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Original Article

Digital Dermatoglyphics- A New Approach in Early Detection of Oral Cancer

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ABSTRACT:
Introduction: Cancer is a curse to modern society which increasingly expanding its dangerous claws day by day upon the human race. Among different cancers oral cancer ranks fifth in the global perspective of cancer burden.The study of the ridged skin patterns is called dermatoglyphics and one very important part of dermatoglyphics is "Fingerprint Patterns". **Materials & Methods:** A total of 100 patients were divided equally into Group A (Control group) and Group B (Study/Oral squamous cell carcinoma group). Then the fingerprints of each individual had been recorded via Fingkey Hamster HFDU06 fingerprint scanner and qualitatively analysed by Nitgen Fingerprint Detector Software. The patterns were divided into 5 different groups; Arch, Ulnar Loop, Radial Loop, Whorl and Compound. **Results:** In Group-A, the fingerprint pattern found maximum was Whorl(54.5%) whereas minimum was Radial loop (1.1%). In Group-B, the fingerprint pattern found maximum was Ulnar loop (45.4%) whereas minimum was Radial loop (2.6%). **Conclusion:** After the qualitative analysis of fingerprints it was observed that the highest prevalence of Whorl type of pattern in Control or Healthy group and Ulnar Loop in oral squamous cell carcinoma (OSCC) group. Thus people with more Ulnar Loop pattern may have high risk to develop oral squamous cell carcinoma more.
Key Words: Oral squamous cell carcinoma, Digital Dermatoglyphics, Arch, Whorl, Ulnar loop, Radial loop, Compound, Early detection

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INTRODUCTION:

Cancer is a dreadful disease, which results in the leading causes of morbidity and mortality worldwide. Oral cancer is one of the most prevalent types of cancer leading to most common causes of death. Oral Carcinomas are among ten most common cancers in the world accounting for 3-5% of all malignancies. But in recent years, it has been steadily increasing and nowranks fifth in the global perspective of cancer burden. In India oral cancer ranks first and third among all cancers in men and women respectively. Most common malignant tumors of oral cavity are Squamous cell carcinoma followed by adenocarcinoma and rarely other types of malignant tumours.Oral squamous cell carcinoma (OSCC) is the fourth leading cancer behind pulmonary, breast and colonic carcinoma, and the eighth leading cause of cancer related death worldwide. Oral squamous cell carcinoma accounts for up to 50% of malignant tumors in Asian countries especially very common in India, Pakistan and Taiwan.[1]
Although histologic examination of tissue from a biopsy is the Gold standard for diagnosing oral cancer but with all cancers early detection is the key to successful treatment and reduction in morbidity.[2]
There are some contemporary methods for early detection of cancer also exists, such as, ABO blood groups, Palmer, sole prints and Fingerprints analysis. The palms and soles of all primates bear ridged skin. The study of the ridged skin patterns is called dermatoglyphic. It is a relatively new science, which involves the study of fine patterned dermal ridges on digits, palms and soles of all primates. Cummins and Midlo (1926) coined the term dermatoglyphic (derma = skin; glyphic = carvings).[3]
Fingerprint patterns do not change or alter with any severity of condition of disease and remains immutable during lifetime as stated by Cherrill FR (1954)[4] and fingerprints are permanent and cannot be changed with time which is postulated by Sir Francis Galton (1892).[5]
Most dermatoglyphic traits develop *in utero* during 17-24 weeks and remain unchanged during an individual's lifetime. Unusual dermatoglyphics may indicate gene or chromosomal abnormalities consistent with diseases such as oral precancer and cancer.[6]

The current state of medical dermatoglyphic is such that the diagnosis of some illnesses can now be done on the basis of dermatoglyphic analysis aloneand currently, several dermatoglyphic researchers claim a very high degree of accuracy in their prognostic ability from the features of the hands.[7]

MATERIALS AND METHODS:

The present study was undertaken to study and compare the finger print patterns of patients with Oral Squamous Cell Carcinoma (OSCC) and healthy individuals (as control group) to determine whether specific dermatoglyphic patterns do exist which would help us in predicting the probability of occurrence of these diseases. From these specific patterns an attempt was made to identify the high risk patients so that, early preventive measures can be instituted in these susceptible individuals in order to prevent occurrence of Oral Precancer and OSCC.

All the subjects were selected for study purpose only after Ethical Committee approved and patient consent form duly signed by all the subjects. The study subjects were drawn from the O.P.D. of Oral Medicine and Radiology Department of Kanti Devi Dental College and Hospital, Shankar Institute of Cancer, Mathura. The total subject were 100 in which 50 belongs to healthy (Control) group (GROUP-A), who did not have any clinical oral lesions. Remaining 50 subjects were grouped into Study group (GROUP-B) comprised of clinically and histologically proved oral squamous cell carcinoma.

Persons with congenital or acquired deformities of fingers, fingerprint Pattern not readable in a patient with Adermatoglyphia, bee sting, scar or wound, plastic surgery, burns or cuts on fingertips; were being excluded from the study.The clinical examination was carried out by adopting methods of Kerr, Ash, Millard (1983)[8] and relevant data were recorded. Guidelines given by Oliver RJ and Sloan P et al(2004)[9] was followed for the biopsy procedure.

Method for taking fingerprint was proposed by Jason Batchelor (2005)[10]. To enhance the quality of dermatoglyphic prints, it is necessary to remove sweat, oil and dust from the skin of fingertip. One by one (starting from right little finger and finishing on left little finger) all the fingertips of the respective fingers to be scanned, had been kept over the scanning surface of Fingkey Hamster HFDU06 fingerprint scanner and this scanner was attached to the computer via USB 2.0 port. Then using the NITGEN FINGERPRINT DETECTER SOFTWARE; the fingerprint was recorded and then saved in the computer as Windows Bitmap Image (BMP). (Figure-1)

Analysis of fingerprint images were done by following the classification given by Galton (1892)[11,12]and modification proposed by Henry (1937) [11,12]. Thus the fingerprints were being divided into 5 different groups; Arch, Ulnar Loop, Radial Loop, Whorl And Compound.(Figure-2)

STATISTICAL ANALYSIS:

The data thus obtained was analysed using SPSS Software (Statistical Package for Social Science) version 17 for windows. Comparisons of the mean values were carried out using unpaired student's t-test and one-way annova test. A P-value less than 0.05 were considered statistically significant.

RESULTS:

Number, Mean with SD of Fingerprint patterns among all the groups showed that in Group-A, the fingerprint pattern found maximum was Whorl of 545 (54.5%) whereas minimum was Radial loop of 11 (1.1%). In Group-B, the fingerprint pattern found maximum was Ulnar loop of 227 (45.4%) whereas minimum was Radial loop of 13 (2.6%). (Table-1)

Comparison of each Fingerprint patterns between the Group-A and Group-B yields that Ulnar loop, Whorl and Compound fingerprint patterns showed statistically highly significant ($P \leq 0.05$) difference, but Arch and Radial loop types were found to be having statistically no significant difference ($P > 0.05$) (Table-2)

Comparison of fingerprint patterns in each group found to be statistically highly significant differences exists ($P = 0.000$) between them. (Table-3)

FIGURE 1: Method for obtaining Fingerprint sample by scanner

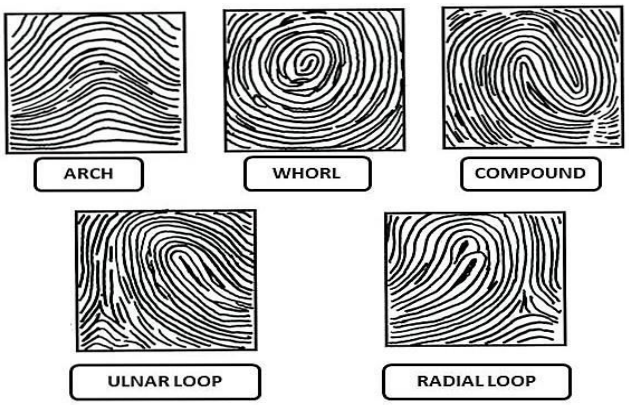

FIGURE 2: Schematic diagrams of different fingerprint pattern

Table 1: Number, Mean with SD of Fingerprint patterns among all the groups

Groups	Type of fingerprints									
	Arch		Ulnar Loop		Radial Loop		Whorl		Compound	
	Number (N)	Mean ± SD	Number (N)	Mean ± SD	Number (N)	Mean ± SD	Number (N)	Mean ± SD	Number (N)	Mean ± SD
Group-A	51 (5.1%)	0.89 ±0.51	341 (34.1%)	3.41 ±2.90	11(1.1%)	0.42 ±0.11	545(54.5 %)	5.45 ±3.33	52(5.2%)	0.98 ±0.52
Group-B	16(3.2%)	0.74 ±0.32	227(45.4 %)	4.56 ±2.50	13(2.6%)	0.48 ±0.24	139(27.8 %)	2.78 ±2.04	105(21%)	2.10 ±1.84

Table 2: Comparison of each Fingerprint patterns between the Group-A and Group-B

	Fingerprint patterns									
	Arch		Ulnar loop		Radial loop		Whorl		Compound	
	Gr-A	Gr-B	Gr-A	Gr-B	Gr-A	Gr-B	Gr-A	Gr-B	Gr-A	Gr-B
Total	51	50	341	462	11	17	545	290	52	181
Mean ±SD	0.89 ±0.51	1.35 ±0.5	3.41 ±2.90	4.63 ±2.50	0.42 ±0.11	0.42 ±0.16	5.45 ±3.33	2.9 ±2.25	0.98 ±0.52	1.81 ±1.75
P-value	0.951 (N.S.)		0.002 (H.S.)		0.403 (N.S.)		0.000 (H.S.)		0.003 (H.S.)	

*(Note:- N.S.= Not Significant; H.S.= Highly Significant)

Table 3: Comparison of Fingerprint patterns in all the groups

Groups	Fingerprint patterns (Mean ±SD)					P-value
	Arch	Ulnar loop	Radial loop	Whorl	Compound	
Group-A	0.89 ±0.51	3.41±2.90	0.42 ±0.11	5.45±3.33	0.98 ±0.52	0.000 (H.S.)
Group-B	1.75 ±0.68	4.70±2.53	0.34 ±0.08	3.02±2.46	1.62 ±1.52	0.000 (H.S.)
Group-C	0.74 ±0.32	4.56±2.50	0.48 ±0.24	2.78±2.04	2.10 ±1.84	0.000 (H.S.)

*(Note: - H.S.= Highly Significant)

DISCUSSION:

Oral cancer ranks fifth in the global perspective of cancer burden. In India oral cancer ranks first and third among all cancers in men and women respectively. Most common malignant tumors of oral cavity are Squamous cell carcinoma.[13]

The researchers are always in search for an easy way to diagnose oral cancer and not only that they are also trying to find out method(s) of early diagnosing. However many methods for early detection of cancer exists but among them dermatoglyphics is found to be noninvasive as well as very easy to perform.[14]The study of the ridged skin patterns is called dermatoglyphic. Unusual fingerprint pattern(s) may indicate gene or chromosomal abnormalities consistent with diseases such as oral cancer.[15]

Taking all the aspects into consideration we had undertaken the present study to reveal the early diagnosis of oral squamous cell carcinoma by qualitatively comparing the fingerprint patterns of oral precancerous and oral squamous cell carcinoma patients with healthy individuals and also assess the high risk patients, so that early preventive measures can be undertaken in the susceptible individuals.

Predominance of fingerprint pattern in this control or healthy group was Whorl type with 54.5% (545 numbers) and minimum was Radial loop with 1.1% (11 numbers). Our observation is in consistent with studies conducted by Venkatesh E et al. (2008)[15]and Agarwal R et al (2011)[16], they stated that Whorls were most predominant in the healthy population.

In Group-B the most prevalent fingerprint pattern present in our study was Ulnar loop [45.4% (227)] which is in agreement with Atasu M and Telatar H (1968)[17], Venkatesh E et al (2008)[15]and Chorlton SH (1970)[18]. The Radial loop observed least prevalent [13 (2.6%)] which is in agreement with the study results of Agarwal R et al (2011)[16]. Fuller IC (1973)[19] reported that many genes which take part in the control of finger and palm dermatoglyphic development distinguished precancer and cancer patients from the general population since these genes also predispose to the development of malignancy.

While comparing among the fingerprint patterns in both the groups we found statistically highly significant result ($p \leq 0.05$). This proves the variability, uniqueness and individuality of fingerprint patterns in Mathura population. This racial variability of fingerprint patterns were established by Cummins' in his various studies involving different races and populations during 1926-1967.[20]This has also been suggested by Gilligan et al (1985) where a significant correlation between dermatoglyphic and geographic area were found

confirming the biological validity of the social and ethnic criteria.[21]

The Compound type of fingerprint pattern is the one which appeared as combination of any two or more fingerprint patterns (Arch, Ulnar loop, Radial loop and Whorl) or different from any of the above pattern. In our study Compound type of fingerprint pattern found to be more prevalent in OSCC patients. This is in accordance with the study of Bierman et al (1975)[11]. This result highlighted the need of one more fingerprint pattern classification in which all Compound types have to be included, since we were following the old system of classification. In Arch and Radial loop type, we got statistically non-significant ($p>0.05$) result, because these fingerprint patterns were less prevalent in healthy as well as cancer patients. Which is in accordance with study conducted by Venkatesh E et al (2008)[15].

CONCLUSION:

Among different cancers oral cancer ranks fifth in the global perspective of cancer burden. The study of the ridged skin patterns is called dermatoglyphics and one very important part of dermatoglyphics is "Fingerprint Patterns". Fingerprints are known to be unique and unalterable, and hence an excellent tool for population studies, personal identification, morphological and genetic research. Different diseases have different fingerprint patterns associated with them. As the dermatoglyphics are genetically controlled characteristics, any deviation in dermatoglyphic features indicates a genetic difference between the control and study group population. Dermatoglyphics has moved from obscurity to acceptability as a diagnostic tool.

The present study was undertaken to study and compare fingerprint patterns in healthy subjects with oral squamous cell carcinoma patients and analyse any relationship among them.

After the qualitative analysis of fingerprints we observed the highest prevalence of Whorl type of pattern in Control or Healthy group and ulnar loop in oral squamous cell carcinoma (OSCC) group. Lowest prevalence was shown by Radial loop pattern. In all the groups the differences between the fingerprint patterns found to be significant and thus proved the diversity, uniqueness of fingerprint patterns among our study population. We had found out a new type of fingerprint pattern named COMPOUND in our population having a prevalence of fingerprint11.65% of the patterns.

Relationship between the fingerprint patterns and oral squamous cell carcinoma (or any other kind of cancer) lies in their deep rooted genetic dependency to develop. It is suggested that many genes which take part in the control of finger and palmar dermatoglyphics development can also give indication to the development of malignancy. In our study population people with more Ulnar loop has maximum risk of malignant development. But still many nationwide studies should be conducted with larger sample size. Not only that different ethnicity and different population with different geographical areas should be included.

Let us all join our hands to detect and fight against cancer.

REFERENCES:

1. Mayne S, Morse D et al. Cancers of oral cavity and pharynx: Cancer epidemiology and prevention. Oxford University Press 2006:674-96.
2. Silverman S. Early Diagnosis of Oral Cancer.Cancer 1988;62:1796-99.
3. Schaumann B and Alter M. Dermatoglyphics in medical disorders. New York: Springer 1976:22-87.
4. Cherrill FR.The Henry System.The fingerprint system at Scotland Yard Pub:LHMJ Office. 1st ed 1954:13-9.
5. Sarpal A.It's all in the palm of your hand. 11th Annual History of Medicine Days. WA Whitelaw 2002:38-42.
6. Henry ER. Classification and uses of finger prints. 8thed. London: HM. Stationary Office 1937:1-45.
7. Finham J. The development of the study of dermatoglyphics. http://www. johnyfinham.com/history/dermatoglyphics.htm 1992 :31-48.
8. Kerr H, Ash MM et al. Principles of clinical examination. Kerr H, Ash MM, Millard H D. Oral diagnosis. 6th ed. St. Louis Mosby Year Book 1983:77-81.
9. Oliver RJ, Sloan P et al. Oral Biopsies: methods and application.Br Dent J 2004;196(6):329-33.
10. Jason B. Fingerprint Scanners. Anthony Vodacek 2006:1-7.
11. Blanka S and Mitton A. Dermatoglyphics in medical disorders. Newyork Springer Verlag, Berlin 1976:27-87.
12. Rajangam S, Janakiram S et al. Dermatoglyphics in Down's syndrome. J Ind Med Ass 1995;93(1):10-3.
13. Neville BW and Day TA. Oral cancer and precancerous lesions. CA Cancer J Clin 2002;52(4):195-215.
14. Landis SH, Murray MT et al. Cancer Statistics. CA Cancer J Clin 1999;49:8-31.
15. Venkatesh E et al. Palmar dermatoglyphics in oral leukoplakia and oral squamous cell carcinoma patients. JIAOMR 2008;3(20):94-9.
16. Agarwal R, Chowdhary DSet al. Digital dermatoglyphics in head and neck cancer patients. JPMI 2011;25(2):101-5.
17. Atasu M and Telatar H. Cancer and dermatoglyphics. Lancet 1968;20:861.
18. Chorlton SH. Dermatoglyphics, blood-groups and cancer. The Lancet 1970:133-38.
19. Fuller IC. Inherited predisposition to cancer: A dermatoglyphic study. Br J Cancer 1973;28:186-9.
20. Mavalwala J. Harold Cummins-and the birth, growth and development of dermatoglyphics. Am J Phys Anthrop 1975;42:177-82.
21. Gilligan SB, Borecki IB et al. A family study of dermatoglyphic traits in India: A search for major gene effects on palmar pattern ridge counts.Am J PhysAnthropol 1985;68(3):409-16.

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