Institute of Experimental Morphology and Anthropology

Acta morphologica et anthropologica, 7
Sofia • 2002

Fluctuating Asymmetry of Dermatoglyphic Features in Patients with Hereditary Motor and Sensory Neuropathy — Type Lom

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The fluctuating asymmetry of bilateral morphological features affords an opportunity to be assessed the developmental homeostasis of individuals, as well as their capability for countering the internal and external unfavourable influence of different factors. In the investigation, the fluctuating asymmetry level of four dermatoglyphic features is determined: the palmar ridge counts of IInd, IIIrd and IVth interdigital areas, the palmar *atd* angle, the finger ridge counts and the pattern type on the homologous digits. Subjects of the study are 16 patients with hereditary motor and sensory neuropathy — type Lom. The results obtained show a high level of fluctuating asymmetry in the investigated dermatoglyphic features, especially regarding the finger ridge counts on IIIth and Vth homologous digits, as well as the palm ridge counts in IInd interdigital area.

Key words: dermatoglyphic features, fluctuating asymmetry, motor and sensory neuropathy.

Introduction

The study of homeostasis in the individual's ontogenetic development is a problem of present days, discussed in many contemporary medical and anthropological investigations. The violations of mechanisms in the homeostatic control and regulation lead to disturbances in the individual's ontogenetic stability, and different phenotypic divergences can appear. Most of these aberrations are connected with the bilateral symmetry violations of certain morphological structures. The assessment of individual's ontogenetic stability is realized by means of many and different methods. To these methods are relevant also those of the fluctuating asymmetry evaluation [3, 4]. The fluctuating asymmetry can be defined as presence of casual differences in theoretically equal morphological structures. The level of its manifestation is accepted as an indication of the organism's capability to overcome the internal and external unfavourable influence of different factors.

The aim of the present study is to assess and analyze the fluctuating asymmetry level by a complex of dermatoglyphic features in patients with hereditary motor and sensory neuropathy — type Lom (**HMSNL**).

The **HMSNL** disease is a neuropathy of demyelination type with autosome-recessive heredity. The disease belongs to the heterogeneous group of hereditary motor and sensory neuropathies, by which is characteristic mainly the slowly expressed muscular atrophy and sensor neuropathy in the distal part of extremities. Up to the present moment, the disease affects only Gypsy populations [2,6].

Material and Methods

Our sample is composed of 16 HMSNL patients (Gypsies — 5 males and 11 females). In the investigation is determined the level of fluctuating asymmetry for four dermatoglyphic features: the palmar ridge count in IInd, IIIrd and IVth interdigital areas, the palmar *atd* angle, as well as finger ridge counts and pattern type on the homologous digits. About the studied dermatoglyphic features is known that: the formation of finger papillar patterns comes to pass throughout 6 and 10.5 gestation weeks, of finger ridge counts throughout 10.5 and 13 gestation weeks, of the palmar ridge counts in the period till 15 gestation weeks, and of the palmar *atd* angle after the 15 gestation weeks. The dermatoglyphic prints are taken by the typographical method. The finger ridge counts are read by the method of C u m m i n s, M i d l o (1). The palmar *atd* angle is determined by the criteria of Penrose [5].

The correlation coefficients (r) for finger and palm ridge counts, palmar *atd* angle in both hands and investigated groups are calculated. The fluctuating asymmetry level about the finger and palm ridge counts, as well as the palmar *atd* angle is determined by the coefficient of indetermination ($1-r^2$) — [4]. On principle, this coefficient characterizes the connection's instability between phenomena bounded by cause and effect relationship. The percentage value of the coefficient shows which part of the manifested asymmetry is obliged to the additional factor that destroys homeostasis. The fluctuating asymmetry level for the papillar finger patterns is estimated by their no coincidence of the right and left fingers.

The data about fluctuating asymmetry level for the **HMSNL** patients are compared with analogous data for a control group healthy Gypsies.

Results and Discussion

The analysis of the investigated dermatoglyphic features shows scanty differences in the distribution of finger and palm ridge counts, as well as of palmar *atd* angle, both in **HMSNL** patients and healthy Gypsies (Table 1). In both groups under investigation, highest are the finger ridge count values on Ist pair digits, and smallest it is on IInd ones in both hands respectively. The finger ridge count values on right hands are predominantly higher compared with those on left ones in both investigated groups. The **HMSNL** patients have statistically significant higher values of finger ridge count only on the IIIth homologous digits in right ($P<0.05$). The other differences established are not statistically significant.

The palmar ridge count values on the interdigital areas, as well as the total palm ridge count (TPRG) ones both in right and left, are smaller in the group of **HMSNL** patients compared with the control group. Statistical significant is only the difference of palmar *c-d* ridge count on the right hands ($P<0.05$).

Table 1. Finger ridge counts, palmar ridge counts and palmar *atd* angles of patients with HMSNL and controls

Dermatoglyphic features	Patients with HMSNL (n=16)		Controls (n=45)		t	P
	X	SD	X	SD		
Finger ridge counts:						
I left	16.1	6.97	15.80	6.26	0.1304	$P>0.05$
II left	11.9	7.05	10.68	6.47	0.5279	$P>0.05$
III left	14.0	4.52	11.43	6.41	1.6266	$P>0.05$
IV left	15.3	3.13	14.42	6.12	0.7458	$P>0.05$
V left	12.9	4.12	12.81	5.13	0.0639	$P>0.05$
I right	16.4	5.64	17.41	6.63	0.5288	$P>0.05$
II right	13.8	4.16	11.58	6.54	1.5000	$P>0.05$
III right	14.1	2.42	11.80	5.42	2.4137	**$P<0.05$**
IV right	15.9	2.85	15.03	5.94	0.7982	$P>0.05$
V right	13.8	4.34	12.64	4.98	0.7891	$P>0.05$
Palmar ridge counts:						
a-b left	38.63	7.38	38.87	4.85	0.1257	$P>0.05$
b-c left	25.19	6.08	24.57	5.35	0.3827	$P>0.05$
c-d left	30.69	5.36	32.82	6.14	1.4295	$P>0.05$
a-d left	94.38	16.93	95.68	12.67	0.2928	$P>0.05$
a-b right	38.00	5.68	37.29	4.58	0.4737	$P>0.05$
b-c right	23.88	8.11	24.38	5.23	0.2381	$P>0.05$
c-d right	31.00	6.10	34.77	4.23	2.3711	**$P<0.05$**
a-d right	93.44	15.45	96.51	10.23	0.7658	$P>0.05$
***Atd* angles**						
left	42.25	4.30	40.23	4.30	1.7265	$P>0.05$
right	43.19	5.28	39.57	3.67	2.6423	**$P<0.05$**

Table 2. Correlations (r) between left and right finger ridge counts, palmar ridge counts and palmar *atd* angles of patients with HMSNL and controls

Dermatoglyphic features	Correlations (r)		P
	Patients with HMSNL	Controls	
Finger ridge counts:			
I	0.7480	0.8281	$P>0.05$
II	0.7046	0.6947	$P>0.05$
III	0.3446	0.6789	$P>0.05$
IV	0.7524	0.8105	$P>0.05$
V	0.5018	0.8270	$P>0.05$
Palmar ridge counts:			
a-b	0.6196	0.6771	$P>0.05$
b-c	0.8975	0.8116	$P>0.05$
c-d	0.7810	0.5767	$P>0.05$
a-d	0.9263	0.8622	$P>0.05$
***Atd* angles**	0.7644	0.6472	$P>0.05$

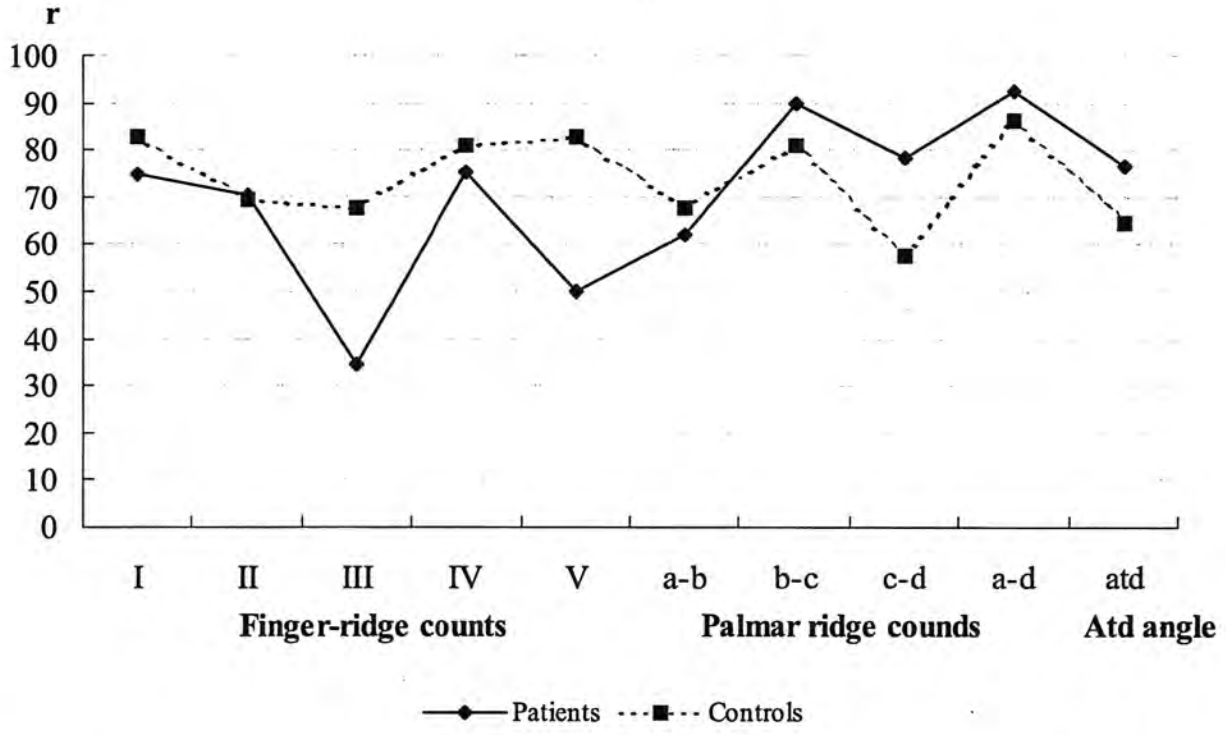

Fig. 1. Correlations (r) between the left and right finger ridge counts, palmar ridge counts and palmar *atd* angles of patients with HMSNL and controls

Table 3. Fluctuating asymmetry measure ($1-r^2$) of finger ridge counts, palmar ridge counts and palmar *atd* angles of patients with HMSNL and controls

Dermatoglyphic features	Patients with HMSNL [N]	Controls [C]	Difference [N-C]
Finger ridge counts:			
I	0.4405	0.3143	0.1262
II	0.5035	0.6647	–0.1612
III	0.8813	0.5391	0.3422
IV	0.4339	0.3431	0.0908
V	0.7482	0.3161	0.4321
Palmar ridge counts:			
a-b	0.6161	0.5415	0.0746
b-c	0.1945	0.3413	–0.1468
c-d	0.3900	0.6674	–0.2774
a-d	0.1420	0.2566	–0.1146
***Atd* angles**	0.4157	0.5811	–0.1654

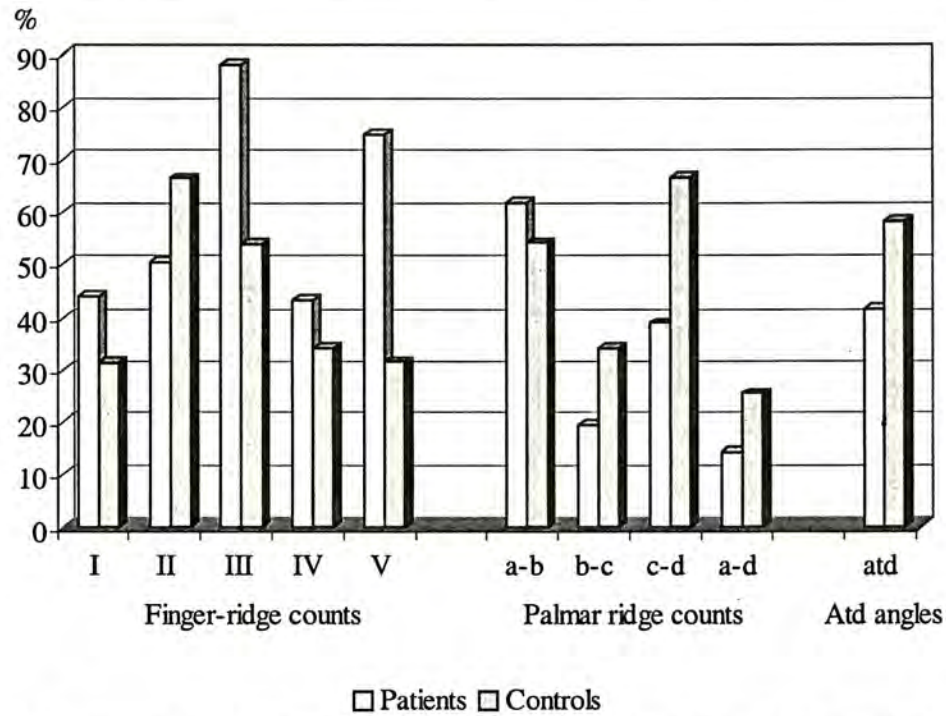

Fig. 2. Fluctuating asymmetry measures ($1-r^2$) of finger ridge counts, palmar ridge counts and palmar *atd* angles of patients with HMSNL and controls

The *atd* angle values, both on right and left hands for the patients with HMSNL disease are higher compared to those of the control group. The *atd* angle differences are statistically significant in right ($P<0.05$), while in left they only come near to the statistical significance.

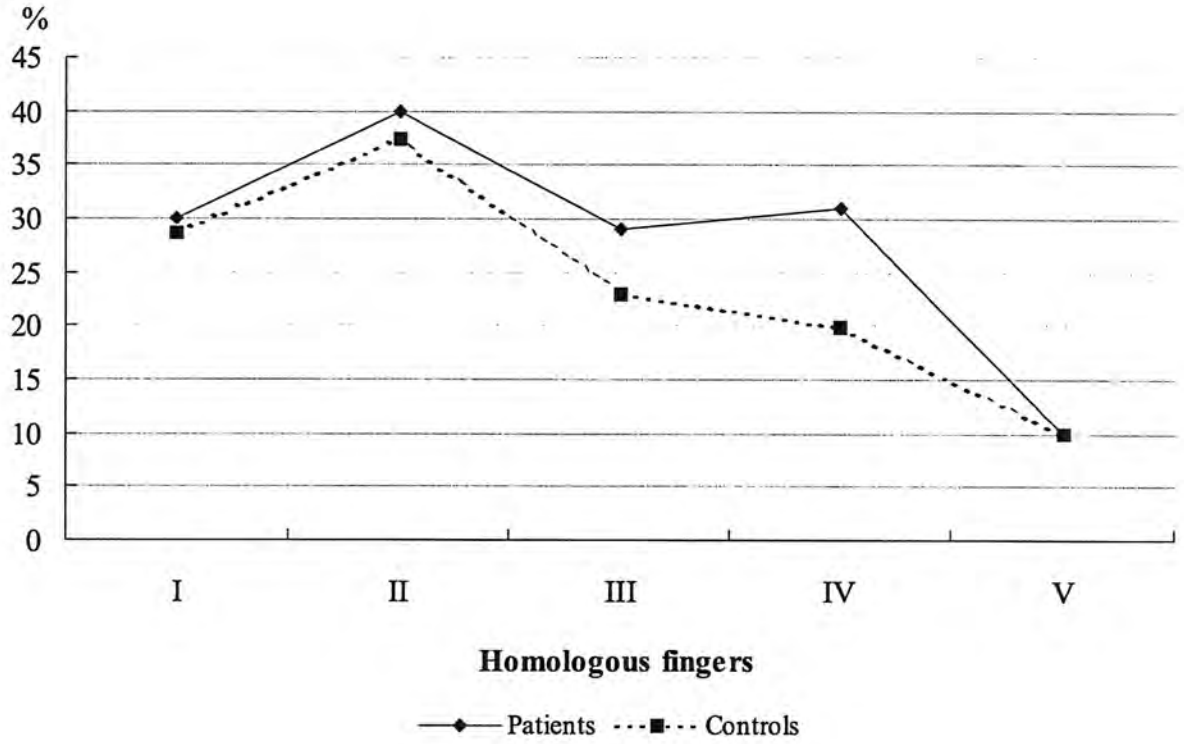

Fig. 3. Discordance in finger print patterns of homologous fingers of patients with HMSNL and controls

Table 4. Coincidence of finger print patterns of homologous fingers of patients with HMSNL and controls

Homologous fingers	Patients with HMSNL		Controls		t	P
	X	SD	X	SD		
I	0.700	0.483	0.714	0.454	0.088	P>0.05
II	0.600	0.516	0.630	0.486	0.174	P>0.05
III	0.700	0.483	0.770	0.424	0.443	P>0.05
IV	0.700	0.483	0.800	0.401	0.637	P>0.05
V	0.900	0.316	0.910	0.300	0.096	P>0.05

The correlation coefficients of finger ridge count have predominantly smaller values in the group of patients with **HMSNL**, than the control group has (Table 2, Fig. 1). As about the correlation coefficients of palmar ridge count and palmar *atd* angle the opposite tendency is observed. The differences of the correlation coefficient in both groups under investigation are not statistical significant. In the **HMSNL** patients, the coefficients of indetermination and respectively the degree of fluctuating asymmetry have higher values for finger ridge count (excepting IInd homologous digits), and smaller — for palmar ridge cuont (excepting the ridge count in IInd interdigital area) and palmar *atd* angle, as well (Table 3, Fig. 2). In the group of **HMSNL** patients the fluctuating asymmetry degree decreases in the direction III > V > II > I > IV, and in the control group it decreases in the direction II > III > IV > V > I. The direction in which the fluctuating asymmetry degree decreases regarding the palmar ridge counts in **HMSNL** patients is *a-b* > *c- d* > *b-c* > *a-d*, and in the control group it is *c-d* > *a-b* > *b-c* > *a-d*. The values of fluctuating asymmetry for *atd* angle are higher for the control group compared to the group of **HMSNL** patients. The differences about these three dermatoglyphic features are high, but not statistically significant.

The greatest coincidence in the type of finger papillar patterns is established for the fifth digit pairs and in both **HMSNL** patients and control group (Table 4). The highest discordance of papillar fingerprints, as well as the greatest fluctuating asymmetry is found for the IInd pair digits and again in both groups (Fig. 3). The fluctuating asymmetry degree of finger patterns decrease in the direction II> I = III = IV> V in the group of HMSNL patients, and in the control group it is II > I > III> IV> V. The differences for both investigated groups are not significant.

Conclusion

According to the data investigated, a higher degree of fluctuating asymmetry for the investigated dermatoglyphic features in the group of **HMSNL** patients compared to the group of healthy Gypsies is established. Very high is the fluctuating asymmetry level of finger ridge counts in the **HMSNL** patients for IIIrd and Vth pairs, and about palm ridge counts most high it is for IInd interdigital area. The presence of a greater level in fluctuating asymmetry presupposes a stronger influence of the unfavourable factors, which disturbs the ontogenetically development in the studied patients. At the same time, it shows how small is the organism's capability of these patients to counter the influence of the unfavourable factors. As about **HMSNL** disease, can be supposed that the high level of fluctuating asymmetry in the four dermatoglyphic features is expressed under the influence of 8,24 mapped mutation, which is determined as a

basic reason for this neuromuscular disease. The different time in which dermatoglyphic features are forming allows their use as "chronomarkers" for an eventual clarifying of the connection between genetically disturbances attendant the **HMSNL** disease and the expressed fluctuating asymmetry. A more extensive research including a larger number of patients can help the more precise conclusions about this problem.

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