Dermatoglyphs in Human Polyploidy

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Chromosomal aberration is frequently accompanied by distortion of the dermatoglyphic patterns on hands and feet. It is therefore to be expected that triploids and tetraploids, whether complete or mosaic, will be likely to show peculiarities. Abnormal dermatoglyphs are inevitable if there is growth disturbance which affects the extremities. It is remarkable, on the whole, how relatively slight are the morphological changes of pattern which have been found in association with human polyploidy as compared with those found, for example, in trisomics. One feature that occurs fairly consistently is some degree of webbing of fingers and the disturbances of ridge formation exhibited are mainly consequences of this peculiarity.

Five cases were available for study, 3 surviving mosaic triploids, one surviving mosaic tetraploid, and one completely triploid foetus. These are listed in Table I.

In all the mosaic triploid cases, leucocyte cultures revealed the presence of normal diploid cells only. Triploid cells were found in varying proportions of fibroblasts examined in different cases. Conversely, the tetraploid mosaicism was only demonstrated in leucocytes (see Table II).

At the time of writing, these five cases are the only examples of human polyploidy surviving birth which have been described, and it may be of interest to summarize the information about their dermatoglyphs even if it is, in some respects, incomplete (see Fig. 1-5). No prints of the soles were available of Case 4 which only survived birth by a few hours. As was not unexpected, the most normal palmar patterns were found in Case 3, where the proportion of polyploid cells was least, and the most unusual features were present on the hands of Case 4 which was entirely triploid.

The most noticeable feature of the finger-tip patterns in these cases, listed in Table III, is that, among 50 digits on which they were decipherable,

there were 5 which showed radial loops—nearly twice as many as might have been expected on the basis of population distributions. It should be noted, however, that, on 40 fingers of the normal close relatives of Case 2, there were 5 radial loops. Nevertheless, the radial loops on digits IV and V of the left hand of Case 4 are exceptional. Arches were found only in Case 5: this was associated with brachyphalangy. The total number of triradii on the ulnar sides of all fingers (R+W) is a little higher than would be normally expected. The sizes of the patterns, as judged by ridge-counting in

TABLE I
LIST OF CASES

Case No.	Sex	Age	Karyotype	Source
1	M	7	Mosaic triploid (XX/XXY)	Böök and Santesson (1960)
2	F	9	Mosaic triploid (XX/XXX)	Ellis, Marshall, Normand, and Penrose (1963)
3	M	10	Mosaic triploid (XY/XXY)	Ferrier, Ferrier, Stalder, Bühler, Bamatter, and Klein (1964)
4	M	—	Triploid (XXY)	Edwards, Yuncken, Rushton, Richards, and Mittwoch (1967)
5	M	2 12	Mosaic tetraploid (XX/XXYY)	W. J. Mellman (1966, personal communication)

TABLE II
SUMMARY OF CYTOLOGICAL DATA: PERCENTAGES

Case No. and Sex	Leucocytes			Fibroblasts		
	Diploid	Triploid	Tetraploid	Diploid	Triploid	Tetraploid
1 M	100	0	0	33	67	0
2 F	100	0	0	50	50	0
3 M	100	0	0	93	7	0
4 M	0	100	0	0	100	0
5 M	31	0	69	100	0	0

These percentage values are estimates based upon the published or reported cell numbers

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 1-5. Tracings of dermatoglyphic main lines in Cases 1 to 5, respectively (scale about one-third natural size).

those cases where this was possible, are normal (see Table IV).

On the palms there are anomalous interdigital triradii which are related to zygodactyly of digits III

and IV on the left hand of Case 2, digits II and III on both hands in Case 4, and IV and V on both hands in Case 5. Although clinical syndactyly was recorded in Case 1, the dermatoglyphic patterns do

TABLE III
FINGER-TIP AND HALLUX PATTERNS

Case No.	Fingers										Toes	
	Left					Right					Left	Right
	V	IV	III	II	I	I	II	III	IV	V		
1	U	U	U	U	U	U	R	R	U	U	W	F
2	U	U	W	W	U	U	W	W	U	U	W	F
3	W	W	W	W	W	W	U	W	U	W	W	W
4	R	R	W	R	W	W	U	W	W	U	—	—
5	U	U	A ^t	U	U	U	A ^t	U	A ^t	A	—	—

Summary of type frequencies:

		Observed	Control Population*	χ^2
Arch	(A)	4	2.4	1.1
Radial loop	(R)	5	2.7	2.0
Ulnar loop	(U)	24	31.6	1.8
Whorl	(W)	17	13.3	1.0
Total		50	50.0	5.9
(R) + (W)		22	16.0	2.2
(U) + (W)		41	44.9	0.3

F = Fibular loop. A^t = Tented arch.

* Holt (1964).

not confirm this but they are consistent with slight generalized webbing. There is a complex pattern on the left hypothenar area in Case 1. Otherwise the most noteworthy palmar peculiarity is the thenar exit of the A-line on the left hands of Cases 1 and 2.

The patterns decipherable on toes were not remarkable. On the soles the configurations of Cases 1 and 3 are both of low intensity, each having only 5 triradii. The zygodactyly in Case 2 is reflected in the three distal interdigital triradii on each sole. Similar effects are just visible on the left sole of Case 5; here, on both soles, there is apparently an un-

TABLE IV

RIDGE-COUNTS ON FINGERS OF PATIENTS Nos. 1, 2, 3 AND 4 AND OF FOUR RELATIVES OF CASE 2 (A-D)

Case		Left					Right				
		V	IV	III	II	I	I	II	III	IV	V
1 M	ULC	12	10	?	5	?	?	0	0	12	2
	RLC	0	0	?	0	?	?	17	11	0	0
2 F	ULC	7	13	12	7	12	21	4	20	15	8
	RLC	0	0	10	15	0	0	16	14	0	0
2A M	ULC	18	17	16	12	21	23	13	19	9	21
	RLC	0	0	0	0	0	0	0	0	17	0
2B F	ULC	17	12	10	0	5	25	0	13	19	16
	RLC	0	0	0	18	17	0	19	0	0	0
2C F	ULC	7	7	9	1	26	25	0	0	6	7
	RLC	0	0	0	0	5	9	5	4	0	0
2D F	ULC	15	16	3	18	20	25	0	14	14	17
	RLC	0	0	0	0	19	13	17	0	16	0
3 M	ULC	13	17	20	13	17	17	16	13	22	18
	RLC	4	19	7	23	14	11	0	8	0	6
4 M	ULC	0	0	7	0	13	8	0	15	12	14
	RLC	11	8	15	11	9	5	12	14	13	0

ULC indicates ulnar loop count; RLC indicates radial loop count.

usual simplification of pattern and, on the right side, it is associated with ectrodactyly.

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