those who are on antibiotics or medications that would jeopardize the periodontal health, underwent oral prophylaxis in the past six months who wore prosthesis were excluded from the present study.

Methods

The subjects were evaluated for probing pocket depth, clinical attachment level, oral hygiene index simplified, Russel periodontal index, modified gingival index, and full mouth bleeding score. Finger patterns were taken from each individual and were subjected to analysis to assess the distribution and frequency of fingerprint patterns of both the right hand and left hand of all fingers including thumb, index finger, ring finger, middle finger, and little finger. Different types of dermatoglyphic fingerprint patterns such as arch, whorls, and loops, and their subsets such as plain arch, tented arch, double loop whorls, plain whorls, central pocket whorls, ulnar loops, and radial loops were subjected to analysis.

Statistical analyses.

The data obtained was recorded on an MS Office Excel sheet (v 2010, Microsoft Corp.) tabulated, and was subjected to statistical analysis using a statistical package for social sciences (SPSS, v. 22.0, IBM) p ≤0.05 was considered to be statistically significant. Software used G* Power 3.1.9.2 to calculate the Effect size which is: 0.5, α error prob: 0.05, Power (1-βerror): 0.95. Based on this the sample of study is considered to be 80. The confidence interval was set at 95%. ANOVA test is done for intergroup analysis and multiple group comparisons were analyzed by post-hoc analysis.

Results

The clinical parameters and clinical indices ie, Probing pocket depth (PPD), Clinical attachment level (CAL), Oral hygiene index simplified (OHI-S), Russell's periodontal index (RPI), modified gingival index (MGI), and full mouth bleeding scores (FMBS) were recorded and calculated between groups at baseline.

The mean clinical parameters i, e PPD and CAL were 3.05±0.75mm, 2.60±0.59mm, respectively for group-1. For group 2, mean scores of PPD and CAL were 4.00±1.076mm, 3.00±0.649mm, respectively. For group -3, the mean scores of PPD and CAL were 6.80±1.642mm, 8.05± 1.191mm, respectively. For group-4 the mean scores of PPD and CAL, were 8.90±1.373mm, 10.30±1.174mm, respectively (Table 1).

Intergroup analysis of clinical parameters showed statistically significant differences between all the groups with p value at 0.000 (Table 2).

Multiple group comparisons with regards to PPD and CAL were analysed by post-hoc analysis. Regarding probing pocket depth, it showed statistically significant between all group comparisons with p-value (0.000), whereas clinical attachment loss showed statistically significant difference between all group comparisons with p value (0.000) (Table 3).

The mean scores of clinical indices ie, OHIS, RPI, MGI, FMBS for group-1were 1.5±0.74, 0.4±0.25, 0.26±0.703, 16.4±2.386 respectively. For group-2 the mean scores of OHIS, RPI, MGI,FMBS were 0.5±0.694 , 1.5±0.283, 0.32±0.808 16.9±2.233 respectively. For group 3 the mean scores of OHIS, RPI, MGI. FMBS were 4.8±0.794, 4.9±0.569, 0.53±0.121, 18.5±2.392 respectively, for group 4 the mean scores of OHIS, RPI, MGI, FMBS were 5.6±0.378, 7.2±0.808 ,0.58±0.097, 19.6±2.427 respectively (Table-1). Inter group analysis of clinical parameters showed statistically significant differences between all the groups with p value at 0.000(Table 2).

TABLE 1: MEANS AND STANDARD DEVIATIONS OF STUDY VARIABLES

Variables	Group 1	Group 2	Group 3	Group 4
Probing pocket depth	3.05 ± 0.759	4.00±1.076	6.80±1.642	8.90±1.373
Clinical attachment level	2.60±0.598	3.00±0.649	8.05± 1.191	10.30±1.174
OHIS	1.5±0.747	2.5±0.694	4.8±0.794	5.6±0.378
RPI	0.4±0.252	1.5±0.283	4.9±0.569	7.2±0.808
MGI	0.26±0.703	0.32±0.808	0.53±0.121	0.58±0.097
FMBS	16.4±2.386	16.9±2.233	18.5±2.392	19.6±2.427

Group-1 = Stage 1 Periodontitis
Group-2 = Stage 2 Periodontitis
Group-3 = Stage 3 Periodontitis
Group-4 = Stage 4 Periodontitis

TABLE2: INTERGROUP COMPARISON OF STUDY VARIABLES BY ANOVA

Variables	Group 1	Group 2	Group 3	Group 4	P value
Probing pocket depth	3.05 ± 0.759	4.00±1.076	6.80±1.642	8.90±1.373	0.000
CAL	2.60±0.598	3.00±0.649	8.05± 1.191	10.30±1.174	0.000
OHIS	1.5±0.747	2.5±0.694	4.8±0.794	5.6±0.378	0.000
RPI	0.4±0.252	1.5±0.283	4.9±0.569	7.2±0.808	0.000
GI	0.26±0.703	0.32±0.808	0.53±0.121	0.58±0.097	0.000
FMBS	16.4±2.386	16.9±2.233	18.5±2.392	19.6±2.427	0.000

Multiple group comparisons of clinical indices i,e OHIS,RPI, MGI and FMBS were analysed by Post-Hoc analysis. Regarding OHIS, it showed statistically significant difference between all individual group comparisons and Russell's periodontal index (RPI) also showed statistically significant difference between all individual group comparisons with P- value (0.000) value (0.000) except group 3 and group 4 with a p-value (0.1). Regarding FMBS, it showed a statistically significant difference between only individual group of group 1 and group 3, group 1 and group 4 with p-values (0.03,0.00)respectively(Table3).Among all the individuals of different stages of periodontitis compared to right hand and left hand , radial loop and ulnar loop finger patterns were highly observed. Intergroup comparison or relationship between periodontal status and right, left hand fingerprints demonstrated statistically significant p-value with 0.03 and 0.02 respectively with ulnar loops found to be the most common among all the stages of periodontitis (Table 4,5).

Table3: POST HOC TESTS BETWEEN GROUPS FOR OHIS, RPI, MGI AND FMBS SCORES

Dependent variable	POST HOC ANALYSIS		P value
OHIS	Group 1	Group 2	0.000
	Group 1	Group 3	0.000
	Group 1	Group 4	0.000
	Group 2	Group 3	0.000
	Group 2	Group 4	0.000
	Group 3	Group 4	0.001
RPI	Group 1	Group 2	0.000
	Group 1	Group 3	0.000
	Group 1	Group 4	0.000
	Group 2	Group 3	0.000
	Group 2	Group 4	0.000
	Group 3	Group 4	0.000
MGI	Group 1	Group 2	0.035
	Group 1	Group 3	0.000
	Group 1	Group 4	0.000
	Group 2	Group 3	0.000
	Group 2	Group 4	0.000
	Group 3	Group 4	0.101
FMBS	Group 1	Group 2	0.91
	Group 1	Group 3	0.03
	Group 1	Group 4	0.00
	Group 2	Group 3	0.139
	Group 2	Group 4	0.03
	Group 3	Group 4	0.487

Table 4: Relationship between periodontal status and right-hand prints

STAGE PERIODONTITIS	PA	TA	RL	UL	PW	CPW	DLW	CW	P value
STAGE-I	4	16	26	37	1	13	0	0	0.035
STAGE-II	6	9	29	33	9	6	2	1	
STAGE-III	8	10	25	35	7	6	8	0	
STAGE-IV	8	7	34	37	5	4	0	0	

TABLE 5: Relationship between periodontal status and Left-hand prints

Periodontal status	PA	TA	RL	UL	PW	CPW	DLW	CW	P value
STAGE-I PERIODONTITIS	8	13	28	36	4	11	7	0	0.026
STAGE-II PERIODONTITIS	6	7	30	38	4	6	2	0	
STAGE-III PERIODONTITIS	8	9	29	26	3	12	0	1	
STAGE-IV PERIODONTITIS	3	7	29	38	7	4	0	0	

Discussion

Maintenance of good oral hygiene is the key to oral diseases. Several researchers have investigated the association of periodontal disease with genetics as it is a multifactorial disease. Dermatoglyphic pattern analysis has been carried out as an advantageous tool in various research aspects of biology, medicine, and genetics and has proven to be an effective key to predicting occurrences and risks for the biomedical event. Dermatoglyphics is a genetic test method suggesting the modes of inheritance of hereditary diseases. The mean scores of clinical parameters PPD, CAL , OHIS, RPI, MGI, FMBS which has similar findings following study by Kranti et al[6] , devishree et al[7], yilimaz et al [8] , shyamala et al[9], Vaidya et al[10], khara et al[11] . Group-wise comparison of mean scores of clinical parameters and indices are more significant among four groups and with the highest significance with stage 3 and 4 periodontitis which was following a study done by Khara et al.[11] The oral hygiene index has been the prime clinical index to assess the oral hygiene status of an individual. Russell's periodontal index is used to evaluate the periodontal status and also the increased risk of an individual for periodontal disease. Modified gingival index and full mouth bleeding scores were assessed for evaluation of the gingival status as the transition of gingivitis to periodontitis led to increased bleeding scores and gingival inflammation.

Thus assessment of these indices helps us to evaluate the overall local pattern is found to be the least pattern and arches found to be the second least pattern observed which is collinear with the observational studies done by Devishree et al[7], Kranti et al[6], Chatterjee et al[2], Vaidya et al[10] Yilmaz et al[8], shyamala et al[9], ' Harikrishna et al[12] Atasu et al[13] ,Anuj et al[14], Elavarasu et al[15]. It was inferred that based on the observed results dermatoglyphics can be a predictor for periodontal disease. in light of these findings, dermatoglyphics could be used together with other diagnostic methods, such as clinical and radiologic investigations, and in identifying patients from distinct groups of Periodontal disease.

The order of dermatoglyphic patterns observed in all groups were ulnar loops> radial loops >central pocket whorls> plain whorls > tented arch>plain arch>double loop whorl > composite whorls.

The drawbacks of the present study are

Consideration of multiple fingers for dermatoglyphic evaluation

Consideration of Overall fingerprint patterns with their subsets.

A healthy group is not included in the study.

Future studies can be done by considering patterns of arches, loops, and whorls without subsets, and comparing with the healthy group is necessary inflammatory status of the individual as well as oral hygiene status.

In the present study, the intragroup comparison of

dermatoglyphic patterns among each group demonstrated the ulnar group of fingerprint pattern was found to more prevalent type in both left and right hand and arches and whorls to be the least common pattern among which composite whorl

Conclusions

Dermatoglyphics may serve as an early predictor in identifying the high risk group individuals of developing diseases like chronic periodontitis that have a strong hereditary background. This study would be helpful in formulating counselling messages based on dermatoglyphic pattern prevalent among young generation and their possible stimulation to determine the young people's likelihood to develop chronic periodontitis in their later age. Future studies with longitudinal approach will help to determine whether the dermatoglyphic pattern can be actual marker for susceptibility of periodontal disease and may give a better insight for use of ancient anthropological approach in the diagnosis of various chronic diseases associated with hereditary background affecting oral cavity.

Ethical committee approval

This study was approved by ethical committee of Sibar Institute of Dental Sciences (Approval number (Pr.153/IEC/SIBAR/2022) dated 16th JUNE 2022.

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Informed consent

Written informed consent was obtained from patients who agreed to participate in the study.

Declaration of Interests: The authors have no conflict of interest to declare.

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