

Dermatoglyphics or Skin Pictures

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Abstract: Dermatoglyphics is a science that studies the genetic interrelationship of the pictures formed by different lines on the palms of the hands and feet, and the tips of the fingers. In these places, the structure of the skin is different, and epidermal ridges form edges. Dermatoglyphic examinations are considered a necessary part of clinical examination in genetic practice. The dermatoglyphics method consists of such parts as dactyloscopy, palmoscopy, plantoscopy. The dermatoglyphics method is relevant as an auxiliary method in the detection of chromosomal syndromes, in the determination of zygosity of twins, in forensic medicine and other fields.

Keywords: dermatoglyphics, Francis Galton, Cumminson and Midlo, dactyloscopy, palmoscopy, plantoscopy, skin crowns, dermatoglyphic analysis.

Introduction: the dermatoglyphics method of diseases is widely used in medical genetics. This method can be used as an additional method to diagnose chromosomal syndromes. As a result of dermatoglyphic changes in multifactorial pathology. In the hereditary development of schizophrenia, diabetes, obesity, and similar, dermatoglyphic changes, but the disease does not have a specific image of dermatoglyphics. Therefore, dermatoglyphic reasons cannot be the only basis for diagnosing a hereditary disease. To be such a specific disease, the proband should have the same character as his healthy mother and genotype. For example, removing a control that may have a higher risk among relatives of a diseased proband based on dermatoglyphic similarity and placing them in a dyspanic control. Dermatoglyphic data may also have prognostic value. The greater the deviation of dermatoglyphic values from the general population level, the worse the prognosis for the proband.

Style: From ancient times in China, India, Japan, and Central Asia, the individuality of skin marks on fingers and palms was known and used as a signature. Previous scientific information about dermatoglyphics appeared in the 17th century. The first information about the uniqueness of skin marks was given in the works of N. Grew (1684), M. Malpighi (1686), and Y. Purkinje (1823). Dermatoglyphics was formed in a separate scientific direction at the end of the 20th century and at the beginning of the century.

The term "dermatoglyphics" (derma - skin, glyphe - to draw) was proposed by Cumminson and Midlo at the 42nd session of the Association of American Anatomists in April 1926.

Francis Galton is considered the founder of dermatoglyphics, he identified its networks in 1892, determined the ethnic differences of people based on certain "patterns" and showed their role in adaptation to the environment. As a result of the scientific work of F. Galton, the study of skin stripes was widely used in forensic medicine to identify criminals. At the beginning of the 20th century, this method was widely used in genetics, studying families and twins. Galton first proposed three basic types of finger patterns: whorl, loop, and arc.



Types of fingerprints. A-arc-shaped, L-shaped, W-circular. Russian scientists M. I. Vilyamovskaya, I. I. Katayeva, and T. D. Gladkova made great contributions to the study of the heredity of skin relief and the problems of ethnic dermatoglyphics



The dermatoglyphics method is mainly divided into three parts:

- 1) dactyloscopy - study of fingerprints;
- 2) palmoscopy - study of the uniqueness of the lines of the palm of the hand;
- 3) plantoscopy - studying the uniqueness of the lines of the heel.

Ordinary typography paints are used to obtain dermatoglyphs. For this, the paint is slightly dissolved in petroleum jelly or turpentine, dripped onto a 15x25 cm glass, and spread evenly with a regular rubber roller used in photography. The palm of the examined person is pressed against the mirror. If the entire area of the paint palm is not completely painted, the roller can be rotated on the palm. Then the palm is pressed evenly on plain paper. If a soft rubber is placed under the paper, the traces of the palm in the deep places will completely fall on the paper. Place the palm gently on the paper and press slowly in the middle. The palm should be lifted from the paper at once.

Fingerprints are taken separately. For this, each finger is smeared with paint and pressed on paper one after the other from the radial part to the ulnar part.



Dactyloscopy is the most widely used method of dermatoglyphics, based on the study of the lines of the fingers. The direction of the papillary lines on the fingers is mainly of three types: arc (A), ridge (L), winding (W). Papillary lines are a polygenic sign that begin to form between 10-20 weeks of embryogenesis and are fully formed at 6 months, then their shape does not change throughout life. Papillary lines are more common (60%), and arc-shaped are the least common (6%). The percentage of occurrence of papillary line forms varies in different races. The quantitative index of papillary lines is represented by the total number of edges (UQS.). To find the number of lines on each finger, the lines are counted from the delta to the center of the wrap or ridge (the lines are not counted because there is no delta in the arc form).

The total number of edges is 10 fingers. It is on average 150 ± 50 in men and 125 ± 50 in women. To study dermatoglyphics, typography paint (other paints can be used) is applied to the palm or heel of the finger, then it is drawn on paper and studied using a magnifying glass.



Palmoscopy is the study of the lines, triradii, and the angles between them in the palm of the hand. Triradius (deltas) is a point of convergence of lines in three different directions. In particular, the angle of triradius atd (the angle between triradius a on the basis of the second finger, triradius d on the basis of the fifth finger and triradius t between the fold of the wrist) is of great importance in various chromosomal diseases. In healthy people, the triangle between the atd triradii does not exceed 57° . It is equal to 80° in Down's syndrome, 42° in Klinefelter's syndrome, and 65° in Shereshevsky-Turner's syndrome.

It has been found that the lines are more complex in Onagai than in the left hand.

Plantoscopy - based on determining the direction of the lines on the heel.

Skin crowns (papillary lines) are linear thickenings of the epidermis. The pores of the sweat glands are visible at the peaks of the epidermal edges, and the glands lie in the thick layer of the dermis. Various dermal suckers capture the ends of capillaries and sensory nerve fibers. Embryonic development of dermal skin structures (pads, folds and epidermal crests) begins at the 6th week of pregnancy and is fully completed by the 17th week.

Results. Dermatoglyphic analysis is especially important when a pathology of an uncertain nature or a teratogenic effect is suspected. The diagnostic value of dermatoglyphics can be clearly seen in chromosomal pathologies, for example, in 95% of patients with Down's disease, the use of eight skin signs is enough to diagnose the disease, but the diagnostic value of dermatoglyphics is great in determining the disorder of brain morphogenesis observed in chromosomal diseases and a number of monogenic diseases. The specific pathology of dermatoglyphics can be clearly seen in Rubinstein-Tebby and De Lange syndromes, which are observed with congenital brain defects.

Discussion. The dermatoglyphics method can be used as an additional method in the diagnosis of chromosomal syndromes. For example, when the number of sex chromosomes changes (aneuploidy), the total number of papillary edges changes. The more the number of X chromosomes, the less the total number of edges. In trisomies D, C, E, the directions of the palmar lines also change. Autosomal aneuploidy also causes a change in the total number of edges. For example, coils are almost never found, radial warts are more common on the IV finger, only arcs are found in trisomy E (the total number of edges is equal to 0). In Down's disease, ulnar warts are more common, the atd angle is close to 80° , and there is a deep transverse fold ("monkey" fold) in the palm. A solitary flexor fold occurs up to 40% of the time (instead of 2%). In Patau's syndrome, the number of arcs increases, the total number of edges decreases, radial warts are more common on IV and V fingers (and on II finger in the general population), as a result of the distal displacement of the triradius, the atd angle increases to 108° . In Edwards syndrome, the number of arches also increases (6 or more fingers), palm lines are simplified.

Summarizing modern knowledge about the possibilities of dermatoglyphic analysis, it is effective to conduct this analysis in a number of fields of medicine:

- ✓ lethal forms of fetal pathologies of uncertain etiology;
- ✓ syndromic forms of retardation of fetal development;
- ✓ somatic asymmetry;
- ✓ chromosomal mosaicism;
- ✓ "Conliguous gene syndromes"

- ✓ congenital defects of limbs;
- ✓ syndromic forms of birth defects of unknown etiology;
- ✓ retardation of psychomotor development or oligophrenia;
- ✓ acrodysplasia;
- ✓ ectodermal dysplasias;
- ✓ connective tissue dysplasias;
- ✓ gender anomalies;
- ✓ dysplasia of skin folds;
- ✓ teratogenic effects.

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