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QUANTITATIVE ANALYSIS OF DIGITOPALMAR DERMATOGLYPHICS IN FEMALE CHILDREN WITH HEMIPARESIS DUE TO CENTRAL NERVOUS SYSTEM LESION

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"Look! (Jehovah) With error I was
brought forth with birth pains.,
- Psalm 51: 5, NW."

Sažetak

Ispitivanje je provedeno u svrhu otkrivanja dojenčadi rizične za cerebralnu paralizu. Analizom 22 ispitanice u 18 varijabla dermatoglifskog crteža nađena je statistički značajna razlika prema kontroli - u smislu smanjenja broja kožnih grebenova - u triradijusu b-c desnog dlana. Iz toga se određenom vjerojatnosti može zaključiti kako postoji mogućnost djelovanja genetskih i ranofetalnih čimbenika koji su istodobno djelovali na oštećenje središnjeg živčanog sustava i promjenu dermatoglifskog crteža na desnom dlanu. Kontrolna skupina sastoji se od otisaka 200 ženskih osoba zagrebačke regije.

Summary

The aim of the study was to elucidate the risky infants for cerebral palsy. Analysis of 18 dermatoglyphic pattern variables in 22 female children showed a statistically significant difference in terms of a reduced ridge count in the right palm b-c triradius compared to controls. This finding probably suggested tte possible simultaneous effects of genetic and early fetal factors, resulting in central nervous system lesion and alteration in the right palm dermatoglyphics. The control group consisted of the prints of 200 female subjects from the Zagreb area.

Key words

infantile cerebral palsy, risky infants female gender, hemiparetic pattern of lesion, dermatoglyphics, quantitative analysis

Introduction

Cerebral palsy is any movement disorder or motor function disorder, arising from a defect, injury or disease of the brain occurring before, during or after birth. The whole clinical syndrome is of a stationary nature (1). According to clinicaln experience, cerebral palsy develops within five minutes in only one out of five newborns with Apgar score of = 3 (2) indicating that there are other factors beside difficult delivery that take part in brain damage, and are denoted as unknown or inheritance factors.

In hemiplegic patients, the etiology of the disorder remains unknown in one third of cases (3). A role of genetic or other prenatal factors, such as infection or vascular occlusion, that occurred early during the fetal development, having allowed the fetus to recover until the birth, without any clinically recognizable disease in the mother, has been postulated. An insult experienced in the early gestation age appears to be quite probable in more than a half of individuals in whom a hemiparetic pattern or hemiplegia develop later in life. Perinatal factors account for less than a half of such cases and include birth trauma with subdural or other intracranial hemorrhage, severe hypoxia, viral and bacterial meningitis and encephalitis, head trauma, epilepsy, and cerebrovascular, accidents. In a study of 200 hemiplegic patients, prenatal and unknown factors accounted for 53% of etiologic factors (3). According to Monreal (4), inheritance underlies as many as 60% - 70% of cases of infantile cerebral palsy.

The aim of the present study was to detect the genetic and early fetal etiologic factors in female children with a hemiparetic pattern due to a central nervous system (CNS) lesion, using a genetic method of quantitative digito-palmar dermatoglyphic analysis. The analysis was exclusively performed in female children because of the effect of sex chromosomes on the metric properties of dermatoglyphics.

Interestingly enough, in other studies of the disease employing dermatoglyphic analysis, the variabilities showed male predominance resulting from their higher intrauterine ecosensitivity (5-10). Recently, however, dermatoglyphic pattern variabilities have been ever more frequently recorded in female children as well (11,12). Using this method, skin ridges between the orientation points, i. e. triradii, of the palms and fingers, are counted (Fig. 1). In qualitative analysis of dermatoglyphics, the patient's digital patterns including arches, loops and whorls, and palmar patterns including region I (thenar with the first interdigital region), most common open area pattern, and patterns in the interdigital areas II, III and IV, as well as in the hypothenar, are analyzed (Fig. 2).

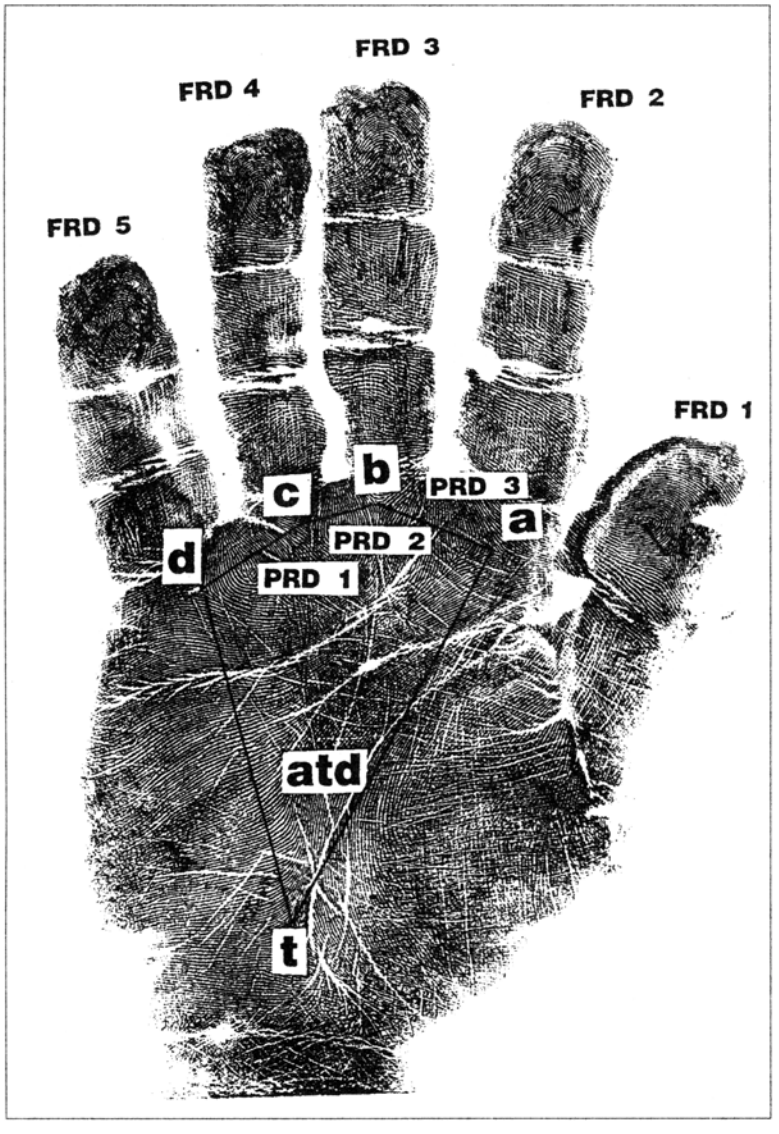

Figure l. The areas of quantitative analysis of dermatoglyphic traits of the digitopalmar complex on the hand.

Slika 1. Područja kvanitativne analize dermatoglifskih svojstava digitopalmarnog kompleksa na ruci.

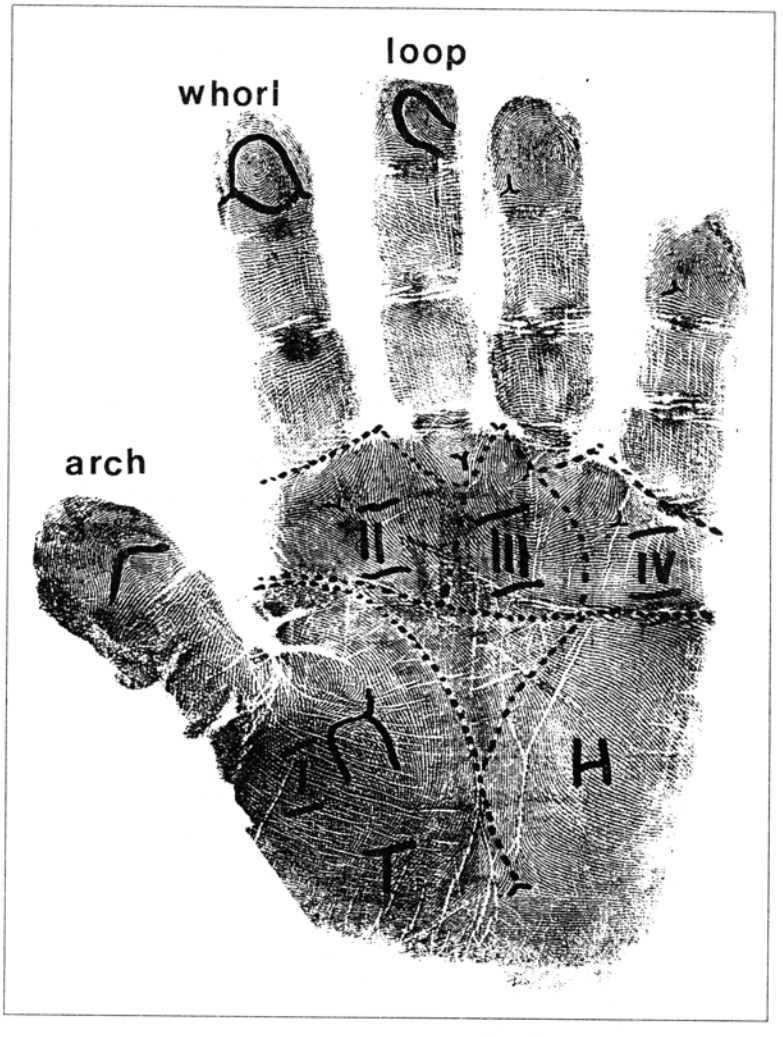

Figure 2. The areas of qaulitative analysis of dermatoglyphic traits of the digitopalmar complex on the hand.

Slika 2. Područja kvalitativne analize dermatoglifskih svojstava digitopalmarnog kompleksa na ruci.

Patients And Methods

The study sample consisted of 22 female children with hemiplegia (hemiparesis) due to a CNS lesion (11 right and 11 ceft), treated at the Department of Physical Medicine and Rehabilitation, Sestre milosrdnice University Hospital from Zagreb. Prints were taken on a transparent adhesive tape (Tovarna dokumentnega papirja, Radeče, Slovenia) by means af HSW silver powder used in criminalistics (13). Digitopalmar prints obtained from 200 phenotypically healthy females from the Zagreb region served as controls (14). Dermatoglyphic prints and their analysis were performed according to the instructions given in the book Dermatoglyphics in Medical Disorders (15). Eighteen variables were examined, i. e. finger cushion ridge count on the ten fingers, and six traits on both palms, including ridge counts between the c - d, b - c and a - b triradii, and atd angle, designated by the following abbreviations:

1	FRD 1:	ridge count on the right hand first finger
2	FRD 2:	ridge count on the right hand second finger
3	FRD 3:	ridge count on the right hand third finger
4	FRD 4:	ridge count on the right hand fourth finger
5	FRD 5:	ridge count on the right hand fifth finger
6	PRD 1:	ridge count between the right palm c - d triradius
7	PRD 2:	ridge count between the right palm b - c triradius
8	PRD 3:	ridge count between the right palm a - b triradius
9	ATD D:	atd angle on the right palm
10	FRL 1:	ridge count on the left hand first finger
11	FRL 2:	ridge count on the left hand second finger
12	FRL 3:	ridge count on the left hand third finger
13	FRL 4:	ridge count on the left hand fourth finger
14	FRL 5:	ridge count on the left hand fifth finger
15	PRL 1:	ridge count between the left palm c - d triradius
16	PRL 2:	ridge count between the left palm b - c triradius
17	PRL 3:	ridge count between the left palm a - b triradius
18	ATD L:	atd angle on the left palm

Results

A statistically significant difference from the controls was recorded in the ridge count in terms of their reduction in the PRD 2 variable (ridge count between the right palm b - c triradius; designated by* in Table 1).

Table 1.

Variable	Patients			Controls			p
	n	x	SD	n	x	SD	
PRD 1	22	35,91	4,80	200	36,70	6,33	>0,05
PRD 2	22	23,77*	6,37	200	27,31	5,91	<0,05
PRD 3	22	39,34	5,38	200	41,03	6,02	>0.05
ATDD	22	48,14	10,33	200	46,87	8,67	>0,05

*statistically significant difference

Discussion

In 1969/1970, Dogan et al. reported on a study of dermatoglyphics in female patients with cerebral palsy (16). The patients were divided in the same manner as in the present study, i. e. according to the topographic neuromotor events (clinical type of hemiplegia / hemiparesis). In a sample of only seven female hemiplegic patients (out of 48 patients with cerebral palsy), they found a decreased total ridge count (total ridge count on ten fingers: 129,84 in controls vs. 119,40 in patients). The present study yielded similar results, i. e. 133,41 in controls vs. 129,53 in patients.

However, none of these differences reached statistical significance.

In the present study, a statistically significant difference from the controls referred to the reduced ridge count between the right palm b - c triradius, suggesting the action of a hypothetical noxa that must have resulted in a CNS damage and simultaneous dermatoglyphic alteration, around the 11^{th} week of intrauterine development, since dermatoglyphics develop craniocaudally, i. e. first on the palms, and then on the fingers, around the 21^{th} week of intrauterine development (17).

Obviously, both of these studies included a too small patient sample to allow any definite conclusions on the pathogenesis of the clinical subtype of cerebral palsy, hemiplegia / hemiparesis, in female subjects. Other authors (Inada describes two cases only) (18) used different approaches, thus their results are not comparable with this study (5, 19, 20).

The practical value of this study is that it pointed to the need of obtaining digitopalmar prints in newborns with risk factors before any risk symptoms develop, which is technically feasible using the method described. In children with reduced total ridge count and decreased ridge count between tine right palm b - c triradius, intensive medical exercise should be initiated as early as possible

within nine months from the birth, as this period of growth is characterized by brain plasticity, allowing correction of the oassible erroneous locomotion pattern, while the CNS damage can still be rendered clinically unperceivable (21).

Interventions taken later than nine months of life yield much poorer results.

Conclusions

There is a certain probability for the action of genetic and early fetal hypothetical impairments which, along with difficult delivery, precipitate the onset of infantile cerebral palsy. Because of the craniocaudal development of dermatoglyphics, beginning on the palms, then on the fingers, a detrimental noxa must have exerted an early intrauterine action, having simultaneously caused damage to the CNS and affected the dermatoglyphic pattern. Accordingly, risk groups for the development of this cerebral palsy subtype with hemiparetic pattern in female gender can be identified by this relatively inexpensive and noninvasive genetic method, in order to timely prevent, treat or alleviate the lacomotor system damage. In addition, this study may serve as a starting point for, more meticulous dermatoglyphic analyses in larger samples of subjects with this clinical entity.

On the end, however, there is a need to emphasize that newly researches point out (Goodman and Alberman 1996, for example) that congenital hemiplegia mainly originate by chance that is, by a litle or with out of genetic factors and evironmental insults (22).

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