

Dermatoglyphic Patterns and Their Co-Relation with Skeletal Malocclusions

Dr. Divyashree¹, Dr. Suhas.A.S², Dr. Sharmada.B.K³, Dr. Tayeepriyanka⁴

¹(Department Of Orthodontics And Dentofacial Orthopedics, Dayanandsagar College Of Dental Sciences, India)

²(Department Of Orthodontics And Dentofacial Orthopedics, Vydehi College Of Dental Sciences, India)

³(Department Of Orthodontics And Dentofacial Orthopedics, Dayanandsagar College Of Dental Sciences, India)

⁴(Dental Surgeon, Bangalore, India)

Abstract:

Background: Dermatoglyphics Is A Sensitive Indicator Of Intrauterine Anomalies And Is Considered As A Window Of Congenital Abnormalities And Genetic Disorders. As Surface Characteristics Of The Skin, Epithelium Of Primary Palate And Enamel Originate From, The Ectoderm And Both Develop At The Same Time Of Intra-Uterine Life, Any Damage To The Tooth Is Reflected In Dermatoglyphics. Thus The Aim Of The Study Was To Determine The Relation Between Dermatoglyphics And Malocclusion.

Materials And Methods: 40 Individuals Cephalometrically Confirmed As Skeletal Class I And Skeletal Class II Based On Downs And Steiner Analysis Between The Age Group Of 15 – 30 Years Were Selected. . Fingerprint Patterns Of The Study Subjects Were Recorded Using Ink And Paper Method And The Finger Prints Were Studied To Find The Frequency Of Occurrence Of Different Types Of Patterns.

Result And Conclusion: The Pattern Distribution Is Significantly Different Between Both The Groups. Increased Frequency Of Whorls Were Found Both In Right & Left Hands In Skeletal Class I Pattern Group. Increased Frequency Of Ulnar Loops Was Found In The Right Hand Of Skeletal Class II Pattern Group.

I. Introduction

Lines On The Hands Have Since Long Been A Topic Of Interest. Ridges Present On The Skin Of Palm And Sole, Unique To Every Individual Have Been Used For Personal Identification. “Dermatoglyphics” As Coined By Cummins And Mildo¹ Refers To The Study Of The Intricate Dermal Ridge Configurations On The Skin Covering The Palmar And Plantar Surfaces Of Hand And Feet Which Has Been Investigated Extensively By Many Reaserchers^{2,3,4}. Etymologically This Term Is Harmonious Blend Of Two Words Derma – Skin, Glyphe - Carve⁵.

Dermatoglyphics Is A Sensitive Indicator Of Intrauterine Anomalies And Is Considered As A Window Of Congenital Abnormalities And Genetic Disorders.⁶ In Recent Times The Diagnosis Of Some Illness Can Now Be Done On The Basis Of Dermatoglyphic Analysis Alone, And Several Dermatoglyphic Researchers Claim A High Degree Of Accuracy, In Their Prognostic Ability, From The Hand Features.⁷

In Dentistry, Data Is Less But Of Great Significance. Oral Diseases Such As Oral Cancer, Oral Submucous Fibrosis, Bruxism, Dental Caries, Skeletal Malocclusions, Dental Fluorosis, Oral Clefts Etc Show Characteristic Dermatoglyphic Patterns With A Sure Scientific Basis, Which Is Explained By Unison Embryological Origin Of Oral And Dermatoglyphic Patterns Along With Same Time Of Foetal Development Around 7th To 12th Week Of Intrauterine Life. Abnormalities In These Areas Are Influenced By A Combination Of Hereditary And Environmental Factors, But Only When The Combined Factors Exceed A Certain Level, Can These Abnormalities Be Expected To Appear. This Threshold Theory Has Been Advanced By The Studies Of Carter (1969)^{8,9} And Matsunaga (1977)^{9,10} The Surface Characteristics Of The Skin, Epithelium Of Primary Palate And Enamel Originate From The Same Layer, The Ectoderm During Embryogenesis. As Both Develop At The Same Time Of Intra-Uterine Life, Any Damage To The Tooth Is Reflected In Dermatoglyphics¹¹.

Dermatoglyphics Has Been Used To Predict And Compare Class I, Class II Div1, Div2 & Class III Malocclusion, Which Showed Increased Arches In All Experimental Groups.¹² This Study Was Designed To Identify And Measure The Qualitative Parameters Such As Loops, Whorls & Arches And Quantitative Parameters Such As Ridge Count Of Individual Fingers Of Both Hands And Total Finger Ridge Count In Skeletal Class I & Class II Patterns.

II. Methodology

The Sample Consisted Of 20 Individuals Cephalometrically Confirmed As Skeletal Class I And 20 Individuals Confirmed As Skeletal Class II Between The Age Group Of 15 – 30 Years Inclusive Of Both

Genders Were Selected. After An Informed Consent, Detailed Case History Was Recorded With Complete Intraoral Examination. Malformation Syndromes Associated With Maxilla And Mandible, Patients With Facial Asymmetry, Acquired Skeletal Defects, Congenital Or Acquired Deformities Of The Fingers And Palms, Amputated Fingers, Patients With Skin Diseases, With Wound Or Scars On The Fingers Were Excluded From The Study. Skeletal Malocclusion Was Assessed By Taking Lateral Cephalogram Following Radiation Protection Protocol Followed By Cephalometric Analysis Such As Steiners, Downs, Tweeds Analysis And Wits Appraisal.

Dermatoglyphic Patterns Was Collected Using Ink Method With The Black Duplicating Ink Manufactured By Kores (India) Limited. Fingerprint Patterns Of The Study Subjects Were Recorded By Applying Duplicating Ink On The Distal Phalanges Of All The Ten Fingers And The Fingerprint Patterns Were Recorded By Using Rolling Impression Technique On A Non-Blotting A4 Size Blank White Recording Paper. Data Collected Was Analyzed For Various Dermatoglyphic Patterns Such As Arches, Loops And Whorls. Loops Can Be Defined As Radial Or Ulnar. Ulnar Loops Open Towards The Little Finger And Radial Loops Open Towards The Thumb. A Triradius Is A Point Of Convergence For Three Regions That Separate Almost Parallel Ridges. Loops Have One Triradius (On The Thumb Side If Ulnar And Towards The Little Finger If Radial) And Whorls Have Two. Arches Are Formed By A Succession Of More Or Less Parallel Ridges, Which Traverse The Pattern Area And Form A Curve That Is Concave Proximally. Arches Lack A Triradius. Some Basic Patterns Can Be Subdivided. For Example, An Arch May Be Plain Or Tented, And A Whorl May Be Simple, Doublelooped, Central-Pocketed, Or Accidental, Depending Upon The Internal Structure Of The Whorl Pattern⁵.

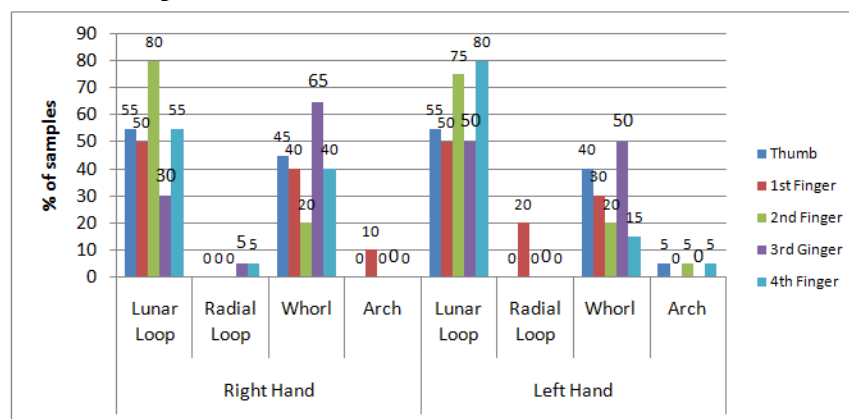
Ridge Count Is Made By Drawing A Line From The Triradius To The Center Of The Pattern And Determining The Number Of Intersected Ridges Between These Two Points. Arches Are Defined As Having A Ridge Count Of Zero. The Ridge Count Of A Whorl Consists Of The Higher Of The Two Counts. A Total Ridge Count (TRC) Is The Summation Of The Ridge Count For All 10 Fingers. The Total Score For All Ten Fingers Averages About 145 In Males And 127 In Females. This Sum Has Been Shown To Be Completely Under Genetic Control.⁵

III. Results

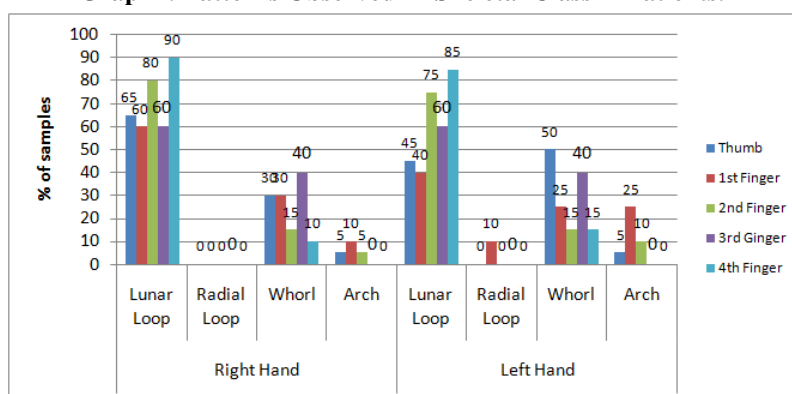
Comparison Of Dermatoglyphic Data Was Done Between Skeletal Class II And Class I Subjects. The Obtained Data Was Calculated And Subjected To Relevant Statistical Analysis Such As Chi-Square Test To Test For Association Between Patterns And Malocclusion Groups And Student's "T" Test To Test For Significance For Individual Finger And Total Number Of Ridges.

Increased Frequency Of Whorls Were Found Both In Right & Left Hands In Skeletal Class I Pattern Group. Increased Frequency Of Ulnar Loops Were Found In The Right Hand Of Skeletal Class II Pattern Group (Graph:1,2).

Graph1: Patterns Observed In Skeletal Class I Patients.



Graph2: Patterns Observed In Skeletal Class II Patients.



Statistically Significant Association ($P > 0.05$) Was Found In 4th Finger Of The Right Hand Wherein More Lunar Loops Were Found In Class II Malocclusion (Table1).

Table 1: Statistical Analysis Of Patterns – Test For Association Between Patterns And Malocclusion Groups:

Hand	Finger	X ²	P-Value
Right	Thumb	0.417	0.519
	1st Finger	0.468	0.792
	2nd Finger	0.173	0.677
	3rd Finger	2.506	0.113
	4th Finger	6.144	0.013*
Left	Thumb	0.902	0.342
	1st Finger	1.131	0.568
	2nd Finger	0.143	0.705
	3rd Finger	0.404	0.525
	4th Finger	0.173	0.677

*Denotes Significant Association

The Difference In Mean No. Of Ridges Between Class I And Class II Malocclusion Was Found To Be Significant In Right Hand 2nd Finger ($P < 0.05$), Right Hand 3rd Finger ($P < 0.05$), Right Hand 4th Finger ($P < 0.01$), Left Hand 1st Finger ($P < 0.01$), Left Hand 2nd Finger ($P < 0.05$), Left Hand 3rd Finger ($P < 0.01$) And Left Hand 4th Finger ($P < 0.05$) As Seen In Table 2.

Table 2: Comparison of Mean No. Of Ridges – Test For Significant Difference Between The Two Malocclusion Groups (At Finger-Level)

Hand	Finger	Mean Difference	T	P-Value
Right	Thumb	2.550	1.672	0.103
	1st Finger	2.650	1.487	0.145
	2nd Finger	3.150	2.426	0.020*
	3rd Finger	2.900	2.195	0.034*
	4th Finger	3.150	2.940	0.006*
Left	Thumb	1.200	0.646	0.522
	1st Finger	5.200	3.157	0.003*
	2nd Finger	3.700	2.193	0.034*
	3rd Finger	3.550	2.914	0.006*
	4th Finger	2.900	2.422	0.020*

*Denotes Significant Difference

Higher Mean Ridges Are Found In Class I Malocclusion Compared To Class II Malocclusion And The Difference Between Them Is Found To Be Statistically Significant ($P < 0.01$).

Table 3: Comparison Of Total No. Of Ridges Between The Two Malocclusion Groups:

Malocclusion	Mean	Std Dev	SE Of Mean	Mean Difference	T	P-Value
Class I	138.80	26.93	6.02	30.950	2.991	0.005*
Class II	107.85	37.64	8.42			

*Denotes Significant Difference

IV. Discussion

Genetics Is Concerned With The Inheritance Of Traits And Also With The Interaction Of Genes And The Environment. Probably The Most Famous Example Of Genetic Trait In Humans Passing Through Generations Is The Pedigree Of Hapsburg Jaw¹³. As Defined By Andrews Malocclusion Is A Significant Deviation From What Is Defined As Normal Or Ideal Occlusion. Many Components Are Involved In Normal Occlusion. The Most Important Are Size Of The Maxilla, Size Of Mandible, Ramus And Body, The Size And Morphology Of Tooth, Number Of Teeth Present And Soft Tissue Contour.¹⁴

A British Anthropologist, Sir Francis Galton Began His Observations Of Fingerprints For Identification In The 1880's. In 1892, He Published His Book, "Fingerprints" Which Included The First Classification System For Fingerprints.¹⁵ A Dermatoglyphic Study Was Conducted By Kharbanda O.P. Et Al (1982)¹⁶ On Twenty Five North Indian Males With True Mandibular Prognathism And Compared This With The Dermatoglyphic Findings Of Individuals With Class I Occlusion And Craniofacial Pattern. They Concluded That The Craniofacial Skeletal Class III Pattern Is Associated With Increase In Arches And Ulnar Loops At The Expense Of Whorls On All Digits Except Digit II And Also Increased Frequency Of Whorls And Radial Loops.

This Study Was Designed To Analyze The Palmar Dermatoglyphic Patterns In Patients With Class I And Class II Malocclusion Classified Based On Downs And Steiners Analysis And To Confirm Genetic Contribution In The Etiology Of Malocclusion. The Pattern Distribution Is Significantly Different Between Both The Groups. Increased Frequency Of Whorls Were Found Both In Right & Left Hands In Skeletal Class I Pattern Group. Increased Frequency Of Ulnar Loops Was Found In The Right Hand Of Skeletal Class II Pattern Group Which Is In Agreement With The Study Done By Dr Sumedha Rajput Et Al¹⁴, Reddy Et Al¹⁷ And Shweta Tiwari Et Al¹⁸. Significantly Higher Mean Ridges Are Found In Class I Malocclusion Compared To Class II Malocclusion. Statistically Significant Association ($P>0.05$) Was Found In 4th Finger Of The Right Hand Wherein More Lunar Loops Were Found In Class II Malocclusion.

V. Conclusion

Finger Prints Are Unique And Unalterable Tool For Personal Identification And Genetic Research. Deviation In Finger Print Pattern Indicates Genetic Difference Between Groups Being Compared. There Is A Definitive Correlation Between Dermatoglyphics And Skeletal Malocclusion. There Was Reduced Frequency Of Whorls Seen In Subjects Having Class II Malocclusion. This Early Detection Of Malocclusion Using Dermatoglyphics During The Growth Periods Of A Developing Malocclusion Would Serve As A Great Aid In Intercepting The Malocclusion Before Attaining A Severe Form.

Reference

- [1] Cummins And Mildo, The Topographic History Of The Volar Pads (Walking Pads) In The Human Embryo Embryol Carnig Inst(Wash) 1929;20:103
- [2] Metin Atasu And Serap Akyitz: Bilateral Absence Of Maxillary And Mandibular Second Premolars. A Clinical, Genetic And Dermatoglyphic Study. J Of Clin Ped Dent 1994 ,18
- [3] Sharma VP, Gupta DS And Kharbanda OP.:Dermatoglyphic Evaluation Of Retrognathism. J Ind Dent Asso 1980 ; 52: 186
- [4] Valentine GH. : Dermal Ridge Patterns, Dermatoglyphics. An Introduction For Clinicians, 2nd Edition, Williams Heineman Medical Books Ltd.,(London 1971 ; 47.7. Alter M: Medical Significance Of Dermatoglyphics. Medicine 1966) 46, 55.
- [5] Richard C. Gibbs, Fundamentals Of Dermatoglyphics Arch Derm(1967:96).
- [6] Blanka Schaumann, Milton,Alter. Dermatoglyphics In Medical Disorders. (Springer- Verlage. New York, Heidel Berg, Berlin, 1976)
- [7] In : Gangani, Editors. Human Genetics. (Churchill Livingston Publications, 2nd Edn.)
- [8] Carter CO. Genetics Of Common Disorders. Brit Med Bull 1969;25:2-57.
- [9] Noboru Kanematsu Et Al . Study On Abnormalities In The Appearance Of Finger And Palm Prints In Children With Cleft Lip, Alveolus, And Palate. J Max Fac Surg 1986;14
- [10] Matsunaga E. Hereditary Factors In Congenital Malformations. Igakunoayumi 1977;103:910-5.
- [11] Balgir RS. Congenital Oral Clefts And Dermatoglyphics. Isr J Med Sci 1984;20:622-4.
- [12] Reddy S; Prabahakar AR; Reddy VVS: A Dermatoglyphic Predictive And Comparative Study Of Class I, Class II, Div1, Div2 And Class III Malocclusions.: J Indian Soc Pedod Prev Dent- Mar 1997;15(1):13-9
- [13] The Heritability Of Malocclusion: Part 1—Genetics, Principles And Terminology.
- [14] Dr Sumedha Rajput Et Al. IJRID Nov.-Dec. 2014;4:6.
- [15] Latti BR, Kalburge JV. Palmistry In Dentistry. J Adv Med Dent Scie 2013;1(2):25-33.
- [16] Kharbanda O P, Sharma V P And Gupta D S. Dermatoglyphic Evaluation Of Mandibular Prognathism". J. Ind. Dent. Assoc. 1982;54: 179 -186
- [17] Reddy S, Prabhakar AR, Reddy VVS. A Dermatoglyphic Predictive And Comparative Study Of Class I, Class II, Div.1, Div.2 And Class III Malocclusions. J Indian Soc Pedod Preventive Dent 1997;15(1):13-9.
- [18] Shweta Tiwari Et Al. Dermatoglyphics And Malocclusion – Are They Related? International Journal Of Advanced Research 2014, Volume 2, Issue 6, 1097-1102;2014;2:6.