



Received 20 January 1984
Final 17 May 1984

Central Pockets in Dermatoglyphic Analysis: Classification, Frequency, Twin and Family Data

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Abstract. Central pockets were defined as small, loop-enclosed whorls whose quantitative values must not exceed the third part of the quantitative value of the loop or as small, whorl-like patterns in the core of a loop having at least one curved ridge with its convexity towards the opening of the loop. Applying this classification scheme, the frequency of central pockets was found to be 17.5% in 200 males and 17.0% in 200 females, but was significantly higher in a sample of 21 male and 22 female pairs of MZ twins (33.2% and 34.1%, respectively). Twin as well as family data (94 families with 269 children) pointed to a rather weak hereditary influence upon the formation of central pockets. Rudimentary central pockets occurred in 9.5% of males and 10.0% of females. Since no common genetic basis could be established for central pockets and rudimentary central pockets, the latter should not be scored as central pockets.

Key words: Central pockets, Dermatoglyphics, Twins

INTRODUCTION

Generally, in dermatoglyphic analysis, a 'small' whorl or a small whorl-like pattern within a loop is called central pocket (CP). But it is not defined up to which size a loop-enclosed whorl may be classified as a CP and there are transitions to 'pockets' which appear as rudimentary central pockets (RCP). The aim of this paper was therefore to propose a clear definition for CP, to collect normal-frequency, twin and family data for these pattern types, and to investigate whether RCP should be scored as CP.

MATERIAL AND METHOD

The sample consisted of 106 unrelated males and females, 94 families with 269 children, 21 male and

22 female monozygotic twin pairs of the Eastern part of Austria. To ascertain the frequencies of CP and RCP we combined the data of the individual persons and the parents of the families resulting in a sample size of 200 males and 200 females.

The following patterns were scored as CP:

- 1) Small 'pockets' as described by Windt and Kodicek [7]. These pockets must have at least one ridge with a convexity towards the opening of the loop; a distinct triradius may be absent.
- 2) Loop-enclosed whorls with a quantitative value not greater than 1/3 of the quantitative value of the loop.

CP must be enclosed. That means that the distal radiant of the triradius of the loop is not allowed to enter the pocket-area. Small CP without a distinct triradius and with no curved ridge as described above for central pockets were classified as RCP. The characteristics of CP and RCP are shown in the Figure.

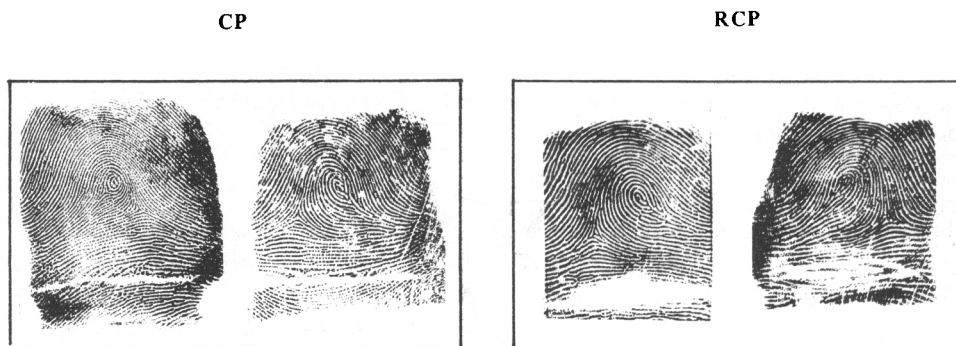


Figure - Central Pockets and Rudimentary Central Pockets.

RESULTS

CP occurred in 17.5% of males and 17.0% of females and RCP in 9.5% of males and 10% of females. In both sexes there were more CP on the right hand (males 56.1%, females 60%) than on the left hand. The digital frequencies of CP were 2.1% in males and 2.0 in females; those of RCP, 1.2% and 1.1%). Only 3 males and 6 females had 2 CP, and 1 man had 4. Only 4 males and 1 female had 2 RCP. In both sexes, CP were most common on digit II (males 34.1%, females 45.0%) and on digit IV (males 51.2%, females 40.0%) of both hands, while RCP occurred most frequently on digit IV of both hands (males 60.9%, females 71.4%).

As to families (see Table A), the frequency of CP in children did not differ whether both parents had no CP or only the father had one (19.4% and 21.3%, respectively), but was considerably higher (36.0%) when the mother was affected, the difference being close to statistical significance ($\chi^2 = 3.70$, $P \sim 0.05$). When one or two children of a sibship had a CP their father or mother had more often a CP than parents of children without a CP (Table B), but the difference is not significant.

Table - Family Data on Presence (+) or Absence (-) of Central Pockets

A

Type of parents	No. of families (N = 94)	No. of children (N = 269)	No. (and %) of children +
Father - Mother -	65	196	38 (19.4%)
Father + Mother -	17	47	10 (21.3%)
Father - Mother +	11	25	9 (36.0%)
Father + Mother +	1	1	1

B

Type of sibship	No. of families (N = 94)	No. of children (N = 269)	No. (and %) of parental types		
			Father + Mother -	Father - Mother +	Father + Mother +
No. child +	56	145	10 (17.9%)	4 (7.1%)	0
1 child +	25	70	5 (20.0%)	3 (12.0%)	1 (4.0%)
2 children +	10	36	1 (10.0%)	3 (30.0%)	0
3 children +	2	9	1	0	0
7 children +	1	9	1		

The frequency of RCP in the children did not seem to be influenced by that in the parents. And there was no clear correlation between CP and RCP frequencies in families: children showed a high frequency of CP (31.0%) when a parent had a RCP, but RCP frequency in children was the same (about 10%) whether a parent had a CP or not.

Monozygotic twin pairs

There was no difference between sexes: about half of the twin pairs had no CP; the other pairs were about twice as often discordant than concordant for CP. As to frequency, 14 male twins (33.2%) and 15 female twins (34.1%) had a CP, which is significantly more than found in our unrelated 200 males and 200 females ($\chi^2_1 = 4.32$ and 6.15, respectively $P < 0.05$). Only 3 twins (one pair and one single twin) had a RCP.

DISCUSSION

With respect to our classification scheme for central pockets, it is, of course, a problem to define exactly up to which size an enclosed whorl may be regarded as 'small'. Certainly, the definition has to take into account the relation between the size of the loop and that of the pocket. In our opinion, the proposed 1:3 relation as the upper border of the relative size of an enclosed whorl is appropriate to differentiate between "CP whorls" and whorls.

According to Wendt [6], pockets without distinct triradius would be classified as 'loop-whorl-transitions'; the upper limit of his 'whorl-loop-transitions' (1:2 count ratio exceeds, in our opinion, the extension of a CP.

According to Schaumann and Alter [5], Casey et al [3] classified a whorl as a CP when the straight line drawn from the triradius of the loop to that of the enclosed whorl did not transect the whorl. Using this method, small whorls undoubtedly will be scored as CP, but also great whorls can fulfil the above mentioned requirement if they are longitudinally shaped.

Compared to our values, Casey et al [3] obtained a higher frequency of individuals with CP (23% as a mean value of both sexes), while Biscatti et al [1] obtained 11% and Blotevogel [2] 6% only. These differences may be caused – at least partly – by different classification criteria.

The high frequency of CP obtained in our monozygotic twins is a striking result and should be confirmed by further investigations.

Family and twin data suggest that hereditary factors are involved in the formation of CP, but this genetic influence did not appear to be very pronounced. There was a mother-child, but no father-child correlation in the frequency of CP, similarly to an observation for fingertip patterns and other dermatoglyphic features by Knussmann [4] who interpreted it as a possible hint for extrachromosomal inheritance. The twin concordance rate for CP was rather low (about 30%), but high enough not to be neglected. RCP and CP were most frequent on digit IV of both hands, and CP also on digit II.

Our families fail to clearly point to a common genetic basis for CP and RCP. Therefore, we should propose that RCP and CP be scored separately.

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