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ANALYZING PATTERNS OF FINGER AND PALM PRINTS IN ORAL POTENTIALLY MALIGNANT DISORDERS-AN EXPLORATORY DERMATOGLYPHIC STUDY

Dental Science

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ABSTRACT

Background: Dermatoglyphics are the dermal ridge configuration on the digits, palms and soles. Diagnosis of many diseases which are genetically or non-genetically determined can now be aided by dermatoglyphic analysis as these patterns have polygenic inheritance. Oral potentially malignant disorders like leukoplakia, oral submucous fibrosis and lichen planus have genetic predisposition. Hence the present study was undertaken to determine whether specific dermatoglyphic patterns exist which help in predicting the occurrence of these diseases.

Methodology: Finger and palm prints were collected using ink method from 40 subjects that were divided into 4 groups as follows: oral leukoplakia (Group A {n=10}), oral submucous fibrosis (Group B {n=10}), oral lichen planus (Group C {n=10}) and controls (Group D {n=10}). Data were subjected to statistical evaluation.

Results: Loops and whorls type of finger prints were more frequent in subjects with OPMDs whereas the frequency of arches was found to be higher in controls and were statistically significant. However the distribution of hypothenar and thenar/I 1 area pattern were statistically insignificant. Similarly there was no correlation between atd angles in all the four groups.

Conclusion: Dermatoglyphic patterns may have a role in identifying individuals either with or at risk for developing oral potentially malignant disorders.

KEYWORDS

Dermatoglyphics, Finger tip patterns, Oral leukoplakia, Oral lichen planus, Oral submucous fibrosis.

Introduction

The word "Dermatoglyphics" as coined by Cummins and Midlo is derived from the Greek word "Derma" meaning skin and "glyphic" meaning carvings.[1] It refers to study of the intricate dermal ridge configurations on the skin covering the palmar and plantar surfaces of hand and feet.[2] Dermal ridge differentiation takes place early in foetal development and the resulting patterns are genetically determined therefore dermatoglyphics is useful in anthropological, medico-legal and genetic studies.[3] The major advantages of the dermatoglyphics are:[4]

i) The epidermal ridge of the palms fingers are fully developed at birth and thereafter remain unchanged for life.
ii) Scanning or recording of their permanent impressions can be accomplished rapidly, inexpensively and without causing any trauma to the patient.

The dermatoglyphic patterns are analyzed in various ways like:[5]

a) Qualitative analysis-
i) Finger prints like loops, arches, and whorls, and
ii) Palmar patterns like hypothenar area, thenar/first interdigital area and I_2, $I_3$and I_4interdigital area.
b) Quantitative analysis like total finger ridge count, absolute finger ridge count, a-b ridge count, atd angle etc.

In dentistry, the significance of dermatoglyphics has been investigated by several investigators but still the data is scanty. Oral diseases such as oral cancer, bruxism, dental caries, dental fluorosis etc show a characteristic dermatoglyphic pattern with a sure scientific basis, which is explained by unison embryological origin of oral and dermatoglyphic patterns along with same time of foetal development. This has drawn attention of investigators to the field of dental dermatoglyphics.[6]

It is well known that in Oral Potentially Malignant Disorders (OPMDs) especially Oral Submucous Fibrosis (OSMF), chances of malignant transformation is extremely high, but that early diagnosis and treatment generally leads to good prognosis. With that in mind, and because of the clear genetic contribution to OPMDs, the present study was undertaken to lay the groundwork for a dermatoglyphic tool that screens populations at risk for OPMDs; specifically we enquired whether the dermatoglyphics of patients with OPMDs differ from those in healthy group.

Methodology

The research protocol for this study was reviewed and approved by the Institutional Review Board of Saraswati Dental College, Lucknow, India and in full accordance with the World Medical Association Declaration of Helsinki. The study was done from February-May 2016. The study consisted of 40 patients that were selected randomly from those who visited the Department of Oral Medicine and Radiology, Saraswati Dental College, Lucknow and were divided into following groups-

Group I- 10 patients with Oral Leukoplakia (OL),
Group II- 10 patients with OSMF,
Group III- 10 patients with Oral Lichen Planus (OLP), and
Group IV- 10 healthy individuals with habits but no lesions were included as control group.

After explaining about the study to the subjects, a written informed consent was obtained. A detailed case history with thorough clinical examination was done. The clinically diagnosed cases of OL and OLP were confirmed histopathologically whereas for OSMF, the subject selection was based upon the clinical features and their association with supporting etiological factors.

Dermatoglyphic patterns were collected using the ink method (as described by Cummins and Midlo)[7] with the black duplicating ink manufactured by Kores (India) Limited. Ink was uniformly spread over the palm and fingers. Prints of fingertip were taken first followed by that of the palm, on a sheet of paper which was kept firm. For digital prints we had one finger at a time in one continuous motion. The subject washed his hands with soap and water to clean the ink off. In this way, a total of 400 finger prints and 80 palm prints were obtained from 40 patients. Prints thus obtained were assessed for the following

parameters-

a. For finger tips: Presence of arches, loops and whorls, and
b. For palms: Hypothenar, Thenar/$I_1$and atd angle.

These dermatoglyphic patterns were analyzed with the help of a magnifying glass (10x), with respect to available standards and comparison of dermatoglyphic data was done between the four groups.

Statistical analysis

The data entry was performed using the SPSS, version 17.0 and Microsoft Excel 2007 software. The values obtained were statistically analyzed with the Chi Square test for qualitative analysis and Analysis of variance test for quantitative findings.

Results and observations

The present study was undertaken to compare the dermatoglyphic patterns in subjects of OPMDs that included OL, OSMF and OLP. Our observation showed the following findings-

1. On comparison of the frequency of various fingerprint patterns in all four groups, there was an increased frequency of loops followed by whorls in subjects with OPMDs whereas the frequency of arches was found to be higher in controls. This finding was found to be statistically significant. **(Table 1)**
2. The most commonly observed hypothenar pattern was arch ulnar, which was almost equally distributed in all the four groups and was statistically insignificant. **(Table 2)**
3. The thenar/I1 area pattern in all four groups in both hands presented no significant difference between the four groups. (Table 3)
4. No significant difference was noted in frequency of mean atd angles in all four groups. **(Table 4)**

Discussion

With an ever growing population it becomes imperative that methods be developed to identify individuals either at risk for or already having a given illness in the most cost-efficient manner without sacrificing quality of care. While such an imperative is not a new concept, the use of dermatoglyphics is rather a unique and extremely useful tool for preliminary investigations into conditions with a suspected genetic base.[8]

Oral potentially malignant disorders convey that not all lesions and conditions may transform to cancer; some may have an increased potential for malignant transformation. These disorders of the oral mucosa are also indicators of risk of likely future malignancies elsewhere in the oral mucosa and not only site specific predictors.[9]

Various epidemiological and experimental evidences indicate a causal relationship between tobacco or betel nut habit and few OPMDs like OL and OSMF, only fraction of people exposed to these agents develop such diseases. Genetically determined differences among these individuals would explain the susceptibility. Similarly, other OPMDs like OLP, discoid lupus erythematosus, palatal lesions in reverse smokers, actinic keratosis, sideropenic dysphagia, chronic hyperplas tic candidiasis shows individual variability, which might explain the genetic predisposition of the disorders.[10]

Considering the high mortality and high morbidity rate due to oral cancer in India, the present study was undertaken to lay the groundwork for a dermatoglyphic tool that screens population at risk for OPMDs. The present study revealed high frequency of loops and whorls type of finger prints in subjects with OPMDs whereas the frequency of arches were found to be higher in controls and was statistically significant. However the distribution of hypothenar and thenar/I_1 area patterns were statistically insignificant. Similarly there was no correlation between atd angles in all the four groups. The study conducted by David MP *et al*. (2015)[9] to determine the dermatogly phic dependence of potentially malignant disorders and oral carcinoma from patients that included 30 subjects with potentially malignant disorders, 10 subjects with oral cancer and 30 healthy controls revealed highly significant statistically with higher mean number of loops and the mean number of total ridge count in subjects with potentially malignant disorders and oral carcinoma when compared with controls.

Similarly, the results of the study conducted by Venkatesh E *et al*. (2008)[8] to determine whether specific dermatoglyphic patterns exists which help in predicting the occurrence of oral carcinoma and oral leukoplakia revealed higher frequency of arches and loop in cases than in controls whereas whorls were more frequent in control group and the distribution of hypothenar and thenar/I_1 area pattern was statistically insignificant with no correlation between atd angles in all the four groups. Ganvir SM *et al*. (2014)[10] studied the fingerprints of 100 normal individuals without habit of chewing or smoking tobacco or betel nut, 100 normal individuals with habit, 100 oral carcinoma patients, and 100 OSMF patients and found that whorl type of fingerprint pattern was predominant in significantly higher number of individuals of oral carcinoma and OSMF group than in control groups, whereas individuals of both the control groups showed loop as a predominant fingerprint pattern. These studies are in harmony with our observations of the present study.

However, Jatti D *et al*. (2014)[11] who carried out a study for the purpose of finding patterns that could identify patients with PMDs and oral carcinoma observed that the arch pattern was predominant with a decrease in whorl pattern in patients with OSMF, OL and oral carcinoma when compared with the controls and the difference was highly significant. Similarly, Veena HS *et al*. (2006)[12] who studied dermatoglyphics among 150 individuals (50 normal individuals without gutkha chewing habit, 50 normal individuals with gutkha chewing habit, and 50 OSMF patients with gutkha chewing habit), observed that there was decrease in frequency of whorls in OSMF patients. The studies by Tamgire DW *et al*. (2013)[13] and Gupta A *et al*. (2013)[14] also showed a highly significant decrease in simple whorl pattern on the left little finger in OSMF patients.

None of the earlier researchers have done analysis of the derma toglyphic patterns in subjects with OLP hence there are no findings for comparison.

The limitations of this study were:

1. An inability to detect whether the dermatoglyphic patterns varied considerably with the severity of the diseases.
2. As the sample size was small, a definite conclusion cannot be made based on this study alone.

Conclusion

Thus, in our study we found a definite correlation between the dermatoglyphic patterns and the OPMDs. Hence it is proven that the field of dermatoglyphics is a precious tool that holds promising results for determining the genetic susceptibility of individuals and can give an indication of pre-malignancy and malignancy. But further studies have to be done with a larger sample size in order to evaluate the significance of these variations in the dermatoglyphic features in subjects with OPMDs.

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LEGENDS FOR THE TABLES

Table 1: Frequency of finger print patterns in all four groups
Table 2: Frequency of hypothenar pattern in all four groups
Table 3: Frequency of thenar/I1 area pattern in all four groups
Table 4: Value of atd angle of both hands

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Conflicts of interest

There are no conflicts of interest.

TABLES

Table 1: Frequency of finger print patterns in all four groups

Pattern	OL (n=10)	OSMF (n=10)	OLP (n=10)	Control (n=10)	X2	p-value
Arches	08	11	09	28	18.783	0.004*
Loops	72	79	57	64		
Whorls	20	10	34	08		

Table 2: Frequency of hypothenar pattern in all four groups

	OL (n=10)	OSMF (n=10)	OLP (n=10)	Control (n=10)	X2	p-value
Right	08	07	08	08	0.067	0.99
Left	07	07	08	07		

Table 3: Frequency of thenar/I1 area pattern in all four groups

	OL (n=10)	OSMF (n=10)	OLP (n=10)	Control (n=10)	X2	p-value
Right	09	09	08	06	0.287	0.96
Left	10	07	08	06		

Table 4: Value of atd angle of both hands

	Right Hand				Left hand			
	Mean	**SD**	**F**	**p-value**	**Mean**	**SD**	**F**	**p-value**
OL (n=10)	37.1	2.92	1.664	0.192	37.2	3.96	**1.397**	**0.259**
OSMF (n=10)	38.1	2.85			38.2	2.97		
OLP (n=10)	38.9	2.47			38.7	2.50		
Control (n=10)	36.1	3.57			35.9	3.60		

X^2= Chi Square test
***=** Statistically significant (p-value <0.05)
SD= Standard Deviation
F= Analysis of variance test

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