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Detection of genetic predisposition in oral Leukoplakia and erythroplakia by quantitative and qualitative analysis of finger print patterns: A Dermatoglyphic study

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Abstract

Background: Dermatoglyphics the study of epidermal ridges on the finger & palmer region of the hand and sole. The finger prints are unique characteristic features of an individual and remain unchanged over lifetime. Most Dermatoglyphics are correlated with genetic abnormalities and are useful in biomedical studies. Precancerous lesion is one of the 10 leading cause of cancers in the world and is amongst the most frequent cancer in India. Genetically determined susceptibility is the most important etiology for Leukoplakia. The present study is conducted to analyse the Dermatoglyphic patterns in precancerous lesion.

Material and methods- The participants were divided in two groups- 100 normalindividual withhabit of smoking or chewing tobacco and 100 patient with potentially malignant lesion havinghabit of smoking or chewing tobacco were selected for the study. A thin layer of black printingink material was applied to finger and palm. Imprints of 5 finger tips were recorded in specified boxes and entire palm imprints were recorded in the middle of the A 4 sheets.

Results and conclusion- The difference in the distribution of thenar crease, distal crease and ATD angle is found to be highly significant in premalignant patient as compared to normal Individual loops were also found to be increased in premalignant lesion. Arches and loops were more frequent in cases than in control whereas whorls pattern are more frequent in control.

Keywords: Dermatoglyphics, Dermal Patterns, Distal Crease, ATD Angle, The Nar Crease.

Introduction

The study of human hands has always been fascinating, not only to the anthropologists and physicians, but also to Psychologists, writers, painters, sages & Chiromancer's. Cummins and Midlo(1926) were the first to coin the term 'DERMATOGLYPHICS' in 1926 1 . It is the science and art of the study of surface markings of the skin, especially feet and hands. (DERM= Skin,GLYPH= Carving) . It is known that the dermal configurations appear at the 12 th week of intra-uterinelife and they are established by the 24 th week. Once completed, the epidermal ridges remain unchanged, except in size, for life. Their variable characteristics are not duplicated in other people not even in monozygotic twins. 2,3,4.

Over the past 150 years, dermatoglyphics has been a useful tool in understanding basic questions in biology, Medicare genetics and evolution, in addition to being the best and most widely used method for personal identification. Thus, the patterns which characterize an

individual may be determined with finality at birth. The inheritance of dermal traits is considered to follow a classical polygenic model 5 (Holt, 1968). Their heridabitilty and polygenic trait have proved useful phenotype to study genetic and heritable disorders, sometimes even superior to stereological markers. 5,6,7

Engler 8 (1982), in his Dermatoglyphics study on breast cancer patients revealed two genes BRCA-1 and BRCA-2 on the q arm of chromosome no. 17 at the 36 th position. Dr. Stowens chief of pathology at St. Luke hospital in Network, claims to diagnose Schizophorenia and Leukemia with 90% accuracy from pattern of hand alone. Unusual ridge configurations have been shown to exist not only in patients with chromosomal defects but also in patients with single gene disorders and in some in whom the genetic basis of the disorder is unclear.

Epidemiological and experimental evidence indicates a causal relationship between tobacco(smoking and non smoking) and oral premalignant lesion ie Leukoplakia, erythroplakia and stomatitis nicotina. However, only a fraction of people exposed to tobacco develop oral Leukoplakia and Erythroplakia. Genetically determined differences among these individuals would explain the susceptibility. This study was undertaken to study Dermatoglyphic patterns in individuals with oral Leukoplakia and erythroplakia, so that individuals with habits and similar patterns can be identified at the earliest and preventive measures can be instituted in these susceptible individuals to prevent the occurrence of oral squamous cell carcinoma.

Materials and Method

A prospective study design was carried out at dept of Periodontology, sarjug dental college,darbhanga and designed to collect the Dermatoglyphic prints of one hundred patient with premalignant lesion having habit of tobacco and one hundred normal individual with habit of chewing or smoking tobacco is undertaken. The patient with cut and wound in the hand are excluded from the study. The materials used in the study were the basic diagnostic instruments for examination and detection of premalignant lesion. For recording the palm print, ink pad, magnifying glass and white sheets of paper were used 9 .

Methodology

The study initiated after obtaining approval from institutional ethics committee. Patient's consent was taken before taking the palmer and plantar impression. All the diagnosed cases of premalignant lesion coming to the department of oral pathology having habit of tobacco and healthy subject accompanying the patient with precancerous lesions were examined. The data was analysed statically by using the student t Test.

Recording of finger tip pattern

Subject hands were cleaned and dried before printing. A thin layer of printing ink was applied to the fingers and palms using black printing ink. Imprints of five fingertips were recorded in specified boxes and entire palm imprint was recorded in the middle of A4 sheet. The same procedure was repeated in relation to other hand. Prints were dried and studying using a magnifying lens to identify the finger and palm pattern. After taking the fingerprints of all fingers and palm, ink was removed by using oil, soap and water.

Evaluation of fingertip pattern configurations

Galton divided the ridge patterns on the distal phalanges of the fingertips into 3 groups.

- Arches
- Loops
- Whorls

Although numerous sub classifications have been subsequently offered, this simple classification is still recognized and used by majority of investigators today.

1) Arches-It is the simplest pattern found on fingertips. It is formed by succession of more or less parallel ridges, which traverse the pattern area and form a curve that is concave proximally. The arch pattern is subdivided into 2 types.

1) Simple arch or plain arch

2) Tented arch

The point of confluence is called a triradius, because ridge usually radiate from this

point in 3 different directions

2) Loops- It is the most common pattern on the fingertip. A series of ridges enter the pattern area on one side of the digit, recurve abruptly and leave the pattern area on the same side. if the ridge open on ulnar side, resulting loop is termed as ulnar loop.

If the ridge opens toward the radial margin, it is called a radial loop.

3) **Whorls-** it is any ridge configuration with two or more triradii. One triradius is on the radial and other on the ulnar side of the pattern.

It is subdivided into 2 types

A) Concentric whorl

b) Spiral whorl.

Interpretation of palmar print

In the palm of a normal individual, three major creases were seen.

1) Distal crease (DC)- originate from the lateral side of the palm and ends in between the pointing finger and the middle finger.

2) Proximal thenar crease (PC)- originates from the hypothenar region and ends in between the thumb and pointing finger

3) Thenar crease (TC) originate from the base of palm and ends in between the thumb and pointing finger **,** generally fused with PC

Ridge counting

It is used to indicate the pattern size. The parameter used whereas)

Total finger ridge count (TFRC)

b) Absolute finger ridge count (AFRC)

c) Atd angle

Statistical Analysis

The data recorded was entered in Microsoft excel sheet and applied for statistical analysis. Chi square test was applied for each variable, to compare the proportions and p was determined.

Results

Table1 : Distribution of TC in control group and study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n=200)	165	82.5%	35	17.5%
Study Group(n=200)	147	73.5%	53	26.5%

Table 2: Distribution of PC in control group and study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n=200)	177	88.5%	23	11.5%
Study group	185	92.5%	15	7.5%

Table 3: Distribution of DC in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 200)	196	98%	4	2%
Study group (n= 200)	175	87.5%	25	12.5%

Table 4: Distribution of atd angle in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 200)	108	54%	92	46%
Study group (n= 200)	48	24%	152	76%

Table 5: Distribution of variables in variation group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 92)	7	8%	85	92%
Study group (n= 152)	3	2%	149	98%**

Table 6: Distribution of (a) in variables in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 92)	199	99.5%	1	0.5%
Study group (n= 152)	194	9.7%	6	3%**

Table 7: Distribution of (b) in variables in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 92)	189	94.5%	11	5.5%
Study group (n= 152)	198	99%	2	1%

Table 8: Distribution of (c) in variables in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 200)	170	94.5%	11	5.5%
Study group (n= 200)	198	99%	2	1%

Table 9: Distribution of (d) in variables in Control group and Study group

GROUPS	NORMAL	PERCENTAGE	VARIATION	PERCENTAGE
Control Group(n= 200)	131	65.5%	69	34.5%
Study group (n= 200)	136	68%	64	32%

Discussion

Dermatoglyphics is diagnostic aid which is very well reflected in number of diseases, genetically as well as none genetically determined. Leukoplakia is a potentially malignant disease caused by tobacco. Not all tobacco chewer or smoker develop Leukoplakia. The genetic susceptibility plays arole. The dermal ridges have various notable characteristics which make them important. The ridges are environment stable and begin to appear from 5 th month of embryonic life. Dermal ridge patterns are genetically determined and have been used as screening procedures in many clinical conditions. Oral Leukoplakia is a pre malignant lesion affecting oral cavity. Chewing of tobacco is said to be the most important risk factor for development of the disease.

Millions of people around world chew tobacco but not all of them develop Leukoplakia. Genetic predisposition explains such individual variability. The disease was also reported in some cases who do not practice tobacco. In the present study we studied quantitative Dermatoglyphic feature like total finger ridge count 11and atd angle. Total finger ridge count was significantly decreased in patients of leukoplakia.The atd angles of right and left hand were significantly decreased in patients of oral Leukoplakia compared to normal tobacco chewers. Same finding was reported by Veena HS et al 10 .In the present era of developing nation like India many young adults are involved in the habit of tobacco chewing and smoking which happens to be the most important predisposing factor for developing oral Leukoplakia. Dermatoglyphic markers like TFRC and atd angle can be used as a large group screening tool to identify persons who will be developing Leukoplakia so that they can be counseled accordingly.

Conclusion

The present study on palmar Dermatoglyphics in oral Leukoplakia and erythroplakia has few significant parameters which would help us to identify an individual with or at risk for developing oral Leukoplakia and erythroplakia, so that high risk individuals can be identified and preventive measures can be instituted at the earliest to prevent the occurrence of oral leuoplakiaand erythroplakia. This further proves that oral Leukoplakia and erythroplakia are not just an environmentally acquired, but their roots are deep seated in the soil of genetics. Thusdermatoglyphics can be used as screening method to diagnose premalignant lesion.

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