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RESEARCH ARTICLE

QUANTITATIVE ANALYSIS OF DIGITOPALMAR DERMATOGLYPHICS IN FORTY FEMALE ANKYLOSING SPONDYLITIS PATIENTS

[1]Miljenko Cvjetičanin, [2]Zrinka Jajić and [3]Nijaz Burgić

[1]Dom zdravlja Zagrebačke županije, Ispostava Ivanić-Grad, Ordinacija za fizikalnu i rehabilitacijsku medicinu, Omladinska 25, blizu Zagreba, Croatia
[2]Klinički bolnički centar, Sestre milosrdnice, Odjel za reumatologiju, fizikalnu medicinu i rehabilitaciju, Vinogradska 29, Zagreb, Croatia
[3]Specijalistička ordinacija fizikalne medicine i rehabilitacije, E. Pascalia 3A, Umag

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ABSTRACT

Dermatoglyphic pattern analysis, the one of the genetic method, was used to determine digitopalmar ridge count in 40 women with ankylosing spondylitis. Twenty five variables (ridge count on each of the ten fingers, their sum on five and ten fingers, four traits o n each palm, i.e. ridge count between a-b, b-c and c-d triradii, and atd angles in degrees, on the palms as well as their sum) were determined. The data thus obtained were compared with digitopalmar prints of 200 healthy women who served as a control group. A significant difference from the control group was found for one variable: ridge count was increased on the lef t fifth finger tip. By the new testing, compared with 40 females from the same control group it has been found another five statistically significant variables. That means that they could used, for prevention, and this is the aim of this study, in the evaluation of the relative risk in family members with positive disease history.

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INTRODUCTION

Ankylosing spondylitis (AS) is a chronic systemic inflammatory disease whose main symptoms are caused by arthritis of the sacroiliac joints (Gran, 1990). The disorder frequently involves spinal and extraspinal joints and entheses. Clinical aspect is shown on picture 1 (Wessinghage, 1984). Etiological and pathogenetic mechanisms apparently include both environmental and genetic factors, then familial heredity (Hersh, 1950; Calin *et al*., 1983; Calin, 1989; Hamersma *et al*., 2001; Pelaez-Ballestas, 2015). An association with the human leucocyte antigen HLA-B27 has been firmly established (Gran, 1990). Prevalence is 23,8 per 10.000 (from 36 eligbile studies) in Europe, Dean 2014), and sex ratio M/F is 3:1 in Croatia (Jajjć I. Reumatologija, 1995). As a form of chronic arthritis of the spine characterized by certain distinguishing features was described by Bechterew (1893), Strumpell (1897), Marie (1898), at the turn of 19th century. Dermatoglyphic analysis, is a simple, inexpensive and non-aggressive genetic method, by which we are looking for their connection with diseases. Namely, if some disorder or genetic mark for him, comes in early fetal development, additive polygenic influence, could have an impact on dermal ridges of palms and soles then fingers too, in the sense of changing them from normal. Because of that, that do not change their shape after birth during life span (Archana Sing, 2016), they are suitable for possibilty of research them for, as early as possible risk, before of break out many diseases. For example, symmultanously impact on damage of central nervous system could may a change them because of their common ectodermal origin. That is exactly what is happened in our: cerebral palsy (Cvjetičanin *et al*, 2017; Cvjetičanin, *et al.,* 1998), and others, less clearly connection, rheumatoid arthritis (Cvjetičanin *et al*., 1998, Cvjetičanin *et al.,* 2012), reactive sponyloarthritis (formerly Reiter's syndrome) (Cvjetičanin *et al*., 2017), primary hypertrophic osteooarthropathy (Cvjetičanin *et al.,* 2016), algodystrophy (complex regional pain syndrome type I and II) (Cvjetičanin, *et al.,* 2005, Cvjetičanin *et al*., 2017), psoriasis (Cvjetičanin *et al*., 2016) and psoriatic arthritis (Cvjetičanin, *et al.,* 2016). Because of the great impact of sex chromosomes and sex hormones in the development of dermatoglyphic pattern and traits, dermatogliphic analysis should be strictly separeted and research according to sex (Bener, 1979; Al-

****Corresponding author:*** **Miljenko Cvjetičanin,**
Dom zdravlja Zagrebačke županije, Ispostava Ivanić-Grad, Ordinacija za fizikalnu i rehabilitacijsku medicinu, Omladinska 25, blizu Zagreba, Croatia.

Jumaily et al 2010). That is why, we have made research by the quantitative analysis of them in 40 men with AS previously (Cvjetičanin, 2000). Beside this, significant differences have also been found within control group of healthy subjects (Schmutzer, 1977).

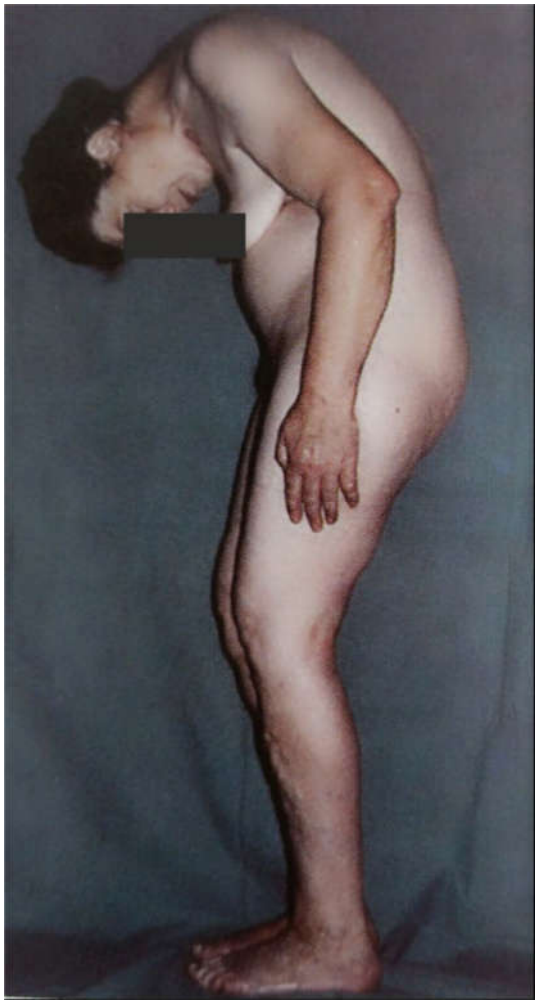
MATERIALS AND METHODS

Dermograms of forty female ankylosing spondylitis patients were analysed according to Modeified New diagnostic criteria (Brown, 2017). Quantitative analysis has conducted in keeping with instructions by Miličić *et al*. (1989). Results were compared with 200 dermograms of phenotypically normal vomen from the Zagreb area, obtained from the Institute of Anthropology in Zagreb (Schmutzer, 1977). Palmar and finger prints were taken by HSW finely granulated, silver-gray powder used in criminalistics, onto transparent, adhesive tape by a brush made of squirrel tail (30). Student's t-test was used to test statistically significant difference in the ridge count between the patient and control group. The following 25 traits were examined by the quantitative dermatoglyphic analysis, as it shown ond Picture 2 and tables 1-3 then 4.

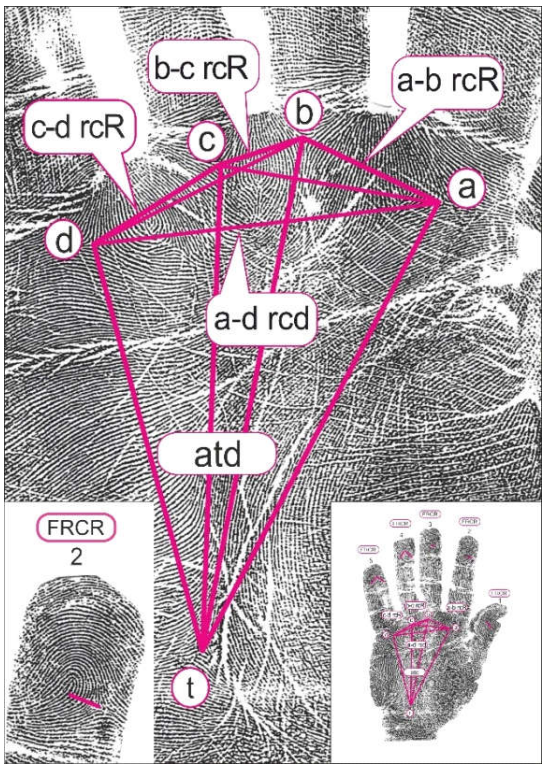
1. FRD1 ridge count on the first finger of the right hand, 2. FRD2 ridge count on the second finger of the right hand, 3. FRD3 ridge count on the third finger ot the right hand, 4. FRD4 ridge count on the fourth finger of the right hand, 5. FRD5 ridge count on the fifth finger ot the right hand, 6. TFRCD total ridge count on the all five fingers of the right hand, 7. a-b rcD ridge count between triradii a-b of the right hand, 8. b-c rcD ridge count between triradii b-c of the right hand, 9. c-d rcD ridge count between triradii c-d of the right hand. 10. TPR rcD ridge count between all triradii, of the right hand (a-b, b-c and c-d all together). 11. ATD angle on the right palm in degrees. 12. FRL1 ridge count on the first finger of the left hand, 13. FRL2 ridge count on the second finger of the left hand, 14. FRL3 ridge count of the third finger of the left hand, 15. FRL4 ridge count on the fourth finger of the left hand, 16. FRL5 ridge count on the fifth finger of the left hand, 17. TFRCL ridge count on all five fingers on the left hand, 18. a-b rcL ridge count between triradii a-b of the left hand, 19. b-c rcL ridge count between triradii b-c on the left hand, 20. c-d rcL ridge count between triradii c-d on the left hand, 21. TPR rcL ridge count between triradii on the left palm (a-b, b-c and c-d all together), 22. ATD L angle on the left palm in degrees, 23. TFRC total ridge count on all ten fingers on hand, 24. TPRC bilateral ridge count between all triradii a-b,c-d and c-d of the palms, 25. ATDDL bilateral sum of atd angles in degrees.

RESULTS

The results are tabularly presented in Tables 1-3 and 4. Statistically siginificant difference to control by the Student's t-test was found in the variable FRL5 on the left fifth finger in the sense of increasing number of epidermal ridges at risk level 1,5 .Because of 200 persons in control group is to much in proportion to only 40 ankylosing spondylitis patients, by random choice it has taken prints of 40 women from the same control group to another testing from data base (Schmutzer, 1977). Presented variables are according to Kolmogorov-Smirnov test of normal division what justify testing hypothesis of absence difference between sick and control group by t-test for indipendent samples. Thresh fold rejection this hypothesis is usual 0,05 (5%). For the analysis purposes used programme STATISTICA 10: Stat Soft, Inc. (2011).



Picture 1. Woman ankylosing spondylitis patient
The picture has taken from Taschenatlas der Rheumatologie (Wessinghage, 1984, p. 178)



Picture 2. The areas of quantitative analysis on palm and finger dermatoglyphics

Table 1. Quantitative properties of right handdigitopalmar dermatoglyphics in patients and controls c

Variable	Patient group	Control group	Risk
	n x SD	n x SD	p
FRD1	40 18,73 5,89	200 17,23 5,56	0,125
FRD2	40 12,70 7,36	200 11,62 6,55	0,350
FRD3	40 11,43 5,42	200 11,44 5,31	0,987
FRD4	40 16,30 5,40	200 15,78 5,72	0,597
FRD5	40 14,30 5,29	200 12,70 4,83	0,061
TFRD	40 73,45 21,34	200 68,77 21,65	0,212
a-b rcD	40 40,78 5,21	200 41,03 6,02	0,803
b-c rcD	40 28,63 5,96	200 27,31 6,00	0,208
c-d rcD	40 38,30 5,09	200 36,70 6,43	0,125
TPR cD	40 107,70 10,50	200 105,05 12,69	0,218
Atd D	40 47,40 9,41	200 46,87 8,67	0,770

Table 2.Quantitative properties of left hand digitopal-mar dermatoglyphics in patients and controls

Variable	Patient group	Control group	Risk
	n x SD	n x SD	p
FRL1	40 15,53 7,14	200 14,80 5,76	0,484
FRL2	40 12,33 7,70	200 10,87 6,88	0,233
FRL3	40 12,35 6,12	200 11,58 5,72	0,440
FRL4	40 16,83 4,27	200 15,13 5,25	0,056
FRL5	40 14,35 5,47	200 12,26 4,80	**0,015**
TRCL	40 71,38 24,43	200 64,62 22,08	0,084
a-b rcL	40 43,00 5,00	200 41,82 5,90	0,803
b-c rcL	40 28,13 5,11	200 26,90 5,67	0,208
c-d rcL	40 38.05 6,60	200 36,34 6,86	0,150
TPR cL	40 109,18 12,58	200 105,20 13,28	0,084
Atd L	40 49,73 10,20	200 47,70 8,39	0,180

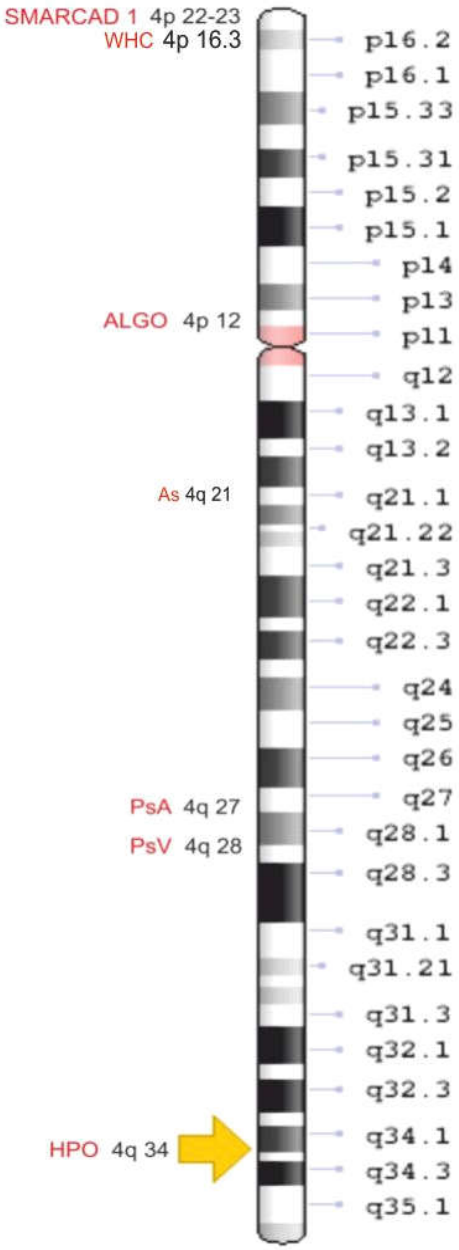
Table 3. Quantitative properties of digitopalmar complex both hands in patients and controls

Variable	Patient group	Control group	Risk
	n x SD	n x SD	p
TFRC	40 144,82 44,33	200 133,39 42,57	0,125
TPRC	40 216,88 21,65	200 211,08 24,46	0,167
ATDDL	40 97,13 18,76	200 94,56 15,88	0,367

Table 4. Quantitative properties of digitopalmar complex hands in patients and 40 same controls in the new testing

Variable	Patient group	Control group	Risk
	n x SD	n x SD	p
FRD1	40 18,73 5,89	40 16,1 5,49	0,041
c-d rcD	40 38,30 5,09	40 35,7 5,89	0,040
FRL2	40 12,33 7,70	40 9,3 5,85	0,053
FRL4	40 16,83 4,27	40 14,5 4,40	0,020
TFRCL	40 71,38 24,43	40 60,6 16,72	0,025
a-b rcL	40 43,00 5,0	40 40,8 5,26	0,056
TFRC	40 144,82 44,33	40 127,1 31,66	0,043

STATISTICA (data analysis soft system), version 10 www.statsoft.com) By the new testing, (now 40 controls from the same control group) it has found statistically significant differences to control in five varijables FRD1 (p=0,041), on the right first finger, between triradii c-d rcD (0,040) on the right palm in variables FRL4 (0,020) the fourth left finger, and TFRCL (0,025) all five fingers together on the left fingers, then TFRC (0,043) on all ten fingers in the sense of increased number of epidermal rigdes too. Very near to stastiscally significant difference to control are variables FRL2 (0,053) on the second left finger, and number of epidermal ridges between triradii a-b rcL (0,056) on the left palm. The second findings, in the new testing, could be the sign-post for future dermatoglyphic research, because of three previously mentioned author's analysis, first in 30 ankylosing women patients, find decreased ridge count between triradi a-b, only (Gomor, 1994) and in the next number of women to small was 7 (Pospišil, 1982) and in third there is not women at all (Wisniewska, 1985).



Picture 3. The Fourth Chromosome and genes in

SMARCAD1 adermatoglyphia, 4p22-23 (Burger, 2011),Wolf-Hirschhorn syndrome 4p 16.3 https://omim.org/194190 complex regional pain syndrome 4p12 (https://www.google.hr/search?q=genes+of+CRPS+syndrome+om+ch), ankylosing spondylitis 4q21 (Brown, 2011), psoriatic arthritis 4q27 (Gladman, 2014), psoriasis 4q28 (Matthews, 1966) and primary hypertrophic osteoarthropathy 4q34 (Dharmil Doshi, 2017).

DISCUSSION

To the best of our knowledge there is not any new publication dealing with dermatoglyphics in ankylosing spondylitis, except what we have found in our first paper (Cvjetičanin *et al.,* 2005). In nearly all populations studied worldwide, HLA-B27 is strongly associated with AS. One hundred and third subtype of HLAB27 have now been reported (European Bioinformatics Database Immuno Polymorphism Database, 2013), and AS

have been reported to occur with the following subtypes: B*2702 (MacLean *et al.,* 1993), *2703 Revielle *et al*., 2000,) *2704 (Lopez-Larrea *et al*., 1995), *2705 (MacLean *et al*., 1993), *2706 (Gonzales-Roces *et al*., 1997), *2707 (Armas al., 1999), *2708 (Armas *et al*., 1999), *2710, (Garda *et al*., 1998), *2714 (Garcia-Fernandez *et al*., 2001),*2715 (Garcia-Fernandez *et al*., 2001) (Djuadi *et al*., 2001). The vast majority of HLA -B27 and *2719 subtypes occuring to of fews individuals to defintive establish their association with the disease. Of those, studied in sufficient number of carriers, HLA-B*2702-5, *2707, *2708 and *2710 clearly significantly increase the risk. There is some evidence suggesting that HLA B*2704 may carry higher risk then the ancestral HLA-B*2705 allele, and that the risk associated with B*2703 may be lower. Two subtypes B*2706 and B*2709, are not associated with disease, but AS has been reported in carriers of each allele, indicating that they are not protective for AS. The whole passage has taken from the reference on page 1, Robinson 2013). Then, in Croatian population Grubić *et al.,* have found in 50 patients HLA-B27*2705 in 83,0%, and HLA-B27*2702 in 13,2% (35). "But, from the other side, there are a lot new genes susceptibility identified by genome-wide association studies for RUNX3,IL23R, IL12Rß2, GRP25, KIF21B, PTGER4, ERAP1, ERAP2, LNPEP, IL12B, CARD9, LTßR, TNFRSF1A, NPEPPS, TBKkapaBP1, TBX21, IL6R, FCGR24, UBE2E3, GPR35, NKX2-3, ZMIZI, SH2B3, GPR65, IL27, SULT1A1, TYK2, ICOSLG EOMES, IL7R and BACH2 Tsui et al 2014). Then, on the end, in the fourth chromosome we have found places of the next genes for disesase susceptibility, Picture 3:

Conclusion

It seems quite likely, that the polygenic system with a small additive action of each of the genes in the development of dermatoglyphic pattern, is identical to the polygenic system or loci for ankylosing spondylitis susceptibiltiy. After all, studies into dermatoglyphics I other diseases (Sucre, 2014; Abbas , 2018; Oladipo, 2009; Rathee, 2014; Khan, 2016) and above mentioned, suggest that this simple, inexpensive and non-aggresive genetic method may be used in the evalutation of the relative risk in family members with positive disease history.

Ethics

There is not any danger for the patient from this kind of research. Dermatoglyphic analysis, which is one of genetic method, is without any harmful conscequence for sick persons. The procedure are in accordance wih ethical standards in scientific research at Croatia Medical Association's Codex of Medical Ethic and Deontology, and Helsinky Declaration of World Medical Association, Edinburg, 2000.

Conflicts of interes: There is no conflicts of interest among the authors at all.

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