Acta Genet Med Gemellol 29:209–221 (1980)
The Mendel Institute / Alan R. Liss, Inc.

Received 28 May 1980
Final 16 September 1980

Reduction of Main Line C

Walter Vormittag and Margarete Weninger

Second Department of Internal Medicine and Institute of Human Biology, Vienna

Fifteen hundred palmar prints of normal persons and patients suffering from various diseases were studied and classified as to dermal ridge configurations at the base of digit IV, after the exclusion of main line C courses with endings at one of the palmar marginal regions. This classification scheme, based on the three classical reduction forms of line C (O,X(8),x), resulted in the differentiation of three main groups, A, B, and C. Within these main groups, pattern types with strong similarity were combined to subgroups allowing an easier documentation. Twin and family data were used to test whether the described pattern types, besides the classical abortive states O,X and x of line C (called special and intermediate forms), are heritable and for which of them a remarkable reduction tendency could be established. The results allow us to confirm the main grouping and the assumed reduction tendency of the special forms of group A.

Key words: **Dermatographics, Classification, Main Line C, Reduction types, Twin and family study**

INTRODUCTION

The dermatoglyphic configuration at the base of digit IV varies extremely, the most striking feature being the reduction of line C. Besides the classical reduction types O,X and x established by Cummins and Midlo [2], there are many ridge alignments with a reduction tendency of line C not systematically classified up to now. Therefore an exact and more detailed classification seemed desirable from the morphological point of view. Furthermore, it should be examined whether or not some ridge alignments denoted usually as endings 7, 9, or 5 of line C should better be interpreted as special reduction forms. Working on this problem seemed possible since the reduction of line C is strongly influenced by hereditary factors (see side difference, twin and family data [2, 3]) and because it can be assumed that complete (O) and incomplete (X) reduction of line C are caused by different genetically determined mechanisms [3].

MATERIAL AND METHOD

To describe the variety of ridge configurations at the base of digit IV, 1,500 palmar prints of normal persons and patients with various diseases have been analysed. A total of 42 monozygotic (MZ) twin pairs and 57 parents with 146 children were investigated to confirm our morphological classification scheme from the genetical aspect and to decide which of our patterns should be considered as reduction forms.

0001-5660/80/2903-0209$04.00

The classification of the ridge configurations observed is based on the degree of deviation from the types O,X and x and resulted in establishing two main groups, A and B, and an additional main group, C, containing pattern types that seemed to present morphological transitions between A and B. The essential characters used for the classification are: lack or existence of a triradius (complete or incomplete), continuity of the ridge course, symmetry or asymmetry of the pattern, loop-like ridges taking part in forming the pattern, course of line C (straight or curved), and proximal extent of the pattern.

To get the twin and family data more comprehensive, similar pattern types have been combined to subgroups.

MORPHOLOGICAL CLASSIFICATION SCHEME

Main Group A: Absence of Patterns or Patterns of Small Proximal Extent (Figure 1)

A. No triradius
- 1. No loop
  - a1: low curved, symmetrical, may be with one or more bifurcations or with an enclosed island.
  - a2, a3, b1, b2: see Figure 1.
  - c1: 1, 2, or 3 neighbouring ridges, interrupted in the midst and proximally curved.
- 2. With loop
  - d1 and d2: narrow, transversal loop (at most five ridges enclosed) on one (d1) or both (d2) sides.

B. Incomplete triradius
- 1. No loop
  - f1: apart from the triradius resembling c1
  - f2: richer in ridges than f1, but at most five ridges.
- 2. With loop
  - a. Very narrow loop or 2–3 parallel loops fused
    - g1: apart from the triradius resembling d1, but forming an obtuse, distally open angle
    - g2 and g3: complete or incomplete doubling (g2) or tripling (g3) of g1 in proximodistal direction.
  - b. Ridges surrounding the pattern proximally with approach to the triradius at one side
    - h1 and h3: asymmetrical loop reversing just proximally of the incomplete triradius, enclosed sticks (h1) or loops (h3)
    - h2: like h1 and h3, but pattern surrounding ridge extending more proximally, sticks enclosed

C. Completely formed triradius, line C ending in area 7 or 9
- k1: small, proximodistal-directed loop with enclosed stick-like ridges (not more than ten, mostly fewer than six!)
- k2: small, radioulnar-directed loop with (at most ten) sticks or (a few) loop-like ridges in the interior.

Main Group B: Patterns With Reduced Line C, More Extended in Proximal Direction Than the Configurations of Main Group C (Figure 2)

A. Line C strongly reduced

Stick-like ridges on both sides (symmetrical A3,A4) or on one side (A3as,A4as) of line C with longitudinal (A3) or oblique (A4) course.

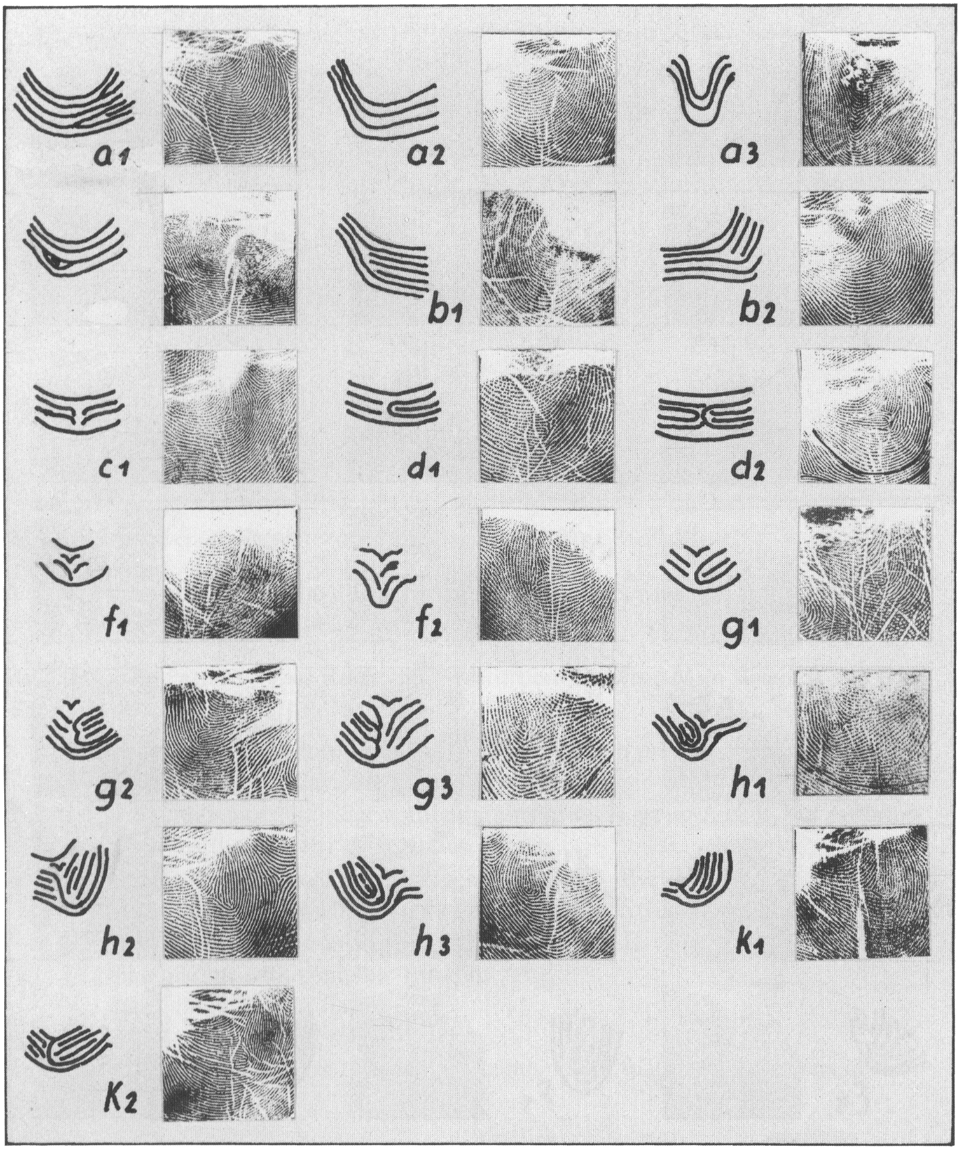

Fig. 1. Pattern types of main group A (c_2: see text).

B. Reduced line C longer (compared to A)
  1. Line C straight (= X)
    a. Symmetrical (= X in the midst of the pattern)
      A1a, A1b, A2: see Figure 2
    b. Asymmetrical
      A1as,A2as: see Figure 2
      A5: X with surrounding loop-like ridge forming one part of the pattern and stick-like ridges forming the rest of the pattern

https://doi.org/10.1017/S0001566000007947 Published online by Cambridge University Press

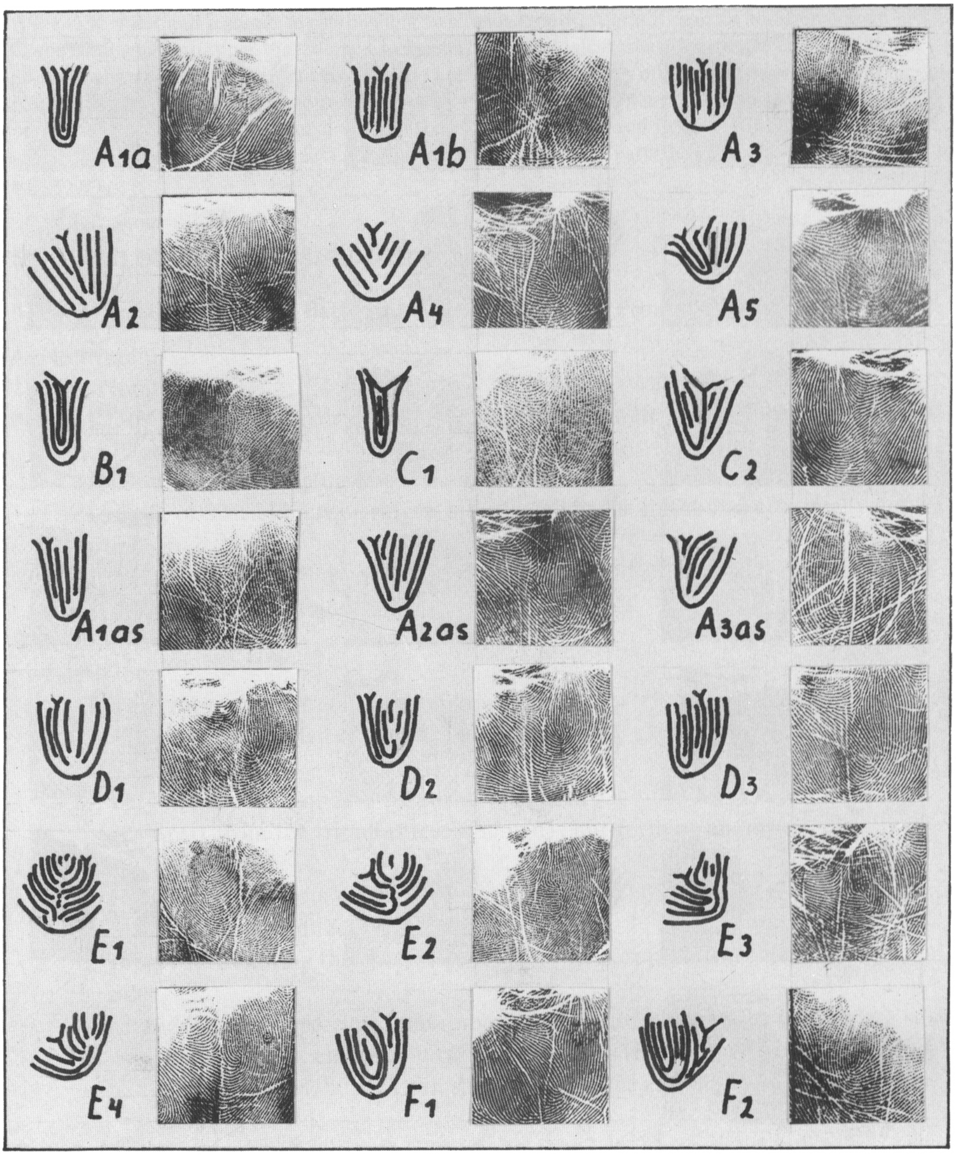

Fig. 2. Pattern types of main group B (D_2, D_4, D_5, E_5: see text).

2. Line C curved

D1, D2, D3: at the concave side, several regularly or irregularly arranged (stick-like) ridges; at the convex side perhaps one to three ridges parallel to line C.

E1, E2: distally resembling D1, proximal of line C several parallel ridges interrupted in the midst.

E3, E4: abortive forms of E1

F1, F2: resembling D1 or D2, but line C shorter and loops and sticks at the concave side of line C.

https://doi.org/10.1017/S0001566000007947 Published online by Cambridge University Press

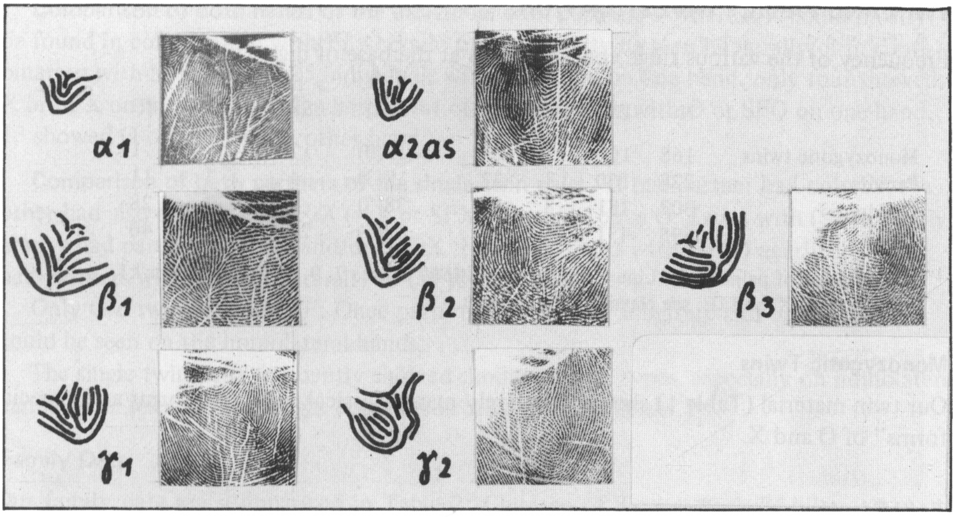

Fig. 3. Pattern types of main group oc C (α_2: see text).

C. Line C ending in one of the distal radiants of triradius c, with 0–1 ridge enclosed
B1, B2, C1, C2: see Figure 2

Main Group C: Pattern Types Resembling Transitions Between Main Group A and B (Figure 3)

A. Patterns with strongly reduced line C and poor extent in proximal direction
$\alpha 1$ and $\alpha 2$ (= x) and $\alpha 2$as: see Figure 3

B. Patterns resembling certain ridge configurations of main group A or B, but differing from them as to their extent or reduction degree.
- $\beta 1$: resembling f2, but of greater extent (more than five ridges)
- $\beta 2$: resembling $\beta 1$, but with loop-like ridges in the proximal part of one pattern side.
- $\beta 3$: resembling E3, but only a triradius without line C
- $\gamma 1$: like h2, but with complete triradius
- $\gamma 2$: resembling F2, but flatter

Morphologically similar pattern types can be combined as follows in subgroups of the main groups A, B, and C:

Main group A	Main group B	Main group C
O = a1, a2, a3	X = A1a, A1b, A2, A3, A4, A5	x = $\alpha 1$, $\alpha 2$
O1 = b1, b2, c1, d1, d2	8 = B1, B2	OX1 = $\alpha 2$as
O2 = f1, f2, g1, g2, g3	X1 = A1as, A2as, A3as	OX2 = $\beta 1$, $\beta 2$, $\beta 3$
O3 = h1, h2, h3	X2 = C1, C2	OX3 = $\gamma 1$, $\gamma 2$
O4 = k1, k2	X3 = D1, D2, D3, E1, E2, E3, E4	
	X4 = F1, F2	

O,X, x = classical reduction forms, x ranging between O and X.
O1–O4 = special forms of O (abbr. SFO).
X1–X4 = special forms of X (abbr. SFX).
OX1–OX3 = intermediate forms of special forms (abbr. IF).

https://doi.org/10.1017/S0001566000007947 Published online by Cambridge University Press

TWIN AND FAMILY INVESTIGATIONS

Frequency of the various ridge configurations at the base of digit IV

	N	Ef	O	SFO	X(8)	SFX	x	IF
Monozygotic twins	168	100	13	22	12(0)	17	3	1
Parents	228	150	7	32	18(3)	4	3	11
Children	302	181	3	40	38(3)	7	2	28
Totals	698	431	23	94	68(6)	28	8	40

N = Number of palms; Ef = Line C ending (doubtless) in area 7, 9, or 5 (exceptions k1, k2); SFO, SFX, and IF: see classification scheme.

Monozygotic Twins

Our twin material (Table 1) showed relatively many classical reduction forms and "special forms" of O and X.

TABLE 1. Monozygotic Twins

Twin pair no.	Pattern types				Subgroup symbols			
	I		II		I		II	
	Left	Right	Left	Right	Left	Right	Left	Right
1–12	–	–	–	–	–	–	–	–
13	–	–	A1b	–	–	–	X	–
14	–	–	A1b	–	–	–	X	–
15	–	–	–	A1b	–	–	–	X
16	–	–	A1b	C1	–	–	X	X2
17	–	–	A1as	–	–	–	X1	–
18	–	–	–	A2as	–	–	–	X1
19	–	–	C1	–	–	–	X2	–
20	–	–	E2	–	–	–	X3	–
21	–	–	F1	–	–	–	X4	–
22	–	–	a2	A2	–	–	O	X
23	A5	–	A5	–	X	–	X	–
24	A5	–	k1	k1	X	–	O4	O4
25	A1b	–	D2	D1	X	–	X3	X3
26	A2	–	–	F2	X	–	–	X4
27	C1	A1b	–	A1as	X2	X	–	X1
28	C2	A1b	C2	–	X2	X	X2	–
29	E4	–	E4	–	X3	–	X3	–
30	E4	–	E4	–	X3	–	X3	–
31	alpha2	–	alpha2	–	x	–	x	–
32	–	alpha2	–	a2	–	x	–	O
33	β1	–	β2	h1	OX2	–	OX2	O3
34	a1	a7	a1	a1	O	O	O	O
35	a1	a1	a1	h1	O	O	O	O3
36	a1	–	h2	h1	O	–	O3	O3
37	a1	h2	–	b1	O	O3	–	O1
38	a1	h1	k2	h1	O	O3	O4	O3
39	d2	–	h2	–	O1	–	O3	–
40	h2	a1	h2	f1	O3	O	O3	O2
41	f1	h2	k2	h2	O2	O3	O4	O3
42	h2	–	k2	–	O3	–	O4	–

(–means Ef = Line C ending (doubtless) in area 7, 9, or 5 (exceptions k1 and k2).

Comparison of both hands of the individual twin partners. Whereas X could mostly be found in combination with Ef, O could predominantly be seen bilaterally or in combination with SFO. Out of 25 individuals with X or SFX on one hand, only four showed X or SFX on the other hand, whereas out of 22 individuals with O or SFO on one hand, 13 showed O or SFO on the other hand.

Comparison of both partners of the single twin pairs. If one partner had only Ef, the other had also only Ef or (SF)X (= X or SFX), but only once O. Twins with (SF)X nearly always had partners with Ef and/or (SF)X. However, twins with (SF)O nearly always had partners with (SF)O bilaterally or (SF)O and Ef.

Only two twin pairs had IF: Once patterns of the same subgroup and once x and O could be seen on the homolateral hands.

The single twin pairs frequently showed similar pattern types, especially on homolateral hands. (The results of left/right comparison are explained below.)

Family Data

Our family data are summarized in Table 2: Children of parents with Ef bilaterally mostly had Ef on both hands too, but also X occurs with high frequency; besides, there were some SFX and OX, but only a single SFO and no O. Similar results could be seen in children whose one parent had bilateral Ef and the other one (SF)X bilaterally or unilaterally combined with Ef or with OX. If one parent had bilateral Ef and the other one (SF)O, the children predominantly showed, apart from Ef, (SF)O; besides, X and OX configurations, but no SFX.

In two cases, one parent had bilateral Ef and the other Ef and IF: Their children showed Ef, X and O3, but no IF. If one parent had X and the other (SF)O, X, SFO, and OX3 could be observed in their children. If both parents had SFO, their children had not only SFO but also O, besides OX3, but no X. SFX were nearly absent in our family material. (Results of left/right comparison resembled those of the twin material and can be found below.)

Regarding the single families, not only accumulation of group-specific patterns but even, in several families, two or more members with the same or similar pattern types could be observed (data on request).

Combined Twin and Family Data

Left/right comparison. Table 3 contains all of our pattern types observed in twins and families, for the left and right hand separately. For each of the three main groups (A, B, C) the total number of pattern types was higher on the left hand. But this could neither be found for each of the three single series (twins, parents, children) nor for each of the single pattern types, probably because of the rather small material; for instance, the classical reduction form A1b did not show any side difference. It seems noteworthy that $\gamma 1$ and $\gamma 2$ occurred more frequently on the left hands of the children, but on the right hands of the parents.

Concordance of the same subgroup in twin pairs or intrafamiliar accumulation.

Main group A: Concordance in twins and familiar accumulation of identical or subgroup-specific pattern types, but occurrence of types of different subgroups in twin pairs and some of the families also.

Main group B: Within the same family frequent occurrence of different X forms; in our material SFX forms were very rare.

https://doi.org/10.1017/S0001566000007947 Published online by Cambridge University Press

TABLE 2. Ridge Configurations at the Base of Digit IV

Parents	Children																
left/right	N1	N2	Ef	X(8)	X1	X2	X3	X4	OX1	OX2	OX3	x	O	O1	O2	O3	O4
a:Ef bil. b:Ef bil.	15	42	58	14	2	1	1	–	–	1	5	1	–	–	–	1	–
a:Ef bil. b:Ef/X	5	9	12	1(1)	–	–	–	–	–	–	4	–	–	–	–	–	–
a:Ef bil. b:X bil.	1	3	2	3	–	–	–	–	–	–	–	–	–	–	–	1	–
a:Ef bil. b:X1/X	1	2	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:X/OX3	1	2	3	–	1	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:8/Ef	1	2	2	1	1	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:X3/8	1	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:Ef/X2	1	4	6	–	–	–	–	–	–	–	–	–	–	–	–	2	–
a:Ef bil. b:O bil.	2	5	6	–	–	–	–	–	–	1	–	–	–	2	–	1	–
a:Ef bil. b:O/O3	1	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:OX1/O	1	2	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:O3/Ef;Ef/O3	4	17	23	2	–	–	–	–	–	–	5	–	2	–	–	2	–
a:Ef bil. b:O3/O3	1	1	0	1	–	–	–	–	–	–	–	–	–	–	1	–	–
a:Ef bil. b:O4/Ef	1	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:O1/O1	1	3	4	–	–	–	–	–	–	–	–	–	–	–	–	2	–
a:Ef bil. b:O2/O3	1	3	3	1	–	–	–	–	–	–	–	–	–	–	–	2	–

a:Ef bil. b:O3/OX3	1	3	0	1	–	–	–	–	–	–	1	–	1	2	–	1	–
a:Ef bil. b:OX2/Ef	1	2	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–
a:Ef bil. b:OX3/Ef	2	6	7	2(1)	–	–	–	–	–	–	–	–	–	–	–	2	–
a:Ef/X b:X1/Ef	1	4	7	–	–	–	–	–	–	–	–	–	–	–	–	1	–
a:X bil. b:OX1/Ef	1	4	5	2(1)	–	–	–	–	–	–	–	–	–	–	–	–	–
a:X/Ef b:Ef/OX3	1	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–
a:X/Ef b:O/O2	1	2	0	1	–	–	–	–	–	–	1	–	–	–	–	2	–
a:X/Ef b:O1/O3	1	3	1	1	–	–	–	–	–	–	1	–	–	1	–	2	–
a:X/Ef b:O3/O3	1	1	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–
a:X/Ef b:O3/Ef	1	2	2	1	–	–	–	–	–	–	1	–	–	–	–	–	–
a:X/OX3 b:O1/Ef	1	2	2	–	–	–	–	–	–	1	1	–	–	–	–	–	–
a:Ef/x b:Ef/O1	1	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1
a:x/OX3 b:O3/O3	1	1	0	2	–	–	–	–	–	–	–	–	–	–	–	–	–
a:x/O3 b:O1/Ef	1	4	4	–	–	–	–	–	–	–	2	–	–	–	–	1	1
a:O4/OX3 b:O3/Ef	1	2	–	–	–	–	–	–	–	–	1	1	1	–	–	1	–
a:O3/O4 b:O3/Ef	1	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–
a:O3/Ef b:O3/Ef	1	3	3	–	–	–	–	–	–	–	2	–	1	–	–	–	–

N1 = Number of the respective parent combination. N2 = Number of children. a and b = Parents.

TABLE 3. Frequency of the Single Pattern Types and Left/Right Ratio

	MZ twins		Parents		Children		Total	
Pattern types	l	r	l	r	l	r	l	r
a1–a7	8	5	4	3	2	1	14	9
b1	–	1	–	–	1	1	1	2
b2	–	–	2	3	4	3	6	6
c1	–	–	–	–	–	–	–	–
c2	–	–	–	–	–	–	–	–
d1	–	–	2	–	1	–	3	–
d2	1	–	–	–	–	–	1	–
f1	1	1	1	–	–	–	2	1
f2	–	–	–	–	1	–	1	–
g1	–	–	–	–	1	1	1	1
g2	–	–	–	–	–	–	–	–
g3	–	–	–	–	–	–	–	–
h1	–	5	4	4	7	7	11	16
h2	5	3	3	2	4	5	12	10
h3	–	–	5	3	–	2	5	5
k1	1	1	1	1	1	1	3	3
k2	3	–	1	–	–	–	4	–
Total	19	16	23	16	22	21	64	53
α1	–	–	–	1	–	–	–	1
α2	2	1	2	–	1	1	5	2
α2as	–	–	2	–	–	–	2	–
β1	1	–	–	–	–	–	1	–
β2	–	–	–	–	1	–	1	–
β3	–	–	1	–	2	1	3	1
γ1	–	–	1	6	11	5	12	11
γ2	–	–	1	–	6	2	7	2
Total	3	1	7	7	21	9	31	17
A1a	–	–	–	–	–	–	–	–
A1b	4	3	4	4	7	9	15	16
A2	1	1	6	2	5	5	12	8
A3	–	–	1	–	2	2	3	2
A4	–	–	1	–	3	3	4	3
A5	3	–	–	–	2	–	5	–
B1	–	–	1	2	1	2	2	4
B2	–	–	–	–	–	–	–	–
C1	2	1	–	1	–	1	2	3
C2	2	–	–	–	–	–	2	–
A1as	1	1	2	–	–	1	3	2
A2as	–	1	–	–	–	–	–	1
A3as	–	–	–	–	2	1	2	1
D1	–	1	1	–	1	–	2	1
D2	1	–	–	–	–	–	1	–
D3	–	–	–	–	–	–	–	–
E1	–	–	–	–	–	–	–	–
E2	1	–	–	–	–	–	1	–
E3	–	–	–	–	–	–	–	–
E4	4	–	–	–	1	–	4	–
F1	1	–	–	–	–	–	1	–
F2	–	1	–	–	–	1	–	2
Total	20	9	16	9	24	25	59	43

Main group C: In two families, members with $\gamma 1$ as well as $\gamma 2$ could be observed; the other IF occurred only sporadically.

DISCUSSION

The aim of this investigation has been to separate, out of the immensely varying ridge configurations at the base of digit IV, all the alignments of line C with no distinct ending in area 9, 7, or 5 and to arrange them according to the degree of deviation from the classical reduction types O,X or x. Following this principle, we developed a classification scheme with three main groups (A, B, and a third group, C, with patterns looking like transitions between A and B) containing a lot of single pattern types. Moreover, we succeeded in arranging the pattern types within the main groups A and B in a way resembling a stepwise morphological development with regard to the reduction of line C, similarly to the "transitions from one pattern type into another" of the finger tips [1] and subsequently to the "Stufenschema" of Wendt [4]. Considering these transitions between the single pattern types, it seems problematical to establish subgroups, but we thought it necessary for an in-depth evaluation.

In spite of the stepwise transition between X and O, and also between SFX and SFO from the morphological point of view (demonstrated by the intermediate forms of main group C) it is well known that X and O have a different genetic background [3]. Therefore, it should be tested by twin and family studies, if the morphological differentiation of our main groups could be accepted from the genetic-developmental point of view also and if all the "special and intermediate forms of reduction" should indeed be regarded as "configurations with a strong tendency to reduction of line C."

To answer these questions seemed possible since – apart from the well-known hereditary character of the classical reduction forms of line C – O,X and x occur more frequently on the left hand, since the complete reduction (O) occurs more frequently bilaterally than the incomplete (X), and since O and X occur very rarely on the hands of the same individual. Finally, it may be assumed that the mentioned characteristics of the classical reduction forms should be right for the special and intermediate reduction forms also, if the latter pattern types had a similar genetic background as the corresponding classical reduction types.

1) Main Group Classification

Both twin and family data show a clear separation of the two main groups A and B, valid for all the special types of reduction: If line C of one twin partner was ending at the periphery (abbr Ef) on both hands, the other one, too, had Ef bilaterally or Ef on one hand and (SF)X (= X or a special form of X) on the other hand, but no (SF)O pattern; if one partner had (SF)O, patterns of main group A could be found on the hands of the other one in most cases. Quite similarly, children of parents with Ef or (SF)X had Ef or (SF)X, but no (SF)O, and children of parents with (SF)O very often had (SF)O too.

Pattern types of subgroup O3 could be observed in children of all the various parent combinations, but first of all, if parents had (SF)O, it therefore seemed justified to understand O3 patterns as belonging to main group A.

Patterns of subgroup OX3 occurred in children of different parent combinations with equal frequency, a fact that could be interpreted as an expression of a genetical intermediate position of these patterns; x and types of subgroups OX1 and OX2 occurred very rarely in our material.

2) Subgroup Classification

The classification of our subgroups ought to be confirmed by the concordance in monozygotic twins and the intrafamiliar accumulation of the same subgroup. Only for subgroup X we succeeded to comply with this requirement. The other subgroups of B occurred too rarely and, as to the occurrence of A-subgroups, no regularity could be recognized. Out of the subgroups of C, 1 and 2 could be observed in two or more members of two families, the other IF occurred only rarely.

3) Characterizing the Single Pattern Types

Although our material is too small for obtaining a clear opinion about every pattern type, the "individual character" of many types seems to be well proved by the occurrence of identical or very similar configurations in the twin partners (Table 1) and/or in the same family (data on request).

4) Reduction Tendency of Special and Intermediate Forms (Concerning Pattern Types Which Could Possibly Be Classified as Ef: g1–g3, O3, O4, OX1, OX2, OX3, X1–X4)

Reduction tendency should be proved by the following criteria:

a) *Combination* of *special* reduction *forms* (SFO and SFX) with the corresponding *classical* reduction *forms,* ie, "concordance" of O and SFO or X and SFX in twins (first of all homolaterally), intrafamiliar accumulation of O and SFO or X and SFX, and – for SFO only – occurrence of the classical and the corresponding special forms in one individual: (Since X rarely occurs bilaterally, the combination of X and SFX should only rarely occur in one person also; if a similar genetic background for X and SFX is assumed: Of 57 57 probands with X on one hand, only 5 showed SFX on the other hand.)

As to SFX, it has to be said that no clear hints for a reduction tendency can be derived because in our twin and family material X mostly showed combination with Ef. The reduction tendency of SFO, however, seems to be strongly affirmed: Of seven twin individuals with O on one hand, three partners showed O and four partners showed SFO on the homolateral hand; and of 18 probands (ten twins, five parents, three children) with O on one hand, five could be found with O and eight with SFO on the other hand. O exclusively occurred in children whose parents had SFO, usually combined with Ef, once with OX3.

b) *Left/right ratio* (O,X and x more frequently in left hands [2]). The added-up values show higher counts for SFO, SFX, and IF in the left hands, but the material is too small to obtain clear results for each pattern type.

c) *O and X only seldom in one individual [2].* (Presuppositions: X often combined with Ef – if X not (often) combined with SFO means that SFO is different from Ef. O combined with Ef or (SF)O – if O not combined with SFX means that SFX is different from SFO or Ef. SFX not combined with SFO ?! – a priori useless, since both SFX and SFO types enumerated above (see page 213) could more correspond to Ef than to classical tion forms.) As to our material (698 palmar prints), 66 probands had X in one hand but only one time SFO in the other hand (number of SFO = 94) and 18 probands with O in one hand had no SFX in the other hand (number of SFX = 28).

From these results, we conclude that SFX and SFO are ridge configurations with a tendency to reduction and that they represent different genetic entities. According to this assumption, SFX and SFO should rarely occur in the hands of a single individual. As to our material, only one of 28 (unilateral) SFX carriers had SFO and only one of 68 (unilateral) SFO carriers showed SFX in the other hand.

CONCLUSION

Distinction of the main groups A, B, and C appears justified both from the morphological and genetic points of view. Genetic heterogeneity of the special reduction forms of A (SFO) and B (SFX) could be demonstrated in a similar way as it had been done for O and X [3]. Concerning OX3, not only a morphological, but also a genetical intermediate position between A and B seems likely; x, OX1 and OX2 occurred very rarely in our material, but there should not be any doubt as to the intermediate character of these pattern types. Our subgrouping could not be confirmed by twin and family data, because SFX and most of the IF occurred too rarely, and SFO subgroups seem to have such a similar genetic background that separation was impossible.

The reduction tendency of all SFO types could sufficiently be demonstrated, whereas only indirect hints support the assumption that SFX are pattern types with reduction tendency.

The proposed classification scheme is in favor of a more exact documentation of the ridge configurations at the base of digit IV. Apart from this descriptive aspect, special problems concerning reduction of line C can be treated with a better and richer equipment, although it must be stated that there are still some uncertainties in our scheme that should be removed by further studies.

REFERENCES

1. Bonnevie K (1924): Studies on papillary patterns of human fingers. J Genet 15:1–112.
2. Cummins H, Midlo Ch (1943): "Finger Prints, Palms and Soles." Philadelphia: Blakiston Comp.
3. Ehrhardt S (1954): Die Reduktion der Hauptlinie C auf der Handfläche. Z Morph Anthropol 46:124–130.
4. Wendt GG (1963): Vorschläge zu einer einheitlichen Befundbeschreibung für die Papillarleisten der Fingerbeeren. Anthrop Anz 26:165–178.

Correspondence: Prof. Margarete Weninger, Institut für Humanbiologie, Van Swietengasse 1, A-Wien 1096, or Dr. Walter Vormittag, II. Medizinische Universitätsklinik, Garniosongasse 12, A-1090 Wien, Austria.