IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 11 Ver. IV (November. 2016), PP 121-124
www.iosrjournals.org

Analysis of Finger Prints Pattern in Patients with Potentially Malignant Disorders: A Cross-Sectional Study.

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I. Introduction

"Dermatoglyphics", a term coined by Cummins and Midlo in 1926, refers to the branch of genetics dealing with skin ridge system. [1]Dermatoglyphics is not a new science and was established by Galton in the year 1892. [2]

Palmar dermatoglyphics has been, and is being studied in many diseases. It is a well accepted fact now that genetics plays an important role in determination of palmar dermatoglyphic patterns. Oral cancer is one of the leading causes of death due to tobacco, alcohol abuse and unhealthy lifestyles.[3]It is also a known fact that millions of people use tobacco or gutkha, but only a fraction of such people develop oral premalignant lesions and conditions, such as leukoplakia or OSMF. Genetically determined differences among these individuals would probably explain this susceptibility. [4]

Since epidermal ridge pattern are formed early in fetal development and remain unchanged throughout life, unusual dermatoglyphics may indicate underlying genetic and chromosomal abnormalities. Dermatoglyphics is now being widely applied in medical field as an aid for the diagnosis of some illnesses like Diabetes mellitus, schizophrenia, hypertension and epilepsy.[5,6,7]Inspection of skin ridges therefore promised to provide a simple, inexpensive means of information to determine whether a given patient could have a particular chromosomal defect.[8]

Unusual dermatoglyphics now have been associated with congenital defects of both genetic and environmental origin.[9] Schaumann and Johnson noted that dermatoglyphics associated with congenital defects are significant markers of prenatal events. Yet, at present little is known about the atypical developmental processes that have produced these associations. It is known that finger and palm prints are formed during the 6-7th week of the embryonic period and are completed after 10-20 weeks of gestation.[10] Accordingly, an understanding of the prenatal morphogenesis of dermatoglyphic traits is fundamental to our interpretation of their variation and their relationship to birth defects.[11]

Dermatoglyphics offers atleast two major advantages as aid to the diagnosis of medical disorders. First is that the epidermal ridge patterns on the hand and soles are fully developed at birth and thereafter, remain unchanged for life, and second that the scanning of the ridge patterns or recording these permanent impressions can be accomplished rapidly, inexpensively and without any trauma to the patients.[12]

As far as oral potentially malignant disorders are concerned, only a limited data are available regarding the finger print pattern of patients suffering from these disorders. If a peculiar dermatoglyphic pattern of potentially malignant disorders are identified, it will be of immense clinical significance, because it may be used as a marker for development of these disorders among tobacco or gutkha chewers. This will further help in provision of preventive measures to these patients at the earliest. On the other hand it is also practically true that study of complete dermatoglyphics is a matter of high expertise and it may not be feasible to be applied by Dentists themselves on a regular basis. Finger print patterns are relatively easier to analyze and hence it was thought to be used as the main parameter in this study.

Consequently, this study was planned to analyze finger print patterns in patients with potentially malignant disorders.

II. Methodology

Patients for the study were selected from regular outpatient Department of Oral Medicine and Radiology, Sinhgad Dental College & Hospital, Pune after the approval from the institutional research board.

The research group comprised of 90 patients aged 18 years and above. After explaining the purpose of the study to the potential participants, an informed consent was obtained and they were segregated into the following three study groups:

Group I: Thirty normal individuals without any tobacco/gutkha chewing habit and lesion

Group II: Thirty healthy individuals with habit of tobacco/gutkha chewing

Group III: Thirty individuals with tobacco/ gutkha chewing habit, with clinical diagnosis of any potentially malignant disorder

A detailed history regarding habit was obtained along with thorough clinical examination, and findings were entered in a pre-designed proforma. The clinically diagnosed cases of oral leukoplakia, pre-leukoplakia and OSMF were confirmed histopathologically and included in the study.The finger prints of individuals with history of tobacco-related habits(smoking/smokeless), pan, betel nut chewing andalcohol consumption (Group II and III), and normal individuals of comparable age group and sex without tobacco-related habits (Group I) were taken for the study. Patients with other causes of oral lesions like cavities, sharp tooth irritation, dentures, aphthous ulcers,etc., were excluded from the study.

Procedure for obtaining prints:

Dermatoglyphic prints were obtained using ink method described by Cummins and Midlo (1961) and as per guidelines by American Association of Dermatoglyphics (Reed T. Meier R. 1990).[13,14]

To obtain a fine quality of dermatoglyphic prints, subjects were asked to wash their hands thoroughly with soap and water followed by drying to remove sweat, oil and dirt from the skin. After thorough washing and drying of hands, sufficient amount of duplicating ink (Black Duplicating Ink by Kores, Bombay) was uniformly spread over the palms and fingers of the patient. Prints of finger tips and that of the palms were then taken on the paper spread over a flat surface.One by one the fingers were placed on a white paper with one lateral edge and then rolled over in the opposite direction. Once the satisfactory prints were obtained, the patient was instructed to wash his hands with soap and water. Then the finger prints were analyzed qualitatively using magnifying glass, ruler and pencil and were recorded in a specially prepared format.Fingertip patterns were studied using qualitative analysis.

Fingertip print patterns were classified as per Galton's Classification[10]into arches (A), Loops (L) and Whorls (W).Patterns on all the 10 fingers in both hands were analyzed. In every subject, the frequency of each pattern was recorded and the percentage of pattern frequency was calculated for the entire group.

All the data collected was sorted, tabulated and analyzed statistically using Frequency Analysis an Chi Square Test.

Observations and Results

Table 1 shows distribution of various finger print patterns in normal patients, patients with habit but no lesion and patients with pre-leukoplakia, leukoplakia and OSMF.When the distribution of various finger print patterns in control group i.e. Group I was studied, it was observed that 9.00% had arches, 38.67% had loops and 52.33% had whorls.In group II that consisted of patients with habit of tobacco/gutkha chewing but no lesion 6.33% had arches, 48.66% had loops and 45.00% had whorls.In group III, i.e. patients with habit of tobacco/gutkha chewing with pre-leukoplakia, leukoplakia and OSMF, 6.00% had arches, 49.00% had loops and 45.00% had whorls.

Various fingerprint patterns in all three groups were compared. In patients with pre-leukoplakia,oral leukoplakia and OSMF there was an increased frequency of arches and loops whereas in control group there was an increased frequency of whorls and loops. *P* value was 0.05, which is statistically quite significant.

III. Discussion

The analysis of dermatoglyphic patterns is now beginning to prove itself as an extremely useful window for diagnosing conditions with a suspected genetic basis.Sir Francis Galton (1892) with his extensive research demonstrated the hereditary significance of fingerprints and biological variations of different racial groups.[14]Oral cancer is one of the common malignancies occurring in the world. In the South-East Asia region, cancers of the mouth and oropharynx are the second leading cause of cancer deaths according to reports from the World Health Organization (WHO).[15]Considering the high prevalence of oral premalignant disorders in our geographical region and also relatively low availability of non-invasive techniques for primary screening of the same, we planned to assess finger print patterns in patients with these disorders and find whether a correlation exists between them and finger print patterns .[16]The considerable influence of lifestyle, habits such as the use of tobacco and alcohol, and the role of diet, on potentially malignant lesions and conditions are well recognized. It is often noticed that several individuals with these habits do not develop Premalignant disorders. Host susceptibility must therefore is speculated to play a role. [17]

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 pre malignancy and malignancy.[18] Hence identifying persons at high risk for oral leukoplakia and OSCC could be of great value to decrease the incidence of the same.

Consequently, individuals with genetic instability might be at a greater risk for developing these lesions. [15,18]As there have been not much literature on this subject, there is still lot of scope for In our study, the finger ridge patterns were observed to find the pattern predominance and it was found that the whorls pattern were predominant in controls (52.33%) when compared with patients with habit but no lesion(45%) and patients with habit diagnosed of pre-leukoplakia ,oral leukoplakia and OSMF (45%) ($P < 0.05$). Loops were more predominant in pre-leukoplakia ,oral leukoplakia OSMF patients (49%) and patients with habit and no lesion(48.66%) when compared with the controls (38.67%) ($P < 0.05$). Arches were found to be in equal percentage in patients with lesion and patients with habit and no lesion (6%) than in control(9%)

However, in patients with habits without lesions, the whorls were less compared with the controls when compared with the patients with pre-malignant lesions and conditions which suggests that these patients are at high risk of oral cancer.One major limitation of this study was smaller sample size and we intend tocontinue the study on a larger sample size.

IV. Conclusion

The results of this study few significant parameters which would help us to identify an individual with or at risk for developing oral leukoplakia and risk oral cancer which further added to the existing importance of dermatoglyphics. This may help us to identify an individual with or at risk for developing oral premalignant disorders, so that high risk individuals can be identified and preventive measures can be taken at the earliest to prevent their occurrence.

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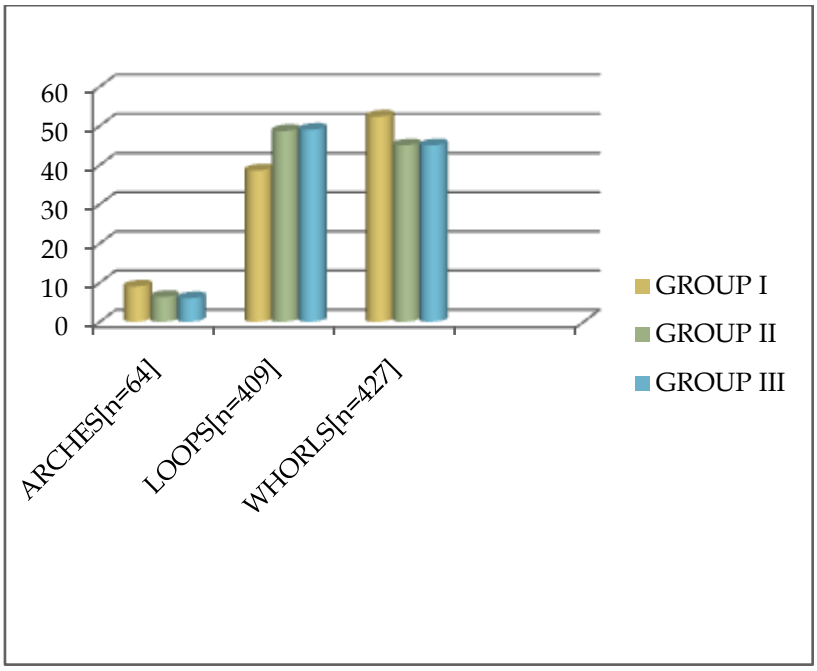
Table 1: Finger print patterns in all the three groups

Pattern	Group I		Group II		Group III	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Arches	27	9.00	19	06.33	18	06.00
Loops	116	38.67	146	48.66	147	49.00
Whorls	157	52.33	135	45.00	135	45.00



Graph 1: Comparative distribution of finger print patterns