Research Paper Biotechnology

A Mother's Guide to Speech and Hearing Impairment-Dermatoglyphic- A Case Study

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ABSTRACT

The aim of this study was to analyse the pattern present on palm print of a patient suffering from speech and hearing impairment and comparing it with his mother. The word "Dermatoglyphics" comes from the two words Derma- skin, Glyphic-curves. The ridge formation of the skin of an individual begins to appear during 3rd or 4th month of fetal development. The fingerprints or the ridges on the palm and its pattern are determined by genes in embryonic life. The speech and hearing impairment are multifactorial, autosomal domininant, autosomal recessive, X- linked recessive. The gene loci associated with common multifactorial language related impairment and goes on to detail the only gene known as FOXP2 to be directly implicated in monogenic speech and language disorder. The GJB2 gene contains the instruction for a protein called Connexin 26, this protein plays an important role in functioning of a part of the ear called cochlea and mutation in these gene causes hearing loss. The dermatoglyphics prints of mother, son who was suffering from speech and hearing loss was collected and compared with the control.

KEYWORDS Dermatoglyphics, Connexin 26, GJB2, FOXP2, multifactorial, autosomal domininant, autosomal recessive, X- linked recessive

INTRODUCTION

Dermatoglyphics

There is the assumption that many gene, both autosomal and sex chromosomal takes part in the function of formation of the dermatoglyphics character, thus the possibility of gene predisposing the onset of the disease is very high [1]. This gene also has the influence in the ridges and grove pattern on the finger as well as on the creases. The relevance of dermatoglyphics is not to diagnose but to prognosis, not according to the existence /study of disease but to the identification of people with the genetic predisposition to develop certain diseases. In the other world Dermatoglyphics can be associated with the use is screening cheaply. The population at the risk of onset of disease and showing the onset of symptoms can be kept at watch. These however require the proof that dermatoglyphics character may furnish a guide to disease. Dermatoglyphics is the scientific study of the grooves and ridges pattern present on the extreme part of the body like palm, sole, lips, toes. The study of dermatoglyphics can be traced to 1892 [3 & 4]. The Father of dermatoglyphics is Sir Francis Galton. Dermatoglyphics is the study of palm prints and the finger prints and this term was coined by Cummins. The finger prints are the imprints of the epidermal ridges which are formed in the early gestation period and remain permanent during whole life [8 & 15]. Dermatoglyphics patterns have polygenic inheritance and are affected by the environmental factor in the uterus [2]. The fingerprints are not disturbed unless the skin is damaged to the depth of 1mm^3 but the healing of the damaged produce the same patterns thus also proving that these patterns are under genetics control. There are various genetics disease for which the genes are directly involved and its abnormalities in the genetic makeup is either inherited to the children or is expressed in the individually in the dermatoglyphics pattern. Thus the dermatoglyphics pattern as a diagnostic aid is well established which have strong hereditary basis. It is usually analysed for various character in fingerprints like the arches, loop, whorls, he ridge counts also have important implication where the ridges count vary from finger to finger [4]. The position of the palmer triradius and the atd angle too has genetic predisposition to develop certain disease.

Speech and Hearing Impairment

The hearing impairment may be due to the hereditary or due to other factor present either in utero or at the time of birth. The genetic of hearing loss may be due to autosomal dominant, X-linked or autosomal recessive. In autosomal dominant hearing loss one parent who carries the dominant gene for hearing loss passed on to the child [5]. The probability of child suffering from hearing loss is 50%. The probability is higher if both parent has dominant gene or if both grandparent of one side of the family have hearing loss due to genetic causes. In autosomal recessive hearing loss both parent who have typically normal hearing carry a recessive gene. In this case the probability of child having a hearing loss is 25 % because both parent have usually have normal hearing and no other family members have hearing loss, there is no prior expectation the child may have hearing loss. In the X-linked hearing loss the mother carry the recessive trait for hearing loss on the sex chromosome and passes on to the male, but not to the female. The autosomal dominant hearing impairment genes are DIAPH1, KCNQ4, GJB3, TMC1, DSPP, P2RX2 etc. The autosomal recessive hearing impairment genes are GJB2, GJB6, TNC1, OTOF, RDX, ESRRB etc. Genes. X-linked hearing impairment genes are DFNX1, BFNX2, and DFNX4 [9 & 11]. The majority of mutations in mitochondrial gene causes spectrum of maternally inherited multisystem disorder, the genes

are MT-RNR1, MT-TS1, MT-CO1 etc. The speech impairment are highly heritable, provide strong support for genetic basis. The underlying genetic architecture is complex involving multiple risk factors. The genetic loci are associated with common multifactorial language-related impairments go on to the detail with gene known as FOXP2 to be directly implicated in a rare monogenic speech disorder. ON gene –mapping studies, it was found that a small region of chromosome 7, was very likely to contain the causative gene [10 & 12]. The denovo translocation involving the break point in the SPCH1 region of chromosome 7 was responsible. FOXP2 is the first gene to be implicated in the speech impairment was identified [7]. In this the verbal dyspraxia is characterized by the difficulties in the control of the orofacial musle leading to deficit in the production of fluent speech. Genome wise linkage analysis identified linkage to chromosome 7q31. There are various chromosome region in which mutation causes speech impairment, few of them are 3p14 (FOXP1), 7q31 (FOXP2), 7q36 (CNTNAP2), 12q23 (GNPTA3), 16p13 (GNPT4), 16P13 (NAGPA).

MATERIAL AND METHOD

The material used for collecting fingerprint and palm print was A4 sheet, kajal, protractor, magnifying glass.

The kajal was applied gently on entire palm of the subject including the wrist crease, and digits. Then we placed the sheet of paper on top of the foam rubber pad on the table top. The subject palm was placed on the paper in such a way that first the wrist and then whole palm and spreaded finger print was formed. The foam pad was used to fill the concavity of the palm when the pressure is applied. The whole palm was removed with the jerk, so that the print does not get smudged. For taking the finger prints, rolling finger technique was used for the same reason.

OBSERVATION

1) MOTHER'S PALM PRINTS

A. RIGHT HAND

- Presence of t' and t" in the hypothenar region of palm.
- Proximal crease is missing.
- Triradius d is totally shifted towards c
- Angle atd is 28 degree
- t is shifted towords centre of palm

SN	TYPE OF FINGER	DERMAL PATTERN	RIDGE COUNT
1	Thumb	Ulnar	25
2	Pointing finger	Ulnar	14
3	Middle finger	Single loop whorl	19,10
4	Ring finger	Single loop whorl	21,9
5	Little finger	Ulnar	19

B. LEFT HAND

- Presence of special land mark between t, c and d
- And this landmark is single loop whorl.
- Presence of a radial loop at the region below the pointing finger
- Angle atd is 41 degrees

SN	TYPES OF FINGER	DERMAL PATTERN	RIGE COUNT
1	THUMB	Radial loop pattern	27
2	POINTING FINGER	Ulnar	16
3	MIDLE FINGER	Single loop whorl	18,16
4	RING FINGER	Single loop whorl	21
5	LITTLE FINGER	Single loop whorl	19

2. PATIENTST'S PALM PRINT

A.RIGHT HAND

- Angle atd is 40degree
- Presence loop at hypothenar region

SN	TYPES OF FINGER	DERMAL PATTERN	RIDGE COUNT
1	Thumb	Double loop whorl	20
2	Pointing Finger	Ulnar	10
3	Midle Finger	Ulnar	15
4	Ring Finger	Double loop whorl	29
5	Little Finger	Ulnar	19

B.LEFT HAND

- Angle atd is 41 degree
- Presense of loop at hypothenar region

SN	TYPES OF FINGER	DERMAL PATTERN	RIDGE COUNT
1	Thumb	Double loop whorl	27
2	Pointing finger	Radial loop	16
3	Middle finger	Ulnar	34
4	Ring finger	Single loop whorl	21
5	Little finger	Ulnar	19

CONTROL

A.RIGHT HAND

- Distal crease, thenar crease and proximal crease are normal
- Angle atd is 44 degrees

SN	TYPES OF FINGER	DERMAL PATTERN	RIDGE COUNT
1	Thumb	Ulnar loop	17
2	Pointing finger	Ulnar loop	13
3	Middle finger	Ulnar loop	10
4	Ring finger	Ulnar loop	19
5	Little finger	Ulnar loop	16

B. LEFT HAND

- Distal crease, thenar crease and proximal crease are normal
- Angle atd is 44 degrees

SN	TYPES OF FINGER	DERMAL PATTERN	RIDGE COUNT
1	Thumb	Composite whorl pattern	29
2	Pointing finger	Ulnar loop pattern	15
3	Middle finger	Tented arch pattern	-
4	Ring finger	Peacock's eye pattern	19
5	Little finger	Peacock's eye pattern	16

CONCLUSION

The presented paper is a case study in order to get bioindicator specific patterns for identification of speech and hearing impairment. We need to have more than 1000 samples from the population and statistatical analysis need to be done for

all patterns, landmarks on the palm; the ridge count of the individual finger, the total ridge count is needed. This case study helps to identify different types of landmark on the palm print and finger print.

Right hand: Mother
In this case study it has been found that there was presence of two extra t (t' and t") and t is shifted towards central line normally towards wrist line. The predominant crease-proximal crease is missing and the angle atd is 28 degrees which is significantly less than normal (42 -44 degree).

Left hand
Usually between the tri radius a, b, c, d and t; there are series of parallel line but in this case special landmark which is single loop whorl had been found between t, c and d tri radius. There was a presence of radial loop or recessive loop but the angle atd has been found normal.

Patient
In the patient's right palm there was a presence of loop in hypothenar region in both right and left hand and the angle atd is normal.

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