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Dermatoglyphic Patterns of Diabetic Children

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Diabetic children have been subjected to dermatoglyphic investigations. The total ridge count above 190 and 200 in female and male diabetic patients, respectively, showed a significantly high incidence. The possibility of the identical origin of dermatoglyphic changes and the congenital anomalies is discussed.

Some decades ago it was suggested that developmental disturbances occur more often in diabetic than in healthy children [18]. These disturbances had not been considered of importance until it was established that illnesses connected with chromosomal abnormalities such as Turner's [6, 10] and Klinefelter's [14] syndromes are frequently associated with irregularities of carbohydrate metabolism.

According to our observations [2, 3], Turner's syndrome, congenital heart defects, dysplasia of blood vessels are more frequent among diabetic than among normal children.

It seemed therefore interesting to examine whether genetic tests would reveal some difference between diabetic and control children. For this purpose the dermatoglyphic pattern was studied, since this was believed to display changes even in those constitutional developmental disturbances which are not associated with chromosomal anomalies [1, 7].

Results and Discussion

A total of 106 children, 58 girls and 48 boys, were examined. Their illness had manifested itself between the 1st and 14th year of life. As a control 210 school-children, 110 girls and 100 boys, were studied.

The dermatoglyphic pattern displayed no detectable difference between the two groups as regards the patterns of the fingers and the position of the axial triradius and triradii [5]. The thenar I interdigital pattern was frequently observed on both hands in the diabetic group, without reaching statistical significance.

The incidence of the 3rd interdigital and the hypothenar pattern was similar in both groups. A simian line occurred in 2.8% of the controls and in 5.6% of the diabetics, while Turpin and Lejeune [16] found it in 1.12% of 100 men and 200 women, Uchida and Soltan [17] in 2.0% of 500 women, Méhes [13] in 3.1% of 418 boys and 350 girls. The inci-

dence observed in our diabetics did not reach statistical significance.

Table I shows average values for the total number of ridges on the 10 fingers, as reported by several authors. As to our own results, they were in accordance with the values given in the literature. In diabetic males the incidence was higher than in the controls, but the mean for the other hand, in cases of Turner's and Klinefelter's syndrome there was a great deviation from the usual.

TABLE I

Mean ridge count in different ethnic groups

Country	Reference	Males	Females
Sweden	4	139.7	120.7
Great Britain	8	144.9	127.2
India	12	139.8	135.9
Germany	7	145.0	127.0
Hungary present data		140.4	132.3
Under pathological circumstances			
Diabetes mellitus present data		157.6	130.1
Klinefelter's syndrome		17	116.4
Turner's syndrome		17	187.5

In the distribution of the data yielding the mean values there was a significant difference between diabetics and controls of both sexes (Table II). Concerning the total number of ridges over 190 and 200, the difference between females and males was also significant, on the basis that males show about ten more ridges than females. A lower number of ridges in the diabetic group, especially among girls, was more frequent and, partly as a consequence of this, the average ridge number was fairly constant.

TABLE II

Total ridge number (per cent)

Girls

Ridge number	Diabetes (58 cases)	Controls (110 cases)
under 40	3.4	0,9
41— 70	6.8	6.3
71—100	19.0	14.0
101—160	42.0	57.0
161—190	13.7	18.0
over 191	15.5 +	2.7

Boys

Ridge number	Diabetes (48 cases)	Controls (100 cases)
under 50	2.0	1.0
51— 80	8.3	4.0
81—110	8.2	12.0
111—170	52.5	70.0
171—200	14.5	12.0
over 201	14.5 + +	1.0

+ $p < 1\%$, + + $p < 0.1\%$

A high number of ridges was significantly frequent among the diabetics, while a low ridge number was not less frequent than in the controls. On the other hand, a low ridge number was more frequent in the diabetic group than in the controls, but the

difference was not significant statistically.

As to the total ridge value, the data of HOLT [8, 9] and PENROSE [15] are of especial interest. HOLT's [9] family examinations revealed that the dermatoglyphic peculiarities, the number of ridges, show best the genetic characteristics of inheritable features. According to PENROSE [15], the X and Y chromosomes have a role in the lowering of the number of ridges. The effect of the X chromosome is stronger than that of the Y chromosome. The ridge number is highest, when the X chromosome is missing, and the number may be low if there are surplus chromosomes, as in the case of Klinefelter's syndrome. Since in Klinefelter's and Turner's syndrome, but especially in the latter a diabetic trend of carbohydrate metabolism is a frequent occurrence, it might be postulated that the frequency of high ridge values in diabetic children is due to a genetical connection between the two conditions. This is supported by the fact that a lag in growth and sexual development is not rare among diabetic children.

It would have been difficult to evaluate our material in this respect as we did not know how the children would have developed, had they not been suffering from diabetes.

As to the shift of the ridge number into both directions, PENROSE [15] called attention to the possibility that foetal oedema or dehydration may significantly influence the formation of ridges. Foetopathies occurring in persons with a diabetic tendency can be brought into connection with the changes in the ridge number. There is, however, no reliable explanation as to the cause of the deviations in ridge number.

Dermatoglyphics may prove important for the clarification of the pathogenesis of diabetes. Especially interesting results can be expected from family studies, for instance of the dermatoglyphic pattern in the healthy and sick members of a family.

Our previous studies [3] revealed a high incidence of developmental anomalies in diabetic children; the present observations suggest that constitutional abnormalities, independent of the metabolic disorder, occur more often in diabetic than in normal children.

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