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DERMATOGLYPHIC RESEARCH IN OPHTHALMIC DISORDERS

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Abstract. The present paper consists of a study on dermatoglyphics pathology on a lot of 200 patients, blind or suffering from other severe ophthalmic disorders (100 men and 100 women) from Moldavia, on the basis of 400 digital palmary impressions. We could say that the high level of sight affection, going up to totally losing sight, is correlated with an ample and significant pathological load in the digital dermatoglyphic picture, but especially in the palmary one of the affected people, suggestively illustrated by a large sphere of abnormalities with deep clinical significance. Present in high percentages, both in men and women and on both palms, many of these abnormalities were reported in other genetic or teratological affections as well, excepting ***the disposing of the papilar ridges from the palm's Thenar, shaped as a dense or very dense network***. The frequency was 41% in our study population, far from the reference sample (5.0%). With some reserves and until new researches, we consider that this abnormality might be specific to severe ocular diseases and the responsible gene could be placed on the X chromosome. This could be explained by its more than double frequency in women compared to men (58.50% and respectively 23.50%).
Key words: dermatoglyphics, blind people, ocular affections, abnormalities or distortions

Rezumat. Lucrarea cuprinde un studiu al patologiei dermatoglifelor, pe un lot de 200 subiecţi nevăzători şi cu alte boli oculare congenitale grave (100 bărbaţi şi 100 femei), provenind din Moldova, de la care au fost recoltate 400 amprente digito-palmare. Se constată că, nivelul crescut de afectare a vederii, mergând până la pierderea totală a ei, se corelează cu o amplă şi puternică încărcătură patologică a tabloului dermatoglific digital dar mai ales a celui palmar al afectaţilor, sugestiv ilustrată printr-o largă paletă de anomalii cu adânci semnificaţii clinice. Prezente în proporţii ridicate atât la bărbaţi cât şi la femei, şi pe ambele palme ale afectaţilor de ambele sexe, multe dintre aceste anomalii au fost raportate şi în alte maladii genetice ori teratologice grave. Studiul nostru se referă la ***dispunerea crestelor papilare din Thenarul palmei în formă de reţea densă ori foarte densă*** cu un procentaj la seria studiată de 41,0% faţă de al lotului martor (5,0%). Cu unele rezerve, până la noi cercetări considerăm că această anomalie ar putea fi specifică bolilor oculare grave iar gena responsabilă este plasată pe cromozomul X. Acest fapt s-ar putea explica prin frecvenţa mai mult decât dublă la femei în raport cu bărbaţii (58,50% şi respectiv 23,50%).
Cuvinte cheie: dermatoglife, nevăzători, afecţiuni oculare, anomalii sau distorsiuni

INTRODUCTION

Among the many correlations of dermatoglyphics with the disease, a special place is occupied by the ones with the severe congenital and hereditary ocular diseases, that there were reported on isolated clinical cases only, or in a small number of patients (2,3,5,6).

They demonstrated the presence of important abnormalities or distortions, with clinical implications, in the

dermatoglyphic picture of the affected people. These abnormalities proved to exist in other congenital affections as well, but in other percentages (3,5,10, 12,13). This reduced specificity of dermatoglyphic abnormalities, even in the case of congenital and hereditary diseases, is due to the intervention in the process of embryogenesis that varies in number and intensity (6).

Given the scarcity of the data concerning the dermatoglyphics pathology in ocular diseases, in the present paper we suggest a dermatoglyphic study from this perspective, on a lot of blind patients and people with other severe congenital ocular affections, coming from Moldavia. Actually it is the first study of this type for our country.

MATERIAL AND METHODS

A number of 200 affected people of all ages (100 males and 100 females) were investigated from the dermatoglyphic point of view. Among these, more than a half were blind at birth, the rest of the patients presenting other severe ocular diseases as: amblyopia, severe myopia, optical pigmentary atrophy, myopical choroidites, unilateral and bilateral aniriditis, infantile glaucoma, congenital cataract, albinism, etc. In parallel with the finger and palmar prints, we undertook an individual investigation to see if the above mentioned diseases have existed in the family before, to the collateral relatives or to the descendants. It came out that most of the ocular affections, including blindness are congenital and hereditary some of them even family diseases (severe myopia, cataract, albinism).

From among the 400 digital palmary impressions taken between 1997 and 2001, a great part came from the children of Special Schools for blind people or suffering from other severe ocular diseases, from Iaşi and Târgu-Frumos. The remaining ones came from Balneological Clinics or from the Cooperative of Handicapped Workers, and from the Mental Health Centre, in Iaşi.

For all the evidenced dermatoglyphic pathology indicators we took into account the sexual and bilateral differences, as well as their disposing to the patients (be it on both hands simultaneously, or only on one hand) as an expression of the degree of the patients' affections. The results thus obtained were compared to those from a reference sample (also coming from Moldavia) or to other congenital diseases (7,8,10,12).

Our motivation in doing this was that the dermatoglyphic abnormalities represent deviations of the frequency of some of the dermatoglyphic characteristics from the apparently normal population existing values, from which the patients belong to.

RESULTS AND DISCUSSIONS

From the individual analysis of the dermatoglyphic files it comes out that the advanced degree of anatomical and functional degeneration of the patients' visual organ is suggestively illustrated in their digital palmary picture, by the presence of 3 up to 7 abnormalities or distortions with medical significance.

At the level of the whole sample of patients they consist of:

➢ ***a sensible diminishing of frequency for, the majority digital model, the loops (L)***, up to values (56.40%) that situate themselves far away from those of the witness lot (71.0%), but are closer to those signaled by us in the case of: parents with malformed, PMC, (54.10%), in epyleptics (56.57%) or patients with congenital malformations of the heart (57.47%). To all these we can add an important overturning from the classical line of sexual dimorphism for L, in the sense of their prevalent occurrence in men (58.80%) *versus* women (53.90%) and also for whorls (W), which appear in equal percentages to both sexes (33.90% in men and 33.70% in women). This last abnormality had an increase of frequency in women, that have between 7 and 8 whirls (25% *versus* 15% for men) and in men with more loops than women (30% and respectively 21%), being a reversed situation of the one representing normal collectivities (2,7,13). The medical implications concerning these abnormalities consist in that they were found in persons with malformed children or plurimalformed ones, from the same zone with the affected people), which are in fact carriers of „malformative sketchcs", of their children's disease (10,11).

➢ ***a substantial reduction of bilateral differences, going sometimes to their total wiping, especially in the feminine series, for all the three main patterns*** (A = 12.60% on the left hand and 12.00% on the right hand- values that are much over the maximum limit of the normality scale- of approximately 6%; L = 54% and respectively 54% and W = 33.40% on the left hand and 34.0% on the right hand). In the Romanian population of both sexes in general and at the one from Moldavia in particular, A and L are predominant on the left hands, while W is predominant on the right ones (13).

➢ ***a very increased occurrence of raketoid loops (32% in women and 25% in men)***- a model that either misses or appears exceptionally in the case of the normal population (2,7,13). To blind people or to patients suffering from other severe ocular diseases this rare model is most frequently met on the fingers IV and V (to both sexes), followed in decreasing order by fingers III > II > I, distribution's succession that we have also met in the case of PMC (10). The disposing of raketoid loops illustrated a majority occurrence on the fingers of the left hand for both sexes.

➢ ***an increase over normal for the radial orientation of the digital structures considered in their totality (A+L+W),*** abnormality whose implications over the carriers may be compared to those produced by the changing of the normal position of internal organs (2,6). Taking into consideration all the 5 fingers, the radiality of digital models reaches an average percentage of 9.40% in our lot (9.60% in men and 9.20% in women), values that are close to those of PMC (11.70% for fathers and 11.40% for mothers) and those of patients with cardio-vascular affections (14.25% in men and 8.73% in women). What

contributes to the increase of the malformative effects of this distortion is the presence of A with this particular orientation on finger I and of complicated structural patterns on fingers IV and V, a situation often occurring in many of the congenital diseases (3,5,6,10,13).

- a digital abnormality with multiple clinical implications and malformative effects for the carriers present in our lot, especially to the feminine series, refers ***to the abnormal increase of the frequency for bilateral monomorphism (the presence of the same pattern on all 5 fingers) and for individual monomorphism (the presence of the same pattern on all 10 fingers of an individual)***. Compared to the normal population, for which the bilateral monomorphism does not go over 15% and to the individual one of 2-3%, the feminine series that we have studied registered an average percentage of 29,0% for the left hand, 24% for the right hand and 12% for the individual mono-morphism (2,7,13). In comparison with the masculine patients, they represented only 18%, 14% and respectively 4%.

Nevertheless, the patients' high level of disease is suggestively illustrated also by the multitude of distortions **from their palmary picture**, among which:

- ***an important deviation from the classical succession of patterns distribution in the 5 palm compartments*** *(IV* **>** ***Hp*** **>** *III > Th/I* **>** *II instead of IV* **>** *III* **>** ***Hp*** **>** *Th/I* **>** *II)* ***as it appears to normal people***) (table 1 a, b).
- ***important deviations from the classical line of sexual dimorphism in the palmary patterns repartition*** that supposes a tendency for slightly increased percentages within the Hypothenar Space (Hp) for men and not for women, and in the Thernar/I (Th/I) II and III compartments for women (table 1 a, b).
- ***a high frequency in comparison with the reference sample (0.50) of the presence of the radial arch (A^R) in the Hp of the palm, a ridge configuration genetically determined and with an important clinical significance*** (4,6,9). In the case of our series, A^R has close percentages for the two sexes (5% in men and 4% in women) and especially on the right hands of patients (table 2). Actually, the A^R disposing to the carriers illustrated a major incidence for its exclusive presence on the right hand, of 64.28% (table 3). Close percentages of A^R to those from patients with ocular diseases were signaled to deaf people (6.8%), to the mentally handicapped ones (4.0%) and to PMC 6.50%), explaining the serious clinical implications of this distortion;
- ***an unexpectedly high percentage for the ulnar loop (L^u) from the same space Hp of the palm,*** which reaches an average of 12.5% at the level of the whole sample compared to only 1.75% in the reference group and to a maximum of 2.5% in other normal populations (2,7,13). L^u appears more often to men than women and with relatively close percentages on both hands (table 2). In what the disposing of L^u to carriers is concerned, as it

results from table 3. The highest frequency belongs to those cases where it is present simultaneously on both palms, suggesting a high degree of affection of the carriers from this perspective.

➢ ***a doubled frequency compared to normality for the presence on the same palm of 2, 3, or 4 triradia, out of which at least one in distal position*** (t", t'", etc). The average percentage of 30.50% is close enough to those of mentally handicapped (28.76%), of deaf people (28.04%) or of PMC (26.50%). Out of the total number of the investigated people, 87 (43.5%) are carriers of this abnormality. In 40.23% the abnormality is present on both palms simultaneously and in the same proportion on the right hand exclusively (table 3).

➢ ***a four times greater percentage than the reference sample of the ending of line T (that starts from the axial triradius "t") in fields 11 and 12 of the palm instead of in field 13 like in normal people.*** This deviation from the normal direction of line T is more frequent in the feminine series and also on the left hands of the patients of both sexes (table 2). In what their disposing is concerned, in most of the cases there was its exclusive presence on the left hands of the carriers (66.66%).

➢ **within the Th/I compartment** of the patients and especially to the feminine series, there is ***a spectacular increase of occurrence for the papilar ridges disposing in a dense and very dense network***, instead of their orientation towards the radial part of the palm, as they are disposed in 95% of the normal people (2,7,13). They have a more than double average frequency in women, in comparison with the affected men (58.50% *versus* 23.50%). Slightly greater on the right hands for both sexes, this abnormality appears to 97 out of the 200 affected people (48.50%), with a majority disposition on both palms of the carriers (69.07%), that which supposes a double pathological load from this point of view (table 3). As in normal population this distortion either lacks or it appears in an exceptional way.

Table 1a. The percentage of the true patterns repartitions in the 5 compartments of the palm, by sex and hand

Sample	Sex	Hp			Th/I		
		L	R	L+R	L	R	L+R
Severe ocular	Male	30.0	37.0	33.5	4.0	1.0	2.5
diseases	Female	28.0	37.0	32.5	6.0	3.0	4.5
N = 200	**Total**	**29.0**	**37.0**	**33.0**	**5.0**	**2.0**	**3.5**
Reference	Male	29.1	35.9	32.3	15.7	8.2	12.0
sample	Female	35.0	35.3	35.2	8.5	40.0	6.0
N= 200	**Total**	**32.1**	**35.7**	**33.9**	**12.1**	**6.1**	**9.1**

Table 1b. The percentage of the true patterns repartitions in the 5 compartments of the palm, by sex and hand

Sample	Sex	II			III			IV		
		L	R	L+R	L	R	L+R	L	R	L+R
Severe ocular	Male	-	5.0	2.5	15.0	48.0	31.5	47.0	35.0	41.0
diseases	Female	3.0	6.0	4.5	18.0	46.0	32.0	54.0	38.0	46.0
N = 200	**Total**	**1.5**	**5.5**	**3.5**	**16.5**	**47.0**	**31.7**	**50.5**	**36.5**	**43.5**
Reference	Male	1.4	3.8	2.6	22.2	52.0	37.1	54.5	43.8	48.9
sample	Female	0.3	2.7	1.5	23.8	46.2	35.0	55.8	40.9	48.3
N= 200	**Total**	**0.9**	**3.2**	**2.0**	**23.0**	**49.1**	**36.1**	**54.9**	**42.3**	**48.6**

Affected people: IV > **Hp** > III > Th/I > II
Reference sample: IV > III > **Hp** > Th/I > I

Table 2. The percentage of palmary distortions repartition to patients with ophtalmic disorders compared to the reference sample, by sex and hand

Palmary abnormalities (distortions)	The affected people and the reference sample	Males (100)			Females (100)			Total (200)		
		Left Hand	Right Hand	Left + Right	Left Hand	Right Hand	Left + Right	Left Hand	Right Hand	Left + Right
A^R	Ocular diseases	3.00	7.00	5.00	2.00	6.00	4.00	2.50	6.50	4.50
	Reference sample	-	1.00	0.50	-	1.00	0.50	-	1.00	0.50
L^U	Ocular diseases	15.00	13.00	14.00	10.00	13.00	11.50	12.50	13.00	12.50
	Reference sample	1.00	2.00	1.50	3.00	1.00	2.00	2.00	1.50	1.75
L^d	Ocular diseases	1.00	5.00	3.00	1.00	2.00	1.50	1.00	3.50	2.25
	Reference sample	-	-	-	-	-	-	-	-	-
tt', tt't'', etc	Ocular diseases	27.00	35.00	31.00	25.00	35.00	30.00	26.00	35.00	30.50
	Reference sample	15.00	16.00	15.50	16.00	17.00	16.50	15.50	16.50	15.75
T_{11} and T_{12}	Ocular diseases	25.00	3.00	14.00	23.00	15.00	19.00	24.00	9.00	16.50
instead of T_{13}	Reference sample	5.00	2.00	3.50	7.00	4.00	5.50	6.00	3.00	4.50
Dense and very	Ocular diseases	21.00	26.00	23.50	57.00	60.00	58.50	39.00	43.00	41.00
dense network in Th/I	Reference sample	3.00	5.00	4.00	5.00	7.00	6.00	4.00	6.00	5.00
Distance a-b<21mm	Ocular diseases	48.00	59.00	53.50	23.00	27.00	25.00	35.50	43.00	39.25
at F and 24mm at M	Reference sample	11.00	13.00	12.00	9.00	12.00	10.50	10.00	12.50	11.25
Cx	Ocular diseases	40.00	27.00	33.50	26.00	16.00	21.00	33.00	21.50	27.25
	Reference sample	14.00	8.00	11.00	7.00	3.00	5.00	10.50	5.50	8.00
Co	Ocular diseases	13.00	8.00	10.50	14.00	11.00	12.50	13.50	9.50	11.50
	Reference sample	3.00	2.00	2.50	5.00	2.00	3.50	4.00	2.00	3.00
Palmary crossing	Ocular diseases	5.00	4.00	4.50	6.00	2.00	4.00	5.50	3.00	4.25
Sulcus	Reference sample	3.00	1.00	2.00	1.00	1.00	1.00	2.00	1.00	1.50

Table 3. The percentage of unilateral and bilateral disposing of palmary abnormalities (distortions) to the affected carriers

Palmary abnormalities (distortions)	Only on the left palm	Only on the right palm	On both palms	Total number of carriers
A^r from Hp	2:14 = 14.28	9:14 = 64.28	3:14 = 21.43	14:200 = 7.00
L^u from Hp	10:34 = 29.41	11:34 = 32.35	13:34 = 38.28	34 : 200 = 17.00
L^d parathenar model	1:2 = 50.00	1:2 = 50.00	-	2: 200 = 1.00
tt't'', etc.	17:87 = 19.54	35:87 = 40.23	35:87 = 40.23	87: 200 = 43.50
T_{12} and T_{12} instead of T_{13}	36:54 = 66.66	6:54 = 11.11	12:54 = 22.22	54: 200 = 27.00
Dense and very dense network in Thenar/I	11:97 = 11.34	19:97 = 19.59	67:97 = 69.07	97: 200 = 48.50
Distance a-b < 21mm – Females and 24mm – Males	12:98 = 12.94	27:98 = 27.55	59:98 = 60.20	98: 200 = 49.00
Cx	45:87 = 51.72	22:87 = 25.29	20:87 = 23.00	87: 200 = 43.50
Co	16:34 = 47.05	7:34 = 20.59	11:34 = 32.35	34: 200 = 17.00
Palmary crossing sulcus	8:14 = 57.14	3:14 = 21.43	3:14 = 21.43	14: 200 = 7.00

In the case of PMC we noticed it only in the cases where, among their children's malformations, there was also present a severe ocular disease. Until new researches, we may include it among ***specific pathological indicators for congenital ocular diseases***.

Concerning the responsible gene for the affection, probably it is situated on the X chromosome (given the much increased occurrence of this distortion in the case of women compared to men).

- **in the interdigital space II**, the only abnormality with severe medical significance present in 49% of the patients of both sexes (in 65% men and 33% women), ***registered a decrease with much under the theoretically admitted average for the Romanian population (21mm for women and 24mm for men) of the distance between triradia* a *and* b** that delimited this palm compartment (3,5,6,11,13). This distortion reaches an average percentage of 39.25% (53.50% in men and 25% in women) in our study, being more often met on the right palms of both sexes (table 2). As in the case of the previous abnormality, the distance *a-b*, much reduced, appears disposed on both palms of the carriers in 60,20% of cases.
- **in the interdigital space III**, of blind people, we noticed ***a sensible reduction of frequency for true patterns, especially on the left hands*** (16.5% *versus* 47% on the right ones) *and a little more for men* (table 1). ***This reduction could be due to a serious abnormality at this level, consisting in the partial or total suppression of the line C's course (CX respectively Co)*** in a proportion of 27.5% for Cx and 11.5% for Co *versus* only 8% and 3% for reference sample. From the two forms of suppression of line C, the first (Cx) is more frequent to the masculine series and Co to the

feminine series (a similar tendency with that of the witness lot) and both with priority on the left hands of the patients, as we can meet them in other congenital diseases (2, 5, 6, 8, 12). Actually, the preferential disposing on the carriers' left hands of the two abnormalities is also illustrated by the increased percentage of the cases where they are exclusively present on the left hand (51.72% for Cx and 47.05% for Co), followed by those with a bilateral disposing (table 3).

The list of palmary abnormalities, remain open up to new researches. We noticed ***relatively increased occurrence of the palmary crossing sulcus*** (4.25%) ***in the case of blind people and of patients with other ocular diseases***, very close to the percentages representing epileptics (4.17%). It reaches equal percentages at both sexes, being more frequent on the left hands of the affected people (table 2). Out of the 14 carriers of this rare ridges formation, 57.14% have it disposed exclusively on the left hand, a position reported for most of the severe congenital diseases, as well as for the normal populations, in general (table 3) (2,3,5,6,7,10,13).

CONCLUSIONS

The high degree of sight affection, going up to its total loss, is associated to an ample and consistent pathological load of the digital picture, but especially of the palmary one of the affected people, suggestively illustrated by multiple abnormalities with profound clinical implications. Present in high percentages in both men and women and on both hands of the patients, some of them have a higher occurrence on the left hands while others, on the right ones. These abnormalities (or distortions) have been reported in the cases of other congenital diseases, even with the same tendency of repartition, depending on sex and laterality. Among them ***only one can be detached- the one referring to the disposing of papilar ridges from the Thenar/I of the palm, under the form of a dense or very dense network instead of their orientation towards the radial side of the palm,*** which, reaches significantly higher percentages compared to the normal, and in proportions higher than double in women, blind people or patients with other severe ocular affection. This leads us to the supposition that it could be typical to these diseases and that the responsible gene for its occurrence might be placed on the X chromosome (given the higher than double percentage to women of this abnormality). As the present study is among the first in the field, for the Romanian population, the obtained results are only preliminary, reason for which we consider it necessary to extend our research in order to reach a greater certainty of our approach.

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