COMPARATIVE DERMATOGLYPHIC STUDY OF FINGERPRINT PATTERNS IN PATIENTS WITH SCHIZOPHRENIA AND HEALTHY CONTROLS

Ferihan Ahmed-Popova[1], Mladen Mantarkov[2], Antoaneta Fusova[1], Todor Atanasov[2], Valentin Akabaliev[2], Stefan Sivkov[1]

[1]Department of Anatomy, Histology and Embryology, Medical University of Plovdiv
[2]Department of Psychiatry and Medical Psychology, Medical University of Plovdiv

ABSTRACT

PURPOSE: The aim of this study was to compare the fingerprint patterns in patients with schizophrenia and healthy controls.

MATERIAL AND METHODS: The study included 136 patients with schizophrenia (72 males, 64 females) and 113 mentally healthy subjects (52 males, 61 females) of Bulgarian origin. Fingerprints were obtained using an ink method and were read with light (6D) magnification in accordance with the methods given by Cummins, Midlo. The data were analyzed with SPSS 17.0.

RESULTS: Our results showed a higher mean score of whorls and lower mean score of loops and arches for both hands in schizophrenia males compared with their same-sex controls. Schizophrenia females had a higher mean score of arches and whorls, but lower mean score of loops for both hands, compared with the healthy females. The differences were statistically significant for the loops and whorls of the left hands in males, and for the loops of the left hands and those of both hands in females.

CONCLUSION: Within the context of neurodevelopmental hypothesis of mental disorders dermatoglyphic traits may become reliable biological markers of the timing of prenatal damage and the pathogenetic mechanisms behind it.

Key words: *dermatoglyphics, schizophrenia, fingerprint patterns, arches, loops, whorls*

INTRODUCTION

Dermatoglyphics are individual characteristics with several features, such as stability, personality, regeneration capacity and hereditary determination. Their biological and clinical value is associated with the common ectodermal origin of the brain and dermal patterns and the strictly defined periods of embryonic formation of papillary ridges (III – IV month of gestation). It is suggested that the presence of specific dermatoglyphic traits is an accompanying feature in a various group of diseases, such as chromosomal aberrations, sickle-cell disease, psoriasis, epilepsy, cancer, congenital heart disease, lupus erythematodes, mental disorders (11,13). Since the presence of abnormal dermal ridges indicates fetal dysmorphogenesis of the ectodermal tissue and its derivatives, dermatoglyphics may be considered biological markers of abnormal neurodevelopment. The data on specific dermatoglyphic patterns in schizophrenia defines them as potential chronomarkers in determining the time of exposure to prenatal insults, and thus supports the

Address for correspondence:
Ferihan Ahmed-Popova
Medical University of Plovdiv, Bulgaria
Department of Anatomy, Histology and Embryology
15 A Vasil Aprilov Blvd, 4002 Plovdiv, Bulgaria
cell phone: 0898 581 071
e-mail: ferylin@abv.bg

Received: January 24, 2013
Accepted: February 11, 2013

Scripta Scientifica Medica, vol. 45, 2013, suppl. 1, pp. 92-96

neurodevelopmental hypothesis for the etiology of the disease (3,4,6).

The aim of this study was to compare the fingerprint patterns in patients with schizophrenia and healthy controls in order to find evidence suggestive of prenatal factors in the etiology of the disease.

MATERIAL AND METHODS

Subjects

The study included 136 patients with schizophrenia (72 males, 64 females) with a mean age of 32.01±9.69 years, consecutively admitted to the Clinic of Psychiatry in Plovdiv and the District Psychiatry Dispensary in Plovdiv. All patients satisfied DSM-IV criteria for a diagnosis of schizophrenia on the basis of case records review, a semi-structured interview based on a checklist of items from DSM-IV (2) (performed by one of the study psychiatrists, V.A.) and information obtained from relatives to enhance the validity of the diagnosis.

Potential subjects were excluded if they had a history of drug or alcohol abuse, an identifiable neurological disorder (seizure disorder, head injury, multiple sclerosis etc.), any signs of mental retardation or a somatic disorder with neurological components, diagnosis of „schizophrenic spectrum disorders" - shizophreniform and schizoaffective disorder, shizotypal, schizoid and paranoid personality disorder. Potential patients were excluded if there were evidences of pathological conditions known to be associated with variation of dermatoglyphic characters, e.g., psoriasis, congenital abnormalities like polydactylia and spina bifida, congenital heart disorders, diabetes mellitus, certain diseases with abnormal caryotype, etc.

The normal comparison group comprised 113 mentally healthy subjects (52 males, 61 females) with a mean age of 39.12±9.88 years. Normality was defined as the absence of a major axis I or axis II disorder according to DSM-IV (2). Normal controls satisfied exclusion criteria similar to those applied to patients. In addition, to separate the control from the schizophrenic group better, potential controls were excluded if they had a first-degree relative with a history of a psychotic disorder, major affective disorder or suicide.

All patients and control subjects were of Bulgarian origin in order to avoid the potential confounding effects of racial and ethnic variations; individuals were excluded if their parental or grandparental ethnic group was other than Bulgarian.

The study was approved by the local Ethics Committee at the St George University Hospital. All subjects gave written informed consent to participate.

Assessment of dermatoglyphic patterns

A set of dermatoglyphic configurations with low racial instability and high diagnostic value was examined (8). Fingerprints were obtained using an ink method in a passive manner, using a rotary cone sample divider method. They were read with light (6D) magnification in accordance with the methods given by Cummins, Midlo (5). For a greater reliability the scoring of the fingerprints was done separately by two persons according to the rules in Memorandum on dermatoglyphic nomenclature (10). Dermatoglyphic patterns are classified as arches, loops and whorls according to the number of deltas (7).

Statistical analysis

The data were analyzed with SPSS 17.0 (Statistical Package for the Social Sciences 17.0), using descriptive statistics, nonparametric analysis: $\chi 2$-test, Fisher's Exact Test, parametric analysis: Student`s t -test (two-tailed).

The level of statistical significance was set at $P < 0.05$.

RESULTS

The incidence of fingerprint patterns in patients with schizophrenia and healthy subjects is shown in Table 1 and Table 2. Because of the known gender differences in the dermatoglyphic patterns, the comparison between patients and controls was carried out separately for each gender.

Our results showed a higher mean score of whorls and lower mean score of loops and arches for both hands in schizophrenia males compared with their same-sex controls (Table 1).

Similar tendency was observed not only for the total mean score of whorls and loops, but also for the right hands and left hands of the compared groups.

Table 1. Mean score of fingerprint patterns in males with schizophrenia and their same-sex controls

***Student's t-test:two-tailed – equal variances**

****Student's t-test:two-tailed – unequal variances**

Males							
		Schizophrenia (n=72)		Healthy Controls (n=52)		Statistical Significance	
	Mean	SD	Mean	SD	t	df	P
Right hand							
Arch	0,1111	0,35823	0,1538	,50038	0,554*	122	0,580
Loop	2,5278	1,62699	2,6154	1,49711	0,306*	122	0,760
Whorl	2,3611	1,67252	2,1923	1,53442	-0,574*	122	0,567
Left hand							
Arch	0,1806	0,48430	0,1731	,58481	-0,078*	122	0,938
Loop	2,6944	1,72503	3,2885	1,43262	**2,090****	**119,560**	**0,039**
Whorl	2,125	1,78363	1,5	1,42113	**-2,169****	**120,770**	**0,032**
Total							
Arch	0,2917	0,73996	0,34	1,06157	0,297*	120	0,767
Loop	5,2222	3,15435	5,8	2,75533	1,047*	120	0,297
Whorl	4,4861	3,28888	3,78	2,79424	-1,276**	115,108	0,205

The differences were statistically significant for the loops and whorls of the left hands (P<0.05).

Females with schizophrenia had a higher mean score of arches and whorls, but lower mean score of loops for the right hands, for the left hands and for both hands, compared with the healthy females (Table 2).

The differences were statistically significant for the loops of the left hands and those of both hands (P<0.05).

DISCUSSION

In accordance with similar dermatoglyphic studies, our results pose the question of the possible reasons for the observed differences in fingerprint patterns between patients with schizophrenia and healthy controls. The overall assessment of dermatoglyphic traits could be interpreted as an expression of caryotype abnormalities, similar to the chromosomal aberrations that are accompanied by certain dermatoglyphic changes. Studies on the caryotype of schizophrenic patients, however, show very low incidence of abnormalities (<1%), making the relationship between the dermatoglyphic changes and possible unrecognized chromosomal defects not probable (9,12).

On the other hand dermatoglyphic differences between the patients with schizophrenia and the healthy population could be due to changes in the relative frequency of normal genes that control the formation of papillary patterns. Such a change in gene frequency seems logical from the standpoint of the genetic theories of schizophrenia. Adams and Niswander (1) suggested that polygenetic systems act as a buffer in the development of resistance to adverse environmental influences. Substitution of the genes in one of these systems can reduce the stability of the individual and thus may increase the possibility of developmental abnormalities, including the formation of fingerprint patterns. This fact affects the inheritance of abnormalities in presence of family history, while single cases of

Scripta Scientifica Medica, vol. 45, 2013, suppl. 1, pp. 92-96

Table 2. Mean score of fingerprint patterns in females with schizophrenia and their same-sex controls
***Student's t-test:two-tailed – equal variances**
****Student's t-test:two-tailed – unequal variances**

Females							
		Schizophrenia (n=64)		Healthy Controls (n=61)		Statistical Significance	
	Mean	SD	Mean	SD	t	df	P
Right hand							
Arch	0,2813	0,62915	0,2459	0,59598	-0,322*	123	0,748
Loop	3,2656	1,22464	3,5738	1,20359	1,418*	123	0,159
Whorl	1,4375	1,33184	1,1803	1,19035	-1,136*	123	0,258
Left hand							
Arch	0,5781	1,20587	0,2623	0,68073	-1,814**	100,387	0,073
Loop	2,8906	1,50256	3,541	1,27245	**2,605***	**123**	**0,010**
Whorl	1,5313	1,52199	1,1967	1,24926	-1,346**	120,384	0,181
Total							
Arch	0,8594	1,64140	0,5082	1,21960	-1,362**	116,189	0,176
Loop	6,1563	2,33822	7,1148	2,30288	**2,308***	**123**	**0,023**
Whorl	2,9688	2,66052	2,377	2,28884	-1,330*	123	0,186

deviations in normal development have different etiologies associated with the impact of exogenous agents operating during fetal development (1).

CONCLUSIONS

Our data determine the need for additional studies on dermatoglyphic traits in schizophrenic patients with the application of specific methodology, clearly identifiable criteria and the inclusion of a significantly higher number of respondents. The inclusion of dermatoglyphics as biological markers of abnormal neurodevelopment in the constellation of certain epidemiological, genetic, clinical and instrumental research would broaden the concepts of the etiology, pathogenesis and diagnosis of schizophrenia.

REFERENCES

1. Adams M.S., J.D. Niswander. Developmental „noise" and a congenital malformation. *Genet Res*, 1967, No 10, 313-317.
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders, ed. 4, Washington, DC, APA, 1994.
3. Avila M.T., J. Sherr, L.E. Valentine, T.A. Blaxton, Q.K. Thaker. Neurodevelopmental Interactions Conferring Risk for Schizophrenia: A Study of Dermatoglyphic Markers in Patients and Relatives. *Schizophr Bull*, **29**, 2003, No 3.
4. Cannon M., M. Byrne, D. Cotter, P. Sham, C. Larkin, E. O'Callaghan. Further evidence for anomalies in the hand-print of patients with schizophrenia: A study of secondary creases. *Schizophr Res*, **13**, 1994, 2, 179-84.
5. Cummins H., C. Midlo. Fingerprints, palms and soles. New York: Dover Publications, 1961.
6. Fatjó-Vilas M., D. Gourion, S. Campanera, F. Mouaffak, M. Levy-Rueff, M.E. Navarro. New evidences of gene and environment interactions affecting prenatal neurodevelopment in schizophrenia spectrum disorders: A family dermatoglyphic study. *Schizophr Res*, **103**, 2008, 1, 209–217.

7. Galton F. Fingerprints. London: Macmillan, 1892, reprinted, New York, 1965.

8. Khit G., N. Dolinova. Racial differentiation of humanity (Dermatoglyphic data). Moscow, Science, 1990 (in Russian).

9. Money J., S.R. Hirsch. Chromosome anomalies, mental deficiency and schizophrenia. *Arch Gen Psychiatry* (Chicago), **8**, 1963, 242-51.

10. Penrose L. Memorandum on dermatoglyphic nomenclature. Birth Defects: *Original Article Series*, **4**, 1968, No 3, 1-12.

11. Preus M., F.C. Fraser. Dermatoglyphics and syndromes. *Amer. J. Dis. Child*., **124**, 1972.

12. Raphael T., M.W. Shaw. Chromosome srudies in schizophrenia. *JAMA*, **183**, 1963, 1022-8.

13. Tornjova-Randelova S., D. Paskova-Topalova, Y. Yordanov. Dermatoglyphics in anthropology and medicine. Sofia, Professor Marin Drinov Academic Publishing House, 2011 (in Bulgarian).