Palmar Ridge Systems

A six — or seven — (fingers) "sites" system with sequential invading of interdigital ridge bundles agrees very well with actual data from literature. The palmridges of the left hand lag one "period" behind those of the right hands. Main line formulas and the regularities in their frequencies are to a large extent predictable and can be understood from the 7- "sites" model proposed in this publication.

Introduction

The complex-ridge arrangements on the human palm have repeatedly been investigated. Very important in this field are the studies by Cummins (1928) and Cummins & Midlo (1961).

These studies are our point of depart for a re-analysis of palms. Before beginning with such a re-analysis we must discuss its necessity. Cummins' work and that of many others after him, was mainly descriptive. Ridge configurations on palms were characterized by the number and the locations of triradii and by the beginnings and endings of main lines. Further attention was directed at the types of patterns in the hypothenar — and interdigital areas.

Triradii and main lines had a sort of "own life"; they could reduce to nihil, fuse, or be situated in abnormal places etc. (see Wilder, 1930).

L. S. Penrose (1965) and Penrose & Loesch (1970) made important contributions in describing the analogy between the topological problems of filling a circle with parallel lines perpendicular to its outer border, and the number of singular points in it (triradii).

L. S. Penrose arrived at a general formula, which predicts the number of triradii, knowing the number of fingers, loops and whorls (a whorl counts for two loops). Mathematical aspects of this "topology of the palm" were worked out by R. Penrose (1979).

A new nomenclature and classification based on this topological approach of the palm were proposed. Penrose's classification of palmar main lines and triradii gives a rapid method for describing the gross topology.

In our study we shall try to analyse the palmar system from a more biological point of view. For this purpose we make use of data given by Cummins (1.c.).

Triradii and Sites

Triradii

A triradius is defined as the ridge configuration caused by the meeting or separation of two or three ridge bundles. The centre of the triradius (often virtual) is located at the point where three ridges, the so-called radiants, meet (or from which they depart). In interpreting radiants as built up by normal ridges, but specified by the meeting or splitting of ridge bundles, ridge bundle development is the primary cause. A triradius does not have "own life", but results from the meeting or splitting up of ridge streams. Thus, we arrive at dynamic concepts to understand dermatoglyphic patterns.
Looking at a triradius we cannot choose between splitting or meeting of the participating bundless as being the causal process. In cases of syndactylism however, we have a transverse bundle, distal on two adjacent fingers, while proximal of this bundle, a triradius is found. This characteristic dermatoglyphic pattern can be explained by:

1) absence of the ID (ID = interdigital) bundle. The bundles coming from both neighbouring ID spaces could pass both fingers proximally and meet each other, thus constructing the triradius.

2) another possibility is that the centripetal courses of the ID bundles hindered the development of the ID bundle from the syndactylic fingerpair.

In this case we might expect to find rudiments of this ID bundle. This often is the case. A complete series of transitional forms, from a normal ID bundle to a complete missing of it, has been published by I. Wilder (1930) in her study on interdigital patterns. From her illustrations we can see how two digital triradii apparently approach each other and finally merge into one ID triradius. The dermatoglyphics in syndactylism and the transitional forms towards it, can be explained by the assumption that ID ridges enter the palm centripetally and hinder by their appearance the transverse ridges to pass proximally from one finger to another.

«Sites»

The place where a finger is connected with a palm (dermatoglyphically) is characterized by tangential fingerridges. Neighbouring fingers are separated by ID ridges. The ulnar and radial ID bundles of a finger, together with the transverse ridges between them form a digital triradius. The «long» radiant between both ID bundles is the main line. These three ridgebundles, one tangential and two perpendicular to the circumference of the more or less circular handplate, are the necessary requisites for a glyphological «finger situation», called by us a «site».

Such tangential and perpendicular ridgebundles are found at the roots of all fingers and at the wrist. Thus, in a topological sense, there are at least six sites. Rather often a site-like situation is also observed in the hypothenar region. There we see an ID bundle coming from radiodistal, and splitting in that region, embracing it, or forming a more or less complicated pattern, often together with ridges coming from ulnar.

There seems to be a narrower or broader «disturbance area» in the hypothenar, by which ID — and other bundles may form one or more triradii. Between this disturbance or barrier area and the 5th finger and/or the wrist, the ridges have centripetal (or -fugal) courses. In many cases the ridges at the periphery of the hypothenar (or outside of it) are formed by tangential bundles. The latter may derive from ID bundles. Thus a sort of (seventh) finger site is present in the hypothenar area. With seven interdigital bundles and seven sites at the circumference of the palmplate, there are 14 places to be numbered for indicating the beginnings and endings of the seven main lines.

Remarkable is that Cummins (1.c.) whithout topological consideration also described the main line endings and beginnings by 14 places (13 numbers, but with both 5' and 5''). His total number of 14 origins/endings corresponds with that in our 7-sites-model. The locations 3, 4, 5' and 5'' correspond with our nrs. 2 (partial), 2, 4, 5, while our nr. 14 (the thenar) is missing in Cummins' notation. So the correspondence between both systems holds for 6-13. Cummins defines position 4 as «The approximate midpoint of the ulnar border»; «often the proximal transverse flexion crease reaches this point» he writes. His first criterion is not topological, the second criterion is based on a crease; creases, strictly speaking, do not belong to the systems of cutaneous ridges. In those cases where a