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PALMAR DERMATOGLYPHIC TRAITS OF SCHIZOPHRENIC PATIENTS AND HEALTHY CONTROLS

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Abstract

The aim of the present study is to examine the differences in palmar dermatoglyphic traits between healthy controls and schizophrenic patients, thus to investigate their possible diagnostic significance in relation to the disease.

The study included 344 subjects of Bulgarian ethnicity, aged 18–64 years, 285 mentally healthy and 59 schizophrenic patients. The patients met DSM-V criteria for schizophrenia. Palmar prints were obtained by the typographic method, in a rotating manner. Palmar dermatoglyphic traits are determined according to the rules of Cummins and Midlo [18]. The data were statistically analyzed using the SPSS software version 17.0.

Our results showed that on the right hand the differences of palmar patterns between healthy and diseased males in interdigital area IV reached statistical significance ($p < 0.05$). On the left hand, the differences between healthy and diseased males in interdigital area IV reached high statistical significance ($p < 0.001$). There was a significant increase in the frequency of Line A ending in the fields 5^{I} and 5^{II} on both hands of diseased males, while in diseased females – in fields 3 and 4 only on the left hand. A higher frequency of accessory triradii in diseased males was found on both hands compared to the healthy ones, as the frequency differences of accessory triradii for the left hand were significant ($p < 0.01$).

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The study confirms the presence of palmar dermatoglyphic dissociations in psychiatric patients, the differences with the healthy are in the palmar patterns, accessory triradii, and in the ending fields of the main Line A.

Key words: palmoscopy, schizophrenia, Bulgarians

Introduction. The constancy in the organization of dermatoglyphic traits and their polygenic inheritance makes them a useful tool in seeking a link between morphological and genetic changes in various diseases.

In recent decades, intensive research has been done in the etiology of schizophrenia. Dermatoglyphics provides an attractive set of potential markers as their development is localized in the III-IV embryonic month, a period during which the fetal brain may be at the highest risk for later development of schizophrenia [1].

Poll (1935) made the first publication of dermatoglyphic traits in schizophrenic patients, and found significant differences comparing with healthy controls [2].

Patients with schizophrenia show more changes in qualitative and quantitative dermatoglyphic features [3,4]. There is a large number of studies on fingerprint dermatoglyphic traits in schizophrenic patients [5,6], whereas publications on palmoscopic traits in psychiatric patients are significantly less [7].

Researchers indicate the size of atd angle and a-b ridge count as reliable biological markers of mental disease from palmoscopic traits [8]. According to Fearon et al. [9] a-b ridge count is the most constant dermatoglyphic anomaly in schizophrenia. Bramon et al. [3] based on meta-analysis, also show that mentally ill patients, suffering from complications at birth, have a statistically significant smaller a-b ridge count.

According Vonk et al. [4] environmental factors have no significance for the formation of dermatoglyphics, but there is a relationship between a-b ridge count and brain volume.

Sengupta and Bhuyan [10] report quite interesting findings about significant differences between patients and control group, in regard to the main Line C ending, axial triradii, ridge count in the a-b interdigital field, frequency and variations of palmar flexor creases.

Jhingan and Munjal [2] report a smaller atd angle in mental patients, compared to healthy controls. Sengupta and Bhuyan [10] indicate a greater incidence of palmar images in the hypothenar and thenar, and the presence of distal axial triradius in patients with psychiatric disorders.

In Bulgaria, the palmar dermatoglyphics have been examined in an ethnic aspect [11], in terms of gender differences [12], as well as in individuals with different dominant hand [13]. The clinical use of palmoscopic traits in relation to chromosomal disorders has been reported by Tornjova-Randelova et al. [14]. Yaneva and Ingilizova [15] and Yaneva and Maslarski [16] published data on palmoscopic dermatoglyphic traits in females with breast cancer.

There are relatively few publications that seek differences in palmoscopic traits between healthy and mentally diseased individuals [17]. This is precisely the aim of this study.

The aim of the present study is to examine the differences in palmar dermatoglyphic traits between healthy controls and patients with schizophrenia, thus to investigate their possible diagnostic significance in relation to the disease.

Material and methods. The study includes 344 persons of Bulgarian ethnic origin, without kinship with each other, clinically healthy (mean age 21.7 ± 3.6) and psychiatric patients (mean age 44.8 ± 10.2) with a diagnosis of schizophrenia. Of all examined people, females were 249 (219 clinically healthy and 30 psychiatric patients) and 95 were males (66 clinically healthy and 29 mental patients). The sample of psychiatric patients is formed from adult patients who have received hospital or outpatient treatment at two Bulgarian Psychiatric Hospitals – State Psychiatric Hospital in Radnevo and Psychiatric Clinic in Medical University of Plovdiv. Psychiatric patients met diagnostic criteria for schizophrenia according to DSM-V.

Potential respondents were excluded from the study in the case of non-Bulgarian ethnicity of one of the parents and grandparents, patients with "schizophrenic spectrum" diagnoses, a history of severe neurological disease, a history of psychotic disorder, first degree relatives with a history of psychotic disorder, pathological conditions characterized by abnormal dermatoglyphic status: psoriasis, congenital heart disease, diabetes, and others. The exclusion criteria refer to both groups of patients and healthy controls.

The study design and methodology were approved by the Ethics Committee of Medical University of Plovdiv, Bulgaria. Written Informed Consent Forms were obtained from the 59 schizophrenic patients and a control group of 285 after introduction to the aim and objectives of the study.

A set of palmar dermatoglyphic traits was investigated. The palmar prints were taken by the typographic method and examined with a slight magnification (6D). Palmar print taking was done in a passive way, through the rotating manner. For better printing of the central part of the palm, the sheet, on which the palmar print is taken, is placed on a convex cylindrical surface. Palmar dermatoglyphic traits are determined according to the rules of Cummins and Midlo [18].

There are reported palmar patterns in hypothenar, thenar/I, II, III, IV interdigital areas (IA), main lines, axial triradii and maximum atd angle, accessory triradii, palmar ridge count.

The data were analyzed by descriptive analysis, alternative analysis and t-tests using the SPSS software version 17.0. A p-value of less than 0.05 was considered statistically significant.

Results. The areas, in which primary types of palmar patterns were examined in healthy controls and diseased patients of both sexes, are hypothenar (Hy), interdigital areas II – IV, and thenar with interdigital area I (Th/I) (Fig. 1).

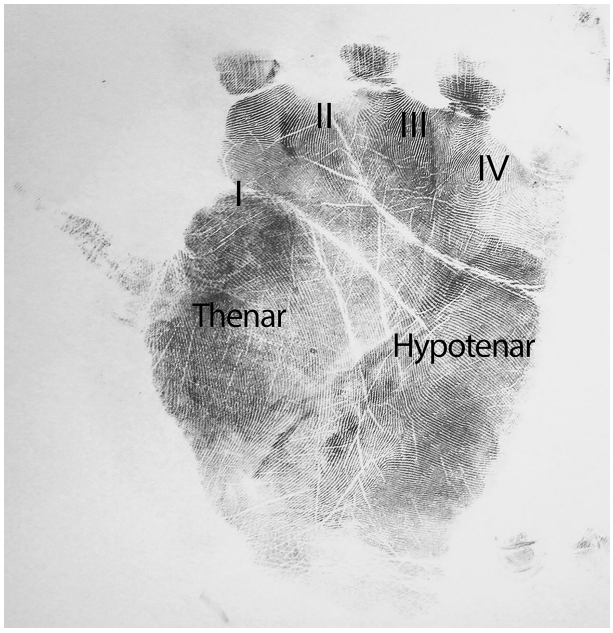

Fig. 1. Dermatoglyphic areas of the palm

Primary palmar patterns include loops, whorls, tented arches, as well as their combinations. The results obtained are shown in Table 1.

On the right hand of healthy males, the highest frequency was found in primary palmar patterns of interdigital area III (63.6%), while in diseased patients – of interdigital area III (51.7%) and also of interdigital area IV (51.7%). The differences between healthy and diseased males in interdigital area IV reached statistical significance ($p < 0.05$). On the left hand, interdigital area IV is the richest in patterns both in the healthy (48.5%) and the diseased (86.2%) however, the frequency is almost twice higher in the diseased. The differences between healthy and diseased males in interdigital area IV reached high statistical significance ($p < 0.001$).

For females, the frequency of primary palmar patterns is lower for both hands of diseased females in all interdigital areas, except interdigital area III, however, the differences with healthy controls did not reach statistical significance ($p>0.05$).

The second task of the study was to compare the frequency of the endings of the main lines in healthy and diseased people of both sexes (Fig. 2). The significant differences found for this indicator are represented in Table 2.

There was a significant increase in the frequency of Line A ending in the fields 5^{I} and 5^{II} on both hands of diseased males, while in diseased females – in fields 3 and 4 only on the left hand.

Concerning the frequency of Line D ending, differences were found between

Table 1

Comparison of the frequency of palmar patterns in healthy and diseased people groups of both sexes

	Males						Females					
	Healthy ($n = 66$)		Diseased ($n = 29$)		Statistical significance		Healthy ($n = 219$)		Diseased ($n = 30$)		Statistical significance	
Field	Count	%	Count	%	χ^2	p	Count	%	Count	%	χ^2	p
Right hand												
Hypothenar	22	33.3	13	44.8	1.14	$p > 0.05$	89	40.6	11	36.7	0.17	$p > 0.05$
Thenar/I	22	33.3	11	37.9	0.19	$p > 0.05$	53	24.2	7	23.3	0.011	$p > 0.05$
II	8	12.1	7	24.1	2.19	$p > 0.05$	19	8.7	2	6.7	0.14	$p > 0.05$
III	42	63.6	15	51.7	1.19	$p > 0.05$	119	54.3	14	46.7	0.62	$p > 0.05$
IV	18	27.3	15	51.7	5.31	$p < 0.05$	92	42.0	9	30.0	1.58	$p > 0.05$
Left hand												
Hypothenar	23	34.8	10	34.5	0.001	$p > 0.05$	85	38.8	8	26.7	1.66	$p > 0.05$
Thenar /I	31	47.0	18	62.1	1.84	$p > 0.05$	84	38.4	10	33.3	0.28	$p > 0.05$
II	2	3.0	2	6.9	0.0	$p > 0.05$	6	2.7	0	0.0	0.84	$p > 0.05$
III	20	30.3	13	44.8	1.88	$p > 0.05$	62	28.3	10	33.3	0.32	$p > 0.05$
IV	32	48.5	25	86.2	11.95	$p < 0.001$	121	55.3	14	46.7	0.78	$p > 0.05$

T a b l e 2

Frequency of the endings of the main lines in healthy and diseased persons of both sexes

Main lines	Males						Females					
	Healthy		Diseased		χ^2	p	Healthy		Diseased		χ^2	p
	n	%	n	%			n	%	n	%		
Right hand												
A					6.53	$p < 0.05$					0.27	$p > 0.05$
1(+2)	–	–	–	–			3	1.4	0	0.0		
3(+4)	49	74.2	14	48.3			165	75.3	23	76.7		
5(5′+5″+6)	15	22.7	12	41.4			48	21.9	7	23.3		
11	2	3.0	3	10.3			3	1.4	0	0.0		
B					0.13	$p > 0.05$					1.80	$p > 0.05$
(0+X)	–	–	–	–			1	0.5	0	0.0		
(3+4+5′+5″)	27	40.9	13	44.8			101	46.1	17	56.7		
(6+7+8+9)	39	59.1	16	55.2			117	53.4	13	43.3		
C					1.88	$p > 0.05$					0.30	$p > 0.05$
(0)	4	6.1	1	3.4			15	6.8	2	6.7		
(4+5′+5″+6+7)	15	22.7	10	34.5			72	32.9	9	30.0		
(8+X)	2	3.0	0	0.0			3	1.4	0	0.0		
(9+10+11+12+13)	45	68.2	18	62.1			129	58.9	19	63.3		
D					0.75	$p > 0.05$					0.74	$p > 0.05$
5″	-	-	-	-			1	0.5	0	0.0		
7 (+8+X+0)	8	12.1	4	13.8			40	18.3	5	16.7		
9(+10)	8	12.1	5	17.2			30	13.7	4	13.3		
11(+12+13)	50	75.8	20	69.0			148	67.6	21	70.0		

Table 2

Continued

Main lines	Males						Females					
	Healthy		Diseased		χ^2	p	Healthy		Diseased		χ^2	p
	n	%	n	%			n	%	n	%		
Left hand												
A					9.48	$p < 0.05$					10.33	$p < 0.05$
1(+2)	8	12.1	0	0.0			44	20.1	0	0.0		
3(+4)	54	81.8	22	75.9			163	74.4	29	93.3		
5(5′+5″+6)	4	6.1	6	20.7			11	5.0	2	6.7		
11	0	0.0	1	3.4			1	0.5	0	0.0		
B					0.14	$p > 0.05$					4.81	$p > 0.05$
(0+X)	–	–	–	–			0	0.0	1	3.3		
(3+4+5′+5″)	50	75.9	23	79.3			158	72.1	20	66.7		
(6+7+8+9)	16	24.2	6	20.7			61	27.9	9	30.0		
C					3.94	$p > 0.05$					2.05	$p > 0.05$
(0)	7	10.6	0	0.0			18	8.2	3	10.0		
(4+5′+5″+6+7)	29	43.9	16	55.2			104	47.5	14	46.7		
(8+X)	1	1.5	0	0.0			13	5.9	0	0.0		
(9+10+11+12+13)	29	43.9	13	44.8			84	38.4	13	43.3		
D					4.33	$p > 0.05$					8.58	$p = 0.061$
3	–	–	–	–			1	0.5	1	.3		
5″	–	–	–	–			3	1.4	0	0.0		
7 (+8+X+0)	15	22.7	12	41.4			69	31.5	4	13.3		
9 (+10)	22	33.3	5	17.2			47	21.5	5	16.7		
11 (+12+13)	29	43.9	12	41.4			99	45.2	20	66.7		

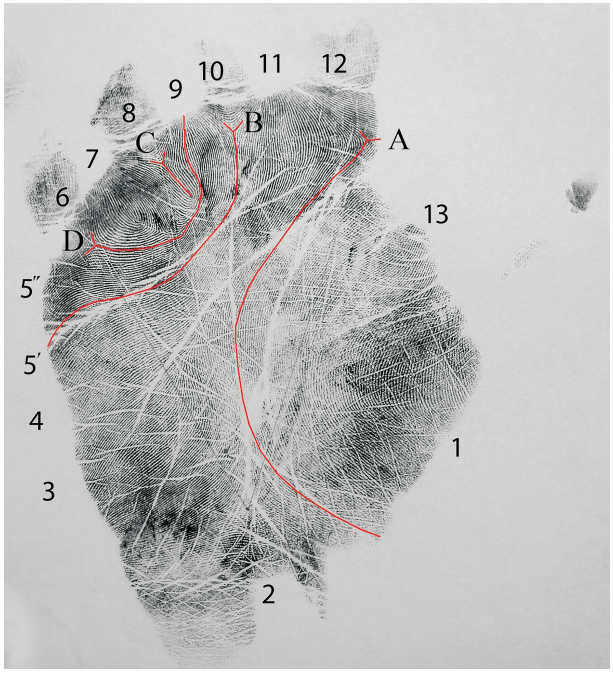

Fig. 2. Main lines and the position of their termination of the palm

diseased and healthy females, again on the left hand, in fields 7 and 11, these differences almost reached a statistical value ($p = 0.061$).

Apart from the principal digital triradii (a, b, c, d), sometimes accessory triradii, located proximal to them, can be found. A higher frequency was found of a_1 and d_1 accessory palmar triradius in diseased males on both hands compared to the healthy ones, as the frequency differences of d_1 for the left hand are significant ($p < 0.01$), and for the right hand, the differences almost reach statistical significance.

Discussion. Our research aims to examine the differences in a set of palmar dermatoglyphic traits in healthy controls and patients with schizophrenia and to seek their possible diagnostic significance in relation to the disease. Palmar dermatoglyphic patterns, ending fields of the main lines, palmar ridge count, maximal atd angle, and accessory palmar triradii were used as signs of impaired neuro-ontogenetic development that occurs during the formation of papillary ridges.

According to the literature, the reduction of ab ridge count in schizophrenic patients may be a marker for the development of the disease that indicates a disorder in the second trimester of the embryonic period, which is a critical period for the central neural system development [3, 7]. In our study, there were no reliable differences found about this sign between healthy controls and mentally ill patients. Similar results have been reported by other authors [4].

A number of publications report on a smaller atd angle as a marker of high diagnostic significance for schizophrenia [1,2,8], although in our findings differences with healthy ones did not reach a statistical value.

There are publications [17], that showed significant differences in the palmar patterns in the hypothenar of females with schizophrenia. Sengupta and Bhuyan [10] recorded greater frequency of palmar patterns in the hypothenar and also in the thenar for patients with mental disorders. In our study, we have found reliable differences in palmar patterns in diseased males too, but in IA IV.

According to literature data, the palmar patterns in some IA are related to the presence of an accessory palmar triradii [14]. Authors reported the presence of such in IA II (a_1) on both hands in schizophrenic males [19]. Our study also found the presence of accessory palmar triradii in diseased males, in IA IV (d_1). The result is logical and is related to the significantly higher frequency of palmar patterns found in this area.

There are relatively few publications that report significant differences in the ending fields of the main lines. Sengupta and Bhuyan [10] showed such differences with regard to the main Line C ending. In the present study, we found significant differences in the ending fields of the main Line A.

Conclusion. We found that the differences between the healthy and the diseased are in the palmar patterns, accessory palmar triradii, and in the ending fields of the main Line A. The study confirms the presence of dermatoglyphic dissociations in psychiatric patients, possibly due to complications and traumas at birth [3], or they are related to anomalies in prenatal development [20].

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