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PRINCIPLES OF CLINICAL GENETICS

Free! Chart High-Yielding Facts

HIGHLIGHTS

- Case-based scenarios with solutions
- Concise text with flowcharts and boxes
- High-yield NEET-PG questions included
- Interesting facts on important topics
- Practice-focused assignments
- Clinically integrated, evidence-based MCQs
- Recent advances included



3rd Edition

As per the Revised Competency Based Medical Education Curriculum (NMC)



Yogesh Ashok Sontakke

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Chapter

10 Dermatoglyphics

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CLINICAL CASE

In the labor room, the nurse has taken prints of fingers, palm and sole of all babies in corresponding case sheets properly and each baby was marked with a hospital case sheet number tag. On the second day, two male babies were found with the missing tag. Their mothers were unable to identify the babies. The nurse asked duty doctor about the utility of prints of fingers, palm and sole for identification of babies. How should the doctor respond?

INTRODUCTION

Q. Write a short note on dermatoglyphics.

Definition

Dermatoglyphics (In Greek, derma = skin, glyph = carving) is the scientific study of patterns of dermal ridges on the palmar surface of digits, palm and sole **(Box 10.1)**. The ridges are formed by epidermal ridges influenced by dermal papillae.

Some Interesting Facts

- Sir Francis Galton reported observations on fingerprints in 1888.
- Dr Harold Cummins (1926) coined the term "dermatoglyphics".
- National Academy of Science, United States of America, in 2009, questioned for utilization of dermatoglyphics in clinical diagnosis.

Box 10.1: Development of dermal ridges.

The specific pattern of dermal ridges begins to develop during 10–16 week and is completed by the 17th week of intrauterine life.

ANATOMY OF FINGERPRINT

- The skin consists of two layers—epidermis (outer layer) and dermis (inner layer).
- The dermis has small projections that extend in the zone of the epidermis and creates papillary ridges.
- On the epidermal (skin) surface, these ridges form a specific pattern called fingerprint.

PATTERNS IN DERMATOGLYPHICS

The patterns of creases and ridges studied in dermatoglyphics are listed in **Box 10.2**.

Box 10.2: Patterns in dermatoglyphics.

Flexor creases of palm
Dermal patterns
- Finger patterns
  - Simple arch
  - Loop
  - Whorl
- Palmar patterns
- Plantar patterns

Flexion Creases of Palm

- Palmar surface of hand shows palmar creases. They are as follows **(Fig. 10.1)**:
  - Wrist creases
  - Thenar crease
  - Proximal palmar crease
  - Distal palmar crease
  - Palmar digital creases **(Box 10.3)**
  - Proximal and distal interphalangeal creases on all fingers except thumb (thumb has only one interphalangeal crease).

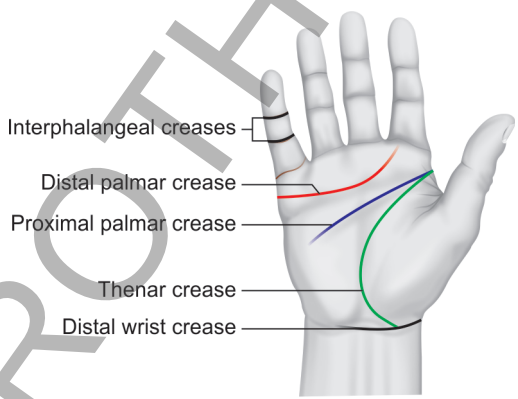

Fig. 10.1: Flexion creases of palm.

Box 10.3: Palmar creases.

- Simian crease—a single transverse crease across the palm instead of proximal and distal palmar creases. It is a characteristic feature of Down syndrome (seen in ~40–50% cases). It is normally found in 1.5% of a general population at least in one hand. *NEET-PG*
- Sydney line—proximal transverse crease crosses the palm completely.
- Suwon crease—proximal and distal palmar creases fuse with each other and there is an additional accessory proximal palmar crease **(Fig. 10.2)**.

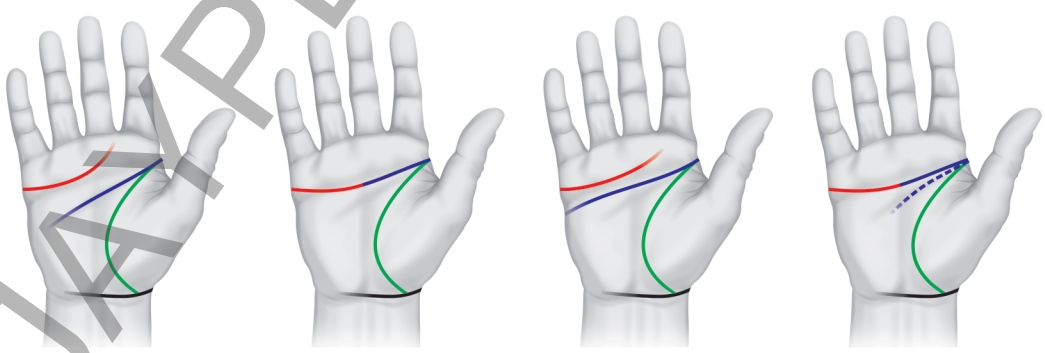

Fig. 10.2: Palmar creases.

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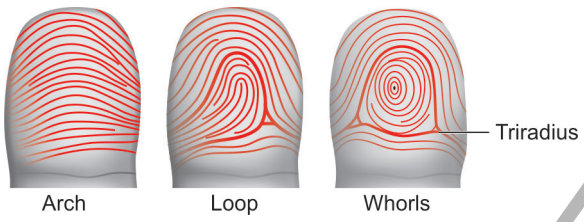

Fig. 10.3: Ridge patterns.

Finger Patterns

The dermal papillae produce specific finger pattern **(Fig. 10.3)**.

GALTON CLASSIFICATION OF FINGER PATTERNS

- Galton classification of finger patterns based on triradii.
- Triradius is a point formed when three ridges course in three different directions at an angle of about 120°.
- There are three classes of finger ridges:
  1. Simple arch—no triradius
  2. Loop—one triradius
  3. Whorl—two or more triradii.
- Loops are of two types—ulnar (tail end of loop towards ulnar side of palm) and radial (tail end of loop towards radial side of palm).

Ridge Count

- It refers to number of epidermal ridges between triradius and core.
- **Method:** Counting of total number of ridges lying across the line drawn from the center of triradius to the center of finger pattern.
- For simple arch, ridge count is zero. *NEET-PG*

Total Ridge Count

- Total ridge count (TRC) is sum of ridge count in all fingers (Both hands together).
- Altered ridge counts and patterns are observed in Turner syndrome and Klinefelter syndrome.

Some Interesting Facts

- Most common finger pattern—loop.
- Greater the number of sex chromosomes, lower the total ridge count.

"atd" Angle

It is an angle formed by joining most proximal triradius on the hypothenar eminence of palm and the triradii below index and little finger **(Fig. 10.4)**.

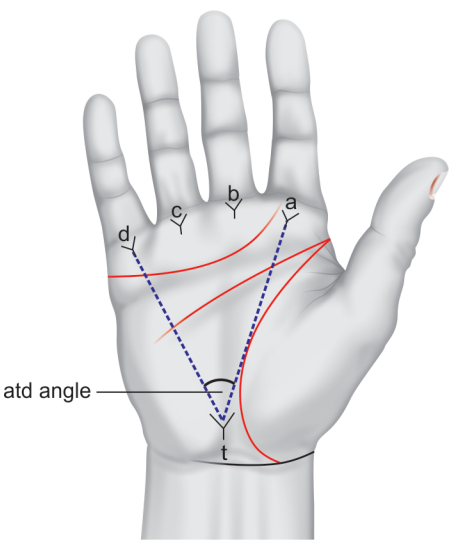

Fig. 10.4: "atd" angle.

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"atd" Angle Significance

- <35°—born athlete
- 35–45°—normal people
- 46–50°—slow learner
- 50°—mentally retarded
- In Down syndrome, usually atd angle is >60°.
- *Note:* All above mentioned values represent old concepts. Modern medicine does not support it.

USES (SIGNIFICANCE) OF DERMATOGLYPHICS

Q. Write a short note on significance or uses of dermatoglyphics.

Following are the significant applications (all below mentioned applications are not supported in modern medicine):

- Anthropological applications of dermatoglyphics
- Inheritance pattern of different dermatoglyphics traits
- Dermatoglyphics in personal identification
- Association of dermatoglyphics pattern and diseases
- Dermatoglyphics in disputed paternity
- Dermatoglyphics in sports selection
- Association of dermatoglyphic patterns and intelligence of individual.

SOLUTION FOR CLINICAL CASE

The doctor should explain the mothers and nurse that dermatoglyphics is useful for the identification of the individual. The impressions of finger, palm and sole are unique for each individual. These impressions remain same throughout the life. Hence, babies can be identified easily using dermatoglyphics provided, it has been recorded properly at the time of birth of these babies.

SUGGESTED READING

1. Dorjee B, Mondal N, Sen J. Applications of ermatoglyphics in anthropological research: a review. South Asian Anthropol. 2014;14(2):171-80.

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PRINCIPLES OF CLINICAL GENETICS

Salient Features

This edition is fully updated as per the latest **Competency-Based Undergraduate Curriculum (CBME)** and the core concepts with modern advances in genetics for clear understanding and rapid revision.

- **Concise, clinically focused content** designed for easy understanding and application in medical practice.
- **Illustrations** and **flowcharts** to help in quick revision and help you tackle exam summaries with ease.
- **Clinical case-based MCQs** to focus on upcoming academic examinations including NEET-PG exam.
- **Interesting facts** and focus **boxes** highlight key topics for deeper insight.
- **Karyotype images** to showcase the role of karyotyping in genetic diagnostics.
- **Practical assignments** to reinforce and practice core concepts.
- **NEET-PG** and **Viva** markings to ensure that you are fully prepared for upcoming medical examinations.
- **Comprehensive glossary** explains unfamiliar genetic terms clearly.
- **Special topics** like gene therapy, stem cell research, genetic counseling, and cutting-edge diagnostic techniques also covered to keep you ahead in the field.

This book is ideal for undergraduate and postgraduate students of **Medicine, Dentistry, Biotechnology, Nursing, Genetic Counseling, and Allied Health Sciences.**

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