



Dermatoglyphic Patterns of Acute Leukemia Patients

Rathee R.¹, Kamal N.^{1*}, Kumar A.², Vashist M.¹ and Yadav R.¹

¹Deptt. of Genetics, M.D. University, Rohtak, Haryana, INDIA

²Deptt. of Zoology, CRA College, Sonapat, Haryana, INDIA

Available online at: www.isca.in, www.isca.me

Received 31st January 2014, revised 15th March 2014, accepted 12th April 2014

Abstract

Dermatoglyphics is the study of patterns formed by epidermal ridges on fingers, palms and soles. The emerging association between certain combinations of dermatoglyphic traits and specific chromosome aberrations quickly established a useful diagnostic and an integral part of the medical diagnostic. The dermatoglyphic features of 176 patients with acute leukemia were compared with those of normal control subjects. Prints of digits and palm were taken by black inkpad method. Arch, loop and whorl pattern and atd angle was calculated in both patients of acute leukemia and control group. Palmer creases were noted as normal, simian and sydney creases. Male patients with leukemia have a higher frequency of digital whorls than male control group. Leukemia patients have more sydney palmar flexion creases than normal control subjects. The association of leukemia to distinctive dermatoglyphic features may represent another prenatal characteristic that may contribute to the understanding of risk factors for leukemia.

Keywords: Dermatoglyphics, leukemia, palmer creases, risk factors.

Introduction

The traits of dermatoglyphic develop between the 10th and 17th week post conception and thus they principally reflect events occurring during the second trimester¹. Specific changes observed in the dermatoglyphic patterns have prompted researchers to search for dermatoglyphic markers which can help in the early diagnosis of disease. The present research is undertaken to compare the finger print patterns of children suffering from acute leukemia to those who are not. The study attempts to explore the value of dermatoglyphics as a screening test tool to detect leukemia in high risk groups at an early age.

The fingerprints patterns have been utilized in methodological studies and are highly individualistic. There are three types of finger patterns i.e., arch, where no triradius is found, loop with one associated triradius and most complex pattern is the whorl pattern with two triradii. Palm flexion creases were classified as normal, simian line, and sydney line. Simian line is a single transverse palm crease formed by fusion of the proximal and distal palm creases². Sydney line is formed by extension of the proximal transverse palm crease to the ulnar border of the hand³. There have been a number of apparently conflicting studies on the fingerprints and handprints of patients with leukemia, which suggests that the dermatoglyphics of children with acute leukemia deviate fairly consistently from normal. A large epidemiological study has shown a slight but significant increase of malignancies in child-age and adult relatives of children suffering from ALL^{4,5}. In another study, some unusual creases were found in more than 50% of children suffering from malignant neoplasia. Since fathers as well as mothers of the patients showed significantly higher frequencies of unusual creases, the phenomenon seems to be a familial one⁶.

Material and Methods

Dermatoglyphics was performed on 126 patients of ALL and 50 patients of AML registered at Pt. B.D. Sharma University of Health Sciences, Rohtak during 2008-2012. Dermatoglyphic analysis of normal person (control group) was done for comparing with patients of ALL, AML and control. Prints of digits and palm were taken by black inkpad method⁷. Other methods include an inkless method using sensitizing fluid, adhesive tape, powder and carbon paper. Dermatoglyphic prints were taken in two steps i.e., finger printing and palm printing. Percentage frequency of arch, loop and whorl pattern and atd angle was calculated in both patients of acute leukemia and control group. Palmer creases were noted as normal, simian and sydney creases. Atd angles were measured between 30-60 both in patients and normal individuals. T-test and z-test were used to find out the statistical significance.

Results and Discussion

In present study, dermatoglyphics was performed on 126 patients of ALL and 50 patients of AML. Dermatoglyphic analysis of equal no of normal persons was done to compare with patients. Patients and normal individuals were divided into two groups children (<15 years) and adults (>15 years). Analysis of finger prints in AML individual digits revealed that the frequency of loops was lower for thumb, index, and little fingers, while the frequency of whorls was higher in all except the middle finger in cases when compared to controls. The number of arches was higher in the index finger of the cases when compared to controls (table-1).

Table-1
Finger print patterns among AML Cases and Controls

Pattern→ Digits ↓	Loops		Whorls		Arches	
	Cases	Control	Cases	Control	Cases	Control
Thumb	50	60	38	28	8	9
Index finger	44	64	42	26	14	10
Middle finger	68	82	29	37	7	8
Ring finger	66	44	55	18	3	6
Little finger	36	72	36	27	4	9
Total	264	322	200	136	36	42

Percentage frequency of fingertip patterns in children and adults ALL cases and controls were compared by z-test. Whorl pattern type had higher frequency in patients. The difference was statistically significant at $p < 0.001$. Ulnar loop and arch had higher frequency in normal children. The differences were statistically significant at $p < 0.01$ and $p < 0.001$ respectively (table-2).

Atd angle: Different atd angles were compared between patients and normal children by z-test. Atd angle between 36-40 of right hand had higher frequency in patients. The difference was statistically significant at $p < 0.05$. However there was no significant difference in left. Atd angles were also quantitatively compared between patients and normal children by t-test. Atd angle between 46-50 of both hands had higher value in patients. The difference was statistically significant at $P < 0.05$. However atd angle between 41-45 of both hands and range 36-40 of right hand had higher frequency in normal children. The difference was statistically significant at $p < 0.05$. Highly significant ($p < 0.001$) difference was observed when means of all atd angles of both hands were compared (table-3).

Table-2

Percentage frequency of fingertip patterns in children and adults ALL cases and control

Pattern	Children	Control	Adults	Control
Whorl**	48	37.6	59.2	35.2
Ulnar loop*	46.2	53.7	39.6	57.8
Radial loop	1.4	0.4	1.1	2.5
Arch**	4.4	8.3	0	4.5

**Significant by z-test at $p < 0.001$, *Significant by z-test at $p < 0.01$.

Different atd angles were compared between patients and normal adults by z-test. Atd angle between 46-50 of both hand had higher frequency in patients. The difference was statistically significant at $p < 0.01$ while atd angle between 36-40 of both hands was significantly higher in normal adults at $p < 0.05$. Atd angles were also quantitatively compared between patients and normal adults by t-test. Atd angle between 46-50 of left hand had higher value in patients. The difference was statistically significant at $P < 0.05$. Highly significant ($p < 0.001$) difference

was observed when means of all atd angles of both hands were compared (table-4).

Table-3

Quantitatively analysed atd angles of both hands of patients of acute lymphocytic leukemia (ALL) and normal children

Palm	Acute Leukemia (mean±SD)	Normal group (mean±SD)
Right*	42.1224+5.76857	37.9388+2.69574
Left*	44.6400+6.41032	37.7400+2.39736

*highly significant at $P < 0.001$.

Table-4

Quantitatively analyzed atd angles of both hands of adults of acute lymphocytic leukemia (ALL) and normal adult

Palm	Patients (mean±SD)	Normal adults (mean±SD)
Right***	44.1923+4.16672	37.2692+2.01112
Left***	44.24146+4.06778	37.68971+0.34777

***highly significant by t-test at $p < 0.001$

Palmer crease: Dermatoglyphic analysis of handprints revealed normal, simian and sydney creases in patients as well as in normal adults (figure-1 and 2). Normal palmer creases were found in 66.7% patients and in 88.3% normal adults. Frequency of simian creases was 18.5% and 4.2% in patients and normal adults respectively. Sydney creases were found in 14.8% patients and in 7.5% normal adults. The frequencies of different palmer creases were compared between patients and normal adults by z-test. Simian crease had higher frequency in patients. The difference was statistically significant at $p < 0.01$ (table-5).

Table-5

Percentage frequencies of palmer creases in adults of acute lymphocytic leukemia (ALL) and normal adults

Palm creases	Patients	Normal
Normal	66.7	88.3
Simian**	18.5	4.2
Sydney	14.8	7.5

**Significant by z-test at $p < 0.01$



Figure-1
Palm prints of patients having Sydney crease and atd angle



Figure-2
Palm prints of patients having Simian crease and atd angle

Discussion: The present research studies the comparative differences in finger print patterns between the cases and controls. The study suggests that the frequency of loops was lower in children suffering from ALL when compared to controls and the frequency of whorls was higher among the cases than controls. Although the distribution of finger print pattern varies in different population groups, loops were reportedly present in around 65%, whorls in around 25% and arches in around 7% individual worldwide⁸.

The emerging association between certain combinations of dermatoglyphic traits and specific chromosome aberrations quickly established a useful diagnostic and an integral part of the medical diagnostic. There have been a number of studies on the fingerprints and hand prints of patients with leukemia which suggests that the dermatoglyphics of patients with leukemia deviate fairly consistently from normal^{3,9}. In the present study,

dermatoglyphic analysis was done to find out the etiology of acute leukemia and to determine whether any association exists between dermatoglyphics and acute leukemia. Significant differences were observed in various parameters of dermatoglyphics i.e. Fingerprints pattern, Palmer creases and atd angle range in hands of patients and normal person. Dermatoglyphic analysis of fingertips revealed four types of patterns i.e. whorl, ulnar loop, radial loop and arch pattern in patients as well as in normal person. In the present study, children and adult patients of acute leukemia had significantly ($p < 0.001$) increased frequency of whorl pattern. Rott and workers have reported increased frequency of whorls on fingertip in Noonan syndrome¹⁰. Turner syndrome was predominated by whorls, although the pattern frequency depends on the particular chromosomal abnormality¹¹. Ulnar loop had higher frequency ($p < 0.001$) in normal children and adults in the present study. Jullan and Verbow have reported

significantly higher frequency of ulnar loop in normal children¹².

In the present study, dermatoglyphic analysis of handprints revealed three types of palmer creases i.e. normal, simian and sydney creases in patients as well as in normal person. Children with ALL had significantly higher frequency of simian ($p < 0.01$) and sydney crease ($p < 0.05$). Adult patients had significantly increased frequency of simian crease ($p < 0.01$). Patients have a significantly increased frequency of abnormal palmer creases in several studies^{1,9,13}. Wertelecki and workers have reported significantly ($p < 0.001$) increased frequency of both type of creases in children of ALL⁹. Higher frequency of simian crease was reported in children by Purvis smith and workers³. The frequency of palmer creases (simian plus sydney) in childhood ALL was significantly different from the control ($p < 0.0001$)⁵. Atd angle of patients of ALL was calculated. The difference was significant at $p < 0.05$. Although there are no reports available on association atd angles with leukemia, Rosner and workers have reported higher proportion of atd angle more than 50° in children with acute lymphocytic leukemia¹⁴.

Conclusion

The frequency of loops is lower in children suffering from acute leukemia when compared to controls and the frequency of whorls is higher among the cases than controls. Quantitatively, atd angle between 46-50 of both hands was significantly higher ($p < 0.05$) in children as well as adult patients. The presence of statistically significant frequency of whorl pattern, and simian crease in patients of acute leukemia indicate an association of dermatoglyphics with acute leukemia. The findings of the study are suggestive of a possible trend and an association of the finger print patterns with ALL in children. Further extended studies on larger cohorts are advocated to confirm the findings of our study.

Acknowledgment

We would like to express gratitude to Dr. Sunita Singh Prof. Deptt. of Pathology, Pt. B. D. Sharma University of Health Sciences, Rohtak for the cooperation and help in collecting data. I express my sincere thank to UGC for funding this project. The authors are grateful to University Grant Commission (UGC) New Delhi, India, for financial assistance.

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