

Original Research Article

Comparison of dermatoglyphic patterns in oral leukoplakia and oral submucous fibrosis patients

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Received: 16 October 2019

Revised: 02 December 2019

Accepted: 09 December 2019

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ABSTRACT

Background: Genetics plays an important role in the detection of an Oral potentially malignant lesion. A major contributor to genetic study is Dermatoglyphics or the study of fingerprints and lines of palmer and plantar surfaces. Many researchers have used dermatoglyphics to connect genetics with oral lesions and malignancies. Thus, the current study has been conducted to find out an association between dermatoglyphic patterns and oral leukoplakia, oral submucous fibrosis and healthy subjects.

Methods: The present study is conducted on subjects that have been already diagnosed with oral lesions. Fingerprint patterns (whorled, loop and arch) were evaluated by utilizing fingerprints.

Results: The present study showed that the loop pattern was common in all three subjects. The frequency of whorled and arch pattern is decreased in oral leukoplakia and oral submucous fibrosis that healthy subjects. Arch pattern is comparatively decreased in subjects with oral leukoplakia than oral submucous fibrosis and there is a decrease in the frequency of whorled patterns in OSMF as compared to oral leukoplakia.

Conclusions: Authors conclude that simply by observing the whorled and arch patterns in a subject, authors can hypothesize that risk of occurrence of oral leukoplakia and oral submucous Fibrosis and take preventive measures against the said lesions.

Keywords: Dermatoglyphics, Fingerprint patterns, Oral leukoplakia, Oral submucous fibrosis

INTRODUCTION

The hand, though decades have been becoming an essential aspect of scientific research, with it implemented in the use of physiological, medical, and genetical correlations. The word dermatoglyphics means "a skin carving." Dermatoglyphic is defined as the study of epidermal ridges and their patterns. The term is coined by the anatomist Cummins (1926). Dermatoglyphics comprises the varied and intricate patterns present on the surface of the skin in man and other mammals.¹ Dermatoglyphic Patterns remain unchanged throughout life and are genetically determined. These are useful not only finding chromosomal defects but also is useful in

understanding certain defects whose genetic basis is not well known. Dermatoglyphic patterns begin to grow in the 6th week of the gestation period and reach full size by 12th and 13th week while complete maturation takes place by the 24th week.² This means that the patterns are not affected by exogenous factors, which is one of the reasons why they are used as an ideal marker for studying individuals in a population. This is one advantage, the other advantage is that recording a permanent impression of fingerprints in an inexpensive, efficient, rapid procedure without causing any trauma or hospitalization of the patients. Dr. Harold Cummins, in 1936, examined several children with trisomy 21 (Down's syndrome) and found consistent dermatoglyphic changes that were

absent among controls.³ Dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine anomalies.⁴

This discovery allowed many other researchers to use dermatoglyphics in understanding disease and correlate with it. For example, researchers have used dermatoglyphics for schizophrenia, hypertension, diabetes mellitus, and pulmonary tuberculosis.^{5,6} In dentistry, dermatoglyphics is used comparatively less. Researchers, however, have used it to correlate with dental caries, cleft lip, and palate, malocclusion, congenital anomalies, and periodontitis.⁷ This present study was conducted to analyze the finger patterns of subjects with oral submucous Fibrosis and Oral Leukoplakia and to compare the patterns with patterns seen in the control group.

Aim of the study was to determine the role of dermatoglyphic patterns in subjects having oral leukoplakia and subjects with oral submucous fibrosis and comparing it with healthy subjects.

Objectives of the study was to evaluate the dermatoglyphics in healthy subjects, having no lesion or habit, to evaluate dermatoglyphics in subjects having oral leukoplakia, to evaluate dermatoglyphics in subjects having oral submucous fibrosis and to compare the dermatoglyphic patterns in healthy subjects, subjects having oral leukoplakia and in subjects having oral submucous fibrosis.

METHODS

The present study is conducted on patients who have come to Bharati Vidyapeeth Dental College and Hospital, Pune and who have been diagnosed with the previously said conditions. The study was carried out from February 2019 till May 2019. Permission to conduct the study was obtained from the Institutional Ethics Committee.

A total number of 60 individuals were selected. Subjects that have been already diagnosed with oral lesions were selected. They were divided into three groups.

- Group A-20 subjects who do not have any lesion or any habit of chewing tobacco/areca nut. This group served as the control group
- Group B-20 subjects who have a habit of chewing tobacco/areca nut with the occurrence of Oral Leukoplakia.
- Group C-20 subjects who have a habit of chewing tobacco/areca nut with the occurrence of Oral Submucous Fibrosis (OSMF).

Inclusion criteria

- Subjects of the control group should not have any active lesions in the oral cavity, the habit of chewing tobacco/areca nut or smoking, no genetic disorder.

- Subjects considered for OSMF should have restricted mouth opening and palpable fibrous bands.
- Subjects who have already been diagnosed with oral leukoplakia should be considered.
- Subjects who are selected for oral leukoplakia and OSMF should have a positive history of the use of tobacco.

Exclusion criteria

- Subjects having tobacco/areca nut chewing habit.
- Subjects with no lesions like ulcer, bulla, and vesicle, having no oral manifestations due to systemic diseases.
- Subjects with genetic disorders.
- The subject should not have an injury, rashes and Psoriasis fingers.
- If the subjects have restricted mouth opening, but the fibrous band could not be palpated, then such subjects are not taken into consideration for the OSMF group.
- Patients having oral malignancy has been excluded.
- Subjects with any dermatological disorder have been excluded.

After taking a thorough history of the patient, clinical evaluation is done, and findings were recorded. In subjects having oral leukoplakia and OSMF, intraoral photographs were taken of the lesion and the lesions were compared to the characteristic clinical features of oral leukoplakia and oral submucous fibrosis, to confirm the lesion.

Subjects were informed about the study in detail. Informed consent was taken in their language.

Materials required

- Blue duplicating ink.
- White bond non-blotting paper.
- Magnifying glass.
- Soap, water, and towel.

The 'Ink Method' by Cummins and Midlo was used for recording dermatoglyphics patterns in this study.⁸

The subjects were asked to wash their hands thoroughly with soap and water to remove any dirt, oil or stain from the hand. This is to enhance the visibility of the duplicated fingerprints.

The ink was uniformly spread on the fingertips of the subjects. Prints of thumbs were taken first, followed by prints of the other finger. Once acceptable fingerprints were obtained, the subjects were asked to wash their hands. The fingerprints were then analyzed for qualitative analysis, using a magnifying glass.

Patterns observed

The viewed patterns were analyzed according to standard guidelines for classification given by Francis Galton (1982).⁹ In total there are three patterns observed. These patterns are further divided into various subdivisions. But for simplicity, these three patterns used are not divided into subdivisions. The three patterns seen are:

- Whorled
- Loop
- Arch

To check the frequency of the fingerprint patterns, all ten fingers of the subject are considered.

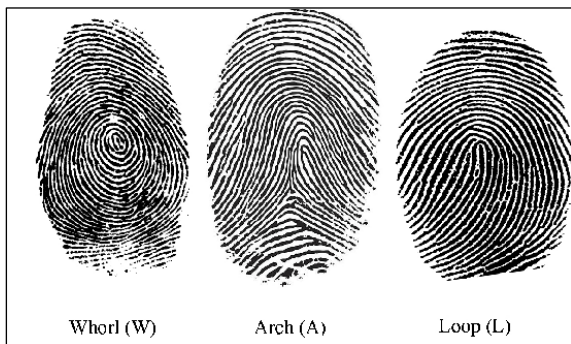


Figure 1: Types of patterns observed.¹⁰

Statistical analysis

The inter-group statistical comparison of the distribution of categorical variables is tested using the Chi-Square test

or Fisher’s exact probability test. The data on categorical variables are shown as n (% of cases).

In the entire study, the p-values less than 0.05 are considered to be statistically significant. All the hypotheses were formulated using two-tailed alternatives against each null hypothesis (hypothesis of no difference). The entire data is statistically analyzed using Statistical Package for Social Sciences (SPSS ver 21.0, IBM Corporation, USA) for MS-Windows

RESULTS

The current study was done to do a comparison between dermatoglyphics and potentially malignant lesions. A total number of 60 subjects were obtained for the study. They were equally divided into a group of 3, each containing 20 subjects (Table 1). Quantitative analysis of fingerprint patterns was done, which included loop pattern, whorled pattern and arch pattern (Table 2).

Table 1: Distribution sample size studied across three study groups.

Group code	Description	No. of cases	No. of dermatoglyphics prints
Group A	Healthy subjects with no lesions	20	200
Group B	Subjects with leukoplakia	20	200
Group C	Subjects with OSMF	20	200
Total		60	600

Table 2: Distribution of dermatoglyphic pattern of Group A, Group B and Group C.

Pattern	Group A (n=200)		Group B (n=200)		Group C (n=200)		p-value (inter-group)		
	N	%	N	%	N	%	Group A v group B	Group A v group C	Group B v group C
Whorl	53	26.5	70	35.0	65	32.5	0.061 ^{ns}	0.399 ^{ns}	0.449 ^{ns}
Loop	122	61.0	116	58.0	114	57.0			
Arch	25	12.5	14	7.0	21	10.5			
Total	200	100.0	200	100.0	200	100.0			

Values are n (% of prints), p-value by chi-square test. p-value<0.05 is considered to be statistically significant. Ns-statistically non-significant.

Group A: Healthy subjects with no lesions

Of 200 prints in Group A, 53(26.5%) had Whorled Pattern, 122(61.0%) had Loop Pattern and 25(12.5%) had Arch Pattern. Loop pattern is the most common pattern seen, followed by a whorled pattern and arch pattern. (Figure 2).

Group B: Subjects with oral leukoplakia

Group B consist of subjects who have been diagnosed with oral leukoplakia. Of 200 prints in Group B,

70(35.0%) had Whorled Pattern, 116(58.0%) had Loop Pattern and 14(7.0%) had Arch Pattern (Figure 3).

Group C: Subjects having OSMF

Group C consists of subjects having Oral Submucous Fibrosis. Of 200 prints in Group C, 65(32.5%) had Whorled Pattern, 114(57.0%) had Loop Pattern and 21(10.5%) had Arch Pattern. The most common pattern observed in the loop pattern, followed by whorled pattern and arch pattern (Figure 4).

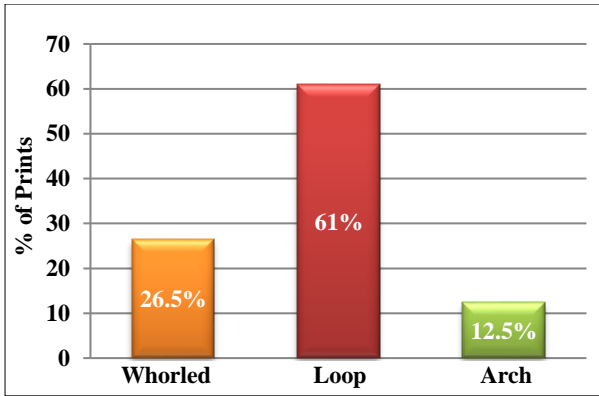


Figure 2: Distribution of dermatoglyphic pattern in group A.

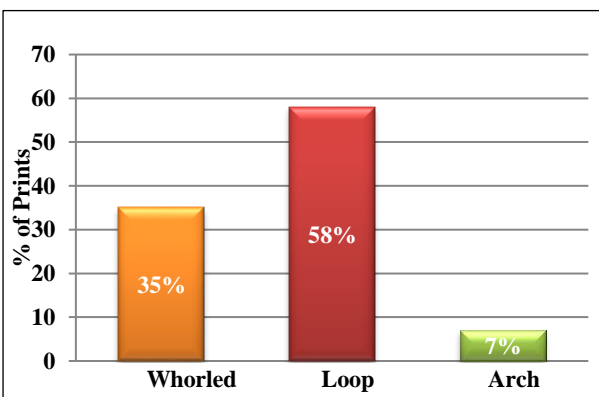


Figure 3: Distribution of dermatoglyphic pattern in group B.

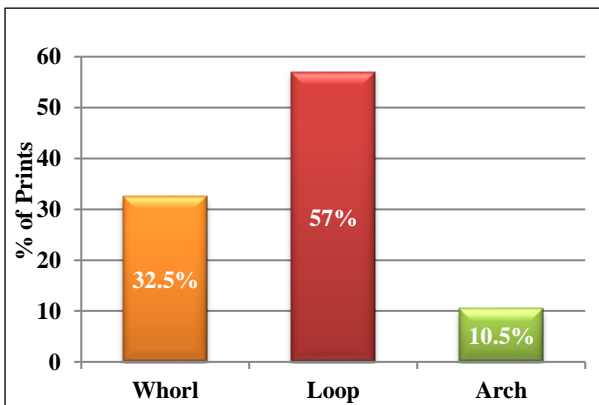


Figure 4: Distribution of dermatoglyphic pattern in group C.

Intergroup distribution and comparison of dermatoglyphic patterns

Intergroup distribution shows the loop pattern, whorled pattern and arch pattern of each group and the percentage of each pattern. Group A has the highest number of loop patterns (61%) as compared to Group B (58.0%) and Group C (57.0%). The whorled pattern is higher in Group B (35 %) than Group A (26.5%) and Group C (32.5%).

The arch pattern is higher in Group A (12.5%) than Group B (7.0%) and Group C (10.5%) (Figure 5).

Comparison of dermatoglyphic pattern between Groups A and B

Of 200 prints in Group A, 53(26.5%) had Whorled Pattern, 122(61.0%) had Loop Pattern and 25(12.5%) had Arch Pattern. Of 200 prints in Group B, 70(35.0%) had Whorled Pattern, 116(58.0%) had Loop Pattern and 14(7.0%) had Arch Pattern. The whorled pattern is higher in Group B as compared to Group C.

Distribution of dermatoglyphic patterns did not differ significantly between Groups A and B (p-value >0.05).

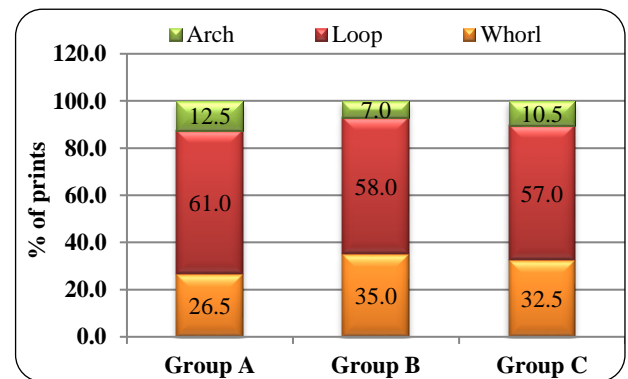


Figure 5: Intergroup distribution of dermatoglyphic pattern.

Comparison of dermatoglyphic pattern between groups A and C

Of 200 prints in Group A, 53(26.5%) had Whorled Pattern, 122(61.0%) had Loop Pattern and 25(12.5%) had Arch Pattern. Of 200 prints in Group C, 65(32.5%) had Whorled Pattern, 114(57.0%) had Loop Pattern and 21(10.5%) had Arch Pattern. The Arch pattern is higher in Group C than Group A.

Distribution of dermatoglyphic patterns did not differ significantly between Groups A and C (p-value >0.05).

Comparison of dermatoglyphic pattern between groups B and C

Of 200 prints in Group B, 70(35.0%) had Whorled Pattern, 116(58.0%) had Loop Pattern and 14(7.0%) had Arch Pattern. Of 200 prints in Group C, 65(32.5%) had Whorled Pattern, 114(57.0%) had Loop Pattern and 21(10.5%) had Arch Pattern.

The Arch pattern is higher in Group C as compared to Group B, while the whorled pattern is higher in Group B than Group C. Distribution of dermatoglyphic patterns did not differ significantly between Groups B and C (p-value >0.05).

DISCUSSION

Over the years, researchers have tried to come up with ways to detect various diseases to prevent it from a further spread in the body or early diagnosis. One such method used is dermatoglyphics. It is the study of the patterns of print found on plantar and palm surfaces of hand and toes. Fingerprints are unique to each other. They form by the 24th week of intrauterine life. Several genes interlink with environmental factors to form these unique patterns of an individual. In the case of chromosomal or genetic alterations, fingerprints show abnormal ridge patterns. Recently, many investigators have focused their attention on finding an association of morphological and genetical characters with several pathological conditions. Developmental instability is reflected and reliably measured by fluctuating asymmetry. Fluctuating asymmetry is an indicator of genetic and environmental stress.¹¹ This asymmetry is seen by assessing various ridge patterns on plantar surfaces of the hands. Thus, dermatoglyphics is a simple, noninvasive, and inexpensive method of connecting genetics to pathologies.

Ramani et al, observed the genetic component for various fingertip patterns.¹² Once formed, they are age and environment stable, becoming a reliable indicator, of genetic damage.¹³ With this information in mind, the present study was done to compare and evaluate the fingerprint patterns in subjects having oral leukoplakia and OSMF. In India, there is a high prevalence of tobacco users. This issue has led to increased cases of oral leukoplakia and oral submucous fibrosis. Although these lesions are reversible, if undiagnosed there is a chance that these lesions might convert into malignancies. Oral potentially malignant lesions are characterized by a range of genetic, molecular and chromosomal alternations, that they share and malignant lesions as well which develop from them. One simple way to study these lesions is through the means of dermatoglyphics.

Awasthy D et al, conducted a study comparing dermatoglyphics with OSMF and oral leukoplakia and healthy subjects without any habit or lesion and subjects with habits but no lesion. They reported that the loop pattern is commonly found in all the groups but there was a mild rise in the frequency of occurrence of loops in pathologic conditions, i.e., OSMF and leukoplakia.¹⁴ In this study, loop patterns were also the most commonly found patterns. However, their frequency changes from healthy subjects to oral leukoplakia and OSMF. More loop patterns are found in healthy subjects, than oral leukoplakia and OSMF.

Munishwar and co-workers reported that the loop pattern was more in a healthy group than in patients of OSMF and gutka chewers.¹⁵ They found that there was an increase in the loop pattern in OSMF patients (43.60%) and the control group (57.60%). The present study shows that there is an increase in loop patterns in healthy

subjects (61.0%), but decreases in subjects having OSMF (57.0%)

Jatti D et al, conducted a study comparing dermatoglyphics with potentially malignant diseases and Oral squamous cell carcinoma. They found that in an arch pattern is commonly found in potentially malignant diseases.⁸ The present study shows decreased in the frequency of arch pattern in leukoplakia but increased in frequency in OSMF subjects as compared to healthy subjects. A study conducted by Tamgire Dw et al, the comparison was done between subjects having habits but no lesions and subjects having OSMF. They found that a decline in patterns of whorls OSMF was seen than in gutka chewers.¹⁶ The present study shows that in comparison with healthy subjects, there is an increased frequency of whorled patterns in oral leukoplakia and OSMF subjects. However, there is a decrease in the frequency of whorled patterns in OSMF as compared to oral leukoplakia.

Gupta and Karjodkar studied the correlation of dermatoglyphics with OSMF and Oral Squamous cell carcinoma subjects. They reported an increased percentage of loops and arch patterns in the OSMF group but a decrease in the frequency of whorled patterns.¹⁷ The present study shows that there is a decrease in the percentage of loop patterns in OSMF patients than in healthy patients while an increase in the frequency of whorled patterns. The results of the present study are similar to the ones obtained by Satish Kumar et al.¹⁸ They examined the correlation subjects without any habit or lesion and subjects having OSMF. They reported increased whorl patterns among OSMF subjects when compared to healthy subjects.

Another study conducted by Venkatesh et al. on dermatoglyphics in patients with oral leukoplakia and OSCC showed an increase in the frequency of arch pattern in oral leukoplakia subjects as compared to healthy subjects, while there was a decrease in the occurrence of a whorled pattern as compared to healthy subjects.¹⁹ In the current study, there is a decrease in the occurrence of arch patterns in oral leukoplakia subjects, while there is a significant increase in whorled pattern as compared to healthy subjects.

CONCLUSION

To conclude this study, dermatoglyphics is a very intriguing subject. It not only is unique to an individual but also helps to identify his/her genetic history. This is one of the reasons why researchers are interested to associate dermatoglyphics with pathology. It helps to determine the nature of the disease and understand it better. For Oral Leukoplakia and OSMF, more study needs to be conducted as the sample size taken for this study is not enough to conclude that the results obtained apply to the entire Indian population. Further study can be done with a large sample size. However, statistically,

these results do show that there are changes in the fingerprints of the said lesion patients. Fingerprint patterns mainly divided into three types, but these groups are further classified. A study can be conducted with these parameters to further understand the relation of dermatoglyphics with potentially malignant lesions. Dermatoglyphics then could be used more efficiently to detect the potential development of these lesions.

ACKNOWLEDGEMENTS

Author acknowledges the support of the Department of Oral Pathology and Microbiology and the Department of Oral Medicine and Radiology of Bharati Vidyapeeth, Dental College, and Hospital, Pune, Maharashtra, India.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kulkarni VV, Chaudhari AR, Kulkarni AS. Comparison of dermatoglyphic patterns in oral leukoplakia and oral submucous fibrosis patients. *Int J Res Med Sci* 2020;8:153-8.