The Role of Dermatoglyphics in Emergent Health Care - A New Future Awaits

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Abstract

A branch of genetics allocating with the system of ridge of the skin is well known as Dermatoglyphics. They are the indications of prosperity and as an ultimate, unchangeable implement for personal identification by forensic authorities. It is used as a diagnostic tool to resolve broader biomedical problems and for the identification of various genetic disorders, systemic diseases, oral diseases, forensic science and helpful in artificial intelligence. Hence the present paper gives an insight review on the researchers done by numerous authors on the clinical characteristics of dermatoglyphics and its role in scientific era.

Keywords: Dermatogyphics; Forensic; Identificaion; Genetic disorders; Artificial intelligence, dentistry

INTRODUCTION

In the field of investigation, hand is used as an authoritative implementation in the investigation of all kind of genetic, psychological and medical circumstances. Dermatoglyphics characterizes the conformation of dermal ridge which originated on the, palms, digits and soles. Fingerprints are firm indicators genetically but are predisposed by environmental services.[1]

"Dermatoglyphics" is a Greek word derived "Derma" and "Glyphics" (**Derma** = Skin + Glyphe = Carve) .2Hence it is defined as "study of fingerprints from proximities of various organs of the humans and animals ".

HISTORY

History reveals, dermatoglyphics has been used as an essential tool in understanding basic questions in evolution , biology, genetics, and medicine. It has been most widely used method for personal identification in medical sciences.[3]

In 1684 Grew was the first person, in the Western World, to study dermatoglyphics. **In 1858 Herschel** performed his first experiment in India on fingerprints.[5]

In 1892 Galton established the hereditary importance of finger-prints and its various forms amongst racial groups.[6]

In 1893 Sir Edward Henry published the book *"The classification and uses of fingerprints," instigating a recent epoch of identifying fingerprint*.[7]

In 1923, **Parkinjee** classified epidermal ridge patterns into nine types[4].

In 1926 Cummins and Midlo invented dermatoglyphics as a technical term. **Cummins** is considered to be the **Father of Dermatoglyphics**.[8]

In 1976: **Schaumann & Alter's** published the book "*Dermatoglyphics in medical disorders."*[9]

EMBRYOGENESIS OF DERMATOGLYPHICS:

The initiation and development of prints in finger and palm was firstly detected universally during 6-7th week of intra uterine life and was accomplished after 10-20 weeks of gestation.[10] Genetically, dermatoglyphic individualities is multifaceted and is accredited with flaws.[11]

CLASSIFICATION OF FINGERPRINTS: In 1892 Sir Francis Galton classified fingerprint patterns as loops, whorls and arches.[1\2] New parameters explored by various investigators are Total Finger Ridge Count (TFRC), Absolute Finger Ridge Count (AFRC), triradius at finger-tips (trF), AB ridge count (number of ridges that present between 'a' and 'b' triradii on the palm) and ATD angle (Angle shaped between the digital triradius 'a' and the axial triradius 't' at the base of the palm and the digital triradius'd'). The Palmar dermatoglyphics can recognize a person, and it varies from person to person.

ADVANTAGES:[13]

It is rapid, inexpensive and convenient.

Completely developed at birth and afterward cannot be changed.

DISADVANTAGES

1. Difficult in the patient with grossly deformed limbs.

2. Apply the ink material in adequate amounts its thin or thick application may result in inappropriate prints.

3. The limitation is in recording the atd angle as it totally depends on the amount of spreading of the fingers and pressure applied while recording the patterns.14

DERMATOGLYPHIC LANDMARKS: Key patterns present on the fingertip are tri-radii, cores and radiants.[15]

a) **Tri-radius:** - confluence of three ridge system, approximately 120 °, commonest site is hypothenar areas of the palms.

b) **Core:** Present in the middle of the pattern.

Radiant: Origin is from tri-radius and enclose the key zone

FINGERTIP GALTON (1892) - ARCHES, WHORLS, LOOPS

ARCHES- It is molded by the series of almost corresponding ridges forming a curve that is concave proximally. It is the commonest pattern found on fingertips.

SUBTYPES: a) **Simple or plain arch**: ridges crossing the fingertip from one end to the other without recurving.

b) Tented arch: Like a tent ridges join at a center.

LOOP: It represents a series of ridges that across the area on one side of the digit, recurve brusquely, and leave the pattern area on the same side.

SUBTYPES: a) Ulnar loop: ridges present on the ulnar side.

b) Radial loop: ridges present on the radial side.

WHORLS: It is the ridge conformation with two or more tri-radii present on radial and ulnar side of the pattern respectively.

SUBTYPES: a) Plain/simple/concentric whorl - successive rings or ellipses present concentrically.

b) Spiral whorl: ridges spiral surrounding the core in either a right-handed or left-handed direction.

c) Central pocket whorl: Small whorl present within a loop and classified as ulnar or radial according depending to the side on which the outer loop opens.

PALMAR PATTERNS:

Three major creases –

1) DISTAL CREASE (DC): Arises from the lateral side of the palm and ends in between the index finger and the middle finger.

2) PROXIMAL CREASE (PC): Arises from the hypothenar area and ends in between the fore finger and thumb.

3) THENAR CREASE (TC): Arises from the base of the palm and ends in between the thumb and index finger, generally fused with PC.

ATD ANGLE: An angle formed by lines drawn from the digital triradius (a) to the axial triradius (t) and from this to digital triradius (d) is called atd angle.

The more distal the position of t, the larger is the atd angle.

METHODS OF PRINTING [16,17]

Ink method: It is most commonly used process in clinically. The required accessories include printer's ink, a roller, a glass or metal inking slab, a sponge rubber, and good quality paper with a slightly glazed surface. It evaluates the association between the epidermal patterns and the underlying bone structures (radio dermatography), study of sweat pores (hygro photography) or study of the spatial shape of the ridged skin areas, for example in primates (plastic mold method).

Faurot inkless method: The unproved solution is available commercially and specially preserved sensitized paper is used for this approach.

Transparent adhesive tape method: In this technique, dry coloring pigment should be applied to the skin and then on lifting it off with the transparent adhesive tape, image will be produced. The coloring agent used may be colored chalk, dust, India ink, standard ink, carbon paper, graphite stick or powdered graphite, common oil pastel crayon etc., Its advantage is prints are clearer and not smudged and can be preserved for longer duration.

Photographic method: Photographic method is based on the fundamental of total internal reflection which occurs when an object is pressed against a prism. The magnified image is photographed by a polaroid camera.

'Lipstick' method : The lipstick method described is natural, harmless, economical,easily avalible, and is least technique sensitive. The 'Lipstick' method requires a dark shade of 'Lip stick', a foam rubber pad and a white sheet of paper. The lipstick is then applied on the entire palm of the subject including the wrist creases, and digits. It is placed on sheet of paper on top of the foam rubber pad on a flat, stable surface. Following this the subject's palm and digit is placed on this and gently pressed. [18].

Numerical method: The fingerprint image synthesis algorithm is used and all the possible arrangements of so-called minutiae are generated in particular. The model allows the digital coding of a fingerprint to be analyzed and also allows statistical cataloguing of minutiae and pattern forms.[19]

Biometrics method: Automatic separate machines for finger and palm scan the hand to record prints. It is expensive [20].

Special methods: This enables the analysis of the association between epidermal patterns and the underlying structures of the bone (radiodermatography), the study of sweat pores (hygrophotography) or the study of the spatial form of ridged areas of the skin, e.g. in primates (plastic mold method)[19].

APPLICATION IN MEDICAL AND GENETIC DISORDERS

Dermatoglyphic patterns of the epidermal ridges serve as a diagnostic tool in a number of diseases that have a robust hereditary background. Different diseases have different fingerprint patterns associated with them as following:

1. Hereditary aneuploidy such as mongolism, trisomy 18, and 15
2. Chromosomal Abberations like Turner's syndrome and Klinefelter syndrome
3. Single Gene Defects like Wilson's Disease, and Huntington's Chorea
4. Uncertain genetic disorders such as idiopathic mental retardation, congenital heart disease, psoriasis

5. Exogenous influences such as thalidomide damaged infants, cerebral palsy, rubella.

Dermatoglyphic studies have been done with respect to a number of genetic disorders and diseases where heredity may be playing some part. To name a few, studies of dermatoglyphics in cancer patients, psoriasis, medical diagnosis, and congenital heart malformations are well documented.

Thus the features of dermatoglyphics express the correlation in many somatic, physiological, neurological and cytological afflictions and syndromes like trisomy G, Cat-Cry-Syndrome, Down's syndrome, Turner's syndrome and trisomy of X chromosome [21,,22]

Dermatoglyphics In Diabetes Mellitus Type II:

The role of Dermatoglyphics is of utmost importance in the diagnosis of diabetes mellitus (DM) and it can evaluate its variations. Type I DM affects children and young adults. It shows a characteristic reduction in loops and a notable increase in whorls and arches.[23-27] Type II DM have an increased number of whorls and decreased ulnar loops without any marked changes in radial loops irrespective of their sex. Males have a significant reduction in arches in right hand whereas females in left.[28.]

Dermatoglyphics In Thalasemmia

Thalassemia is a genetic disorder of early age which in sever forms needs blood transfusion. By dermatoglyphics which deals with epidermal ridges cases of thalassemia can be diagnosed. Mahato et al conducted a study to find whether any specific pattern of palmer dermatoglyphics exist for thalassemic population of Vidarbha region of India among 100 patients. They found that Palmar patterns are significantly more in thalassemics mainly in hypothenar and thenar areas than controls. Significant increase in number of palmar triradii was also seen. There is distal displacement of axial triradii is available in both male and female thalassemics. 'atd' angles and 'a-b' ridge count iwas also more in thalassemics than control cases [29].

Gualdi et al collected the fingerprints of 162 children with Cooley's trait and analyzed statistically significant differences in thalassemic children in comparison with controls were observed especially with regards to fingerprint type frequency and their distribution on each sex[30].

G Floris found that The data concerning the digital, palmar and plantar dermatoglyphics of 108 individuals suffering from Cooley's anemia (of both sexes). The main differences found after comparison with normal individuals were a greater transversality of A line and therefore of the epidermal palmar ridges and the absence of sexual dimorphism [31].

Dermatoglyphics In Sickle Cell Anemia

Oladipo et al. performed a study on Dermatoglyphic analysis of 90 Sickle-cell Anaemia cases and 90 healthy subjects. It comprised the digital patterns, ATD angle, A – B ridge count, axial triradius, digital triradius and palmar crease on the hands. However, there was no statistically significant results when the two groups were evaluated [32].

Another study by Ramesh et al. verified the possibility that Dermatoglyphics is helpful for the diagnosis of sickle cell anaemia. The differences of qualitative (finger ball patterns, palmar creases, and location of axial triradii) data were tested for their significance and quantitative (ridge counts and palmar ATD angle and interradial a-b ridge count) data analysis was done. The study revealed that TFRC and ATD angles showed a significant increase in patients which can conclude that sickle-cell anaemia has dermatoglyphic correlation and could be considered as a marker for both the sexes as a diagnostic tool in linking sickle cell anaemia to dermatoglyphics[21].

Dermatoglyphics In Kidney Diseases

Dermatoglyphic in different kidney disorders have not been extentensively studied. Wijerathne, in their review, appraised the available literature that evaluated an association of different dermatoglyphic variables with kidney diseases. Possible association of Dermatoglyphics with Wilms tumour (WT) have been evaluated in and

was found that fewer whorls and a lower mean TRC. In another study evaluation of Type III adult polycystic kidney disease (APCD) revealed lower TRC means among all patients. Whorl pattern frequency and TRC have been used widely to investigate the uncertainty related to the origin of several kidney diseases such as WT and APCD type III[33].

Dermatoglyphic in Atopic Diseases

The lawfulness of the application of the method of dermatoglyphics in the study of atopic diseases is ensured by the polygenic inheritance of signs of dermatoglyphics, on the one hand, and the pathogenetic heterogeneity of these diseases, on the other hand, as well as high informative ability of signs of dermatoglyphics as markers of diseases of hereditary and multifactorial nature.

Cherkasov et al detected the differences in qualitative signs of digital dermatoglyphics between patients with atopic dermatitis, allergic rhinitis and bronchial asthma. The specificity of the digital typology of atopic diseases was established, which was based on the differences in the frequency and location of the whorl, central pocket and arches between the young men, except those indicated - a random pattern between young women, patients with atopic dermatitis, bronchial asthma, allergic rhinitis. Additionally, when comparing young men, patients with allergic rhinitis with patients with bronchial asthma and atopic dermatitis - ulnar loop; for bronchial asthma with patients with allergic rhinitis and atopic dermatitis - lateral pocket loop (in young men) and ulnar, lateral pocket and double loops (in young women); when comparing young men, patients with atopic dermatitis with patients with bronchial asthma, and allergic rhinitis - a random pattern was established [34]

Dermatoglyphics in Down's Syndrome

It is a genetic disorder caused by presence by mutation in chromosome 21 and is characterized by facial abnormalities and decreased intellectual capacities.[35] It shows high frequency of creases, bilateral, radial loops on digits 4 and 5 and ulnar loops.[36,37]

Dermatoglyphics in Hypoparathyroidism

It is caused due to reduction in circulating parathyroid hormones levels, hypocalcaemia and hyperphosphatemia.[38] It causes muscles spasms leading to tetany and several other symptoms. It is characterized by short broad bands and increased arch patterns.[39,40]

Dermatoglyphics in Rubinstein-Taybi Syndrome

It is characterized by shot stature, mental disability, broad thumbs and first toes and facial anomalies hence it is also known as broad thumb hallux syndrome. They show four or more arches in finger tips and are bilateral.[39,40]

APPLICATIONS IN DENTISTRY

Dermatoglyphics In Dental Caries

Worldwide dental caries is a commonly present in individuals and is multifactorial with genetic predisposition as prime etiology.

Atasu et al. compared caries and caries with individuals and found variation between these two classes in dermatoglyphic patterns. Students with minimal caries had more ulnar loops on their fingertips and students with severe caries had more whorls on their fingertips.[41]

Sharma et al. worked on 90 subjects and found a relationship between salivary bacteria interactions, dermatoglyphics, and dental caries. They concluded that there was a positive correlation with loops and Streptococcus mutans growth to control group that had negative correlation with both.[42]

The dermatoglyphic pattern variations of dental caries between the control and experimental group were studied by Sengupta et al. They found that the characteristic feature showed a large increase in the caries group, increased finger TRFC and AFRC, reflecting the size and types of the patterns. There was a substantial difference between the different patterns of caries and the control group and the number of "finger tri radii" in fingers, the percentage of patterns on all palmar regions, the total number of palm triradii and main line index[2].

Padma et al. evaluated the dermatoglyphic peculiarities and caries experience of Deaf and Mute children. They found that the frequency of whorls was more in the caries group and the frequency of loops more in the caries-free group. It was concluded that Dermatoglyphics is a non-invasive and an early predictor for dental caries and hearing impairment in children. [43]

Dermatoglyphics In Early Childhood Caries

There are various methods to diagnose early childhood caries (ECC). However, so far, there is no method to predict ECC. The basis of considering dermatoglyphic pattern as a genetic marker for dental caries is that the epithelium of finger buds, along with enamel have an ectodermal origin and both develop at the same time of IU life. 200 children aged between 4 and 5 years were examined by Anitha et al. Among them, the DMFS score was assessed. There was an increased incidence of ulnar loops in caries-free children and whorls in ECC children. The ECC group observed a low mean ATD angle and a low mean TRC. [44.]

Dermatoglyphics In Periodontal Diseases

Atasu et al. compared finger- tip patterns amongst the patients of periodontitis. The incidence of twinned and transverse ulnar loops on all fingers of Juvenile Periodontitis(JP) patients decreased . In patients with Rapidly Progressive Periodontitis (RPP), there was a decrease in the frequency of double loops and a rise in the frequency of radial loops on the right second digit. There was a increase in frequency of concentric whorls and transversal ulnar loops on all fingers of the patients with Adult Periodontitis (AP), an increased frequency of the tri-radii on the palms and soles of the patients with JP were found[45]

Dermatoglyphics In Malocclusion

The aim of Reddy et al. In their study was to compare dermatoglyphic parameters of subjects with normal occlusion and various malocclusion classes. In Class I & Class II Division I malocclusion, an improvement in the frequency percentage of arches was noticed and there was a notable increase in whorls observed in Class II malocclusion. Decreases in the frequency of radial loops, twin loops and central pocket loops were found in subjects with Class III malocclusion. Hence, the authors concluded that different malocclusions were having their significant patterns.[46]

Dermatoglyphics In Oral Clefts

Compared with their unaffected relatives, a Filipino study was performed on subjects with non-syndromic cleft lip with or without cleft palate (CL/CP). It was concluded that the number of arches and ulnar loops with a reduced number of whorls in the affected individuals increased markedly. Compared to those of unaffected female individuals, they were found to be more common in affected female patients. There were no major variations among males,.[47]

Dermatoglyphics in Oral Potentially Malignant Disorder and Oral Cancer:

Tobacco is been widely consumed in today's life, but many do not suffer from oral potentially malignant disorders (OPMDs) like oral submucous fibrosis (OSMF), oral leukoplakia (OL), and oral squamous cell carcinoma (OSCC). Jatti et al. compared the dermatoglyphic patterns of such patients, in patients without habits and in patients with habits but with no lesions. The study group demonstrated an increase in the mean TFRC as compared to the normal individuals, and the result was found to be statistically significant. Therefore, Dermatoglyphics can be implemented as a screening tool in patients with OPMDs and OSCC [48].

Shetty et al assessed the dermatoglyphic pattern of subjects with OSMF and to compare it with that of the control group. It was found that the difference between the percentage of arches and whorls of the two groups was significant suggesting that dermatoglyphics could be used as a genetic marker for determining susceptibility toward OSMF[49]

In another study by Dutta et al assessed the correlation of dermatoglyphic parameters with OSMF which could act as a useful tool in

assessing the risk of OSMF in gutka chewers. The study found decrease in arches pattern, radial loop pattern, whorl pattern and atd angle in patients with OSMF. Therefore, Palmar Dermatoglyphics can foretell the probability of occurrence of OSMF which can help in screening of gutka chewers to identify susceptible persons and can recognize a person in the prefibrosis stage[50].

Samudrawar et al analyzed and compared digital dermatoglyphic patterns in patients with OL and OSMF and their role as noninvasive diagnostic tool. The study found increase in frequency of whorls, palmar patterns in I2–I3 area, TFRC, total triradius count and decrease in atd angle with the absence a–b ridge count in patients with OL and OSMF[51].

The dermatoglyphic prints of tobacco chewers with and without OSMF were obtained by Tamgire et al. from 200 subjects. Group A consisted of 100 non-OSMF tobacco chewers, and Group B consisted of OSMF patients with tobacco chewing, and they concluded that there was significant decrease in the simple whorl pattern with an increase in the composite whorl pattern on the left small finger in Group B relative to Group A, a decrease in the composite whorl pattern of the right index finger in Group B when the composite whorl pattern of the right index finger was compared to Group A.

Tamgire et al. collected the dermatoglyphic prints of the gutkha chewers with and without OSMF amongst 200 subjects. Group A consisted of 100 gutkha chewers without OSMF, and group B consisted of gutkha chewers with OSMF, and they concluded that there was a highly significant decrease in simple whorl pattern with increase in composite whorl pattern on the left little finger in Group B as compared with Group A, decrease in composite whorl pattern of the right index finger in Group B when compared with Group A, increase in simple whorl pattern on the right thumb in Group B when compared with Group A. Relative to Group A, the composite whorl pattern on the left thumb in Group B increased and the radial loop on the left index finger in Group B decreased compared to Group A.[1]

David et al. did a study to determine the dermatoglyphic dependence of OPMD and OSCC. The author used ink method from 70 patients to collect the data. Mean frequency of loops and TRC was found to be higher in case of subjects with OPMD and OSCC when compared with healthy individuals. Arches were predominantly more in patients with OSCC[52]

One name that triggers panic is OSCC and retains an undeserved high ranking as silent killer. Not all individuals who use tobacco products suffer from these illnesses. Such human variability that can be predicted by using different cytogenetic markers could be explained by genetic predisposition. These studies are, however, much more expensive and complicated. In order to segregate those people who are at an elevated risk for contracting these diseases, dermatoglyphics can therefore be of considerable clinical significance.

The palmar dermatoglyphics in OSCC and OSMF were examined and a dermatoglyphic marker was identified by Gupta et al. The frequency of arch and ulnar loop patterns on finger tips increased in OSCC, the frequency of simple whorl patterns on finger tips decreased, and the number of palmar accessory triradii on both hands decreased. Significant results in OSMF included an increase in arch and ulnar loop pattern frequency, a decrease in finger-tip frequency of basic whorl patterns, a decrease in ATD angle on the right hand, a decrease in the right hand frequency of palmar accessory triradii. The results showed that the Dermatoglyphics field has promising results for determining the genetic susceptibility of individuals to develop OSCC and OSMF [53].

ROLE OF ARTIFICIAL INTELLIGENCE IN DERMATOGLYPHICS

There are many benefits of dermatoglyphics multi-intelligence test (DMIT) for children/students and in the corporate sector. The test helps in identifying their inborn talents and weaknesses, tailor-make any child's learning programs and help in the subject and educational stream selection. Emotional quotient, the

intelligent quotient, adversity quotient and creativity quotient can be assessed. At many places, it is being used for preemployment screening. DMIT is done in three easy steps by the combination of new computer technology and science using DMIT software[22].

A research work aimed at finding the relative associations that exists between the dermatoglyphic parameters and intelligence level among the medical students of Nigeria with ultimate purpose of using dermatoglyphic characteristics as bio-indicators for selection of categories of students into good, average and weak academic performances. Ulnar loop pattern was prevalence in all categories of students and higher symmetrical arrangement was observed in both hands among the good student, however, no incidence of arch pattern was recorded among them. More than two different sets of patterns were observed to be distributed in each hand among the weak students and also asymmetrical arrangements were significant on both hands among them. Reduction in the ridge counts, TFRC, AFRC and palmer tri-radial angles was noted[54]

Atinga et al. aimed at determining the association between dermatoglyphic patterns and academic achievement among individuals. Handprints were analyzed for fingerprint patterns (FPP), FRC, TFRC, ATD angle, number of Primary creases, Intersections of the primary crease and Complete transverse crease (PIC) and PIC symmetry. The study revealed that subjects with symmetrical PIC patterns were likely to achieve higher in academia compared with those with asymmetrical palm prints and the results confirm an association of digitopalmar dermatoglyphic patterns with academic achievement[55].

Palm print scanning: Palmprint is an important key player in biometric family and also informs some extra basic personality details of an individual. It is a widespread method for biometric identity detection which has advantages over other methods including its simplicity and relatively lower cost. Novel methods for biometric verification and identification by contactless palm scanning technique has been previoisly been proposed.

Hardalac in their study propose, Ripplet-I Transform (R-IT) which is a generalized form of Curvelet Transform (CuT), used in addition to multi-resolution transforms as palm print verification and identification methods such as Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Contourlet Transform (CoT). The highest Identification Rate (IR) was achieved by using the LBP+CoT+ED algorithm with 84.444% for for palm print identification[56].

Prasad and colleague designed an automated mobile vision (MV) system to extract principal lines from human palm and analyze them for behavioral significances. In the proposed system, the computational tasks are offloaded to a dedicated palmistry server and efficiently minimizes the energy consumption of mobile device after performing some preliminary computational low-level tasks. The basic palmistry uses line lengths, angles, curves and branches to identify a person's behavior. The exhaustive experiments show that the proposed system achieves an average accuracy of 96%, 92% and 84% for heart, life and head line detection and personality prediction, respectively[57].

CONCLUSION: The evaluation of Dermatoglyphic pattern in various clinical disorders is a simple, achievable, inexpensive clinical test and research tool used in screening of various pathologies. On getting result of which, genetically susceptible individuals can be isolated, counselled accordingly and inspired to change their routine life. Therefore, it plays an extensive role in preventing the severity of the disease thereby outspreading the life span of an individual. Also, the dermatoglyphics in artificial intelligence plays a pivotal role in assessing the human behaviour. It enables us to assess individual's potential & personality Type. Therefore, Dermatoglyphics is based on

understanding from Neuroscience, Genetics, Psychology and Embryology.

Abbreviation:

Total Finger Ridge Count :TFRC

Finger Ridge Count: FRC

Absolute Finger Ridge Count: AFRC

triradius at finger tips: trF

DISTAL CREASE : DC

DMFT: DECAYED MISSING FILLED TOOTH

PROXIMAL CREASE : PC

THENAR CREASE: TC

Juvenile Periodontitis: JP

Rapidly Progressive Periodontitis : RPP

Adult Periodontitis: AP

CL/CP: Cleft lip cleft palate

OSMF: Oral submucous fibrosis

OSCC: Oral squamous cell carcinoma

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