

Dermatoglyphics of fingers and palm in Klinefelter's syndrome

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ABSTRACT

Dermatoglyphics is important in anthropology and medical genetics, chiefly because of their diagnostic usefulness. We studied the ridges of finger tips and palm in six Klinefelter's syndrome patients (47,XXY) in the present work. Then the results were compared with equal number of controls. Statistical analysis was done using EPI- info, version- 6.04 d software. We found statistically significant increased in whorls and decreased in loops in klinefelter's syndrome patients as compared to the controls.

Keywords: Dermatoglyphics, Klinefelter, syndrome.

INTRODUCTION

Dermatoglyphics is the study of the patterns of the ridged skin of the digits, palms and soles. This definition has been broadened to include the flexion creases and other secondary folds as well.¹ These patterns are set right in the embryonic life and are known to have hereditary basis.² They are important in medical genetics chiefly because of their diagnostic usefulness in some syndromes. Nowadays the diagnostic role of dermatoglyphics is promising in cases of chromosomal abnormalities. Some investigators found frequent occurrence of arches on the fingers of Klinefelter's syndrome patients.^{3,4} Dermatoglyphic analyses of seven patients with an XXYY chromosomal complement showed characteristic configurations of the hypothenar area involving the presence of an ulnar triradius with a loop carpal, loop radial or arch radial pattern. This hypothenar pattern was specific for this chromosome complement.⁵ A study of Japanese patients with Klinefelter's syndrome noted significantly lower ridge counts for loops and whorls and increased frequency of arches and ulnar loops as compared with normal controls.⁶ While studying palmar dermatoglyphics of the patients with Klinefelter's syndrome (47,XXY), some authors observed no significant variation in the frequency of palmar pattern elements between the patients and controls, except for the axial triradius of patients, which was more distally located.⁷ On comparing the digital dermatoglyphics findings of 20 patients with Klinefelter's syndrome with that of normal controls, researchers found reduced total ridge count in patient group.⁸ The goal of present work was to study the different types of finger and palm prints in patients with klinefelter's syndrome and to identify any landmark dermatoglyphic pattern specific for Klinefelter's syndrome.

MATERIALS AND METHODS

The present work was a case-control study. Fingertips and palms of 6 patients of Klinefelter's syndrome were compared with that of same number of finger tips and palms of normal persons. The cases were men with primary infertility who were referred to Cytogenetic laboratory of Mahatma Gandhi Institute of Medical Sciences, Sevagram for karyotyping. Cytogenetically confirmed cases of Klinefelter's syndrome (Karyotype: 47,XXY) were selected for the study. The prints were collected by standard ink method. Controls were all medically examined and were classified as healthy and free of any genetic or other disorders. There was no parental history of any genetic disorder in the controls. Following parameters were studied:

- Qualitative analysis of finger tip pattern (FTP) Study of loops, whorls and arches (Fig. 1a and 2b).
- Quantitative analysis of fingertip patterns by doing finger ridge count (Fig. 1c): Total finger ridge count (TFRC) and Absolute finger ridge count (AFRC)
- Quantitative analysis of a-b ridge count (a-b RC)
- Qualitative analysis of palmar pattern
- atd angle (Fig. 2).
- Total number of triradii (NOT)

Total finger ridge count (TFRC) represents the sum of ridge counts of all ten digits, where only the larger count is used on those digits with more than one ridge count. Absolute finger ridge count (AFRC) is the sum of the ridge counts from all the separate triradii on the fingers (all ten digits). 'atd' angle is formed by lines drawn from digital triradius 'a' to the axial triradius 't' and from axial triradius 't' to the digital triradius 'd'.⁹

Statistical evaluation was done with software "EPI- info, version- 6.04 d".

Table-1: Statistical analysis of loops and whorls of fingertips

Parameter	Controls (n=60)		Klinefelter (n=60)		p value	Results
	n	%	n	%		
TL	39	65.0%	19	31.7%	$Z_{TL}=3.87, p < 0.01$	Highly Significant
TW	21	35.0%	40	66.7%	$Z_{TW}=3.65, p < 0.01$	Highly Significant

**Fig. 1a.** Whorl Concentric**b.** Plain Arch**c.** Loop Ulnar line drawn was used for ridge counting

RESULTS

Observations on basic fingertip pattern as shown in Table-1:

- 1) Loops: Total loops were reduced in klinefelter's syndrome patients (19; 31.7%) as compared to that of controls (39; 65.0%). This reduction was statistically significant.
- 2) Whorls: Total whorls were increased in klinefelter's syndrome patients (40; 66.7%) as compared to the controls (21; 35.0%). This was statistically significant.
- 3) Arches: Total arches were slightly increased in infertile males (1; 1.7%) as compared to control (0%).

Mean value of total finger ridge counts were decreased (140) in Klinefelter's syndrome patients as compared to control (146) which was not statistically significant (Table-2).

Mean value of absolute finger ridge counts were increased (211) in Klinefelter's syndrome patients as compared to control (187) which was not statistically significant.

a-b Ridge count: Mean value of a-b ridge count was decreased in Klinefelter's syndrome patients (76) as compared to controls (83). But this was not statistically significant.

atd angle: Mean value of atd angle was increased in Klinefelter's syndrome patients (88) as compared to the controls (81). But this was not statistically significant.

Number of triradii (NOT): Mean value of number of triradii was equal in klinefelter's syndrome patients (10) and controls (10).

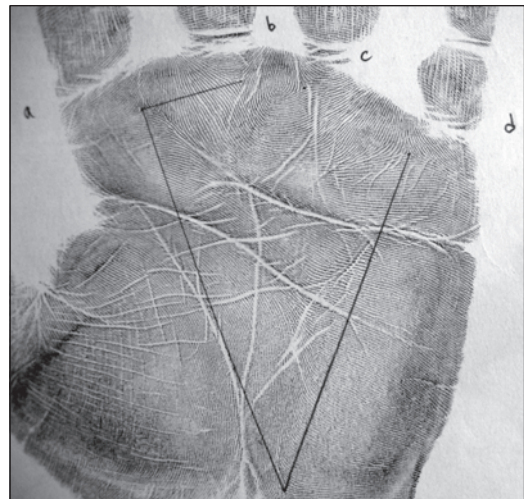
True palmar pattern as shown in Table-3: a) Hypothenar area: No any pattern was seen in both patients as well as controls.

b) Thenar and 1st interdigital area: No palmar pattern was seen in klinefelter's syndrome patients but in controls it was seen (2; 16.7%), which was not statistically significant.

c) 2nd interdigital area: No any pattern was seen in both patients as well as controls.

d) 3rd interdigital area: Percentage of true palmar patterns seen in patients and controls was equal (4; 33.3%).

e) 4th interdigital area: Percentage of true palmar patterns seen in patients and controls was equal (9; 75%).

**Fig. 2.** atd angle a-b ridge count**Table-2:** Statistical analysis of TFRC, AFRC, a-b RC and atd angle

Parameter	Controls (n=6)			Klinefelter (n=6)			t value	p value	Results
	n	Mean	SD	n	Mean	SD			
TFRC	878	146.33	40.52	842	140.33	38.74	0.262	$p > 0.05$	Not Significant
AFRC	1123	187.16	84.67	1266	211	73.55	0.52	$p > 0.05$	Not Significant
a-b RC	499	83.16	10.49	456	76	4.32	1.55	$p > 0.05$	Not Significant
atd	487	81.16	5.23	533	88.83	16.85	1.06	$p > 0.05$	Not Significant

Table-3: Statistical analysis of palmar pattern

Parameter	CONTROLS (n=12)		KLINFELTER (n=12)		P Value
	Total No.	St. Deviation	Total No.	St. Deviation	
Hyp	0	0	0	0	—
Th+I1	2 (16.67%)	0	0	0	0.460181
I2	0	0	0	0	—
I3	4 (33.3%)	0	4 (33.3%)	0	—
I4	9 (75.0%)	0	9 (75.0%)	0	—

If P value less than 0.05, it is significant

Abbreviations Used:

CM: Control male, EM: Experimental male, TL: Total loops, TA: Total arches, TW: Total whorls, TFRC: Total finger ridge count, AFRC: Absolute finger ridge count, a-b RC: a-b ridge count, atd: atd angle, NOT: Number of triradii, Hyp: Hypothenar, Th: Thenar, I1: Interdigital area 1, I2: Interdigital area 2, I3: Interdigital area 3, I4: Interdigital area 4.

DISCUSSION

Different workers have described different types of finger tip patterns in Klinefelter's syndrome patients as compared to that of controls. In the present study we found significant reduction of loops in Klinefelter's syndrome patients (31.7%) as compared to that of controls (65.0%). A similar finding was reported by a study on Japanese patients with Klinefelter's syndrome.⁶ We also found a significant increase of whorls in Klinefelter's syndrome patients (66.7%) as compared to that of controls (35.0%). Similar findings were reported by studies done on Japanese and Turkish patients.^{10,11} Our findings of mean value of total finger ridge count showed little lesser number in Klinefelter's syndrome patients (140) as compared to controls (146). While another author reported similar finding while comparing the digital dermatoglyphics of Klinefelter's syndrome patients with controls.⁸ Contrary to our expectation the mean value of the absolute finger ridge count was more in Klinefelter's syndrome patients (211) as compared to controls (187). In our series we found only a single arch (1) in Klinefelter's syndrome patients while arches were zero (no arches) in controls. While some workers reported increase in the number of arches in Klinefelter's syndrome patients.^{3,4,6} But they did not mention whether increase in the number of arches were significant or not. Like some other authors, we also found lower mean value of a-b ridge count in Klinefelter's syndrome patients (76) as compared to that of controls (83).¹⁰ In our study mean value of atd angle showed a slight difference in Klinefelter's syndrome patients (88) as compared to that of controls (81). But some workers found no difference in mean value of atd angle between

normal people and Klinefelter's syndrome patients.^{10,11} In our series the number of triradii were same in both the groups (10) while some workers found increased frequency of triradii, particularly in 48,XXYY karyotype Klinefelter's syndrome patient and suggested that this pattern might be helpful for distinguishing the 48,XXYY karyotype from other types of Klinefelter's syndrome (47,XXY).^{5,12,13} Studying the palmar

pattern we have not found any particular pattern of significance as like a study done on Japanese patients.⁷

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