



## **Analysis of digital and Palmar dermatoglyphic pattern in individuals with oral squamous cell carcinoma**

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### **ABSTRACT**

*Oral cancer is one of the leading cause of death now a days. All the persons having deleterious habits do not suffer from this condition. This is possibly because of genetic predisposition in some individuals. The present study aimed to assess the correlation between the digital and palmar dermatoglyphics pattern in individuals with Oral Squamous Cell Carcinoma and to compare them with healthy normal individuals. Participants for the study were enrolled among the patients reporting to the outpatient department of Oral Medicine and Radiology, SGT Dental College and Hospital, Gurugram. Patients were allocated in the following groups. Group 1- 30 patients with OSCC confirmed histopathologically. Group 2- 30 patients with no adverse oral habits and without any oral lesions. Fingerprint patterns analysed were simple and tanted arch, ulnar and radial loops, simple, compound, composite and accidental whorl. In the present study, on qualitative analysis of dermatoglyphics patterns whorl pattern was predominant among the patients with OSCC followed by loop in study group with a p value 0.0001 and equal frequency of loop and whorl pattern was observed in control group with a p value 0.0001 calculated using chi square test which was statistically significant. When individual fingers of both right and left hand were analyzed in control and study group, pattern in right hand ring finger was predominantly whorl type of pattern with p value 0.012 which was statistically significant. On quantitative analysis of the right and left ATD angle and TFRC using mannwhitney u test it was found that ATD angle was higher and TFRC was lower in OSCC groups with a p value <0.05 which was statistically significant. Dermatoglyphics in OSCC have few important parameters that would help us to find out an individual with or having risk for developing OSCC. So at the time of clinical examination high risk subjects can be identified and certain preventive measures can be instituted at the earliest by observing the fingerprints patterns.*

**Keywords:** Dermatoglyphics, OSCC, preventive, analysis, adjunct

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### **INTRODUCTION**

Oral Cancer consists of group of tumors that affect any area of the oral cavity, pharynx, and salivary glands. Most dangerous thing about this neoplasm is that it cannot be noticed in the early stages. Common sites where OSCC arises are the tongue, lips, and floor of the mouth [1]. Dermatoglyphics is the study of epidermal ridges and their patterns. It is introduced by Dr. Harlod Cummins who is known as the father of fingerprint analysis. It is the study of naturally occurring patterns of the surface of hands and feet. The first person who used this technique in India was William Herschel in the year 1958 who used it for identification of criminals. Major advantage of finger print patterns and configurations is that they are fully developed at birth and are not affected by age and environment. Scanning or recording of patterns is quick, cheap, and convenient. There are various dental conditions in which finger prints pattern were analysed earlier that includes dental caries, oral cancer, bruxism, malocclusion, anomalies of teeth, periodontal disease and dental fluorosis [2-4].

Patient can be convinced easily for this procedure as it is a chair side procedure which is cost effective and non invasive. It can also be used as an educational tool because by analysis of fingerprint patterns dentist can educate the patient about oral cancer and early identification of this disease improved the prognosis. The present study was therefore undertaken to assess the correlation between the digital and palmar dermatoglyphics pattern in individuals with Oral Squamous Cell Carcinoma and to compare the patterns of these diseases with the control group.

### **MATERIAL AND METHODS**

Participants for the study were enrolled among the patients reporting to the outpatient department of Oral Medicine and Radiology, SGT Dental College and Hospital, Gurugram. The approval from the

institutional ethical committee was obtained before starting the study. The study protocol was explained to the patient and a written informed consent was taken. Patients were selected after screening and the patients with OSCC were evaluated after fulfilling the inclusion and exclusion criteria designated for the study. Patients were allocated in the two groups. Group 1 had 30 patients with OSCC which were confirmed histopathologically and Group 2 had 30 patients with no deleterious oral habits and without any oral lesions. Inclusion criteria for Group 1 were patients with deleterious habits and OSCC confirmed histopathologically, patients with age group between 30 to 70 years and patients who had given willing consent for the study. Inclusion criteria for Group 2 were patients without any deleterious habits, patients with age group between 30 to 70 years and patients who had given willing consent for the study. Exclusion Criteria for Group 1 and Group 2 were patients undergoing treatment for oral carcinoma, patients having any syndrome or abnormalities and patients with injury to digits. Fingerprints were obtained with the help of ink using Cummins and Midlo method. After recording fingerprints, the ink was removed with oil, soap and water.

**Qualitative analysis includes** analysis of fingertip patterns. A total of 8 patterns were analysed. Fingertip patterns analysed were simple and tented arch, ulnar and radial loops, simple, compound, composite and accidental whorl. Quantitative analysis includes analysis of TFRC and ATD angle.

### **STATISTICAL ANALYSIS**

Data was analysed using (SPSS) version 21, IBM Inc. Shapiro-Wilk W test was used to analyse the data (p-value was less than 0.05). Mann Whitney U test was used for comparison of two or more groups. Chi square was used for categorical variables. A level of  $p < 0.05$  was considered statistically significant.

### **RESULTS**

In the present study, whorl pattern was predominant among the patients with OSCC followed by loop as compared to control group with a p value = 0.0001 calculated using chi square test which was statistically significant  $< 0.05$ .

Table 1 and graph 1 showed dermatoglyphics pattern in patients with oral squamous cell carcinoma. The patterns which we found frequently in study group was whorl [49.70%] followed by loop [47.30%]. The frequency of fingerprints patterns in OSCC patients was ulnar loop [47.30%], central pocket whorl [20.70%], plain whorl [14.70%], double loop whorl [13.30%], tented arch [2.00%], simple arch [1.00%] and accidental whorl [1.00%].

Table 2 and graph 2 showed dermatoglyphic patterns in healthy subjects. We had found equal frequency of loop and whorl pattern in control group. The frequency of patterns was radial loop [47.70%] followed by central pocket whorl [18.00%], double loop whorl [14.30%], plain whorl [13.70%], accidental whorl [1.70%], tented arch [3.70%], simple arch [1.00%].

Table 3 and graph 3 showed distribution of dermatoglyphic patterns in two groups [Qualitative analysis]. The patterns which we found frequently in study group was whorl followed by loop. We had found equal frequency of loop and whorl pattern in control group. The frequency of arch pattern was least reported in both groups with higher being reported in control group as compared to study group.

When individual fingers of both right and left hand were analysed for whorl, loop and arch pattern in control and study group, pattern in right hand ring finger with a p value 0.012 calculated using chi square test was significant with predominant whorl type of pattern.

Table 4 and graph 4 showed distribution of dermatoglyphic patterns in right hand ring finger of two groups. The pattern which was more common in OSCC was plain whorl and normal patients was central pocket whorl with a p value 0.012 calculated using chi square test which was statistically significant.

Table 5 and graph 5 showed Comparison of ATD and TFRC between two groups [Quantitative analysis]. The right and left ATD angle (palm) was compared using mannwhitney u test. The difference was found to be significant with higher being reported in OSCC groups. The TFRC was compared using mannwhitney u test. The difference was found to be significant with lower being reported in OSCC groups.

### **DISCUSSION**

OSCC is one name that conjures fear and holds an very inflated ranking as a killer. It is a prevalent disease linked with significant morbidity and mortality. Dermatoglyphics is a subfield of genetics dealing with the study of skin ridge system. Because most of the investigations required to confirm the diagnosis of an oral cancer are complex and expensive dermatoglyphic can be efficiently used as a screening tool along with clinical signs and symptoms in identifications of a disease. The dermatoglyphic analysis is now starting to prove itself as an useful tool for diagnosing conditions with a suspected genetic basis [5, 6].

In our study on analysis of the dermatoglyphics pattern in study group whorl pattern was predominant among the patients with OSCC followed by loop as compared to control group with a p value 0.0001 calculated using chi square test which was statistically significant as depicting in Table 1 and graph 1. The

frequency of fingerprints patterns in OSCC patients was ulnar loop [47.30%], central pocket whorl,[ 20.70%], plain whorl[14.70%] , double loop whorl[13.30%], tented arch[2.00%], simple arch[1.00%] and accidental whorl[1.00%].

Patil *et al* 2017 did a study on dermatoglyphics in subjects with oral cancer and observed that the whorl pattern was increased in frequency followed by arch pattern [7]. Ganvir *et al* 2014 in their study showed intriguing results by observing an increased frequency of whorl type of fingerprint pattern in subjects with OSCC than in control groups [8]. Kumar *et al* 2014 conducted a study on palmer dermatoglyphics and concluded that there was a marked decrease of tented arches, ulnar and radial loops, and an increase of simple whorls in PMD subjects in appraisal with normal individuals [9]. Another study by Venkatesh *et al* 2006 showed 70 %whorls and 6.30 % loop type of fingerprints in OSCC patients [10]. Abbasi *et al* 2005 observed that increase frequency of whorl was associated with increased breast cancer [11].

Smitha *et al* 2021 carried out a study on OSCC patients and concluded that OSCC patients had higher percentage of loops as compared to patients with habits and without habits [12]. Patients with loops had higher chances of occurrence of OSCC. Roy *et al* 2021 showed similar results [13]. Another study by Karthik *et al* 2020 stated that OSCC revealed higher incidence of loop patterns followed by whorl pattern [14]. Sharma *et al* 2020 did a study and concluded that in cancer patients the most common pattern seen was ulnar loop followed by single loop whorl in the study group [15]. Study done by Vaishali *et al* 2020 showed that arches and loops were more frequent in cases than in controls whereas whorls were more frequent in control group.<sup>16</sup>According to Gupta *et al* 2013 OSCC showed similar results with increase in frequency of arch & ulnar loops on finger tips, decrease in frequency of whorl patterns on fingertips [17].

On analysis of the dermatoglyphics pattern of healthy subjects we have found equal frequency of loop and whorl pattern in control group as compared to study group with p value 0.0001 calculated using chi square test which was statistically significant as depicting in Table 2 and graph 2. In contrary to the study conducted by Singh *et al* 2017 in healthy control group there was increased frequency of loops as compared to study group [18]. Smitha *et al* 2017 concluded that healthy subjects had more whorl pattern [12]. Ghosh *et al* 2017 carried out a study in 100 patients which were divided equally into Group A (Control group) and Group B (Study/Oral squamous cell carcinoma group). In Group-A, the fingerprint pattern found maximum was whorl (54.5%) whereas minimum was radial loop (1.1%).<sup>19</sup>Vijayaraghavan *et al* 2015 carried out a study and observed that predominant dermatoglyphics pattern in control group was whorls (35.5%) and loops(18.8%) as compared to arches [20].

In comparison to whorl and loop, the arch pattern was 3% in study group and 4.70 % in control group with a p value >0.05 which was not significant.

On comparison of patterns between group 1 and group 2 patients, patterns which we found frequently in study group was whorl followed by loop. We had found equal frequency of loop and whorl pattern in control group. The frequency of arch pattern was least reported in both groups with higher being reported in control group as compared to study group as depicting in Table 3.

When individual fingers of both right and left hand were analysed in control and study group, pattern in right hand ring finger was whorl type of pattern with a p value 0.012 calculated using chi square test was statistically significant as depicting in Table 4.

In the present study, quantitative analysis of the right and left ATD angle (palm) and TFRC was done using mannwhitney u test as depicting in Table 5 and graph 5. On comparing right and left ATD angle between study and control group the difference was found to be significant with p value 0.032 and 0.021 respectively. It was concluded that higher ATD angle was reported in OSCC groups. Our result was congruent with Karthik *et al* 2020 which showed that patient with OSCC had the highest value of ATD angle [14]. According to Kadam *et al* 2016 the mean ATD angle was slightly larger in patients with OSCC than in control group [21]. On the contrary, Smail *et al* 2020 stated that ATD angle was lower in subjects without adverse habits and potentially malignant disorders [22]. On quantitative analysis of comparison of total finger ridge count between the two groups in the current study it revealed that the difference was found to be significant with p value 0.012 with lower being reported in OSCC group. On the contrary, Smail *et al* 2020 stated that total ridge count was found to be higher in oral carcinoma in comparison with controls [22]. According to Singh *et al* 2017 there was an increase in the total finger ridge count in OSCC which was not congruent with our study [18]. According to Jatti *et al* [23] there was an increase in the total finger ridge count in patients with OSCC as compared to control groups which was also not congruent with our study.

**Table 1 : Analysis of dermatoglyphics pattern in patients with oral squamous cell carcinoma [Qualitative analysis]**

		SCC
PW: PLAIN WHORL	N	44
	%	14.70%
DLW:DOUBLE LOOP WHORL	N	40
	%	13.30%
AW: ACCIDENTAL WHORL	N	3
	%	1.00%
CPW:CENTRAL POCKET WHORL	N	62
	%	20.70%
RL:RADIAL LOOP	N	0
	%	0.00%
UL:ULNAR LOOP	N	142
	%	47.30%
TA:TENTED ARCH	N	6
	%	2.00%
SA:SIMPLE ARCH	N	3
	%	1.00%
Total	N	300
	%	100.0%

**Table 2 Analysis of dermatoglyphic patterns in healthy subjects [Qualitative analysis]**

		NORMAL
PW: PLAIN WHORL	N	41
	%	13.70%
DLW:DOUBLE LOOP WHORL	N	43
	%	14.30%
AW: ACCIDENTAL WHORL	N	5
	%	1.70%
CPW:CENTRAL POCKET WHORL	N	54
	%	18.00%
RL:RADIAL LOOP	N	143
	%	47.70%
UL:ULNAR LOOP	N	0
	%	0.00%
TA:TENTED ARCH	N	11
	%	3.70%
SA:SIMPLE ARCH	N	3
	%	1.00%
Total	N	300
	%	100.00%

**Table 3: Distribution of dermatoglyphic patterns in two groups [Qualitative analysis]**

		SCC	NORMAL	
PW: PLAIN WHORL	N	44	41	85
	%	14.70%	13.70%	14.2%
DLW:DOUBLE LOOP WHORL	N	40	43	83
	%	13.30%	14.30%	13.8%
AW: ACCIDENTAL WHORL	N	3	5	8
	%	1.00%	1.70%	1.3%
CPW:CENTRAL POCKET WHORL	N	62	54	116
	%	20.70%	18.00%	19.3%
RL:RADIAL LOOP	N	0	143	143
	%	0.00%	47.70%	23.8%
UL:ULNAR LOOP	N	142	0	142
	%	47.30%	0.00%	23.7%
TA:TENTED ARCH	N	6	11	17
	%	2.00%	3.70%	2.8%
SA:SIMPLE ARCH	N	3	3	6
	%	1.00%	1.00%	1.0%
Total	N	300	300	600
	%	100.0%	100.00%	100.00%
CHI SQUARE VALUE	287.737			
P VALUE	0.0001*, SIG			

**Table 4: Distribution of dermatoglyphic patterns in right hand ring finger of two groups**

				Total
		SCC	NORMAL	
PW: PLAIN WHORL	N	14	10	24
	%	46.7%	33.3%	40.0%
DLW:DOUBLE LOOP WHORL	N	1	1	2
	%	3.3%	3.3%	3.3%
CPW:CENTRAL POCKET WHORL	N	3	14	17
	%	10.0%	46.7%	28.3%
UL:ULNAR LOOP	N	12	4	16
	%	40.0%	13.3%	26.7%
TA:TENTED ARCH	N	0	1	1
	%	0.0%	3.3%	1.7%
Total	N	30	30	60
	%	100.0%	100.00%	100.00%
CHI SQUARE VALUE		12.784		
P VALUE		0.012*, SIG		

**Table 5: Comparison of ATD and TFRC between two groups [Quantitative analysis]**

	GROUP	N	Mean	Std. Deviation	Z VALUE	P VALUE
RIGHT ATD ANGLE (PALM)	SCC	30	44.93	5.265	-2.141	0.032*, SIG
	NORMAL	30	42.30	4.458		
LEFT ATD ANGLE (PALM)	SCC	30	46.000	5.9770	-2.306	0.021*, SIG
	NORMAL	30	42.633	5.3012		
TFRC : TOTAL FINGER RIDGE COUNT	SCC	30	108.433	13.5816	-2.515	0.012*, SIG
	NORMAL	30	119.700	26.4538		

**CONCLUSION**

Usually, dermatoglyphic patterns can be seen with the unaided eye. Given that OSCC have a genetic basis, people who are predisposed to developing these lesions should avoid the trigger events by understanding their dermatoglyphic patterns. Dermatoglyphics are important for identifying persons who have a hereditary predisposition to particular diseases, not for making diagnoses. It acts as an auxiliary diagnostic tool that can be regularly used in dental clinics to identify the group that is more at risk.

**FUTURE SCOPE OF THE STUDY**

1. Study can be done on patients with bigger sample size.
2. Samples to be taken from different geographic distribution to find out the impact of area/ geography on dermatoglyphic patterns.
3. Different methodology which includes ways of digitalization for recording dermatoglyphic patterns.
4. Use of various digital applications so that we can conclude more number of individuals as a part of our study group.

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