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Quantitative Analysis of Digitopalmar Dermatoglyphics in Seventy Female Psoriatic Patients

TO JEHOVAH

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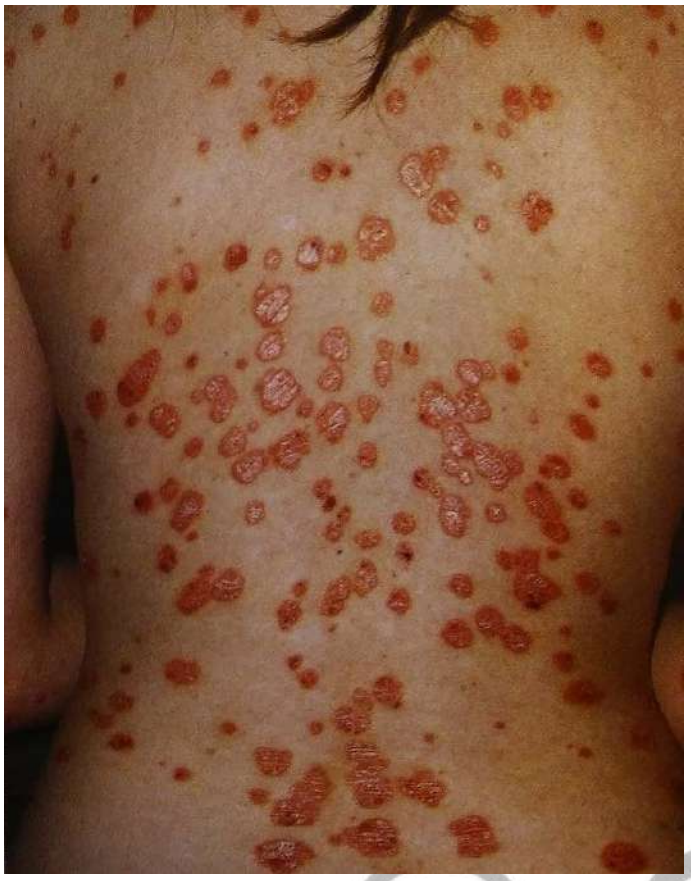
Abstract

By the quantitative dermatoglyphic analysis, one of the genetic methods, we have made research 25 variables in a number of epidermal ridges on palms and fingers in seventy female psoriatic (PsO) patients: on all ten fingers, on five fingers separately and their sum all together, between triradii a-b, b-c and c-d on both palms, their sum on one and both palms and atd angles on one and both and their sum all together in degree. Obtained were compared with control group of 200 healthy women from the Zagreb area in Croatia. Statistically significant differences to control, by the Student's t-test, were found in 13 variables, in the sense of increasing number of epidermal ridges on each of ten fingers, their sum on five and ten all together. Accordingly a polygenetic system identical in some loci to polygenic system predisposing to female psoriasis susceptibility, might be found responsible for a change of dermatoglyphic pattern development symultataneously, because, of their common ectodermal origin.

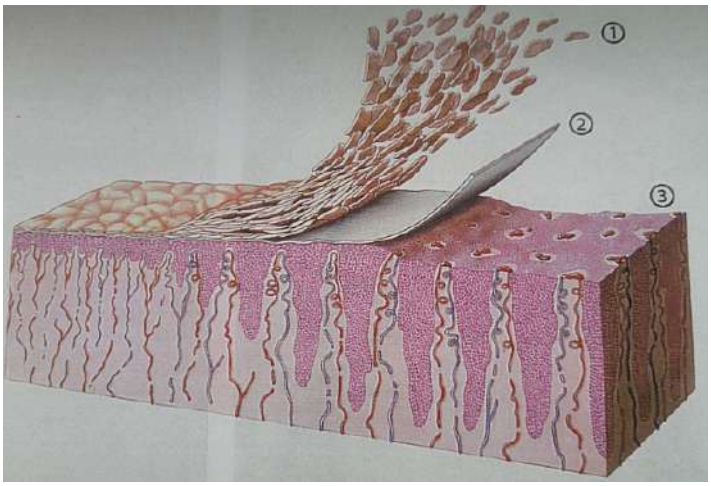
1. Introduction

Psoriasis (PsO) (1) is a chronic inflammatory dermatosis characterized by flat squamous papulas or circumscribed larger foci covered with silvery-shining or whitish-grayscales. Primary efflorescences are up to the head of the buttonhole large papules, reddish in color, which can persist for a long time without increasing (**PsO follicularis**, **PsO punctata**). Such forms are more commonly seen in connection with angina, influenza or focal infections. It is more common for some or all foci to increase and reach the size of a lens, ie coin (**PsO guttata**, **PsO nummularis**, **Picture 1**, or even larger (**PsO discoides**, **serpiginosa, confluens, diffusa and generalisata**). Initially, when there is no manifest peeling, it can be caused by careful scraping with a blunt curette, with very thin lamellae appearing on the surface. If the scales are gradually removed, they rise and take on an asbestos appearance and resemble the drops of a stearin candle when removed from velvet. This is the **phenomenon of a candle drop – Picture 2**. There is a slightly moist, shiny base under

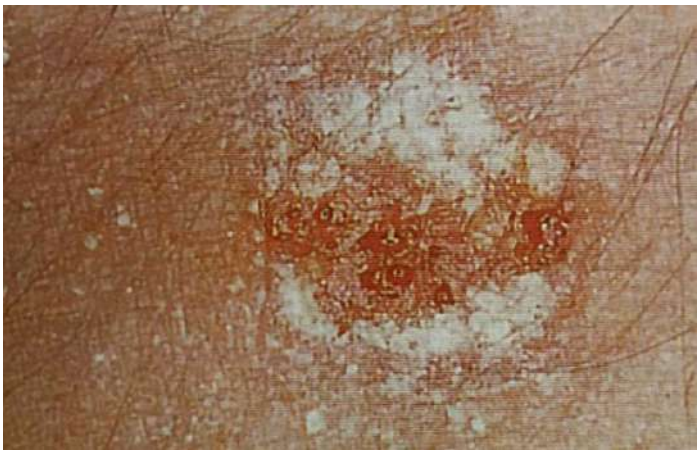


Picture 1

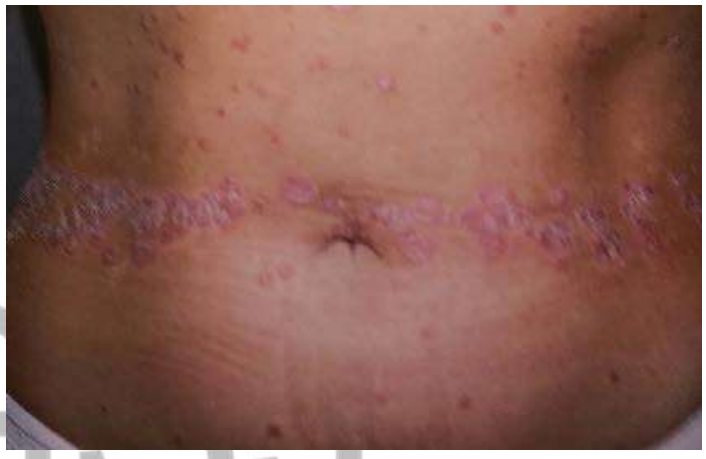
the removed scales. By further scraping, this thin transparent membrane (**Bulckley's subsquamous cuticle)** can no longer peel, but tears, after which spotting occurs at this point. This **phenonomenon is known as the Auspitz's pehenomenon or the phenomenon of bloody dew – Picture 3.** In psoriasis **Kobner's** phenomenon is pronounced – **Figure 4, (or Kreibich's isomorphic stimulus effect**): in time of the begining psoritic efflorescences on skin psoriatics respond to



Picture 2



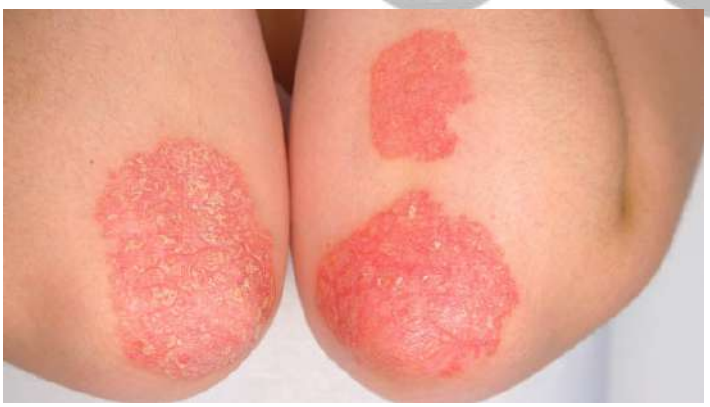
Picture 3



Picture 4

psoriatic morphs of various secondary stimuli, that have crossed a certain threshold of skin irritation. In the places of the removed scales, red foci remain, which are more or less infiltrated. Immediately along the edge of smaller fresh foci, an anemic ring (**halo anaemicus, or Woronoff's ring**) is sometimes observed (2). Regression can occur in the center of some foci, and the process spreads even further on the periphery. In this way, annular and circinate forms (**PsO annularis,, PsO circinata**) are formed. At the point of confluence of the centrally regressed foci, the phenomenon of erasure occurs, so that the dreamy outer parts of the circles or arcs remain. According to their appearance, we are talking about **PsO gyrata, figurata or geograpfica.** In addition to the typical forms of psoriasis, more or less atypical forms can occasionally be found. Psoriasis **eczematoides** has a mild exudative character. On these foci there is a smudged yellowish shell, under which a slightly moist, edematous and shiny base is observed. The scales may become more like scabs (**PsO crustosa**) due to exudation, which is lost in the psoriatic scales. If on the basis of psoriatic foci at more or less initial intervals a stronger exudation still occurs, **PsO ostracea rupioides** develops, in which the deposits are similar to oyster shells (oysters) and in these forms the lowest youngest parts are the largest, while the upper ones are centrally located, the exudate-glu

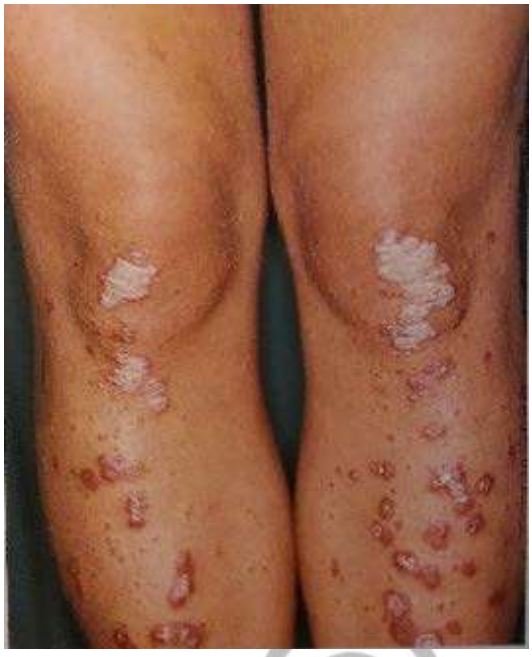
ed shells represent the oldest parts. In addition to this form, there are also forms with smaller circular foci (**PsO microcircinata**), as well as chorbyform-arranged smaller foci around a centrally located larger morph (**PsO corymbiformis**). Stronger developed purulent exudative psoriatic forms, extended pustulosis on the trunk and extremities, characterize pustular psoriasis (**PsO pustulosa**). Pustular efflorescences may confluent and gradually progress to generalized exfoliative erythroderma (**PsO, erythrodermica, or erythrodermia psoriatica**). This rare form is a severe disease with shivering, fever, and arthritic pain. It can affect the entire skin (**the so-called Zumbusch type**) or is symmetrically limited to the palms and soles of the feet (**Konigsbeck-Barbe type**) with the most characteristic being unconfused pustules on red, scaly skin usually with psoriatic changes on the nails. In adventurous psoriasis, inflammatory changes in the joints occur more often than usual, **PsO arthrotpathica or arthropathia psoriatica.** This form of psoriasis is characterized by pain in swollen joints (**PsO dolorosa**) and has a very chronic course. Arthritis changes very rarely occur before skin changes, so in such cases the diagnosis is difficult. Gradually, severe joint deformities can occur (ankylosis and pseudoankylosis, bone atrophy, luxation and subluxation). These forms of the disease usually occur in bouts of severe pain and fever. Almost always, the disease first develops on the more distally located joints of the hand, legs and chest, and later on the knees and hips. After the regression of psoriatic foci, light brown or dark brown pigmentation often and transiently lags behind. The best known of these limited hyperpigmentations is circumscriptive depigmentation at sites of rehabilitated psoriatic morphs ((**leukodermia psoriaticum**).



Picture 5

With psoriasis, changes in the nails can also be found. They appear on the nail plate as tiny dotted depressions, so the nail looks as if it has been pierced with a needle (**PsO punctata unguium foveolatus**). The created onycholysis spreads in the proximal direction, so gradually the entire nail plate becomes yellowish, brown of white like chalk. More pronounced changes can also occur: cracking, irregular growth, dystrophic changes, longitudinal or transverse stripes, etc. Subungually located psoriatic papule (**papula psoriatica subungualis Alkiewicz**) leads to progressive onycholisis of the middle part of the nail (**Gottron's oil spot).** Subungual psoriatic erythema (erythema psoriaticum subunguale) also leads to psoriatic onycholisis, so the nail looks diffusely red. Localization of psoriasis: Psoriatic morphs most often occur on the extensor sides of extremities (knees and elbows) and can remain istolated and less pronounced (**PsO discreta**) for a long time. Very often, psoriasis is localized on the scalp under the image of sharply demarcated squamous foci of various sizes. On other occasions, it appears in the form of larger, sharply demarcated red foci covered with scales, which can extend to the skin of the forehead, earlobes, and retroauricular region. Of the trunk accommodation psoriasis is particularly common in the lumbosacral region. On the palms and soles, it occurs in the form of smaller yellowish, macular eflorescences with exfoliation in the center, so that the pink edge around the scales surrounds the exfoliated center. In addition, circinous-squamous foci can develop on the palms which spreads serpiginously and gradually cover the entire palms and soles. Occasionally, enlaarged hyperkeratotic foci without a sharp edge on the periphery, with centrally located painful rags, are seen on the palms and soles. On the penis, especially on the glans, the peeling does not have to be more strongly developed, but only shallow brownish-red spots with a parchment-like scale develop, which can be completely peeled off, leaving an erosive spot. Localization on the scrotum and genitocrural areas usually causes severe itching, and the foci are covered with slight scales (importance of the terrain for clinical appearance), therefore, atypically locatlized psoriasis (flexor sides of the extremites, inguinal region, submammary and perigenital area, armpits) a layer of scales, but only red and as slightly moist foci. This form is known as **PsO invertata** (the name PsO invertata- meaning inverted with respect to accomodation – sholuld not be confused with the name PsO inveterata, which refers to long-standing and old psoriatic foci. Psorias most often begins in young people and in very young children, just as in later age (**today division is PsO type I in earlier, and Type II in late age of life**) (3). The course of disease is very different. In some patients the foci remain localized throughout life only at predilection sites (knees, elbows, capillaries), until in others spreads to different places. **PsO erythrodermica or erythrodermia psoriatica** develops less frequently as generalized exfoliative erythrodermia in which typical psoriatic changes are usually no longer seen, also occur as a consequence of intensive local therapy or in internal disorders (myocardial damage, poor circulation, for example). After cessation of noxa or internal disturbance, a picture of typical vulgar psoriasis reappears. Histological picture is characteized by very pronounced acanthosis (which is the basis of the Auscpitz phenomenon), parakeratosis and papilomatosis. Stratum granulosum is missing; a slight perivascular infiltrate is seen in the subpapillary and papillary layers. The stratum spinosum is narowed above the apex of the elongated papillae, and the interpapillary epidermal plugs reach deep into the corium. In the capillary microscope, the capillaries show irregular bends, considerably elongated, and in some places exctension can be seen under the image of spindle aneurysmus with orange staining ot the pericapillary tissue. Cluster of polynuclear cells, known as Munro-Haslund or Sabouraud

microabscesses (better micro-pustules) can be found subcorneally (The almost whole text of Introduction has been taken from the book Specijalna dermatologija, (Special Dermatology) by Professor Šime Čajkovac, Medicinska naklada, Sixth edition, Zagreb, 1971, unfortunatelly we could not get permission not of the Author, or Publishing house.

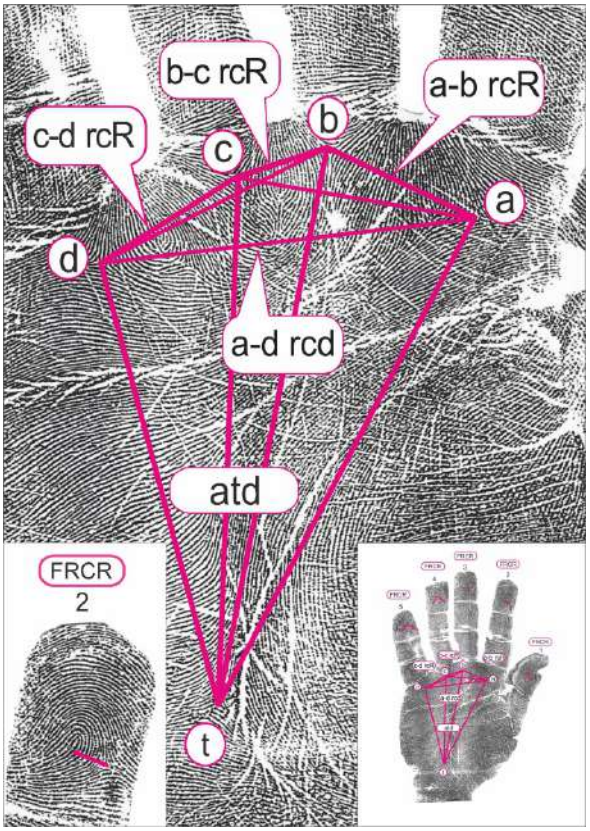


Picture 6

2. Methodology

Dermograms of seventy female psoriatic patients were analysed by clinical and in some, with patohystolgical examination, HLA typisation,then, diagnosis is confirmed in all of them. Quantitative analysis has conducted in keeping with instructions by Miličić, Rudan, Schmutzer, *et al*. (4). Results were compared with 200 phenotypically normal women from the Zagreb area, obtained from the Zagreb Anthropology Institute in Croatia (5). Palmar and finger prints were taken by HSW finelly granulated, silver-gray powder used in criminalistics, onto transparent, adhesive tape by a brush made of squirrel tail (6). Student't-test was used to test statistically significant differences in the ridge count between the patient and control group. Dermatoglyphic analysis should be strictly separated according to sex, because of the great impact of sex chromosome and sex hormones on dermatoglyphic traits (7,8). Even significant sex difference has found in control group (5). Student's t-test was used to test statistically significant difference group. The following 25 traits were examined by the quantitative dermatoglyphic analysis, as it shown on Picture 7 and tables 1-3, in the ridge count between the patient and control.

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. FRD 3.** 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 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. TPRCD** ridge count between a-b triradii of the right hand, a-b, b-c and c-d all together. **11. AtdD** angle on the right palm in degrees. **12. FRL1.** ridge count on the first finger the left hand, **13. FRL2.** ridge count on the second finger the left hand, **14. FRL3** ridge count of the third finger the left hand **15. FRL4** ridge count on the fourth finger the left hand, **16. FRL5.** ridge count on the fifth finger the left hand, **17. TFRC.** ridge count on all five fingers left hand, **18. a-b rcL** ridge count between triradii a-b the left hand, **19. b-c rcL** ridge count between triradii b-c the left hand, **20. c-d rcL** ridge count between triradii c-d the left hand, **21. TPRL.** ridge count between triradii a-b, b-c, c-d all together, the left palm, **22. AtdL** angle on the left palm in degrees. **23. TFRC.** total ridge count on all ten fingers on both hand, **24. TPRC,** bilateral ridge count between all triradii a-b, c-d and c-d on the palms, **25. ATDDL.** bilateral sum of atd angles in degrees. **Picture 7.**



Picture 7

The areas of quantitative analysis on palm and finger dermatoglyphics

3. Results

Results are tabularly presented in Tables 1-3.

Statistically siginificant differences to control by the Student's t-test were found in thirteen variables, in the sense of increasing number of epidermal ridges on the fingers, right hand six: first, second, third, fourth and fifth, then on all five fingers, all at the risk level 0,001, what is presented by FRD1, FRD2, FRD3, FRD4, FRD5, TFRC, respectively in Table 1. Further, on the left hand six: first, second, third, fourth and fifth, then on all five fingers, all at risk level 0,001, what is presented by FRL1, FRL2, FRL3, FRL4, FRL5, TFRCL, all at risk level 0,001, what is presented in Table 2. Then, ridge count on both hand fingers, were statistically significant at risk level 0,001 too, what is presented by TFRC variable respectively in Table 3.

Table 1. Quantitative properties of right hand digitipalmar dermatoglyphics in patients and controls

Variable	Patient group			Control Group			Risk
	n	x	SD	n	x	SD	p
FRD1	70	21,3	4,46	200	17,2	5,56	**0,001**
FRD2	70	18,0	4,84	200	11,6	6,55	**0,001**
FRD3	70	16,2	3,79	200	11,4	5,31	**0,001**
FRD4	70	20,3	4,26	200	15,8	5,72	**0,001**
FRD5	70	16,6	4,26	200	12,7	4,83	**0,001**
TFRCD	70	92,4	15,20	200	68,8	21,65	**0,001**
a-b rcD	70	38,4	6,39	194	36,7	6,33	**0,203**
b-c rcD	70	28,7	5,93	200	27,3	5,91	**0,342**
c-d rcD	70	41,6	5,81	200	41,0	6,02	**0,707**
TPRCD	70	108,7	12,96	194	105,0	12,50	**0,145**
Atd D	70	45,0	8,05	200	46,9	8,67	**0,237**

Table 2. Quantitative properties of left hand digitopalmar dermatoglyphics in patients and controls

Variable	Patient group			Control group			Risk
	n	x	SD	n	x	SD	p
FRL1	70	19,4	5,13	200	14,8	5,76	**0,001**
FRL2	70	16,6	5,41	200	10,9	6,88	**0,001**
FRL3	70	16,6	4,69	200	11,6	5,72	**0,001**
FRL4	70	19,8	4,95	200	15,1	5,25	**0,001**
FRL5	70	16,3	4,28	200	12,3	4,80	**0,001**
TFRCL	70	88,8	16,48	200	64,6	22,08	**0,001**
a-b rcL	70	37,3	7,94	194	36,3	6,63	**0,367**
b-c rcL	70	28,0	5,91	200	26,9	5,48	**0,484**
c-d rcL	70	42,4	5,09	200	41,8	5,90	**0,403**
TPR cL	70	107,7	14,92	194	105,0	12,95	**0,359**
Atd L	70	45,0	7,72	200	47,7	8,39	**0,070**

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

Variable	Patient group			Control group			Risk
	n	x	SD	n	x	SD	p
TFRC	70	181,2	30,38	200	133,4	40.57	**0,001**
TPRC	70	216,4	27,25	200	210,1	24,21	**0,210**
ATDDL	70	90,0	14,47	200	94,6	15,88	**0,094**

4. Discussion

The first dermogram of psoriatic women, his cousin, the first author has taken in 1987. After that until now, 2021, he has collected some fifteen hundred psoriasis and psoriatic arthritis patients prints. 1990. he has delivered the first lecture about, with third coauthor, at Zadar Rheumatology Congress in former Yugoslavia (9). The next of our research, which is this a part of him, 1997, we have presented on International scientific Meeting "Some News in Dermatgology", Zagreb-Ivanić-Grad, September 22nd-23rd (10). The next two were presented in Sweden 2009 and 2012 (11,12), Doctoral Thesis of the first author 2014 (13) and the last paper is from 2016 (14). Research of dermatoglyphics in psoriasis carried by many scientists all over the world. Jilek 1972, has found in total ridge count signficantly higer number of epidermal ridges in 65 female psoriatics 146+-50 to control 127+- 52 (15). Sharma et al, 1977, have found in 8 female psoriatics increased total ridge count, but increase was not significant (16). Verma et al 1980 in 8 females have found increased total ridge count 133,5 to 123 controls (17). Nagar et al, 1981, in 24 female psoriatics to 25 control have found increased papilar lines on the first right finger 18,4 to control 18 (risk 0,005) and the fourth on left hand 15,6 to 12,4 control (risk 0,005) (18). Singh et al 1983, in 100 psoriatics (50 females and 50 males to 100 controls have found increasing total ridge count in 50 females 143,7+-48,1 compared to controls but not statisitcally insignificant 128,8+-48,0. (19). Zghonzhi L 1988 found increased number epidermal ridge in total ridge count, in both sexes (20). Aswathy Umesh al, 2017, have found the mean total finger ridge count increased in 103 psoriatic patients (without divided according to gender), but not statistically significant (21) Niharika Padhy and Rajalaxmi Panda 2018, have found in 90 female psoriatics increased total ridge count,154,4 to control 133,4 (risk 0,001). (22). There are more papers dealing with dermatoglyphics in psoriasis, (23-36) but they are uncomparable to our. Why? Because of composition of the article. General role according to the opinion of the first author are the next: Analysis should be conducted separatelly according to gender because of hormone's and sex chromosome's great impact onto dermatoglyphic traits (7.8), Then, analysis should be done in quantitative and qualitative analysis. But, genetic stabilitiy is more pronounced in a quantitative, less susceptible to external factors that is, inflluences, (6, page 82), then qualitative analysis, despite the last is technically easier to make. Than quantitative variables were found to be consinstensly better for discriminatory purposes than were qualitative variables, (Blackwell, (37).

Further, respondents, that is patients, should be from the same or nearby population, because of great diversity among the people. Control groups about the same number as the respondents, from the same populations too. For children, it is necessary that control groups should be taken from the same age respondents, because, at least, of atd angle width. How get to a correct control group? The answer is: task impossible. Why? It is not enough to state phenotypically healthy subjects served as a control group from an area, what is the main shortcomings in this and our previous research. The only reliable method obtaining a representative control sample is to obtain data from a group of first-degree relatives of the patients in the study. That is why, genetic testing by HLA typed in the sixth chromosome in this Croatian area perhaps could be any solution, at least in rheumatology. The first author gathered more than ten hundred typed in psoriatic arthritis and psoriasis patients: HLA B7, B8, B13, B17 (B57), B27, Cw6, DR4, DQ1, for example. That means, the people who don't have these antigens could be served as a control group for psoriasis and psoriatic arthritis. The data could be collected from Blood Transfusion Institutes voluntary blood donors, and their prints. The pictrure of the fourth chromosome is downloaded from literature data, because no testing is possisble done in these areas, 4q27 psoriatic arthritis and 4q28 psoriasis, and other loci, especialy SMARCAD1 single gen, 4q22, which deletes dermato-glyphic drawings. The next big problem is how many patiens are needed for correct reasoning in scientific research? Task impossible too. According to Momirović, 1980, a great statistician from this area, stated in oral communication, between 384 and 667 respondents are needed, otherwise a multitude of other statistical tests is necessary to apply. It is self-evident, further, necessity of accurate diagnosis according to the last classification/digagnostic criteria. In the end, in a relationship of this research, there is a data how 6-42 % of psoriatic patient might be psoriatic arthritis sufferers which could compromise this research to same extent. But, according to the opinion to the first author, psoriatic arthritis is a separate entitiy, and arthritis might be connected with other dermatological diseases (see the poster presentation: Some reflections on psoriatic arthritis 2017 (38)

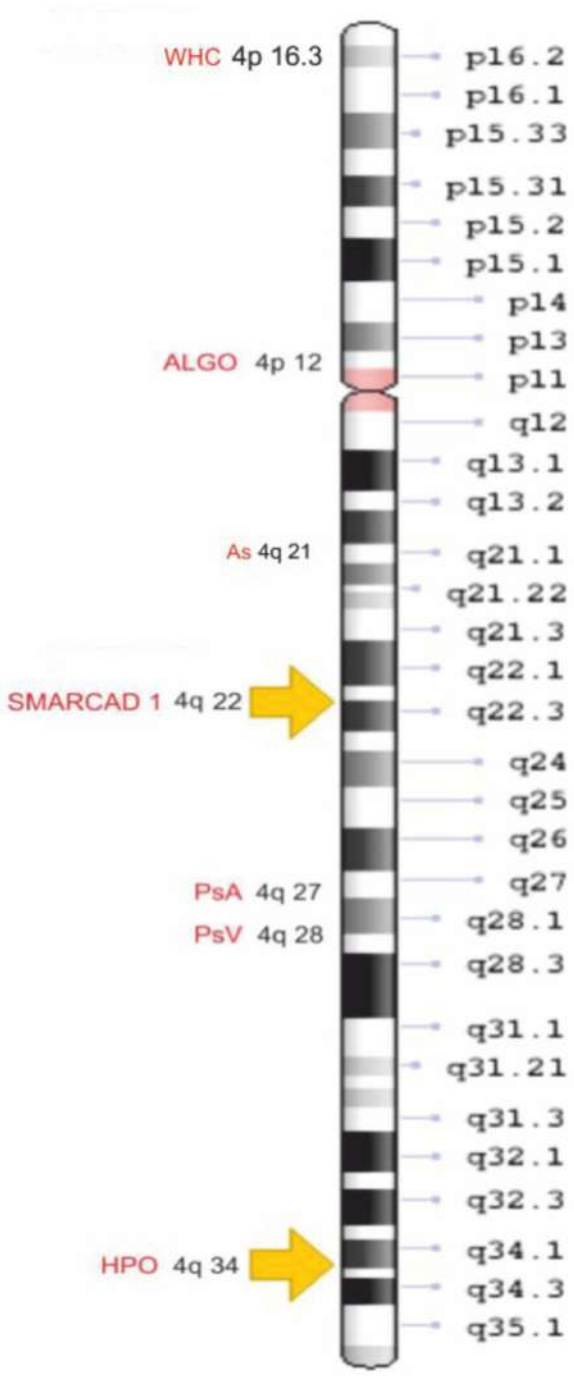
5. Conclusion

It seems that polygenic system, by a few main and greater number of modification genes responsible for intrauterine dermatoglyphics development (between seventh a twenty fifth week), is identical in some loci with polygenic system for liability to psoriatic female patients. That is quite possible to take a reading from dermatoglyphic drawings. This very cheap genetic method may be used to diagnostic, preventive and even the prognostic purpose.

6. Ethics

There is not any danger for the patients from this kind of research, which is one of the genetic method, is without any harmful consequence for sick persons. The procedure is in accordance with ethical standard in scientific research at Croatian Medical Association of Medical Ethic and deontolgy, and Helsinki Declaration of World Medical Association, Edinburg 2000.

The Fourth Chromosome



Genetic loci in the fourth chromosome of interest: complex regional pain syndrome type I and II (algodystrophy) 4p-12 psoriatic arthritis 4q27, psoriasis 4q28 , ankylosing spondylitis 4q21, primary hypertrophic osteoarthropathy 4q34, and a single gene **SMARCAD1** 4p22-23 which deletes epidermal ridges on digits, palms and soles – **adermatoglyphia.** When this gen is included cannot be implemented this kind research.

7. Conflicts of Interest

There is not conflict of interest among the authors.

8. Acknowledgments

We thank to acamedician Professor Pavao Rudan, from the Zagreb Anthroplogy Institute, Croatia, for his kidness that he permitted us to use their Control group for this research. Special thanks deserves Professor Valeriy Gunas from National Pirogov Memorial University, Vinnnytsia in Ukraine, for reference which we couldn't get it from Medical school in Zagreb nor over the web.

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Poster presentation