Global Academic Journal of Dentistry and Oral Health

Available online at https://www.gajrc.com

DOI: 10.36348/gajdoh.2021.v03i01.001

OPEN ACCESS

ISSN-2706-8994 (P)
ISSN-2707-8868 (O)

Research Article

Palmar Dermatoglyphics in Oral Squamous Cell Carcinoma – A Comparative Study

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Article History
Received: 06.01.2021
Accepted: 18.01.2021
Published: 23.01.2021

Abstract: Dermatoglyphics is correlated with diseases which are genetically linked. As the cytogenic markers for cancer are expensive and complex, dermatoglyphics may be of clinical significance to detect individuals who are at increased risk in developing oral squamous cell carcinoma (OSCC). An attempt can be made to study the palmar dermatoglyphics and intercept the impending disease and this can prove worthy to save lives. The Aim of the study was to determine if dermatoglyphic patterns have role in identifying individuals at risk of developing oral squamous cell carcinoma. The dermatoglyphic patterns were taken from 30 patients diagnosed with OSCC, 30 individuals with habits of tobacco and / or alcohol consumption but no oral lesions and 30 healthy individuals with no habits. The finger & palm prints of both the hands were taken by using ink method. Then the finger and palm prints were subjected to qualitative and quantitative analysis. Patients with OSCC had 11 arches, 194 loops and 95 whorls. Patients with habits had 46 arches 76 loops and 178 whorls. Patients without habits had 50 arches 85 loops and 165 whorls. That represents OSCC patients had higher percentage of loops as compared to patients with habits and without habits. As OSCC has a genetic basis, with the knowledge of dermatoglyphic patterns, individuals who are prone to develop these lesions can avoid the trigger factors. The relevance of dermatoglyphics is not for diagnosis, but for prevention, and identification of people with the genetic predisposition to develop certain diseases.

Keywords: Palmar dermatoglyphics, Squamous cell carcinoma, loops, whorls, arches, genetic predisposition.

INTRODUCTION

Oral squamous cell carcinoma is the most common malignant neoplasm affecting the oral cavity. Worldwide, oral cancer accounts for 2-4% of all the cancers [1]. Tobacco use and alcohol consumption are well established factors for development of oral squamous cell carcinoma. But only a fraction of individuals having these habits develop oral squamous cell carcinoma suggesting that genetic susceptibility is a factor that contribute to the etiology of the disease. Genetic predisposition might explain such an individual variability that can be predicted by using various cytogenic markers [2]. Regarding the etiopathogenesis of oral squamous cell carcinomas, it is believed that some patients appear susceptible to cancers because of an inherited trait which affects their ability or inability to metabolize carcinogens and/or procarcinogens. Others have an inherited impaired ability to repair the damaged DNA which follows after exposure to the carcinogens. In some others, the susceptibility to cancers may be acquired as in some acquired immune defects. In a few, there are inherited susceptibilities arising from disordered function of the genes controlling the fate of chromosomally damaged cells and the cell cycle tumor suppressor genes and genes involved in cell signalling such as proto-oncogenes and oncogenes [3, 4].

Through decades of scientific research, the palm has attracted great attention as a powerful tool in the diagnosis of medical, psychological and genetic conditions. Dermatoglyphics represent the dermal ridge configuration found on the digits,

palms and soles. They are genetically determined and are influenced by environmental factors that operate before birth. As dermatoglyphic patterns are genetically determined, they remain unchanged from birth to death. It is considered as a window of intrauterine and congenital abnormalities [5].

Unusual palmar ridge configuration has been found to exist not only in patients with chromosomal defect but also in patients with precancerous lesions and cancerous condition. Dermatoglyphic analysis is now beginning to prove itself as an extremely useful tool for preliminary investigations into condition with a suspected genetic basis [6]. The dermatoglyphic features can thus be exploited qualitatively and quantitatively to be “genetic marker” of a disorder. This study was undertaken to study and analyse the finger & palm print patterns of patients with OSCC, healthy individuals (as control group) and patients with habits of using tobacco, alcohol and related habits but without any tobacco induced lesions. It is very true that the patients who have habits are susceptible to oral cancer but for those patients, who develop this dreadful disease without any cause or habit, an attempt can be made to study the palmar dermatoglyphics and intercept the impending disease and this can prove worthy to save lives.

The aims and objectives of the study were to determine if dermatoglyphic patterns have role in identifying individuals at risk of developing oral squamous cell carcinoma. To determine dermatoglyphic findings among patients with oral squamous cell carcinoma, in healthy subjects with or without habits but no evident oral lesions. To analyze whether specific dermatoglyphic patterns exist in patients with oral squamous cell carcinoma.

MATERIAL AND METHODS

The study consisted of 90 subjects both males and females in the age group of 18 – 80 years selected using simple random sampling for (Group–2 and Group–3) subjects and using purposive sampling for (Group–1) subjects. A brief history with clinical intraoral examination was carried out prior to the selection of the subjects. This study comprise of 3 groups:

Group 1 - 30 patients diagnosed with oral squamous cell carcinoma.

Group 2 - 30 individuals with habits of tobacco and / or alcohol consumption but no oral lesions.

Group 3 - 30 healthy individuals with no habits.

Ethical clearance was obtained from the institutional ethical committee to perform this study. A written consent was obtained from the subjects selected to be a part of the study and they were explained in detail about the procedure that will be carried out. A detailed history of habits, medical history, and family history was elicited. Dermatoglyphic data was obtained for Group 2 and Group 3 subjects. Clinical examination was carried out followed by establishing clinical and histopathological diagnosis for Group 1 subjects as per the structural format designed for the study. To enhance the quality of dermatoglyphics prints it was necessary to remove sweat and dirt from the skin. This was accomplished by washing the ridged areas with soap and water followed by drying.

METHOD OF RECORDING DERMATOGLYPHIC PRINTS

The finger and palm prints were taken using black duplicating ink on A4 size paper by ink method. The finger impressions of each of the five fingers, i.e., thumb, index, middle, ring, and little fingers of both the hands were taken. These are referred to as "rolled" impressions because fingers are rolled from one side of fingernail to the other in order to obtain all available ridge detail. The impressions of both the palms are taken without rolling, printing at a 45 degree angle. These are referred to as "plain", "slapped" or "flat" impressions. Thin ink will be uniformly spread over the palm and fingers. Prints of fingertip will be taken followed by that of the palm, on the paper over the table (Figure-1). Once the satisfactory prints are obtained of the fingers and palms the subjects will be instructed to wash their hands with soap and water. Then the finger and palm prints were subjected to qualitative and quantitative analysis.

Fig-1: Showing the palm and finger prints

A) QUALITATIVE ANALYSIS

a) Fingertip patterns could be: 1. Arch (A) 2. Loops (L) 3. Whorl (W)

b) Palmar patterns were studied as:

1. Thenar/First/I1 interdigital area

2. I2, I3 and I4 interdigital area
3. Hypothenar area

B) QUANTITATIVE ANALYSIS
1. Total Finger Ridge Count (TFRC), 2. ab ridge count, 3. ATD angle

The different dermatoglyphic patterns encountered are whorls, loops, arches and their subtypes. These patterns are present on the finger tips/buds, whereas the whole of the human palm shows certain other features such as triradii. These are points formed by the convergence of three patterns of ridges. Point A-triradii, it is the point present below the index finger. Point B-triradii is the point present below the middle finger. Point D-triradii is the point present below the little finger. Point T-triradii present in the thenar area. The word 'hypothenar' refers to the prominent part of the palm of the hand above the base of the little finger - but below the 'upper transverse crease'. The most common variations of the basic types: whorl, loop, tented arch and arch (including 3 types of 'hypothenar whorls') which are present in this area.

Quantitative analysis of dermatoglyphic pattern includes ridge counting. It is used to indicate the pattern size. The counting is done along a straight line connecting the triradii point to the point of core. The ridge count most frequently obtained is between triradii a and b, and is referred to as the a-b ridge count. The ATD angle is a dermatoglyphic trait formed by drawing lines between the triradii below the first and last digits and the most proximal triradii on the hypothenar region of the palm.

Measurement of the ATD angle involves locating three triradii and then measuring the angle between these points. Locating and marking a, d and t triradii on the print, and drawing straight lines from a to t and from d to t. (Figure-2).

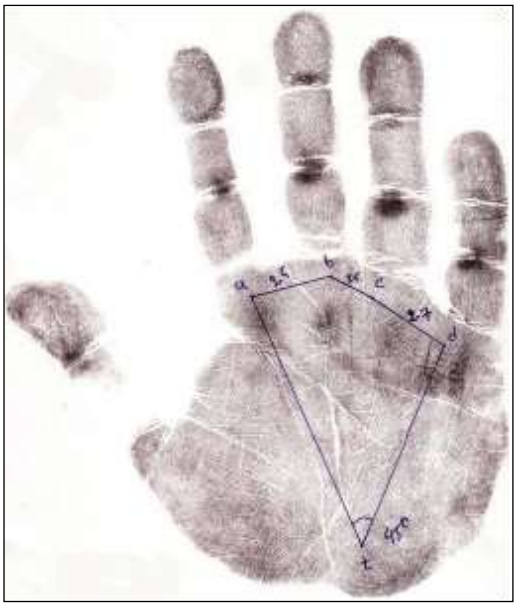

Fig-2: Measurement of ATD angle

The statistical analysis was done using the SPSS version 16 statistical software package. Data were collected, tabulated and then subjected to the statistical analysis using Descriptive analysis, Cramer's Test, One way ANOVA and t - test.

RESULTS

The results obtained and the observations are as follows. Finger ridge pattern - Patients with oral squamous cell carcinoma had 11 arches, 194 loops and 95 whorls. Patients with habits had 46 arches, 76 loops and 178 whorls. Patients without habits had 50 arches, 85 loops and 165 whorls. Patients with OSCC had 64.67% loops, 31.66% whorls, 3.6% arches. That represents patients with squamous cell carcinoma had higher percentage of loops as compared and patients with habits and patient without habits. Patient with habits had higher percentage of whorls as compared to patients with OSCC and patient without habits. Patient without habits that are control group had higher percentage of whorls as compared to patient with OSCC. Chi square test result was 126.03. P value was 0.001 which is significant **(**Table-1).

Table-1: Frequency of finger ridge pattern

	ARCHES	**LOOPS**	**WHORLS**	**X^2**	**P**
OSCC	11 (3.66%)	194 (64.66%)	95 (31.66%)	126.03	< 0.001
Patients with habits	46 (15.33%)	76 (25.33%)	178 (59.33%)		
Patients without habits	50 (16.66%)	85 (28.33%)	165 (55.0%)		

Frequency of hypothenar pattern in patients with oral squamous cell carcinoma was 23 (76.6%) on right hand and 22 (73.3%) on left hand. Frequency of hypothenar pattern in patients with habits on right hand was 24 (80.0%) and on left hand was 24 (80.0%) and in patients without habits had frequency of 23 (76.66%) on right hand and 23 (76.66%) on left hand. Chi- square test gave a result of 0.015 and P value is 0.99 which is not significant (Table-2).

Table-2: Frequency of hypothenar pattern

	OSCC (n=30)	Patients with Habits (n=30)	Patients without habits (n=30)	X^2	P
RIGHT	23 (76.6%)	24 (80%)	23 (76.66%)	0.015	0.99
LEFT	22 (73.3%)	24 (80%)	23 (76.66%)		

Frequency of I1 pattern in patients with oral squamous cell carcinoma is 28 (93.33%) on right hand and 29 (96.66%) on left hand. In patients with habits frequency of I1 pattern was 28 (93.33%) on right hand 22 (73.33%) on left hand. In patients without habits frequency of I1 pattern was 27 (90.0%) on right hand and 25 (83.33%) on left hand. Chi square statistics was 0.05373 and P value was 0.7759 which is not significant.

Frequency of I2, I3, I4 patterns in patients with oral squamous cell carcinoma was 23 (34.85%) on right hand, 26 (35.14%) on left hand. Frequency in patients with habits was 25 (37.88%) on right hand and 27(36.49%) on left hand. In patients without habits it was 18 (27.27%) on right hand and 21 (28.38%) on left hand. Chi square statistics was 0.0343 and P value was 0.9829 which was not significant.

AB ridge count - In patients with oral squamous cell carcinoma mean ab ridge count on right hand was 39.40 and 40.97 on left hand. In patients with habits mean ab ridge count on right hand was 40.20 and 40.50 on left hand. In control group it was 40.47 on right hand and 40.60 on left hand. P value of right hand was 0.324 and left hand was 0.775 which is not significant (Table-3).

Table-3: AB ridge count

	Right Hand				Left Hand			
	Mean	SD	F	P	Mean	SD	F	P
OSCC	39.40	2.955	1.143	0.324	40.97	2.671	0.256	0.775
Patients with habits	40.20	2.929			40.50	2.701		
Patients without habits	40.47	2.636			40.60	2.608		

ATD angle - Patients with oral squamous cell carcinoma had mean ATD angle of 42.93 on right hand and 40.70 on left hand. Patients with habits had mean ATD angle of 41.57 on right hand and 40.13 on left hand. In patients without habits it was 41.97 on right hand and 40.23 on left hand. P value for right hand is 0.115 and left hand is 0.460 which is not significant (Table-4).

Table-4: ATD angle

	Right Hand				Left Hand			
	Mean	SD	F	P	Mean	SD	F	P
OSCC	42.93	2.651	2.221	0.115	40.70	2.168	0.782	0.460
Patients with habits	41.57	2.417			40.13	1.737		
Patients without habits	41.97	2.671			40.23	1.675		

Mean total finger ridge count in patients with oral squamous cell carcinoma was 167.63. In patients with habits mean TFRC is 169.97and in patients without habits it is 169.60. P value is 0.073 which is not significant (Table-5).

Table-5: Total Finger ridge count

	Mean	SD	F	P
OSCC	167.63	5.203	2.694	0.073
Patients with habits	169.97	1.974		
Patients without habits	169.60	4.651		

DISCUSSION

Oral cancer holds the eighth position in the cancer incidence ranking worldwide, with epidemiologic variations between different geographic regions. It is the third most common malignancy in south-central Asia [7]. Tobacco use and alcohol consumption are the key established risk factors for premalignant disorder (PMD) and oral cancer. Of all the individuals who use tobacco only few are susceptible to premalignant disorders and oral cancer. These variations in the occurrence of the condition with the habit of smoking, alcohol could be related to the genetic susceptibility of the individual. Thus, susceptibility factors must play a role in at least some cases, but little attention has been paid to this. Because of the inability to

metabolise carcinogens or pro-carcinogens and repair the DNA damage, some individuals appear to be more susceptible to cancer. Whereas there are a group of people who have an inborn error of repairing the DNA damage. Therefore, there is a need to develop markers which are genetically determined. This genetic determination could also be related to the dermatoglyphic pattern which is also genetically determined and least changed by the environment. These patterns are unique for every individual and even it is dissimilar in monozygotic twins. Genome-wide association studies (GWAS) have successfully identified disease susceptibility loci to various complex diseases [8].

Once the finger prints are formed they do not change till death. Moreover, the differentiation of oral structures also occurs at the same time. Carter and Matsunaga have postulated that abnormalities in dermal ridges can only appear when the combination of hereditary and environmental factors exceed a certain level [9]. Dr. Harold Cummins in 1936 has proved certain unique consistent dermatoglyphic changes in several children with Down's syndrome that were absent among controls. This earth-shattering discovery helped to move the budding science of dermatoglyphics from a place of obscurity to being acceptable as a diagnostic tool among medical personnel. Since then widespread interest in epidermal ridges developed in medical field since it became apparent that many patients with chromosomal aberrations had unusual ridge formations. Inspection of skin ridges therefore seemed promising, simple, inexpensive means for determining whether a given patient had a particular chromosomal defect. It is suggested that many genes which take part in the control of finger and palmar dermatoglyphic development can also give indication to the development of premalignancy and malignancy. Hence identifying persons at high risk for Oral squamous cell carcinoma could be of great value to decrease the incidence of the future risk of oral cancer.

Considering the high mortality and high morbidity rate due to oral cancer in India, we planned to determine any specific palmar dermatoglyphic patters exist in patients with oral squamous cell carcinoma so that an attempt can be made to study the palmar dermatoglyphics and intercept the impending disease and this can prove worthy to save lives. In the era of non-invasive diagnostic methods palmar dermatoglyphics can be used as an effective tool in determining the high risk individuals, as it is a non-invasive and economic method.

In the present study the palmar and finger prints were analysed qualitatively and quantitatively. Comparative evaluation was done between the 300 finger prints of patients with OSCC and 300 finger prints of patients with habits, and 300 finger prints in healthy patients without habits as control group and it was found that Loops were found with increased frequency in patients with OSCC. Elluru Venkatesh *et al*., found that arches and loops were more frequent in patients with OSCC than in controls whereas whorls were more frequent in control group which is similar to present study [10].

The dermatoglyphic patterns studied in the hypothenar areas of both the hands in the two study groups showed no significant differences. The most commonly observed hypothenar pattern was arch ulnar, which was equally distributed in the two groups and was statistically insignificant. This is similar to study done by Vishwas D. Kadam *et al*., [11], Atasu and Telatar 1968 found that there was no significant difference between the two groups in the patterns of the right and left thenar and hypothenar areas in patients with OSCC and controls.

The dermatoglyphic patterns studied in the I2, I3, and I4 area patterns in both hands showed a decreased frequency of loops in patients with OSCC as compared to the control group. This is similar to study done by Vishwas D. Kadam *et al*., [11]

The quantitative analysis which included the total finger ridge count, AB ridge count and the ATD angle were found to be statistically not significant

Considering the high mortality and high morbidity rate due to oral cancer in India, we planned to determine whether any specific palmar dermatoglyphic patters exist in patients with oral squamous cell carcinoma so that an attempt can be made to study the palmar dermatoglyphics and intercept the impending disease and this can prove worthy to save lives. In the era of non-invasive diagnostic methods palmar dermatoglyphics can be used as an effective tool in determining the high risk individuals, as it is a non-invasive and economic method.

CONCLUSION

Our study confirms that there is a qualitative variation in the finger ridge patterns in patients with OSCC as compared to patients with habits and patient without habits. Though there exist a lot of limitations for study dematoglyphics could be used as an effective tool in determining the high risk individuals for OSCC, as it is a non-invasive

and economic method. It can also be used as an education tool to motivate the patient to quit the habit early thus avoiding the future risk of cancer.

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