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DERMATOGLYPHICS OF DIGITOPALMAR COMPLEX IN FORTY MALE PATIENTS AFFECTED BY RHEUMATOID ARTHRITIS - QUANTITATIVE ANALYSIS

DERMATOGLIFI DIGITOPALMARNOG KOMPLEKSA U ČETRDESETORICE MUŠKIH BOLESNIKA OBOLJELIH OD REUMATOIDNOG ARTRITISA - KVANTITATIVNA ANALIZA

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At night, Jehovah, my very bones have been bored through (and dropped) from off me, and (pains) gnawing me do not take any rest.
Job 30:17, NW.

Summary

Quantitative analysis of digitopalmar ridge count was performed in forty male patients with rheumatoid arthritis to evaluation of genetic factors in that disease. Twenty five variables (ridge count on each of ten fingers, their sum on five and ten fingers, four traits on each palm, i. e. ridge count between a-b, b-c and c-d triradii, their sum on each and both palm and at angle on two palms and their bilateral sum) were determined. The data thus obtained were compared with digitopalmar prints of 200 healthy men who served as a control group. A significant difference from the control group was found in eight variables. Ridge count was increased on the first and fifth finger bilaterally, on the fourth right finger tip, and their sum on each, and both fists. Accordingly, a polygenic system identical in some loci to the polygenic system predisposing to rheumatoid arthritis susceptibility might be found responsible for the dermatoglyphic pattern development. That means that they could used, and that is the aim of this study, as a diagnostic tool in rheumatic diseases.

Key words

dermatoglyphic pattern, rheumatoid arthritis, male sex, quantitative dermatoglyphic analysis

Sažetak

Kvantitativna analiza digitopalmarnih dermatoglifa provedena je u četrdesetorice muškaraca s reumatoidnim artritisom zbog procjene udjela genetičkih čimbenika u toj bolesti. Ispitano je 25 varijabli (broj kožnih grebenova na svakom od deset prstiju, njihov zbroj na pet i deset prstiju, četiri značajke na dlanovima: broj grebenova između a-b, b-c i c-d triradijusa, zatim njihov zbroj na svakom dlanu i obostrano, te atd kutovi na svakom dlanu i njihov obostrani zbroj). Dobiveni podaci uspoređeni su s dvjesto pari otisaka zdravih muškaraca koji su poslužili kao kontrolna skupina. Statistički značajne razlike u odnosu na kontrolnu skupinu, u smislu povećanog broja grebenova, nađene su na prvom i petom prstu obostrano, te četvrtom desno, zatim njihovu zbroju na svakoj šaci posebno i obje zajedno. Prema tome, moguće je pretpostaviti kako je poligenetički sustav odgovoran za razvoj dermatoglifa identičan s nekim lokusima za oboljevanje od reumatoidnog artritisa u muškaraca, što znači kako bi se dermatoglifi mogli iskoristiti kao dijagnostičko sredstvo u reumatskim bolestima.

Ključne riječi

dermatoglifi, reumatoidni artritis, muški spol, kvantitativna dermatoglifska analiza

Introduction

Rheumatoid arthritis (RA) is the most common inflammatory type od arthritis. RA is more common in women than men, and typical onset for the disease is between 25 and 50 years of age. Symptoms of rheumatoid arthritis include swelling, los of movement, stiffnes, and pain of joints, most commonly the fingers and wrists. RA is to be feared and respected because it is a sytemic autoimmune chronic condition that affects internal organs as well as joints (1).

RA has a multifactorial etiology, with twin studies indicating that genetic factors account for 60% of the variance in liability to disease. HLA genes contribute 30-50% of the genetic risk, although the extent to which HLA determines disease severity rather than disease susceptibility continues to be debated. The HLA association may, to an extent, explain the geographic variation in the prevalence of disease. The importance of non-HLA genes in RA is currently emerging from large-scale linkage and candidate gene association studies. The excess of RA among females indicates an influence of hormonal and reproductive factors. Parity, breast feeding, and the use of exogenous hormones have been implicated in determining susceptibility to the disease. Environmental and lifestyle factors implicated include obesity, dietary exposure to antioxidans, smoking, coffee consuption and certain specific occupational exposures. There is no conclusive epidemiological evidence for a single infectious trigger, have concluded MacGregor and Silman, in their summary of classificaton and epidemiology of RA (2).

The association of RA with some chromosomes and the genes in them was well established. By the procedure of Genome-wide meta-analysis (meta analysis being increasingly used as a tool for integrating data from different studies of complex phenotypes, because the power of any one study to identify causal loci is limited), for rheumatoid arthritis, was provided marginal evidence ($p<0.05$) of linkage for chromosome 1, 2, 5 and 8, strong evidence ($p<0.01$) on chromosome 8 et 16, and overwhelming evidence in the HLA region of chromosome 6 (3). The connection DR4 and DR1 was well known (4,5). On the molecular level, the link of a set of related HLA-DR allels, DRB1*0101(DR1), DRB1*0401 (DR4/Dw4), DRB1* 0404 (DR4/Dw14), DRB1*0405 (DR4/Dw15) and DRB1*1402 (DR6/Dw16), which share amino acid sequnce EQ(K/R)RAA and also have an increased susceptibility to develop RA has been well established (6), and for Croation population to: DRB1*0101, DRB1*0401 and DR B1*0404 (7). The next, in chromosome 1, is PTPN22 one of number of protein tyrosine phosphatases involved in regulating the immune response, gene which increasing risk of RA by 40-70 percent in Caucasian populations (8). Then, very interesting are two genes in chromosome 9 which are responsible for the inflammation associated with RA: TRAF 1 and C 5. TRAF 1 codes for tumor necrosis factor, a specific target for many new biologic drugs used to treat RA. C 5 codes for complement, a protein that also play big role in inflammation. A double shot of that genetic mutation, increased the risk for RA by 87 percent, and second gene mutation, found in a region known as STAT 4 in chromosome 2 (STAT 4 controls a signaling molecule involved in the effects of immune system compound called cytokines, including as IL-12 and some types of interferon which also are involved in inflammation), one who had two copies of that gene, had a 60 percent higer risk of RA (9).

There are three new papers of RA dealing with in dermatoglyphic study (10,11,12) and with two of them partially, could be compared to ours previous (13,14). Dermatoglyphic analysis should be strictly separated according to sex, because of the great impact of sex chromosomes and sex hormones on the dermatoglyphic traits (15,16). Even significant sex differences have been found within control groups (17).

Material and methods

Dermograms of forty male RA patients was analysed according to the American Rheumatism Association 1987 Revised Criteria (18), and in keeping with the instructions provided by Miličić et al. (19). Results were compared with 200 dermograms of phenotypically normal men from the Zagreb area, obtainded from the Institute of Anthropolgy in Zagreb (17). Palmar prints were taken by use of finely granulated silver-gray powder onto a transparent, adhesive tape (20).

Twenty-five variables, abbreviated and designated as follows, were examined by the quantitative dermaglyphics analysis: 1. **FRD1** ridge count on the first finger of the right hand; 2. **FRD2** ridge count on the second finger of the right hand; 3. **FRD3** ridge count on the third finger of the right hand; 4. **FRD4** ridge count on the fourth finger of the right hand; 5. **FRD5** ridge count on the fifth finger of the right hand; 6. **TFRCD** total ridge count on all five fingers of the right hand; 7. **a-b rcD** ridge count between a-b triradii of the right hand; 8. **b-c rcD** ridge count between b-c triradii of the right hand; 9. **c-d rcD** ridge count between c-d triradii of the right hand; 10. **a-d rcD** ridge count between a-d triradii of the right hand; 11. **atd D** atd angle on the right palm; 12. **FRL1** ridge count on the first finger on the left hand; 13. **FRL2** ridge count on the second finger on the left hand; 14. **FRL3** ridge count on the third finger on the left hand; 15. **FRL4** ridge count on the fourth finger on the left hand; 16. **FRL5** ridge count on the fifth finger on the left hand; 17. **TFRCL** to-

tal ridge count on all five fingers of the left hand; 18. **a-b rcL** ridge count between a-b triradii of the left hand; 19. **b-c rcL** ridge count between b-c triradii of the left hand; 20. **c-d rcL** ridge count between c-d triradii of the left hand; 21. **a-c rcL** ridge count between a-c triradii of the left hand; 22. **atd L** atd angle on the left hand; 23. **TFRC** total ridge count on all ten fingers; 24. **TPRC** bilateral ridge count between all triradii of the palms; 25. **ATDDL** bilateral sum of palmar atd angle (in degrees).

Student's t-test was used to test the statisically significant differences in the ridge count between the patients and control group.

Results

Results are tabularly presented in tables 1-3.

Ridge count on the first, fourth, fifth finger and on all five fingers of the right hand was significantly greater in RA patients compared with controls at the risk level 0.2%, 1.5%, 0.4% and 0.4% respectively. This is presented by FRD1, FRD4, FRD5 and TFRCD variables in table 1. Ridge count on the first, fifth and on all five fingers of the left hand was significantly greater in RA patients compared with controls at the risk level 0.0%, 0.0% and 0.3%, respectively. This is presented by FRL1,

Table 1. **Quantitative properties of right hand digitopalmar complex in patients and control subjects**
Tablica 1. **Rezultati analize kvantitativnih svojstava digitopalmarnog kompleksa u bolesnika i kontrole na desnoj ruci**

Variable	Patient group			Control group			p	Risk level
	n	x	SD	n	x	SD		
FRD1	40	22.33	5.10	200	19.38	5.63	.002	stat.signif.differ.fr.controls
FRD2	40	13.68	6.85	200	11.42	7.27	.071	
FRD3	40	13.75	6.40	200	11.99	6.58	.121	
FRD4	40	18.68	4.78	200	16.16	6.15	.015	stat.signif.differ.fr.controls
FRD5	40	16.50	4.48	200	13.64	5.16	.001	stat.signif.differ.fr.controls
TFRCD	40	84.48	20.02	200	72.57	24.65	.004	stat.signif.differ.fr.controls
a-b rcD	40	37.03	5.84	194	37.94	6.07	.384	
b-c rcD	40	29.83	5.17	194	28.58	5.87	.215	
c-d rcD	40	43.13	4.93	200	41.85	6.86	.264	
a-d rcD	40	109.98	11.84	194	108.47	13.39	.510	
atd D	40	45.70	10.34	200	47.43	8.27	.251	

Table 2. **Quantitative properties of left hand digitopalmar complex in patients and control subjects**
Tablica 2. **Rezultati analize kvantitativnih svojstava digitopalmarnog kompleksa u bolesnika i kontrole na lijevoj ruci**

Variable	Patient group			Control group			p	Risk level
	n	x	SD	n	x	SD		
FRL1	40	20.50	5.72	200	16.20	6.14	.000	stat.signif.differ fr.controls
FRL2	40	12.35	6.36	200	10.76	6.78	.I72	
FRL3	40	13.63	6.72	200	11.78	6.37	.098	
FRL4	40	17.55	5.11	200	16.25	6.17	.149	
FRL5	40	16.52	4.15	200	13.50	4.60	.000	stat.signif.differ fr.controls
TFRCL	40	80.75	21.94	200	68.47	21.94	.003	stat.signif.differ fr.controls
a-b rcL	40	44.85	5.40	200	43.58	7.05	.283	
b-c rcL	40	29.85	5.65	191	28.71	5.85	.262	
c-d rcL	40	35.63	7.50	191	36.60	7.00	.428	
a-d rcL	40	110.35	11.98	191	109.02	14.79	.595	
atd L	40	40.95	8.89	200	47.86	7.70	.166	

Table 3. **Quantitative properties of digitopalmar complex on both hands in patients and control subjects**
Tablica 3. **Rezultati analize kvantitativnih svojstava digitopalmarnog kompleksa u bolesnika i kontrole na obje ruke zajedno**

Variable	Patient group			Control group			p	Risk level
	n	x	SD	n	x	SD		
TFRC	40	165.48	40.89	200	141.03	47.44	.002	stat.signif.differ fr.contols
TPRC	40	220.33	22.90	188	217.94	27.19	.565	
ATDDL	40	91.65	14.30	200	95.28	14.30	.226	

FRL5 and TFRCL variables in table 2. Ridge count on all ten fingers was significantly greater compared with controls at the risk level 0.2%, presented by TFRC variable table 3.

Discussion

We have made such a research in women RA patients (21), but it could not be compared with this, in men, because of the reasons mentioned before (15,16,17). The another paper (10) dealing with, is uncomparable to our because of his qualitative dermatoglyphic analysis.

That is why we could compare our investigation only with men RA patients. Belov in 1985, found no metric alterations of the dermatoglyphic patttern in a sample of 69 men (22). Taneja et al. in 1993, in metric characteristics recorded an increase in the total sum of ridges on ten fingers which, however, did not reach statistical significance in nine male patients (23). Hwang et al, 2005, in 57 male patients found the total fingerprint ridges more numerous compared to controls of 2095 normal Korean males (11) what is the exactly the same to ours. Rajangam et all, 2008, were observed a trend towards significance in right hand male patients with respect to their increase in "total finger ridge count" (12).

In the purpose of differential diagnostics, however, it is interesting to compare to psoriatic arthritis 20 men from the third group of Moll and Wright clinical subtypes (rheumatoid like polyarthritis) (24). Statistically significant differences in relation to control group were found in 11 variables in psoriatic patients in the sense of decreased ridges: on the second (FRD2), the third (FRD3) and on the all five fingers (TFRCD), then between triradii a-d (a-d rcD) and the ATDD angle (in degrees) on the right hand. On the left hand, on the second (FRL2), the fourth (FRL4) and on the all five fingers (TFRCL), then the ATDL angle (in degrees). Lastly, on the all ten fingers (TFRC) and ATDDL angle of both hands, in decreased number of ridge to. Statistically significant differences between RA and psoriatic arthritis patients (rheumatoid like) were found in 16 of 25 variables in the sense of decreased ridges in psoriatic arthritis patients to those with RA: on the first (FRD1), second (FRD2), third (FRD3), fourth (FRD4), fifth (FRD5), and on the all five fingers (TFRCD) of the right hand, and between triradii a-d rcD and ATDD angle (in degrees) on the right hand to. Then on the first (FRL1), second (FRL2), fourth (FRD4), fifth (FRL5), and on the all five fingers (TFRC) and ATDL angle (in degrees) on the left hand, and on all ten fingers (TFRC) and ATDL angles (in degrees of both hands (25). We have found statistically significant differences between RA and psoriatic arthritis women polyarthritic (rheumatoid like) form in ten varibles: on the third, the fourth and the fifth finger, on the fingers of each hand separatelly and both together, and between triradii ab rcL on the left palm to (26).

Conclusion

In conclusion, it seems quite likely, based on our own (27-36) and other studies performed to date (37-43), that this simple, inexpensive and non-agressive genetic method may be used as a diagnostic tool in rheumatic diseases.

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