Acta Paediatrica Academiae Scientiarum Hungaricae, Vol. 21 (2—3), pp. 107—121 (1980)

Dermatoglyphics in Cuban mongols

by

LIANE BORBOLLA, DANIA GUERRA, J. BACALLAO

Department of Cytogenetics, William Soler Pediatric Hospital and Center of Cybernetics Applied to Medicine, ISCMH. La Habana, Cuba

Received 5th January, 1980

Finger and palm prints of 220 Cuban mongols, all trisomic 21, were statistically compared with those of a group of 400 normal Cuban individuals. The most important dermatoglyphic findings in the patients were: an excess of ulnar loops on the 2nd and 3rd fingers, and radial loops on the 4th and 5th fingers; a paucity of patterns in the thenar/I area; more hypothenar true patterns, specially ulnar loops, higher percentages of patterns in the II and III interdigital spaces with less true patterns in the IV interdigital space; distal position t″ of the axial triradius and large atd angles of more than 70°; high values of the main-line index; predominance of radial type of the C line and higher frequencies of type 11 of the D line. The simian crease, especially the complete variety, had more diagnostic value than the Sydney line. Parathenar patterns which did not seem to have been described previously in mongols, were significantly more frequent in the patients than in controls. The results are very similar to those observed in other countries and it seems that the peculiar dermatoglyphic pattern of patients with Down syndrome is not affected by ethnic influences.

The dermatoglyphic abnormalities of individuals with Down syndrome are well known since the report of Cummins [2]. Thereafter, many investigators [5, 6, 8, 10, 11, 12, 13] had confirmed these findings.

No dermatoglyphic study of this entity had been made in Cuba which has its own ethnic characteristics. For this reason, we have compared the digital and palmar patterns of Cuban patients with Down syndrome and controls, in order to verify whether the dermatoglyphic features in the former were similar to those described in the literature.

MATERIAL AND METHODS

The patient group consisted of 220 subjects, 120 males and 100 females, ranging in age from 16 months to 30 years, all with trisomy 21. The control group of 400 unrelated individuals, 200 males and 200 females, aged 18 years or more, consisted of workers of a Havana paediatric hospital. In a previous paper [1] we studied the dermatoglyphics of white and coloured apparently normal Cuban individuals; as there was no significant difference between the two groups, in the present study no such distinction was made.

Digital and palmar prints, rolled and plain, were taken by a standard technique, using black ink. The features studied were the four basic finger pattern types and configurations in the five palmar areas. In the hypothenar area, only true or not true patterns and types of single loops were compared. Width of the atd angle was measured and position of the axial triradius was estimated by the method used by Walker [12] and by that of Preus et al [9]. In the latter, when the atd angle was less than 46°, it was classified as t; 46°—70° as t′; and when it was more than 70°, as t″. Pattern intensity index, a-b ridge count

and main line index were also recorded. Modal types of the main lines C and D were classified according to Plato [7] and Cummins and Midlo [4]. The simian line of complete and transitional types and the complete Sydney line were also analysed.

As parathenar patterns were found in some mongols and there were none in the initial control group, for comparisons of this rare pattern, dermatoglyphics of 301 apparently normal subjects were added to the control group. Prints of 40 other trisomic 21 mongols were also included in the patient group.

Chi-square test, tests for comparisons of means (normal deviation and Student's t test) and Fisher's test were used for statistical analysis.

Epidermal ridges of all patients, at least in some areas, showed a "dot line" appearance and for a better reading of the prints, a stereoscopic microscope was used.

Results

The frequencies of fingerprint pattern types of patients and controls for the left hand are shown in Table I. Significant differences were found on fingers 1, 2, 3, 4 between male mongols and controls, and on fingers 2, 3, 4, 5 between female patients and controls. Considering the fingers separately, on the thumb, male mongols showed a significant increase of ulnar loops with decrease of whorls. For this sex, no significant differences were observed in the distribution of radial loops and arches. Between female mongols and controls, there was a significant difference in the decrease of arches in the patients.

On the index, a highly significant increase of ulnar loops with a significant decrease of each one of the other patterns were found in the patients of both sexes as compared to the controls. On the third finger, male and female mongols had significantly more ulnar loops and less arches than the controls. Male mongols had also significantly less whorls. Frequencies of whorls between female mongols and controls and of radial loops for both sexes did not differ significantly.

On the 4th finger, there was a significant increase of radial loops in patients with Down syndrome for both sexes when compared to controls. No significant differences were found in the frequency of ulnar loops between patients and controls of both sexes. Male mongols had significantly fewer whorls and female patients less arches than the controls. Distribution of whorls in female mongols and controls and of arches in male mongols and controls were not significantly different. On the 5th finger, male patients had significantly more radial loops than the controls. No significant differences were found in the frequency of this pattern between female patients and controls. Arches were significantly fewer in female mongols than in controls and no significant differences were found in the proportion of ulnar loops and whorls between the two groups of both sexes.

The same comparisons were made on the right hand (Table II). Significant differences were found in all patterns on fingers 1, 2, 3, 4 between male mongols and controls and on fingers 2, 3, 4 between female patients and controls. On the 1st finger, the only significant difference observed

TABLE I

Per cent frequencies of fingerprint patterns in mongols and controls in left hand

Finger		Male				
		U	W	R	A	p
1	Mongols	69.2	19.2	0.8	10.8	$p < 0.001$
	Controls	54.5	39	0	6.5	
		$p < 0.01$	$p < 0.001$	*NS	NS	
2	Mongols	90 8	5	2.5	1.7	$p < 0.001$
	Controls	36	38.5	16	9.5	
		$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$	
3	Mongols	93.4	5.8	0.8	0	$p < 0.001$
	Controls	66.5	22.5	1.5	9.5	
		$p < 0.001$	$p < 0.001$	NS	$p < 0.001$	
4	Mongols	57.5	35	5	2.5	$p < 0.05$
	Controls	50	47	0.5	2.5	
		NS	$p < 0.05$	$p < 0.01$	NS	
5	Mongols	74.2	20.8	4.2	0.8	NS
	Controls	78.5	20	0	1.5	
		NS	NS	*$p < 0.01$	NS	

Finger		Female				
		U	W	R	A	p
1	Mongols	62	30	1	7	NS
	Controls	55	34.5	0	10.5	
		NS	NS	*NS	$p < 0.05$	
2	Mongols	94	4	2	0	$p < 0.001$
	Controls	36	33	14	17	
		$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$	
3	Mongols	84	15	1	0	$p < 0.001$
	Controls	67	19.5	0	13.5	
		$p < 0.005$	NS	*6NS	$p < 0.001$	
4	Mongols	54	37	9	0	p 0.01
	Controls	52	40.5	1.5	6	
		NS	NS	$p < 0.005$	$p < 0.001$	
5	Mongols	77	21	2	0	$p < 0.05$
	Controls	73	22.5	0	4.5	
		NS	NS	*NS	*$p < 0.05$	

Mongols ♂ n = 120 Controls ♂ n = 200 U: Ulnar loop W: Whorl R: Radial loop A: Arch
♀ n = 100 ♀ n = 200 *Fisher's test

was between male mongols and controls with an increase of ulnar loops and a decrease of whorls in the patients.

On the 2nd finger, the same significant differences in distribution of patterns were found as on the left hand. On the 3rd finger, for both sexes,

there were significantly more ulnar loops, less whorls and less arches in patients than in controls. On the 4th finger, as on the left hand, there were significantly more radial loops in patients than in controls, with an excess of ulnar loops and fewer whorls in male mongols. On the 5th finger,

TABLE II

Per cent frequencies of fingerprint patterns in mongols and controls in right hand

Finger		Male				
		U	W	R	A	p
1	Mongols	71.6	24.2	0	4.2	$p < 0.001$
	Controls	49	47.5	0	3.5	
		$p < 0.001$	$p < 0.001$	—	NS	
2	Mongols	93.3	3.3	1.7	1.7	$p < 0.001$
	Controls	33	39.5	18	9.5	
		$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.01$	
3	Mongols	93.4	5.8	0	0.8	$p < 0.001$
	Controls	72	21	0.5	6.5	
		$p < 0.001$	$p < 0.001$	*NS	$p < 0.025$	
4	Mongols	55.8	34.2	10	0	$p < 0.001$
	Controls	42.5	54.5	0.5	2.5	
		$p < 0.025$	$p < 0.001$	$p < 0.001$	*NS	
5	Mongols	72.5	24.2	3.3	0	NS
	Controls	70.5	28	0	1.5	
		NS	NS	$*p < 0.05$	NS	

Finger		Female				
		U	W	R	A	p
1	Mongols	67	31	0	2	NS
	Controls	64.5	31	0	4.5	
		NS	NS	—	NS	
2	Mongols	88	10	1	1	$p < 0.001$
	Controls	48	33	9	10	
		$p < 0.001$	$p < 0.001$	$p < 0.01$	$p < 0.05$	
3	Mongols	92	8	0	0	$p < 0.001$
	Controls	65	25	0	10	
		$p < 0.001$	$p < 0.001$	—	$p < 0.001$	
4	Mongols	55	34	9	2	$p < 0.001$
	Controls	60.5	63.5	0	3	
		NS	NS	$*p < 0.001$	NS	
5	Mongols	73	24	2	1	NS
	Controls	75	21	0	4	
		NS	NS	*NS	NS	

Mongols ♂ n = 120 Controls ♂ n = 100 U: Ulnar loop W: Whorl R: Radial loop A: Arch
♀ n = 100 ♀ n = 200 *Fisher's test

when each pattern was compared separately, there was only a significantly higher percentage of radial loops in male mongols than in the controls.

On the left hand, no significant difference was found in the distribution of patterns in the thenar/II area, between males with Down syndrome and controls, but significantly less true patterns were present in female mongols than in the controls (Table III). On the right hand, male and female mongols had significantly fewer true patterns in this area. The true pattern more often observed in mongols was a distal loop, while in controls the association of a distal loop with a proximal one was more frequent.

Hypothenar patterns (Table IV). Mongols of both sexes had significantly more true patterns in the hypothenar area in both hands than controls. When the types of single loops were compared, significant differences between patients and controls were due to higher frequencies of ulnar loops in mongols whereas in controls, radial loops were more frequent. On the right palm, male mongols had also significantly less carpal loops and more whorls than controls.

In the 2nd interdigital space (Table V), only comparisons between frequencies of true patterns and not true patterns could be made. Between male mongols and controls, although no significant difference was found, true patterns were relatively more frequent in the former. On both hands, female mongols had significantly more true patterns than the controls and these true patterns were principally loops with an accessory triradius. In the 3rd interdigital space, there were significant differences in the proportion of true patterns *vs* not true patterns between patients and con-

TABLE III

Per cent frequencies of thenar/I area patterns in patients with down's syndrome and controls

Patterns	Male				Female			
	Left		Right		Left		Right	
	Mongols	Controls	Mongols	Controls	Mongols	Controls	Mongols	Controls
L^d/L^p	0	5	0	1	0	9	1	1
L^p	0	2	0	2.5	0	3	0	7.5
L^d	5	3.5	0	1	5	2	0	1
Total	5	10.5	0	4.5	5	14	1	9.5
O/A and V	95	89.5	100	95.5	95	86	99	90.5
	NS		$p < 0.025$		$p < 0.025$		$p < 0.01$	

L^d: Loop distal. L^p: Loop proximal. O : Open field. A: Arch. V: Vestige.
Patients ♂ n = 120 Controls ♂ n = 200
♀ n = 100 ♀ n = 200

TABLE IV

Per cent frequencies of hypothenar patterns in mongols and controls

Patterns	Male				Female			
	Left		Right		Left		Right	
	Mongols	Controls	Mongols	Controls	Mongols	Controls	Mongols	Controls
Not true patterns	44.2	63.5	40.8	69	33	66	35	66.5
True patterns	55.8	36.5	59.2	31	67	34	65	33.5
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
Single loops total number	59	65	54	56	60	62	50	55
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
L^u	93.2	23.1	94.4	12.5	100	19.3	96	14.5
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
L^r	3.4	73.8	1.8	71.4	0	77.4	0	83.6
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
L^c	3.4	3.1	3.7	16.1	0	3.2	4	1.8
	NS		$p < 0.01$		NS		NS	
Double loops	1.7	1.5	0	0	3	1.5	4	1.5
	NS		NS		NS		NS	
Whorls	4.1	2.5	14.2	3	4	1.5	10	4
	NS		$p < 0.05$		NS		—	
W/L^u	0.8	0	0	0	0	0	0	0
A^t	0	0	0	0	0	0	1	0.5

L^u: Ulnar loop. L^r: Radial loop. L^c: Carpal loop. W: Whorl. A^t: Tented arch. NS: Not significant.
Mongols ♂ n = 120 Controls ♂ n = 200
♀ n = 100 ♀ n = 200

TABLE V

Per cent frequencies of patterns in the 2nd, 3rd and 4th interdigital spaces in mongols and controls

Types of patterns	Area II							
	Left				Right			
	Male		Female		Male		Female	
	M	C	M	C	M	C	M	C
L	0	0	0	0	0	0	0	0
D	6.7	4	13	3.5	10.8	7.5	19	5.5
W	0	0	0	0	0	0	0	0
Total	6.7	4	13	3.5	10.8	7.5	19	5.5
V/O	93.3	96	87	96.5	89.2	92.5	81	94.5
	NS		$p < 0.05$		NS		$p < 0.001$	

TABLE V. cont.

Types of patterns	Area III							
	Left				Right			
	Male		Female		Male		Female	
	Mongols	Controls	Mongols	Controls	Mongols	Controls	Mongols	Controls
L	51.7	30.5	68	35	82.5	51	86	43.5
	*NS		*NS		NS		*$p < 0.001$	
D	0	0.5	0	0.5	0.6	0.5	0	4.5
	*NS		*NS		NS		$p < 0.001$	
W	0	0.5	0	0	0	1	0	1
	*NS		*NS				*NS	
Total	51.7	31.5	68	35.5	83.3	52.5	86	49
V/O	48.3	68.5	32	64.5	16.7	47.5	14	51
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	

Types of patterns	Area IV							
	Left				Right			
	Male		Female		Male		Female	
	Mongols	Controls	Mongols	Controls	Mongols	Controls	Mongols	Controls
L	14.2	44	15	44	7.5	37.5	9	41
	$p < 0.005$		$p < 0.005$		NS		$p < 0.001$	
D	15	14	23	17.5	5.8	11	17	11
	$p < 0.005$		$p < 0.001$		NS		$p < 0.001$	
W	0	1.5	0	3	0	0.5	0	2
	*NS		*NS		*NS		*NS	
Total	29.2	59.5	38	64.5	13.3	49	26	54
V/O	70.8	40.5	62	35.5	86.7	51	74	46
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	

M: Mongols ♂ n = 120 ♀ n = 100 C: Controls ♂ n = 200 ♀ n = 200 NS: Not significant.
*Fisher's test. L: Loop. D: Loop with an accessory triradius.
W: Whorl. V/O: Vestige/open field.

trols. Mongols of both sexes and in each hand had more true patterns than controls. No significant differences were found in the distribution of types of true patterns between male and female mongols and controls on the left hand, and between male mongols and controls on the right hand. The only significant difference between female mongols and controls occurred on the right hand. There were significantly more loops without, and less loops with, an accessory triradius than in the controls. The frequency of whorl patterns did not differ significantly between the two groups. In the

TABLE VI

Per cent frequencies of heights of axial triradius in mongols and controls

Heights	I							
	Left				Right			
	Male		Female		Male		Female	
	Mong.	Cont.	Mong.	Cont.	Mong.	Cont.	Mong.	Cont.
t	20	56.5	8	47	18.3	58.5	9	54.8
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
t′	14.2	37	15	52	15.8	36	18	41.7
	$p < 0.001$		$p < 0.0001$		$p < 0.001$		$p < 0.001$	
t″	65.8	6.5	77	1	65.8	5.5	73	3.5
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	

Heights	II							
	Left				Right			
	Male		Female		Male		Female	
	Mong.	Cont.	Mong.	Cont.	Mong.	Cont.	Mong.	Cont.
t	6.6	70	7	65.5	6.6	77	8	73.4
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
t′	33.3	26.5	21	34	29.2	21.5	33	26.1
	NS		$p < 0.025$		NS		NS	
t″	60	3.5	72	0.5	64.2	1.5	59	0.5
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	

Mong.: Mongols ♂ n = 120
♀ n = 100

Cont.: Controls ♂ n = 200
♀ n = 200

I) t 0—14.9%
t′ 15.0—39.9%
t″ 40% and over.

II) t < 46*
t′ 46*—70*
t″ > 70*

I: Method of Walker.
II: Method of Preus et al.

4th interdigital space, mongols of both sexes had significantly less true patterns than controls. This lower frequency of true patterns in the patients was due to the paucity of loops without an accessory triradius, whereas there was an increase of loops with an accessory triradius on the left hand for both sexes, and on the right hand in female mongols. No significant differences were observed in number of whorls between the two groups.

Position of the axial triradius (Table VI). There was a significant difference in distribution of the position of the axial triradius between patients and controls. With the method of Walker [12] there was a significantly marked increase in the frequency of position t″, and a decrease of positions t and t′. With the

TABLE VII

Pattern intensity index

P. II	Left			Right			Left + Right		
	$\bar{X}$	S	S.E.$\bar{X}$	$\bar{X}$	S	S.E.$\bar{X}$	$\bar{X}$	S	S.E.$\bar{X}$
Male									
Mongols	5.71	1.26	0.11	5.79	1.26	0.11	11.55	2.33	0.21
Controls	6.36	2.00	0.14	6.66	1.92	0.13	13.04	3.71	0.26
	$p < 0.001$			$p < 0.001$			$p < 0.001$		
Female									
Mongols	6.00	1.34	0.13	6.01	1.47	0.15	12.01	2.66	0.26
Controls	5.99	2.14		6.11	1.96		12.10	3.89	
	NS			NS			NS		
	t′ NS			t′ NS			t′ NS		

Mongols ♂ n = 120 Controls ♂ n = 200 t′: Behrens—Fisher's test.
♀ n = 100 ♀ n = 200 NS: Not significant.

TABLE VIII

Frequencies of atd angles in mongols and in controls

ATD angles	Left			Right		
	$\bar{X}$	S.D.	S.E.$\bar{X}$	$\bar{X}$	S.D.	S.E.$\bar{X}$
♂						
Mongols	71.85	18.81	1.717	73.35	17.88	1.633
Controls	44.49	9.45	0.668	43.25	8.11	0.573
	$Z = 8.057$ $p < 0.005$			$Z = 17.389$ $p < 0.001$		
♀						
Mongols	77.80	16.85	1.685	72.86	20.14	2.014
Controls	43.88	8.07	0.571	43.74	6.89	0.489
	$Z = 19.064$ $p < 0.001$			$Z = 14.05$ $p < 0.001$		

Mongols ♂ n = 120 Controls ♂ n = 200
♀ n = 100 ♀ n = 199 : case had not.t.
$\bar{X}$: Mean. S.D.: Standard deviation. S.E.$\bar{X}$: Standard error of the mean.

method of Preus et al [9] the position t″ was significantly more, and the position t less, frequent on both hands of mongols of either sex, while the frequency of position t′ on the left and right hands of male mongols and on the right hand of female patients did not differ significantly from the controls. A difference of borderline significance was found concerning the left hand between female patients and controls. Females with Down syndrome had less position t′ than the controls. In this series, controls and

patients had not been matched for age.

Values for the means, standard deviation and standard error of the mean of pattern intensity index (P. I. I.) are shown in Table VII. The P.I.I. was significantly lower in male mongols on the left hand, the right hand and both than in the controls. No significant difference was, however, found in the mean values for the P.I.I. between female patients and controls. Neither did comparisons with Behrens-Fisher's test reveal significant

TABLE IX

a—b Ridge count in mongols and controls

a—b Ridge count.	Left			Right			Left + right		
	$\bar{X}$	S	E.S.$\bar{X}$	$\bar{X}$	S	E.S.$\bar{X}$	$\bar{X}$	S	E.S.$\bar{X}$
Male									
Mongols	42.32	6.49	0.59	41.35	6.65	0.60	83.66	12.40	1.13
Controls	40.86	5.59	0.39	40.18	5.73	0.40	81.04	10.41	0.73
	$p < 0.05$			NS			$p < 0.05$		
Female									
Mongols	40.16	5.58	0.55	39.31	6.75	0.67	79.43	11.50	1.15
Controls	41.27	5.95	0.42	40.27	5.81	0.41	81.50	10.89	0.77
	$p < 0.05$			NS			NS		

Mongols ♂ n = 120 Controls ♂ n = 200 NS: Not significant.
♀ n = 100 ♀ n = 200

TABLE X

Main-line index in mongols and in controls

M.L.I	Left			Right		
	$\bar{X}$	S.D.	E.S.$\bar{X}$	$\bar{X}$	S.D.	S.E.$\bar{X}$
Male						
Mongols	8.94	1.68	0.153	10.57	1.56	0.142
Controls	7.61	1.94	0.137	8.92	2.15	0.152
	$Z = 11.272$ $p < 0.001$			$Z = 7.911$ $p < 0.005$		
Female						
Mongols	10.57	1.65	0.165	10.63	1.35	0.135
Controls	7.74	2.13	0.151	8.75	2.06	0.146
	$Z = 12.612$ $p < 0.001$			$Z = 9.543$ $p < 0.005$		

Mongols ♂ n = 120 Controls ♂ n = 200
♀ n = 100 ♀ n = 200
$\bar{X}$: Mean. S.D.: Standard deviation. S.E.$\bar{X}$: Standard error of the mean.

TABLE XI

Per cent frequencies of modal types of C and D main line

Modal type	C Line							
	Left				Right			
	Male		Female		Male		Female	
	Mongols	Controls	Mongols	Controls	Mongols	Controls	Mongols	Controls
Radial	52.5	30	68	36.5	82.5	51.5	85	45.5
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
Ulnar	16.7	46.5	1 4	47	6.7	38	9	42
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
Proximal	25	18	13	11.5	8.3	8.5	4	9
	NS		NS		NS		NS	
Absent	5.8	5.5	5	5	2.5	2	2	3.5
	NS		NS		NS		NS	
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	
	D Line							
Type 7	1.7	19	4	15	3.3	14	3	29
	$p < 0.001$		$p < 0.005$		$p < 0.005$		$p < 0.001$	
Type 9	28.3	53.5	24	42.5	10.8	37	18	41
	$p < 0.001$		$p < 0.005$		$p < 0.001$		$p < 0.001$	
Type 11	70	27.5	72	42.5	85.8	49	79	30
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.01$	
	$p < 0.001$		$p < 0.001$		$p < 0.001$		$p < 0.001$	

Mongols ♂ n = 120 Controls ♂ n = 200
♀ n = 100 ♀ n = 200

differences in the mean values for the pattern intensity index between patients and controls for this sex.

Significant differences were found in the mean values of the atd angle on the left and right hands between mongols of both sexes and the controls (Table VIII). With all comparisons the mean atd angle of the patients was almost twice higher, more than 70°, than in the control group.

The mean values for a-b ridge count are given in Table IX. The a-b ridge count of mongols was simila as that obtained in the controls. The only significant difference was found between male mongols and controls, with a higher a-b ridge count on the left hand and a higher summed a-b ridge count in the patients. In female mongols, on the left hand the mean values for the a-b ridge count were significantly lower than in the controls. No significant differences were found in the other comparisons made for this sex.

TABLE XII

Per cent frequencies of simian and sydney lines in mongols and controls

Simian line	Males		Females	
	Mongols	Controls	Mongols	Controls
	per cent		per cent	
Bilateral Complete	31.7	0	18	0.5
	$p < 0.001$		NS	
Unilateral Complete	13.3	5	16	1.5
	$p < 0.001$		NS	
Total	45	5	34	2
	$p < 0.001$		$p < 0.001$	
Bilateral Transitional	8.3	1	3	0.5
	$p < 0.025$		NS	
Unilateral Transitional	6.7	6	6	4
	$p < 0.025$		NS	
Total	15	7	9	4.5
	$p < 0.025$		NS	
Complete and transitional	10	1	10	0.5
	$p < 0.001$		$p < 0.001$	
Total	70	13	53	7
	$p < 0.001$		$p < 0.001$	
Sydney line				
Bilateral	0.8	0	2	0.5
	NS		*NS	
Unilateral	6.7	1.5	8	1
	NS		*NS	
Total	7.5	1.5	10	1.5
	$p < 0.01$		$p < 0.001$	

Mongols ♂ n = 120 ♀ n = 100 Controls ♂ n = 200 ♀ n = 200 N.S. Not significant *Fisher's test.

The mean values for the main line index were significantly higher on both hands of patients than of the controls (Table X).

Frequencies of modal types of C line and D line are given in Table XI. Modal types of line C were significantly different on both hands in mongols from the controls; this was due to the higher frequency of radial type of main line C and the lower frequency of ulnar type in the mongols than in the controls. No significant differences were found between patients and controls in the distribution of the proximal and absent modal types of C line, but there were significant differences in all modal types of main line D between mongols and controls. The modal type 11 of D line was significantly more and modal types 9 and 7 less frequent in mongols than in the controls for both sexes and both hands.

Significant differences were found in all types of simian line between both male and female mongols and the controls (Table XII). In the male mongols the frequency of each type of simian crease was significantly higher than in the controls, but in female mongols there was a significant difference only in the frequency of complete bilateral and unilateral simian crease and of complete and transitional simian crease which were both higher in the patients. Significant differences were also found in the distribution of the Sydney line between mongols and controls. The frequency of the Sydney line was higher in patients than in controls when all types were considered together, but the distribution of bilateral and unilateral Sydney lines was not significantly different between mongols and controls for both sexes.

Parathenar pattern. The total frequency of parathenar patterns was 6.53% (17/260) in the mongols, 6.66% (8/120) in females, and 6.42% (9/140) in males. In the controls, the total frequency of this pattern was 0.85% (6/701), 0.95% (4/420) in females and 0.71% (2/281) in males. There were significant differences in the frequency of this pattern between mongols and controls, with an increase of parathenar patterns in male mongols ($p < 0.001$), in female mongols ($p < 0.001$) and both ($p < 0.001$).

Discussion

Commins [2, 3, 4] observed in patients with Down syndrome an increase of ulnar loops with a decrease of whorls and the presence of radial loops on the 4th and 5th fingers. On the palm he found a reduction in number and a complexity of patterns in the thenar/I area, higher frequencies of hypothenar patterns principally L^u, L^c and A^c, a central position of the axial triradius in t″, a higher frequency of patterns in the II and III interdigital spaces and a lower incidence of patterns in the IV interdigital area, a more transverse course of the palmar main lines with a high main-line index and an increased frequency of the simian line. These results are in agreement with the present ones. In the present study, difference in pattern types between mongols and controls were specially analysed for each individual and every finger of the left and right hand. Rosner et al [10] found a preponderance of ulnar loops on all but the little fingers of mongols and significant differences among the males between the 1st, 2nd, 3rd and 4th fingers on the right and left hands and the equivalent finger of the controls. Between the female mongols and controls, the significant differences concerned the 1st, 2nd and 3rd fingers on the left hand and the 2nd, 3rd and 4th fingers on the right hand. Our results agreed well with those of the above authors in male mongols on the left and right hands and on the right hand of female patients. The results were different on the left hand of female mongols.

The characteristic paucity of true patterns in the thenar/I area among

the mongols was more evident on the right hand. Plato et al [8] reported that when a single loop is present on the hypothenar of Down patients, it is an ulnar one and practically no radial loops are seen on the palm of individuals with trisomy 21. This was confirmed in the present study. The distribution of patterns in the II, III and IV interdigital spaces of our patients were also similar to that reported in other series of mongols.

The distal position t″ of the axial triradius was again verified in the patients. For its determination the Walker method [12] seemed more reliable than the method of Preus et al [9]. As in both patients and controls, the more frequent digital pattern was the loop, it was not surprising that in both groups the values for the pattern intensity index were not significantly different, except in males.

In our material, in agreement with other studies, the mean values for the atd angle were more than 70° in the mongols. The a-b ridge count did not differ much in the groups.

Determination of the modal types of main lines C and D in mongols is a very useful test as there were marked differences against the controls, in full agreement with Plato et al [8].

The presence of simian line as an important sign in mongols has again been observed, especially of the complete type and the association of the complete and transitional types. The value of the Sydney line in these patients was less than that of the simian crease.

Parathenar patterns were not reported previously in mongols, and as the pattern is very rare, it may be a figure of diagnostic value.

Practically, in all comparisons performed in the present material the characteristic abnormalities observed in Cuban mongols were the same as those described in patients from other countries. This seems to mean that the peculiar dermatoglyphics of patients with Down syndrome are not affected by ethnic influences.

References

1. Borbolla, L., Guerra, D., Rodriguez, J., Delgado, A.: Estudio dermatoglifico comparativo en controles. Rev. cuba. Pediat. **49**, 253 (1977).
2. Cummings, H.: Dermatoglyphic stigmata in mongoloid imbeciles. Anat. Rec. **73**, 407 (1939).
3. Cummins, H., Talley, C., Platou, V. R.: Palmar dermatoglyphics in mongolism. Pediatrics **5**, 241 (1950).
4. Cummins, H., Midlo, C.: Finger prints, palms and soles. Dover Publications Inc., New York (1961).
5. Fang, T. C.: The third interdigital pattern of the palms of the general British population, mongoloid and non-mongoloid mental defectives. J. ment. Sci. **96**, 780 (1950).
6. Penrose, L. S.: The distal triradius t on the hands of parents and sibs of mongol imbeciles. Ann. hum. Genet. **19**, 10 (1954).
7. Plato, C. C.: Polymorphism of the C line with a new classification of the C line terminations. Amer. J. phys. Anthrop. **33**, 413 (1970).
8. Plato, C. C., Cereghino, J. J., Steinberg, F. S.: Palmar dermatoglyphics of Down's syndrome: Revisited. Pediat. Res. **7**, 111 (1973).
9. Preus, M., Fraser, F. C., Levy, E. P.: Dermatoglyphics in congenital heart malformations. Hum. Hered. **20**, 388 (1970).
10. Rosner, F., Steinberg, F. S., Spriggs, H.: Dermatoglyphic patterns with selected neurological disorders. Amer. J. med. Sci. **254**, 695 (1967).

11. Turpin, R., Lejeune, J.: Étude dermatoglyphique des paumes des mongoliens et de leurs parents et germains. Sem. Hôp. Paris **76**, 3955 (1953).
12. Walker, N. F.: The use of dermal configurations in the diagnosis of mongolism. J. Pediat. **50**, 19 (1957).
13. Walker, N. F.: The use of dermal configurations in the diagnosis of mongolism. Pediat. Clin. N. Amer. **531**, (1958).

Prof. L. Borbolla
William Soles Pediatric Hospital
Ave. San Francisco 10112
La Habana 8, Cuba