ORIGINAL RESEARCH PAPER

Volume-8 | Issue-6 | June-2019 | PRINT ISSN No. 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PALMAR DERMATOGLYPHICS – A NON-INVASIVE SCREENING TOOL FOR POLYCYSTIC OVARY SYNDROME WITH SUBSTANTIATING EVIDENCE FROM NORMAL MALES.

Anatomy

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ABSTRACT

Purpose: Polycystic Ovarian Syndrome (PCOS) is a heterogeneous clinical syndrome affecting 8-20% of women in reproductive age. It is an intensely familial and heritable disorder with far-reaching damaging effect on health, emphasizing the need for its early diagnosis. The dermatoglyphic study in PCOS will serve this requisite. The aim was to study the dermatoglyphic pattern of PCOS females and to compare them with that of normal females & normal males.

Materials and methods: The dermatoglyphic patterns were analyzed for fingertip patterns, Main Line Formula, Main Line Index, Total Finger Ridge Count, Absolute Finger Ridge Count, Inter digital ridge counts and angles atd, dat & adt. The data were analyzed and compared using chi-square test and independent student t-test.

Results: In PCOS females, the Main Line Formula pattern (I) 9,7,5',4,13, showed a significantly higher occurrence of 13% and a significantly higher c-d ridge count on right hand compared to control females. Angle adt was significantly less in PCOS females when compared with both control females and males. With the background of hyperandrogenism in PCOS females, the cases also had significant similarities with control males in various parameters studied.

Conclusion: Dermatoglyphic study, being the simplest, cost effective and reliable method to be considered as one among the screening methods for PCOS.

KEYWORDS

fingertip pattern, PCOS, Main line formula, hyperandrogenism, adt angle.

INTRODUCTION

Dermatoglyphics is a study encompassing epidermal ridge configurations on fingers, palms, toes and soles [1]. In 1970, Holt suggested these epidermal ridges were genetically determined [2]. In the recent past, the methodology of Dermatoglyphics is acknowledged as a scientific tool that is widely used to screen and diagnose diverse genetic disorders [3]. Polycystic Ovarian Syndrome (PCOS) is a heterogeneous clinical syndrome affecting 8-20% of women in reproductive age worldwide [4, 5]. PCOS is a disorder with obscure etiology whose genetic basis is still not clearly understood [6]. In this regard, we have taken up the study of genetically determined dermatoglyphic patterns, to understand the genetic significance of PCOS. PCOS also increases the risk of occurrence of Type II diabetes mellitus, cardiovascular disease, infertility and endometrial cancer [7, 8]. This emphasizes the need for early diagnosis of the disease. In this scenario, compared to other routine screening methods for PCOS, dermatoglyphic study in PCOS being a simple, less time consuming and cost effective method holds an immense potential to be applied as a screening tool especially among large scale population.

Hyperandrogenism exists as one of the key phenotypes in PCOS females [9] authenticating the need for comparison of fingerprints of PCOS females with normal males. The scarcity of work done on Dermatoglyphics in PCOS has instilled the curiosity to further explore their dermatoglyphic pattern with increased PCOS sample size. Most of the dermatoglyphic studies in PCOS have focused mainly on the fingertip pattern frequency while MLF patterns, ridge counts and angles were not studied by many of the authors. Hence, we studied the dermatoglyphic pattern of PCOS females and compared it with control females and males.

MATERIALS AND METHODS

The study was a descriptive type of study conducted at Sri Venkateshwaraa Medical College Hospital & Research Centre, Puducherry, from October 2012 to December 2013. Clearance from the Institutional Ethics Committee was obtained prior to the study. Totally 155 subjects were included in the study in which 55 were PCOS females, 50 age matched male and female controls in each group. Diagnosed cases of PCOS females included in the study had no history of any other genetic disorder.

For obtaining dermatoglyphic patterns, the subjects were asked to wash their hands thoroughly with soap and water before taking prints. Requisite amount of kajal was applied on both the palms and distal third of fingers. The palm was placed on a white paper and firm pressure was given by the investigator on the center of the dorsum of hand and inter-digital areas. Then each finger was placed with one lateral edge and then rolled over in opposite direction [10]. The dermatoglyphic patterns thus obtained were studied by magnifying lens [11, 12 and 13]. The prints were studied for the following parameters **(refer figure1.)**

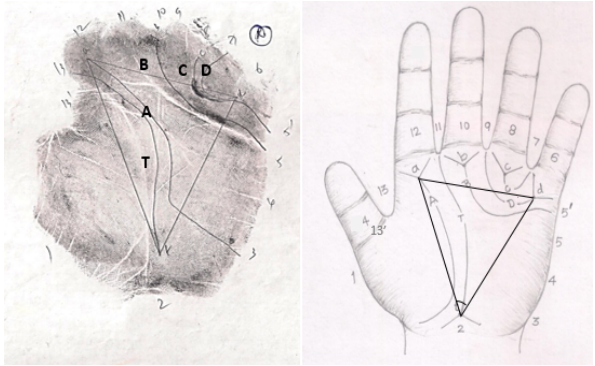

Figure 1. Palmar dermatoglyphic pattern of right hand showing markings of triradii, palmar main lines and angles atd, adt &dat

QUALITATIVE PARAMETERS:

- Frequency of fingertip patterns- whorls, loops, arches & composite.
- Main line formula (MLF)

QUANTITATIVE PARAMETERS:

- Main line index (MLI)
- atd angle, dat angle, adt angle
- Inter digital ridge count (a-b, b-c, c-d)

- Total finger ridge count (TFRC)
- Absolute finger ridge count(AFRC)

The fingertip pattern frequency and MLF pattern frequency was analyzed and compared between cases and controls using chi-square test for difference whereas independent student t-test was used for parameters MLI, angles and ridge counts. All the statistical calculations were done using SPSS software version 17 and graph pad instat 3 and p-value ≤ 0.05 was considered significant.

RESULTS:

Table 1: Comparison of fingertip pattern frequency in both hands between polycystic ovarian syndrome cases and controls

S.No	Fingertip Pattern	PCOS	Control females	p-value	Control males	p- value
1.	Whorls	195(35.45%)	201(40.20%)	0.128	243(48.6%)	<0.0001
2.	Ulnar loop	320(58.18%)	269(53.80%)	0.172	243(48.6%)	0.0023
3.	Radial loop	11(2%)	6(1.20%)	0.434	2(0.4%)	0.039
4.	Arches	22(4%)	22(4.40%)	-	8(1.6%)	0.032
5.	Composite	2(0.36%)	2(0.40%)	-	4(0.8%)	-
	Total	550	500		500	

Groups are compared using chi-square test. P value < 0.05 is considered statistically significant.

Table 2: Comparison of Main Line Formula (MLF) pattern frequency (both hands) between Polycystic Ovarian Syndrome cases and controls

S.No	MLF Pattern (D,C,B,A,T)	PCOS (110)	Control females (100)	p-value	Control males (100)	p-value
1.	9,7,5',4,13 (I)	15(13.63%)	4(4%)	0.010	12(12%)	0.723
2.	11,9,7,5,13 (II)	18(16.36%)	14(14%)	0.630	11(11%)	0.261
3.	11,9,7,4,13 (III)	13(11.81%)	8 (8%)	0.360	12(12%)	0.967
4.	7,5',5',4,13 (IV)	1(0.91%)	9(9%)	0.015	3(3%)	0.547

Groups are compared using chi-square test. P value < 0.05 is considered statistically significant.

Table 3: Comparison of Main Line Index (MLI),atd angle, dat angle and adt angle between Polycystic Ovarian Syndrome cases and controls

S.No	Parameters	PCOS (110)	Control females (100)	p-value	Control males (100)	p-value
1.	MLI					
	Right hand	9.11±1.62	8.82±2.24	0.446	8.83±1.87	0.411
	Left hand	8.22±2.38	7.52±2.16	0.110	7.81±2.17	0.360
2.	atd angle					
	right hand	43.25±6.78	41.91±3.16	0.090	41.22±5.26	0.090
	left hand	43.42±6.71	42.16±3.31	0.230	41.37±5.33	0.080
3.	dat angle					
	right hand	55.78±5.49	56.14±4.03	0.700	56.44±3.97	0.485
	left hand	56.07±5.86	55.91±3.97	0.870	56.35±4.43	0.780
4.	adt angle					
	right hand	80.91±3.71	82.34±3.46	0.044	82.42±4.23	0.050
	left hand	80.22±4.05	81.91±3.31	0.020	82.12±4.05	0.010

Groups are compared using student t test. P < 0.05 is considered statistically significant.

Table 4: Comparison of ridge counts between Polycystic Ovarian Syndrome cases and controls

S.No	Parameters	PCOS (110)	Control females (100)	p-value	Control males (100)	p-value
1.	a-b ridge count					
	right hand	38.51±4.93	36.98±5.19	0.120	8.83±1.87	0.411
	left hand	38.98±5.03	38.02±4.35	0.300	7.81±2.17	0.360
2.	b-c ridge count					
	right hand	25.35±6.11	26.02±4.78	0.558	41.22±5.26	0.090
	left hand	26.17±5.28	27.15±4.66	0.358	41.37±5.33	0.080
3.	c-d ridge count					
	right hand	36.18±5.19	33.95±5.33	0.042	56.44±3.97	0.485
	left hand	35.35±5.92	35.55±6.54	0.172	56.35±4.43	0.780

Groups are compared using student t test. P < 0.05 is considered statistically significant.

Table 5: Comparison of Total Finger Ridge Count (TFRC) & Absolute Finger Ridge Count (AFRC) between Polycystic Ovarian Syndrome cases and controls

S.No	Parameters	PCOS (110)	Control females (100)	p-value	Control males (100)	p-value
1.	TFRC	137.24±30.628	147.70±31.668	0.1091	157.73±32.10	0.001
2.	AFRC	170.38±73.68	194.47±73.063	0.1036	213.08±65.52	0.002

Groups are compared using student t test. P < 0.05 is considered statistically significant.

PCOS females vs control females:

1. Main line formula pattern (I) 9, 7,5',4,13 showed 13% occurrence (including both hands) in PCOS which was significantly higher when compared with control females. (Table 2)
2. Main line formula pattern (IV) 7,5',5',4,13 was present only in 0.91% of PCOS females which was significantly very less compared to control females indicating its infrequent occurrence in PCOS females. (Table 2)
3. Angle adt was significantly less in both hands compared to control females. (Table 3)
4. c-d ridge count in right hand was significantly more in PCOS females when compared with control females. (Table 4)
5. There was no statistically significant difference between PCOS females and control females in parameters such as

- Fingertip pattern frequency (Table 1)
- MLI, angles atd & dat (Table 3)
- ridge counts a-b, b-c, TFRC & AFRC (Tables 4 & 5)

PCOS females vs control males:

1. PCOS females had similarities with control males in the following parameters

- MLF pattern (Table 2)
- MLI, angles atd & dat (Table 3)
- ridge counts a-b, b-c, c-d (Table 4)

2. The fingertip pattern frequency in both hands of PCOS females presented a statistically significant increase in loops and arches and decrease in whorls when compared to control males. (Table 1)
3. Angle adt was significantly less in both hands compared to control males. (Table 3)
4. TFRC & AFRC are significantly less in PCOS females compared to control males. (Table 5)

DISCUSSION

The major finding in our study is that there is a significantly higher incidence of Main Line Formula pattern 9,7,5',4,13 (I), lesser adt angle in both hands and higher c-d ridge count in right hand of PCOS.

Loop finger print pattern is predominant in both cases (60%) and control females (55%) (Table 1). Similar finding was documented by Ciovîrnache M *et al.* in virilizing PCOS where they found loop-like digital patterns especially those with radial orientation compared to the normal [14]. Recently, Aaditi Shah and Vasanti Arole observed that the elliptical whorl pattern in fingertip was absent in both hands in PCOS [15] whereas in the present study, 35.45% of fingertip patterns were whorls in PCOS females. Spasov *et al.* conducted a dermatoglyphic study in PCOS showed evidence that women with Stein-Leventhal syndrome have hand dermatoglyphic characteristics similar to those of normal men [16]. But in our study we observed that the fingertip dermatoglyphic pattern of PCOS is significantly different from males in terms of reduction in whorl pattern, increase in loop and arch pattern. However, other parameters in palm of PCOS females matched with the control males; MLF patterns (I, II, III, IV), MLI, angles atd and dat and ridge counts at the basis of fingers. This observation concurred with earlier study done by Ciovirnache *et al.* in Stein-Leventhal syndrome patients [13].

The MLF pattern (D, C, B, A, T) is a qualitative parameter that is contributed by 5 different entities [10]. This results in a greater number of heterotypical patterns. In the present study, PCOS group presented 37 different MLF pattern types and control population presented 22 different pattern types (distinctive for control males and control females). Occurrence of repeated heterotypical pattern in a population is uncommon; more so in a specific disorder. Consequently, the predominance of any specific MLF pattern that significantly differs from control females contributes to the reliability of MLF pattern frequency as a good screening parameter.

The frequency of MLF pattern (II) and (III) is uniformly high in all three groups (Table 2). The MLF pattern (IV) is found in 9% of control females (both hands) whereas it occurred only in 1 out of 110 hands belonging to PCOS population. This denotes the unusual occurrence of pattern (IV) in PCOS females. The frequency of MLF pattern (I) is significantly higher in PCOS females (13.63%) than control females (4%) and is similar to that of control males (12%). This is notable, as this is one among the dermatoglyphic features where the PCOS females resembled control males.

Nishu Sekar *et al.* conducted a Multi-Parameter Approach for Evaluation of Genomic Instability in the PCOS and observed that PCOS patients have the elevated atd angle when compared with control group [17]. However, in the present study, there is a significantly lesser mean adt angle in PCOS females relative to control females (table 3).

The cd ridge count on right hand is higher in PCOS females compared to control females (table 4). But a contrasting finding has been reported in study done on virilizing PCOS women where the cd ridge count was less in PCOS than both female and male control groups [13].

The fingertip pattern frequency in PCOS neither varied much from control females nor concurred with control males (table1). We hypothesize that our ethnicity may have an influence in the dermatoglyphic presentation on finger tips, the genotypes involved in the genesis of PCOS may not have a role in the epidermal ridge pattern development in the fingertips & in the PCOS females, the fingertips alone may not have male phenotypic dermatoglyphic presentation.

CONCLUSION

Higher incidence of Main Line Formula pattern 9,7,5',4,13 (I), lesser adt angle in both hands and higher c-d ridge count in right hand of PCOS are the significant dermatoglyphic findings of PCOS females elucidated from the present study. The presence of one or more of the above-mentioned findings could aid in the screening process for early detection of PCOS.

LIMITATIONS

More dermatoglyphic studies in PCOS with increased sample size would help in arriving at a reliable dermatoglyphic parameter for screening of PCOS. Being a clinical parameter that is linked to genetic aspect of the disorder, its association may be further strengthened by studying the chromosomes of the affected individuals.

ACKNOWLEDGEMENT

My grateful thanks to Dr.S.NandaKumar for his professional guidance and Dr. Senthil Kumar Subramanian, for his valuable comments that greatly improved the manuscript.

REFERENCES

1. Cummins, H. Keith H. Midlo C.Montgomery, R.G. Haris, H. Wuder W. (1929) Revised Methods of interpreting and formulating palmer dermatoglyphics. Amy Phys Anthropol. 12:415-473.
2. Holt S B. Thomas C, Springfield I. The Genetics of Dermal Ridges; 1970.
3. Jeewandeep Kaur, Arvinder Pal Singh Batra. Role of Dermatoglyphics in Medical Disorders; Indian Journal of Fundamental and Applied Life Sciences 2013 Vol. 3 (3) July-September, pp.536-539.
4. Sirmans, S. M., & Pate, K. A. (2014). Epidemiology, diagnosis, and management of polycystic ovary syndrome. Clinical Epidemiology, 6, 1–13.
5. Dunaif A, Thomas A. Current concepts in the polycystic ovary syndrome. Annu Rev Med. 2001; 52: 401-419.
6. Kosova G, Urbanek M. Genetics of the polycystic ovary syndrome. Molecular and Cellular Endocrinology 2013. 373 29–38. (10.1016/j.mce.2012.10.009).
7. Peigne M, Dewailly D. Long term complications of polycystic ovary syndrome (PCOS) Ann Endocrinol (Paris) 2014; 75(4):194–199. [PubMed]
8. Norman RJ, Dewailly D, Legro RS, Hickey TE. Polycystic ovary syndrome. Lancet 2007; 370: 685–697.
9. Azziz R, Sanchez L, Knochenhauer ES, et al. Androgen excess in women: experience with over 1000 consecutive patients. J Clin Endocrinol Metab. 2004; 89(2): 453–462.
10. Taking Dermatoglyphics prints a self-instruction manual. Department of medical Genetics, Indiana University School of Medicine, Indiana Polis, USA 2002.
11. Purvis-smith S G. Finger and palm printing technique for clinician. Medical journal of Austria.1969; 2:189.
12. MajorandaniRashida H, Kubavat D, Maluka O, Nagar S K, Uttekar K, Patel B. Palmar dermatoglyphics in patients of Thalassemia. National journal of medical research. Sept 2012; 2(3). 288
13. Ranganath P, Rajangam S and Kulkarni R.N. Triradii of the Palm in Idiopathic Epilepsy. J.Anat. Soc. India .2004;53(2):23
14. Ciovîrnache M, Ioaniţiu D, Ionescu B, Dumitrache C, Milea E, Dumitrache M. Dermatoglyphics in the virilizing polycystic ovary syndrome. Romanian journal of medicine. Endocrinology. 1986Apr-Jun; 24(2): 87-96.
15. Aaditi S &Vasanti A. Chromosomes, Dermatoglyphics and Polycystic Ovary Syndrome (pcos). Int J Biol Med Res. 2014; 5(1): 3850-3854
16. Spasov SA, Dokumov SI. Dermatoglyphic investigations of patients with Stein-Leventhal syndrome. Green journal (or) Journal of the American Academy of Obstetrics and Gynecology. 1973Dec; 42(6): 877-880.
17. Nishu Sekar1, Manju Nair1et al. Multi-Parameter Approach for Evaluation of Genomic Instability in the Polycystic Ovary Syndrome. DOI:http://dx.doi.org/10.7314/APJCP. 2015. 16. 16. 7129