

NEW CONTRIBUTIONS TO THE STUDY OF THE TRANSVERSE PALMARY SULCUS AND OF ITS SIMILAR RIDGE FORMATIONS

BY

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Finger prints of 684 men and 700 women coming from 7 Moldavian endogamous rural communities have been taken into study, viewed from the perspective of the incidence of the transverse palmary fold (TPF) and of some similar ridge formations. It was observed that the relatively high degree of endogamy of the communities under study is to be correlated with a high frequency of the classical forms of sulcus I and II (10.20%), which is not only sensibly moving off normality (1-3%), but also coming closer to that of the persons with malformed children (14.55%), or even exceeding the value recorded in infantile autism (9.20%) at mentally-handicapped ones (8.60%), in heart's congenital malformations or other cardio-vascular diseases (5.35%), at deaf-dumb people (5.45%), in blindness or other severe ocular affections (4.25%) - all coming from the same area, which explains the presence - already by now - of such maladies in the clinical picture of the studied population. The average frequency of the persons having in their palms at least one of the transverse or transversal (special forms) palmary sulcus is - in the series under investigation (24.80% of which 27.48% in men and 22.13% in women) - over 6 times higher than that generally recorded for Europoid populations, in which it does not exceed 5% in men and 2.5% in women. Sexual dimorphism, as well as the bilateral differences in the distribution of the most frequent forms of TPS I and II, agree fully with those recorded in other Romanian and European reference groups, assuming higher ratios in men - comparatively with women - and also their presence on the left palms of both male and female subjects.

Introduction

A genetically - determined ridge formation, always present on the palm of Simian monkeys - which also explains its name: *Simian line* -, the transverse palmary sulcus, or the transverse palmary fold, defined - as early as 1877 by Broca as a *perfectly continuous ridge over the whole palm breadth*, is to be observed in the human palm, as well, usually associated either with most of various congenital or hereditary maladies or with severe neuropsychical disorders [3, 8, 10, 11, 13, 14, 15, 17], sometimes being nevertheless present in apparently healthy individuals, as a signal or a stigmat of a possible disease, that might be manifested in any of the stages of its carrier's - or of one's descendants' - postnatal life.

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In its classical form, the transverse palmar sulcus results from the fusion of palm's flexion ridges 2 and 3; fusion may be total (without maintaining signs of the two ridges) - this is type I classical sulcus (Fig. 1. I^a - I^b), or it may keep smaller or higher fragments of the two, in this case having the aspect of an intermediary form towards type I - denominated as type II classical sulcus (Fig. 1. II^a - II^b). The two forms of sulcus (I and II) are also known in the literature of the field as *transverse sulcus* [4, 5, 7]. However, the crease crossing the palm from its ulnar to its cubital side may be, as well, formed exclusively on the flexion ridge 2 - being noted with SF₁ (special form 1) or exclusively on ridge 3 - being noted with SF₂ (special form 2), (Fig. 1 SF₁ - SF₂) to which still other two special transition forms SF₃ and SF₄ should be added (Fig. 1, SF₃-SF₄). These last 4 special forms of sulcus - denominated as such by Weninger and Navratil [17] - have been named by other authors *transversal sulcus* [1, 3, 4, 5]. According to the classification of Weninger and Navratil, and in full agreement with other specialists of the field [4, 5, 6, 7], to the 2 forms of transverse (type I - II) and transversal (SF₁, SF₂, SF₃, SF₄) sulcus, an atypical form (type III) - grouping together palm's configurations to which the trajectory of the three main flexion folds, 1, 2 and 3, is slightly different from the normal one (without evidencing elements of palm's crossing), assuring shifting towards the palm in which their disposition is normal - should be added. If considering that the transverse (I + II), transversal palmary folds and form III have a different ethiology [1, 4, 5, 8], they will be analyzed separately in the present study.

Starting from the above considerations, the author discusses the incidence of palmary sulcus and of its similar ridge formations in some predominantly Catholic populations from Moldavia (counties of Yassy, Bacău and Neamț), a region never studied until now from this perspective. Worth mentioning from the very beginning is that the demographic investigations on the 7 Catholic communities taken into study evidenced that, along the 10 decades of the XXth century, they have been characterized by a relatively reduced degree of demographic opening - as suggestively illustrated by an endogamy index ranging between 65% and 85%. However, such a high endogamy is not caused by villages' geographical isolation, but, instead, by the still unchanged traditional pattern of marriage, as well as by the marriages contracted between more or less related people - which led to a higher risk of consanguinity and, implicitly, to the spreading, at the level of the communities, of certain pathological genes, the malformative effect of which are to be found, too, in the dermatoglyphic picture of some of the individuals, occurring as signals (deviations from normality) with deep clinical implications, among which one should notice, too, the transverse palmary sulcus, so frequently met in various congenital maladies. Consequently, the populations taken into study from this perspective show, as it will be seen in the following, a similar behaviour to that of the collectivities affected by various maladies, which actually explains the presence - already - here of a complex pathological picture, including cardio-vascular, ocular, digestive or pulmonary affections, neuropsychical disorders, etc. Several of these maladies have been declared as having existed, too, in the ancestry of the sulcus carriers,

with the risk of their further transmission to the descendants - if considering the strong hereditary character of dermatoglyphics, generally, and of palmary sulcus, especially.

Material and methods

Along the years 1995-2001, there has been dermatoglyphically investigated, a total number of 1,384 subjects of all ages (684 men and 700 women) - coming from the villages of Săbăoani and Gherăești (Neamț county), Fărăoani and Prăjești (Bacău county), Răchiteni, Hălăucești and Butea (Yassy county), all having a predominantly Catholic population, each place being represented (with the exception of Hălăucești, with 84 men but again 100 women), by 100 men and 100 women.

Analysis of the frequency of palmary sulcus and of its similar ridge formations was based on the classification of Weninger and Navratil [17], considered the most comprehensive one, being also much similar to the one applied for other groups of Europoid population [1, 3, 4, 5, 7]. If considering that the palmary sulcus' frequency in populations is quite restricted (1-3%), the analysis of such formations was performed at the level of the whole population taken into study, a procedure applied by other authors, too [3, 4, 5, 7, 17]. For all sulcus forms under analysis, the sexual and the bilateral differences have been evidenced by the ratios of the frequency observed to the total number of hands. Once known, nevertheless, that sulcus' occurrence on one of the hands was not independent on its configuration on the other one (Lestrangle M. 1969), the author also calculated the frequency of the persons carrying at least one sulcus form, alongwith following - by means of the *bimanuar* diagram - the way in which the different types of sulcus are associated among them on the two hands.

The working methods applied are the ones usually utilized in the investigations of normal and pathological dermatoglyphics [4, 8, 17].

Results and discussion

The data listed in Table 1 - showing the percent distribution, according to hand and sex, of the sulcus forms, by the classification of Weninger and Navratil [17] - show that, both the I - and II - type, and the special or transversal forms and the atypical form III *are to be more frequently met on the left hands of subjects of both sexes, well-known as carriers of most malformative stigmata* [8, 9, 10, 12, 17].

As a sex-dependending distribution, sulcus' types I and II are more frequent in men while, on the contrary, the special forms and types III - in women, the sexual differences being quite low, especially in the last 2 cases. Out of all sulcus forms considered for analysis, the highest occurrence in our sample is represented by type II (7.84%) which, together with type I, amounts to an average ratio of 10.02% (11.55% in men and 8.50% in women) - a value sensibly different from that recorded in demographically-open collectivities (1-3%), but nevertheless close to, or even exceeding the one registered in various congenital and hereditary affections from the same Moldavian region (Table 2), and which may be found out in the whole clinical picture of the populations considered.

Out of the 4 special forms of sulcus, more frequently met is SF₂ (3.54%), followed - at an appreciable distance - by SF₁ (0.79%) on the last position, and very weakly represented numerically, in equal ratios (0.36%) occurring: SF₃ and SF₄ (Table 3). **The cumulated average weight of the four special forms of Sulcus values, of 5.05%** (5.21% in women and 4.90% in men) is more than double comparatively with the one recorded by us for the population of the Maramureș region (2.26%). Instead, for **form III of transition towards palm's normal configuration, our series record an average ratio of only 4.73%**, comparatively with 8.14% - the value recorded in the same Maramureș population, where the sexual dimorphism favoured the masculine series (10.67% comparatively with 5.46%) while, in this case, it is slightly in favour of the feminine series (5.92% versus 3.51% in masculine ones).

The classical type I sulcus, for which the author possesses comparative data on its frequency, in still other Romanian and Europoid reference groups, as well (Table 4), provides - if considering the total number of investigated persons - a double ratio, comparatively with the total number of hands under investigation (of 4.26% and, respectively, 2.13%) - which actually represents one of the highest values versus other Romanian and Europoid populations studied. Such a rare formation is to be met in double ratio in men (5.70% versus 2.86% in women) - known as carriers of most atavic characters [7, 8].

As realization of sulcus on one of the hands is not independent on its configuration on the other one [4, 5] **the author calculated, too, the frequency of the carriers of various sulcus forms**, alongwith the manner in which they associate on the two hands, differentiated for men and for women (Bimanuar 1 and 2). Therefore, one may observe from Bimanuar 1 that, out of the 684 investigated men, 227 are carriers of at least one or another sulcus form (227/684 = 33.18%), 131 of whom have at least one type I and II (131/684 = 19.15%), 57 - at least one special sulcus form (57/684 = 8.33%), and 39 - least one atypical form III (39/684 = 5.70%). On the whole, the frequency of those carrying at least one transverse (I and II) or transversal sulcus is, on the average, of 27.48% (188/684), being more than 5 times higher than the value recorded in other European masculine reference groups [1, 5, 7]. Another observation to be made is that most of the men carrying sulcus or other similar formations have them disposed on a single hand (15 cases for type I, 73 for type II, 50 for SF and 34 for form III), the remaining 55 cases showing them on both palms, in various combinations, most frequent being the one with the same sulcus type (I with I = 9 cases, II with II = 14 cases, etc). **In the cases of women (Bimanuar 2)**, out of the 700 persons under investigation, 183 evidenced one or another sulcus form (183/700 = 26.14%), 97 of them - at least one I and II forms (97/700 = 13.85%), 58 - at least one transversal or special form (58/700 = 8.28%), and 28 - type III (28/700 = 4.0%), **the total weight of the carriers of I and II forms and of special forms being - in this situation - of 22.13% (155/700), comparatively with 27.48%, the value recorded with men**, this being about of 10 times higher than the value recorded in other European feminine groups [5, 7].

Another observation to be made from the two bimanuaries is that the sexual differences regarding the frequency of sulcus carriers are mainly registered with types I and II, which favours the masculine series with +5.30%.

As in the case of men, the most frequent arrangement of the different sulcus forms in women is the unilateral one (10 cases for type I; 49 for II; 50 for the special forms and 28 for the atypical form III), in the remaining 49 women, the disposition occurring on both hands, associated in various combinations, of which the most frequent is, once more, that with the same type of sulcus (I with I = 4 cases; II with II=16 cases, SF with SF = 8 cases, and only 2 cases of III with III). For types I and II, most frequently met in our sample, and whose clinical implications are well-known [8, 10, 11, 12, 14, 15], the analysis followed, too, the *ratios of carriers to whom they are present either exclusively on the left hand or exclusively on the right one, or on both hands, simultaneously*, an aspect suggesting, too, the carriers' degree of affection, once known the pathological significance of their presence even if on only one hand. Indeed, as expected, the priority disposition with carriers of both sexes is the one exclusively on the left hand, on specifying that, for type I, a higher frequency is recorded with women (68.75% versus 46.66% in men) while for type II, it is, on the contrary, with men (61.61% versus 50.60% in women). The second position of sulcus I - as to its frequency - is occupied by the bilateral disposition (30% in men and 25% in women), while that of sulcus II - the exclusive disposition on the right palm, which is slightly more frequent in women (31.32% versus 23.30% in men). Taken together, the two forms of sulcus (I and II) combine for their exclusive arrangement on the carriers' left hand, an average ratio of 56.03% (57.89% with men and 53.53% its women) followed, in descending order of value, by their presence exclusively on the right hand (27.27% with women and 23.31% with men), the last position being occupied by the cases in which the two classical sulcus forms occur on carriers' both palms (about 19% for both sexes).

Conclusions

The dermatoglyphic study of the predominantly Catholic Moldavian populations, considered as to the incidence of the transverse palmary sulcus and of its similar crease formations, has demonstrated the relation existing between the aspect under consideration and the endogamous character of the origin places of such collectivities.

Indeed, an unexpectedly high frequency is to be recorded - comparatively with normality - for the classical sulcus (I and II), the average value of which - of 10.02% is not only close to but even exceeds the one recorded in collectivities of individuals (from the same Moldavian areas) affected by severe congenital and hereditary diseases, already present in the spectrum of the pathological picture of such populations. Also, for the classical form of sulcus (type I), the clinical implications of which are among the most important, our series register one of the highest frequencies (4.26%), comparatively with other Romanian and Europoid populations.

In close correlation with the above observations, one should also notice a very high number of carriers of at least one transverse or transversal sulcus form, of 24.80% (27.48% in men and 22.13% in women), which is - in the present case - over 6 times higher than the value recorded for other European groups in which it does not exceed - on the average - 5% in men and 2.5% in women. However, as to the frequency of sulcus forms I and II (the most frequently considered in the investigations of the field), as a function of sex and laterality, the populations under study may be ranged within the general European behaviour, which assumes their higher incidence in men (11.55% *versus* 8.50% in women), and on the left palms (12.02% *versus* 7.37% on the right palms). This general peculiarity has been confirmed, too, by the analysis of the frequency of sulcus I and II carriers, which evidenced that a higher weight of theirs is recorded in men (19.15% *versus* 13.85% in women), and the preferential distribution for both sexes is exclusively on the left palms (57.89% in men and 53.53% in women).

Table I Percent distribution, according to hand and sex, of the transverse palmary sulcus and of its variants (classification of Weninger and Navratil)

Sex	Nr of hands investigated			I ^a + I ^b			II ^a + II ^b			I + II			SF ₁ + SF ₂ + SF ₃ + SF ₄ (special forms)			III		
	L	R	L + R	L	R	L + R	L	R	L + R	L	R	L + R	L	R	L + R	L	R	L + R
Men	684	684	1368	3.36	2.34	2.85	11.55	5.85	8.70	14.91	8.19	11.55	6.87	2.92	4.90	3.95	3.07	3.51
Women	700	700	1400	2.28	0.71	1.43	8.14	5.85	7.00	10.42	6.56	8.49	7.28	3.14	5.21	6.43	5.42	5.92
Total	1384	1384	2768	2.82	1.52	2.13	9.82	5.85	7.84	12.02	7.37	10.02	7.07	3.03	5.05	5.20	4.26	4.73

Table II Frequency of forms I and II of palmary transverse sulcus viewed comparatively with the one present in various congenital and hereditary maladies in Moldavia

Sex	Population investigated	MH	DM	PMC	OA	CVA	Down Syndrome	Epilepsy	Infantile autism
Men	11.55	8.00	7.90	12.00	4.50	2.50	46.90	5.90	11.90
Women	8.49	9.20	3.00	17.10	4.00	8.20	23.80	2.90	6.50
Total	10.02	8.60	5.45	14.55	4.25	5.35	35.35	4.40	9.20

MH = mentally handicapped; DM = deaf-mutes; PMC = parents with malformed children; OA = ocular affections (blind ones included); CVA = cardio-vascular affections (heart congenital malformations included)

Table III Percent distribution of the special forms of sulcus (*transversal sulcus*) as a function of sex

Sex	Nr of hands investigated	Special sulcus forms („transversal sulcus”)				Total special forms
		SF ₁	SF ₂	SF ₃	SF ₄	
Men (684)	1368	9 = 0.65	53 = 3.87	2 = 0.14	3 = 0.22	67 = 4.90
Women (700)	1400	13 = 0.93	45 = 3.21	8 = 0.57	7 = 0.50	73 = 5.21
Total (1384)	2768	22 = 0.79	98 = 3.54	10 = 0.36	10 = 0.36	140 = 5.05

Table IV. Frequency of the type I transverse palmary sulcus comparatively with other European populations

Ethnic group	Authors	Sex	Sample	Frequency		Safety interval-limits	
				N	%	min.	max.
French (of various ages)	Monique Th de Lestrang (1966)	Men	696	22	4.02	2.67	5.82
		Women	952	22	1.47	0.80	2.48
		M + W	1648	44	2.55	1.84	3.44

Ethnic group	Authors	Sex	Sample	Frequency		Safety interval-limits	
				N	%	min.	max.
Austrian (children)	Margaret Weninger and L. Navratil (1957)	Men	316	13	4.11	1.89	6.33
		Women	270	5	1.85	0.21	3.49
		M + W	586	18	3.05	1.63	4.47
Spanish	Jordan J. Pons (cited by H. Wilder)	Men	390	15	3.85	2.13	6.38
		Women	105	2	1.90	0.23	6.88
Ethnic group	Authors (cited by H. Wilder 1955)	Sex	Sample	Frequency		Safety interval-limits	
		M + W	495	17	3.43	1.98	5.52
Romanian (all ages)	M. Weninger (1953)	Men	521	28	5.37	3.57	7.77
		Women	557	15	2.69	1.49	4.47
		M + W	1078	43	3.99	2.89	5.36
Romanian (all ages)	Marta Dumitrescu Ciovârnache (1964)	Men	2535	91	3.59	2.89	4.41
		Women	2659	53	1.99	1.49	2.61
		M + W	5194	144	2.77	2.33	3.27
Romanian (children from the Supper. Basin of Teleajen)	C. Vulpe and A. Rudescu (1968)	Men	393	12	3.05	1.58	5.34
		Women	395	9	2.28	1.04	4.32
		M + W	788	21	2.66	1.65	4.07

Ethnic group	Authors	Sex	Sample	Frequency		Safety interval-limits	
				N	%	min.	max.
Romanian (all ages from Valley Mara)	Ana Țarcă (1973)	Men	483	16	3.31	1.67	5.05
		Women	512	9	1.76	0.60	2.92
		M + W	995	25	2.51	1.53	3.49
Romanian (all ages the Central Moldavian Plateau)	Ana Țarcă (2003)	Men	684	39	5.70	3.50	6.60
		Women	700	20	2.86	1.50	4.50
		M + W	1384	59	4.26	2.65	5.60

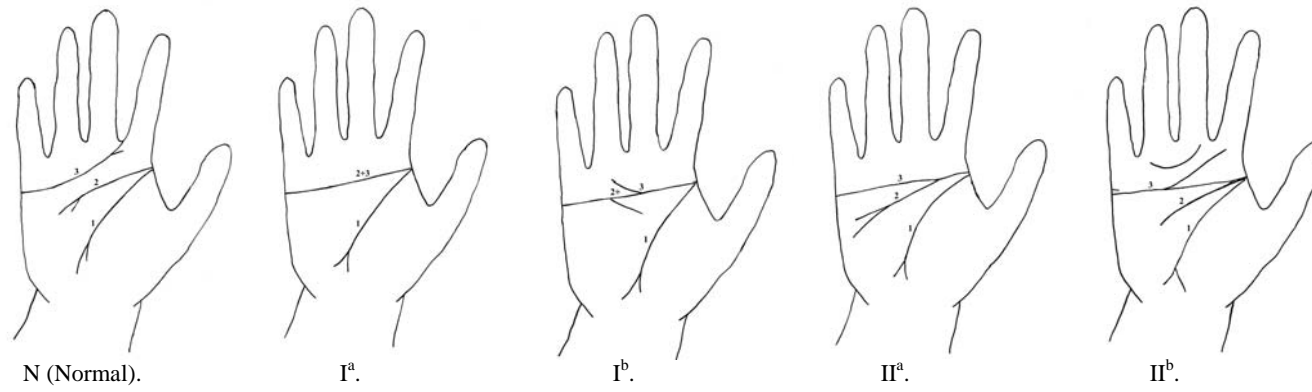
Bimanuar 1 - scheme on the percent distribution of the association ways of the different sulcus forms on the two hands, with the masculine series

One hand	O	SF	III	II	I
Another hand					
I	15	1	1	8	9
II	79	3	7	14	
III	34	2	3		
SF	50	7			

**Bimanuar 2 - scheme on the percent distribution of the association ways of the different sulcus forms on the two hands,
with the feminine series**

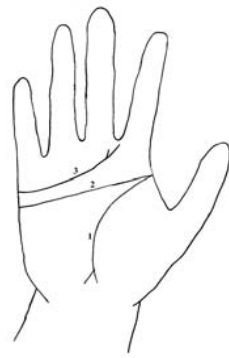
One hand	O	SF	III	II	I
Another hand					
I	10	1	-	4	4
II	49	6	7	16	
III	25	1	2		
SF	50	8			
O	517				

Fig. 1. Different forms of sulcus (Weninger and Navratil)

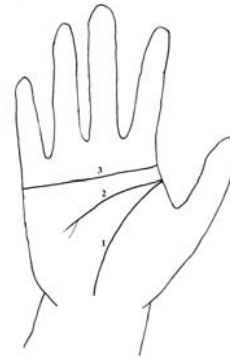




III.



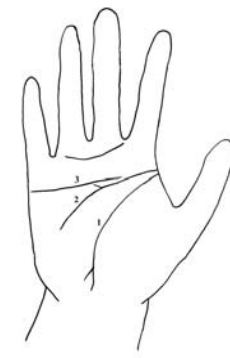
SF₁.



SF₂.



SF₃.



SF₄.

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