DERMATOGLYPHICS IN CLEFT LIP AND CLEFT PALATE ANOMALIES

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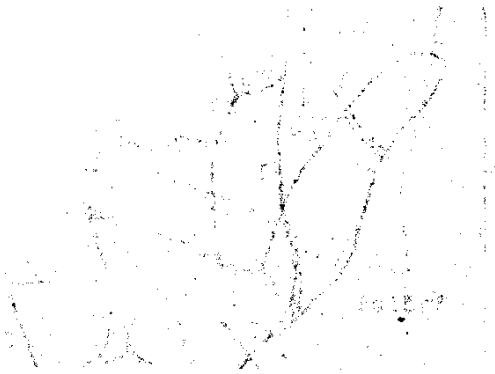

ABSTRACT

Dermatoglyphic characteristics of sixty nine cases of cleft lip with or without cleft palate and twenty eight isolated cleft palate cases were evaluated for digital patterns, interdigital patterns, palmar simian crease and sydney line, and model types of C- and D-line terminations. Increased frequency of ulnar and radial loops than the arches and whorls was observed in cleft lip with or without cleft palate patients compared to controls. Interdigital patterns were less frequent in cleft lip and cleft palate patients. Simian crease and Sydney line were more common in patients than in controls. Model types of C- and D-line terminations showed variations in patients and controls. Wider 'atd' angle (more than 30°) and dermatoglyphic asymmetry were noted in the patient groups. The findings suggest the dichotomy or heterogeneity of cleft lip and cleft palate anomalies. The role and utility of dermatoglyphics in genetical etiology of congenital defects were emphasized.

Key words: *Cleft lip, Cleft palate, Dermatoglyphic associations.*

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Congenital abnormalities of the cleft lip with or without cleft palate and isolated cleft palate are developmentally as well as genetically distinct entities(1,2). Evidence from various population surveys, twin studies and family pedigrees reveals that the cases of cleft lip and palate either have a positive family history or genetic origin(1, 3-5). Most cases of cleft lip with or without cleft palate have a polygenic mode of inheritance with sex modification(6), a certain proportion associated with recognizable chromosomal aberrations(7), rare mutant genes(3-7) and unknown environmental causations(8,9). The influence of genetic and/or environmental factors on early development are often reflected by the altered dermatoglyphics(10).

Dermatoglyphics have been used in clinical genetics as a diagnostic tool(7,10). Earlier, Silver(11) was of the opinion that the development of dermatoglyphics seems to be independent from the formation of cleft lip with or without cleft palate. However, in later studies, Dziuba(12) showed the decreased finger-tip pattern intensity in male patients than in controls by an increased frequency of ulnar loops and arches and a consequent decrease of whorls. Female patients had a lower frequency of the patterns in the 4th interdigital area of the left hand than did controls.

By comparing the dermatoglyphics of familial and teratogenic groups, Deshmukh and coworkers(13) found that these two groups were separate entities. A strong genetic etiology for congenital cleft lip and palate anomalies was emphasized by Balgir(2-4). The present study attempts to explore dermatoglyphically whether the cleft lip with or without cleft palate are genetically different from isolated cleft palate or from controls and the use of derma-

toglyphics in the study of genetic etiology of these dysmorphic entities.

Material and Methods

This study includes sixty nine cases (fifty boys and nineteen girls) suffering from cleft lip with or without cleft palate and twenty eight (twelve boys and sixteen girls) cases of isolated cleft palate, attending the Out Patient Department of Plastic Surgery at Nehru Hospital, Chandigarh. The age varied from three to fifteen years for these cases. The parents of these cases were interviewed to exclude patients whose mothers used drugs or suffered from any kind of serious infection during pregnancy, especially in the first trimester. The cases having other congenital anomalies were excluded. It was also ensured that the patients were not related to each other. From families having positive family history of these deformities, only one member was included in the study. All these cases were residents of North Western India.

Fifty apparently healthy individuals without any evidence of congenital anomalies or medical disorders and matched with patients for age, sex, socio-economic status, caste, religion and ethnic background were used as controls.

Bilateral rolled finger and palmar prints were obtained using ink and pad technique as described by Cummins and Midlo(14) and were analyzed according to the standard guidelines (*Figs. 1 & 2*) for classification of patterns(14), C- and D-line termination(15) and for Sydney line and simian crease(16). The data were analyzed for boys and girls, separately. For statistical analysis, the Chi-square test was applied to find the significance of the difference between the two groups.

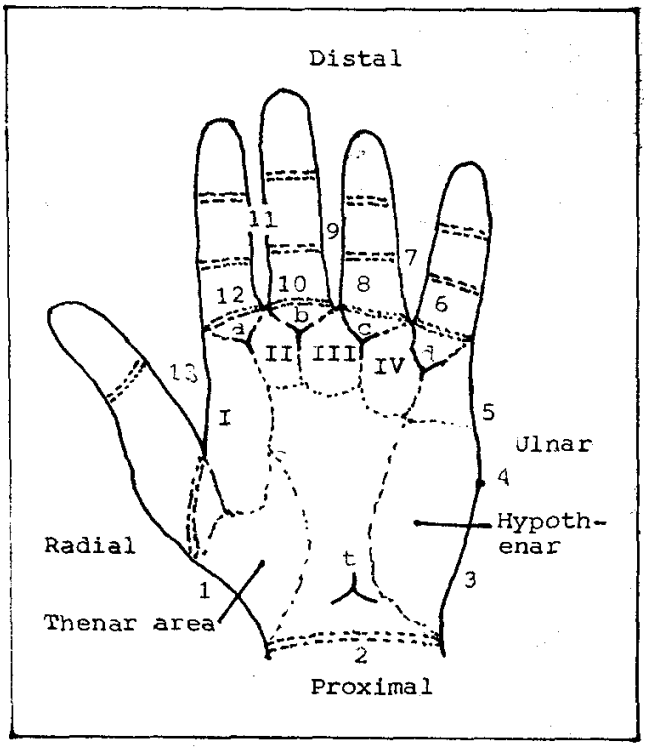

Fig. 1. Diagram of left palm showing main line terminations, interdigital areas and classification of dermatoglyphic areas.

Results

The frequency of ulnar loops was much higher than the radial loops and that of whorls lower in cleft lip with or without cleft palate group as compared with control population (*Table I*). The incidence of arches was also lower in cleft lip with or without cleft palate group. Thus, the distribution of finger-print pattern was statistically significant between these two groups in girls ($p<0.05$). The isolated cleft palate patients significantly differed from the controls in the distribution of arches on the Ist right digit of boys and Ist left digit of girls and whorls on the Ist left digit of boys and the IV right digit of girls (boys, $p<0.05$); girls, $p<0.05$). While comparing the finger-print patterns of cleft lip with or without cleft palate and isolated cleft palate patients, there was a statistically significant difference in boys ($p<0.02$).

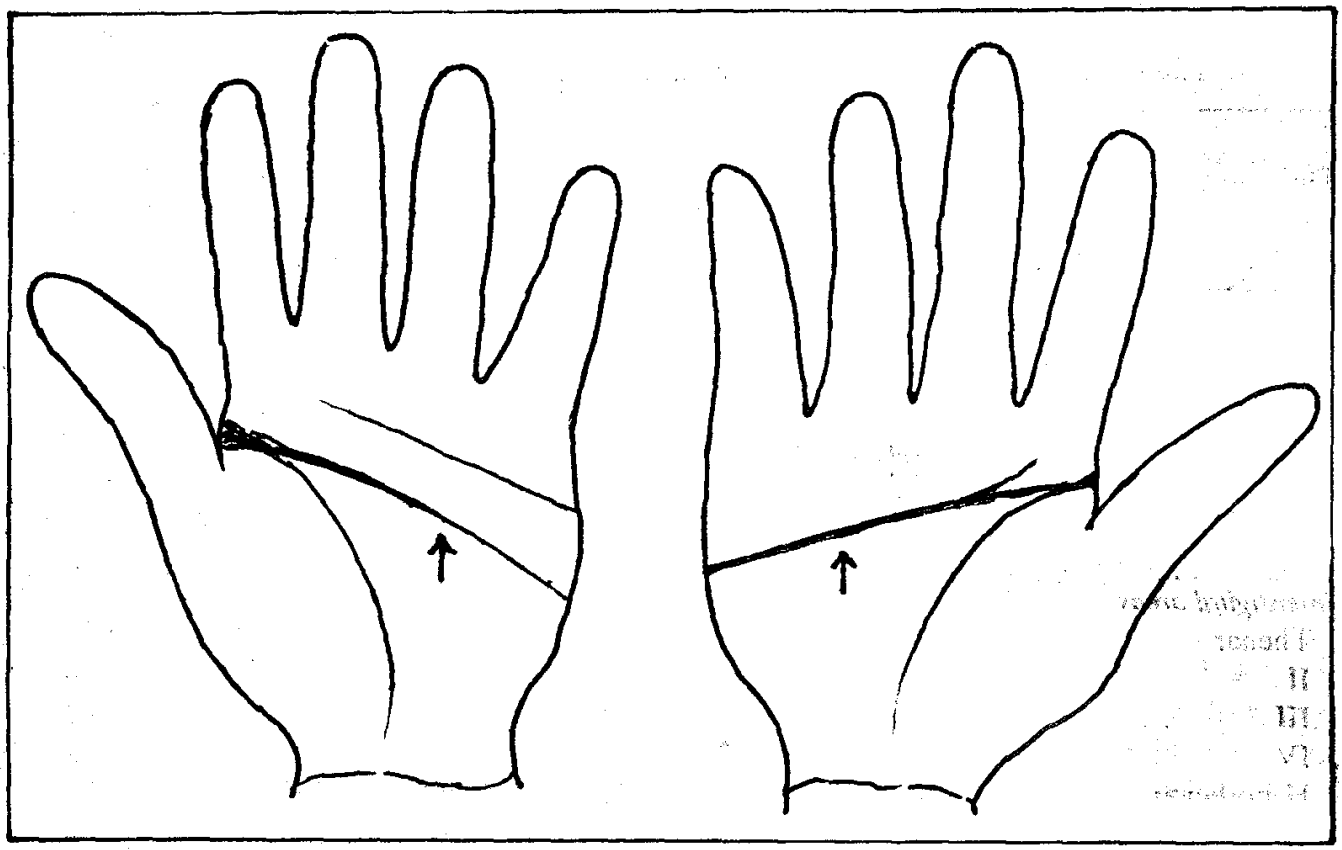

Fig. 2. Diagram of palm showing Sydney line (left) and Simian crease (right).

For presence of interdigital patterns, the boys and girls of cleft lip with or without cleft palate differed from controls in II interdigital area ($p<0.01$) and in thenar and Ist interdigital area ($p<0.02$), respectively. The control group was significantly distinguished from the cleft lip with or without cleft palate (boys, $p<0.01$; girls, $p<0.01$) and isolated cleft palate (boys, $p<0.01$; girls, $p<0.02$) group in III interdigital area (*Table I*).

The frequency of pattern was significantly reduced in IV interdigital area of boys ($p<0.02$) and girls ($p<0.02$) in cleft lip with or without cleft palate patients and in girls of cleft palate ($p<0.05$) as compared to controls.

In the hypothenar area of palm, the cleft lip with or without cleft palate patients significantly differed from the controls ($p<0.05$) and isolated cleft palate cases ($p<0.05$), but this difference was statistically insignificant in boys.

The frequency of Simian crease was significantly higher in cleft lip with or without cleft palate boys as compared to controls ($p<0.01$). The incidence of Sydney line was significantly higher in cleft lip with or without cleft palate cases (boys, $p<0.01$; girls, $p<0.001$) and in sporadic cleft palate (boys, $p<0.02$; girls, $p<0.001$) patients as compared to the control population (*Table I*).

While considering the model types of C-line terminations, it was observed that the frequency of proximal and absent types was considerably higher in cleft lip with or without cleft palate patients (boys, $p<0.001$; girls, $p<0.02$) and isolated cleft palate cases (boys, $p<0.001$; girls, $p<0.05$) as compared to the controls. Similarly, the D-line termination was absent in cleft lip

TABLE— *Percentage Distribution of Dermatoglyphic Features in Controls, Cleft Lip and Isolated Cleft Palate Patients.*

Dermatoglyphic features	Boys			Girls		
	Controls (n=50)	Cleft Lip (n=50)	Cleft palate (n=50)	Controls (n=50)	Cleft lip (n=19)	Cleft palate (n=16)
Finger-print patterns						
Arches	3.2	3.0	8.3	7.8	4.2	8.1
Ulnar loops	51.4	55.8	41.7	47.0	52.6	53.1
Radial loops	1.0	1.6	5.0	2.4	7.9	6.9
Whorls	44.4	39.6	45.0	42.8	35.3	31.9
Presence of patterns in interdigital areas						
Thenar + Ist	11.0	12.0	4.2	13.0	0.0	3.1
II	11.0	1.0	0.0	7.0	5.3	0.0
III	55.0	33.0	16.7	50.0	23.7	25.0
IV	41.0	24.0	41.7	54.0	31.6	43.8
Hypothenar	33.0	21.0	33.3	37.0	18.4	43.8
Presence of Simian crease	4.0	18.0	8.3	4.0	7.9	0.0
Presence of Sydney line	6.0	20.0	20.8	3.0	39.5	18.8
C-line termination						
Radial	56.0	30.0	33.3	50.0	29.0	21.9
Ulnar	25.0	29.0	25.0	31.0	29.0	53.1
Proximal	17.0	21.0	8.4	14.0	34.2	15.6
Absent	2.0	20.0	33.3	5.0	7.8	9.4
D-line termination						
11	63.0	39.0	33.4	66.0	44.7	34.4
9	20.0	34.0	25.0	21.0	29.0	21.9
7	15.0	16.0	20.8	10.0	18.4	31.2
Absent	2.0	11.0	20.8	3.0	7.9	12.5
'atd' angle						
<30°	40.0	27.0	12.5	39.0	13.2	21.9
31°–40°	40.0	60.0	58.3	53.0	63.2	56.2
>41°	20.0	13.0	29.2	18.0	23.7	21.9

For 'atd' angle the percentage figures are of number of persons and not of dermatoglyphic features.

with or without cleft palate boys ($p<0.01$) in comparison to controls (*Table*). In the isolated cleft palate patients, the incidence of missing of D-line termination was statistically significant in boys ($p<0.001$) and girls ($p<0.01$) as compared to controls.

It was observed that the axial triradius was more distally placed in cleft lip with or without cleft palate cases and isolated cleft palate as compared to controls, suggesting

a wider 'atd' angle in these patients. The 'atd' angle between control and cleft lip with or without cleft palate cases was statistically significant wider in boys ($p<0.02$) as well as in girls ($p<0.05$). The cleft palate boys also significantly differed from controls for 'atd' angle However, the difference between cleft lip with or without cleft palate and cleft palate patients was statistically not significant for 'atd' angle (*Table I*).

Further, the overall dermatoglyphic asymmetry was more pronounced in cleft lip with or without cleft palate patients than in cleft palate cases and controls.

Discussion

The findings of the present study show that specific dermatoglyphic features exist for congenital cleft lip with or without cleft palate and isolated cleft palate anomalies. Both cleft lip with or without cleft palate and sporadic cleft palate probands differ dermatoglyphically from the control population. Moreover, statistically significant dermatoglyphic differences between the cleft lip with or without cleft palate and controls, isolated cleft palate and contro and cleft lip with or without cleft palate, and cleft palate cases further testify the etiological differences and suggest that the isolated cleft palate is probably an independent entity.

Evidence from embryonic developmental studies(17), twin and family constellations(18), dermatoglyphics(2,8) and serogenetic markers(5) suggests that cleft lip with or without cleft palate and isolated cleft palate are genetically heterogenous entities which are inherited by a multifactorial process(6). The dermatoglyphic findings of the present study substantiate not only the dichotomy, but also the etiological and genetic heterogeneity of the cleft lip and palate anomalies.

The results of this study to a large extent are consistent with those of other investigators(8,19) with respect to fingerprint patterns, interdigital, thenar and hypothenar area patterns, palmar C- and D-line terminations, 'atd' angle and dermatoglyphic asymmetry in the cleft lip with or without cleft palate and isolated cleft palate patients. This compatibility of findings further strengthens the role and use of dermatoglyphics in the etiological studies of disputed entities.

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REFERENCES

1. Bhatia SN. Genetics of cleft lip and palate. Br Dent J 1972, 132: 95-103.
2. Balgir RS, Mitra S. Congenital cleft lip and cleft palate anomalies: a dermatoglyphic study. J Postgrad Med 1986, 32: 18-23.
3. Balgir RS. Congenital oral clefts and dermatoglyphics. Isr J Med Sci 1984, 20: 622-624.
4. Balgir RS. Dermatoglyphic features in congenital cleft lip and cleft palate anomalies. J Indian Med Assoc 1986, 84: 369-372.
5. Balgir RS. Serological and biochemical genetic markers in congenital cleft lip and cleft palate anomalies. Isr J Med Sci 1986, 22: 572-575.
6. Spence MA, Westlake J, Lauge K, Gold DP. Estimation of polygenic recurrence risk for cleft lip and palate. Hum Hered 1976, 26: 327-336.

7. Schaumann B, Alter M. Dermatoglyphics in Medical disorders. New York, Springer-Verlag, 1976, pp 206-208.
8. Vormittag W, Weninger M, Hollmann K, Hoffmann D. Heterogeneity of cleft lip and/or palate and dermatoglyphics. *In:* Dermatoglyphics–Fifty years later. Birth Defects. Original article series. Vol XV. Eds Wertelecki W, Plato CC. New York, The National Foundation-March of Dimes, 1979, pp 649-659.
9. Balgir RS. Parental age and incidence of cleft lip and cleft palate anomalies. Acta Anthropogenet 1984, 8: 231-235.
10. Balgir RS. Dermatoglyphic studies in effective disorders: an appraisal. Biol Psychiat 1982, 17: 69-82.
11. Silver WE. Dermatoglyphics and cleft lip and palate. Cleft Palate J 1966, 3: 368-375.
12. Dziuba P. Dermatoglyphics in cases of hare lip and cleft palate. Int Dermatol Assocn News Bull 1972, 25: 1195.
13. Deshmukh RN, Grewal MS, Sidhu SS. Dermatoglyphics in cleft lip and cleft palate anomaly: familial and teratogenic groups. Indian J Med Res 1979, 70: 814-818.
14. Cummins H, Midlo C. Finger prints, palms and soles: An introduction to dermatoglyphics. New York, Dover Publication, 1961.
15. Plato CC. Polymorphism of the C-line with a new classification of the C-line terminations. Am J Phys Anthrop 1970, 33: 413-420.
16. Steinberg FS, Cereghino JJ, Plato CC. The dermatoglyphics of American Negroes. Am J Phys Anthrop 1975, 42: 183-193.
17. Adams MS, Niswander JD. Developmental 'noise' and a congenital malformation. Genet Res 1967, 10: 313-317.
18. Bixler D. Heretability of clefts of the lip and palate. J Prosthet Dent 1975, 33: 100-108.
19. Woolf CM, Gianas AD. A study of fluctuating dermatoglyphic asymmetry in the sibs and parents of cleft lip propositi. Am J Hum Genet 1977, 29: 503-507.

NOTES AND NEWS

USE AND ABUSE OF VITAMINS IN PEDIATRIC PRACTICE

A National Review Workshop on Use and Abuse of Vitamins in Pediatric Practice in India will be conducted under the joint auspices of Nutrition Chapter of Indian Academy of Pediatrics, Ahmedabad Branch and National Neonatology Forum on *28th March 1993* at the Department of Pediatrics, Civil Hospital and B.J. Medical College, Ahmedabad.

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