Original Article

DOI: 10.7860/JCDR/2017/26938.10410

Dentistry Section

The Relation Between Dermatoglyphics And Mesiodistal Width Of The Deciduous Second Molar And Permanent First Molar

NAVEEN KUMAR RAMAGONI[1], VINOD KUMAR[2], HAMSINI ADUSUMILLI[3], KM PARVEEN REDDY[4], NH PRAVEEN KUMAR[5]

ABSTRACT

Introduction: Dermatoglyphics is one of the important diagnostic tools used in the recent days for identification of an individual. Dermatoglyphics is the study of type of patterns present on digits, palms and foot. The mesiodistal diameter of the tooth is an important factor which reveals the tooth-bone discrepancy. Deciduous second molar and permanent first molar exhibit least degree of variation. Both the dermal ridges and the enamel layer of the tooth originate from ectodermal layer and during the same period of intrauterine life.

Aim: To determine and compare the dermatoglyphics with the mesiodistal width of the deciduous second molar and permanent first molar.

Materials and Methods: A sample of 120 child ranaged between 6-12 years were included in the study whose digital and palmer traits were recorded using ink method and the mesiodistal widths of the deciduous second molar and permanent first molar were recorded using a vernier caliper. The data was subjected to statistical analysis using unpaired t test.

Results: The 'ATD' angle was found in the range of 40˚-50˚. The loop patterns were more common followed by whorls and arch patterns. Girls expressed a greater mesiodistal diameter of deciduous second molar than boys. No significant correlation was found in between the dermatoglyphics and tooth size.

Conclusion: There was no significant correlation between the finger print patterns, 'ATD' angle and the mesiodistal diameter of the deciduous second molar and the permanent first molar.

Keywords: ATD angle, Finger prints, Tooth size

INTRODUCTION

The study of the mystery that human hand unfolds has always been fascinating from anthropologists, psychologists, writers, painters, sages to physicians [1]. The term Dermatoglyphics was coined by Cummins in 1926 who is known as "Father of Dermatoglyphics". Dermatoglyphics is a greek word which is a blend of two words 'derma' meaning skin and 'glyphe' meaning carvings [2,3]. Dermatoglyphics is the study of the epidermal ridge patterns of the digits, palms and soles [3]. The tooth size is a polygenic entity which is most commonly measured by its mesiodistal crown diameter. Mesiodistal diameter provides valuable information on human evolution and biological problems, forensic science and clinical dentistry by revealing the interrelation among populations and environmental adaptations [4]. The duration of genesis of the dermal ridges and tooth formation in the intrauterine life is around sixth-eighth week. Hence, the genetic meaning decoded during this stage can also be replicated by the dermatoglyphics [2].

The aim of this study was to assess the dermatoglyphic patterns and correlate them with the mesiodistal diameters of the maxillary deciduous second molar and permanent first molar.

MATERIALS AND METHODS

The present study was a cross sectional study which was carried out in the Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India. Prior to the commencement of the study, ethical committee clearance was obtained from the Institutional Ethical Committee. Informed consent was obtained from the parents and school authorities before the commencement of the study.

Children aged between 6-12 years with completely erupted and non-carious maxillary deciduous second molars and permanent first molars were included in the study, whereas children with any tooth anomalies, carious, fractured, eroded, restored or partially erupted maxillary deciduous second and permanent first molar were excluded and also children with trauma or skin diseases to palms were excluded.

A sample of 120 children was included in this study by using purposive sampling method and was divided into two groups. Group A included 60 girls and Group B included 60 boys.

Dermatoglyphics Pattern Recording and Interpretation

The finger and palmer prints were recorded on color coded Royal Executive bond papers using ink method stated by Cummins and Midlo [5]. Before recording the prints, children's hands were scrubbed thoroughly with soap and water to make them free from sweat, dirt and oil on the skin and were blot dried using clean white towel. The children were explained regarding the procedure clearly before recording the prints. Kore's black duplicating ink [6] was uniformly spread on the finger and palmer surfaces (both right and left hand) with a sterile cotton pellet. The palmer prints were recorded by pressing the hand on the bond paper and applying pressure on the dorsum of the hand [6]. The thumb impression was recorded separately on the side of the sheet by placing it on one lateral side and rolling it to the opposite side, as the thumb print could not be recorded properly due to its spatial orientation compared to other fingers [7]. The palmer prints obtained were analyzed by a magnifying lens (×2) for their clarity and presence of the triradii. If the landmarks were not clear, the prints were repeated. The examiner analysing 1200 digital prints and 240 palmer prints was blinded to the gender of the individuals.

Qualitative Dermatoglyphics Analysis

Sir Francis Galton [7] in 1892 classified the finger print patterns into three types loops, whorls and arches [8].

Loops: A loop is a series of epidermal ridges which enter the pattern area from one side of the digit, recurves and exits from the same side. It comprises of one core and one triradii [2,8].

Whorls: A whorl is a concentric arrangement of ridges, which consist of one core and two or more triradii. They may be simple, double looped, central pocketed or accidental [2,8].

Arches: It is the simplest ridge pattern formed by successive epidermal ridges which enter the finger from one side and exits from the other forming an arch like curve at the centre [2,8].

Quantitative Dermatoglyphic Analysis

ATD angle: It is a palmer trait that reveals the position of three triradii 'a', 't' and 'd'. 'a' and 'd' are triradii located on the distal portion of the palm at the radioulnar region of the second and fifth digits. The triradii 't' location varies from the proximal palm just distal to the wrist, to the centre of the palm. The ATD angle for each palmer print was measured by drawing two straight lines joining the triradii 'a' and 't' and the other joining 't' and 'd'. The angle thus formed was measured using a protractor [2,6].

Mesiodistal Width of molors: The mesiodistal diameter of the maxillary right and left deciduous second molar and permanent first molar were recorded placing the beaks of vernier caliper parallel to the occlusal surface at the contact points inside the child's mouth [4,9].

STATISTICAL ANALYSIS

The data was collected by using a structure proforma. Data entered in MS excel sheet and analysed using SPSS 19.0 version. Quantitative data was expressed in terms of mean and standard deviation. Qualitative data was expressed in terms of proportions. Comparison of mean and standard deviation between two groups was done by using students unpaired t-test. Association between two groups was found using Chi square test. The p-value of <0.05 was considered as statistically significant whereas, the p value < 0.001 was considered as highly significant.

RESULTS

The comparison of the 'atd' angle between boys and girls [Table/Fig-1] showed no statistically significant difference (p>0.05). Girls expressed a mean ATD angle of 45.17° (right hand) and 46.05° (left hand). Boys expressed a mean ATD angle of 44.88° (right hand) and 45.23° (left hand). Both boys and girls the left 'ATD' angle was greater than the right ATD angle. The evaluation of finger prints between both the groups [Table/Fig-2] showed no significant correlation. Both groups showed loop pattern of finger print more commonly followed by the whorl pattern and the least found was the arch pattern. The comparison of mesiodistal widths of maxillary left second deciduous molar and right and left permanent first molar [Table/Fig-3] showed no significant difference except the right maxillary second deciduous molar which showed a significant difference between both the groups. The comparison of right and left ATD angle and mesiodistal width of maxillary deciduous second molar and permanent first molar in boys and girls [Table/Fig-4,5] revealed no statistically significant difference. However, no statistically significant correlation was found between the 'atd' angle and the finger print patterns [Table/Fig-6,7] among both the groups.

DISCUSSION

The basis for considering the relation between the dermatoglyphic patterns and the tooth size was due to the fact that both the epidermal ridges and the enamel layer of the teeth are formed from the same embryonic tissue (ectoderm), during the same period around sixths to eighth week of intrauterine life and hence, any deformity occurring during this instinct of time can affect both epidermal ridges as well as enamel of tooth [5,7,10].

The maxillary deciduous second molar and permanent first molars were considered in this study as they exhibited least variability in relation to mesiodistal width of the tooth [11]. Tejero A et al., stated that the mesiodistal diameter of the tooth provides a valuable information regarding the alignment and occlusion of the tooth in the arch as it determines the dental-bone discrepancy [12].

In the present study, 1200 finger prints of 120 children were analyzed and found that loop pattern was more common followed by whorl and arch patterns but not statistically significant. These results were in accordance with the studies done by Madan N et al., [7]. Atasu M [13]. Sharma A and Somani R [14]. and Ahmed RH et al., [15], who reported that caries free children expressed more amount of loop patterns followed by whorls and arches.

In the present study, 240 palmer prints of 120 children were analysed and found that the ATD angle exhibited was in the range of 400 to 500. Girls expressed a mean ATD angle of 45.17° (right hand) and 46.05° (left hand). Boys expressed a mean ATD angle of 44.88° (right

Atd angle	Groups	Number	Mean number	FF Deviation	t	df	p	Inference
Left ATD	Girls	60	46.05°	6.99	0.721	118	0.473	Not Significant
	Boys	60	45.23°	5.32			(>0.05)	
Right ATD	Girls	60	45.17°	6.37	0.261	118	0.795	Not Significant
	Boys	60	44.88°	5.51			(>0.05)	

[TableFig-1]: Comparison of ATD angle between boys and girls.

Patterns	Groups	Number	Mean (Number of patterns)	FF Deviation	t	df	p	Inference
Arch	Girls	60	1.05	1.87	-0.416	118	0.678	Not Significant
	Boys	60	1.18	1.63			(>0.05)	
Whorl	Girls	60	4.10	3.14	0.114	118	0.909	Not Significant
	Boys	60	4.03	3.25			(>0.05)	
Loop	Girls	60	4.85	2.99	0.159	118	0.874	Not significant
	Boys	60	4.77	2.74			(>0.05)	

[TableFig-2]: Evaluation and comparison of finger prints patterns in boys and girls.

Tooth	Groups	Number	Mean (number)	FF Deviation	t	df	p	Inference
55	Girls	60	9.43	0.88	2.484	118	0.014	Significant
	Boys	60	9.08	0.69			(<0.05)	
65	Girls	60	9.33	0.94	1.285	118	0.201	Not Significant
	Boys	60	9.12	0.84			(>0.05)	
16	Girls	60	10.08	0.92	1.330	118	0.186	Not significant
	Boys	60	9.86	0.86			(>0.05)	
26	Girls	60	9.97	0.82	1.539	118	0.127	Not significant
	Boys	60	9.75	0.72			(>0.05)	

[TableFig-3]: Evaluation and comparison of mesiodistal width of maxillary deciduous second molar and permanent first molar in boys and girls.

Left ATD				Right ATD		
Tooth number	Pearsons correlation (r)	p	Inference	Pearsons correlation (r)	p	Inference
55	-0.9	0.49	Not significant	-0.03	0.79	Not significant
56	-0.15	0.254	Not significant	-0.04	0.75	Not significant
16	-0.16	0.19	Not significant	-0.16	0.21	Not significant
26	-0.11	0.37	Not significant	-0.15	0.23	Not significant

[TableFig-4]: Comparison of ATD angle and mesiodistal width of maxillary deciduous second molar and permanent first molar in girls.

Left ATD				Right ATD		
Tooth number	Pearsons correlation (r)	p	Inference	Pearsons correlation (r)	p	Inference
55	-0.13	0.29	Not tsignificant	-0.01	0.9	Not significant
56	-0.02	0.84	Not significant	-0.02	0.83	Not significant
16	-0.09	0.47	Not significant	-0.04	0.73	Not significant
26	<0.001	1	Not significant	0.14	0.23	Not significant

[TableFig-5]: Comparison of ATD angle and mesiodistal width of maxillary deciduous second molar and permanent first molar in boys.

Left ATD				Right ATD		
Parameters	Pearsons correlation (r)	p	Inference	Pearsons correlation (r)	p	Inference
Arches	-0.018	0.889	Not significant	0.124	0.344	Not significant
Whorls	0.143	0.275	Not significant	0.159	0.225	Not significant
Loops	-0.139	0.289	Not significant	-0.245	0.059	Not significant

[TableFig-6]: Correlation between finger pattern and ATD angles in girls.

Left ATD				Right ATD		
Parameters	Pearsons correlation (r)	p	Inference	Pearsons correlation (r)	p	Inference
Arches	0.094	0.473	Not significant	0.070	0.593	Not significant
Whorls	-0.150	0.254	Not significant	-0.002	0.988	Not significant
Loops	0.133	0.309	Not significant	-0.029	0.827	Not significant

[TableFig-7]: Correlation between finger pattern and ATD angles in boys.

hand) and 45.23˚ (left hand). Both boys and girls the left ATD angle was greater than the right ATD angle. This finding was in contrast to the findings of Atasu M [13] and Ahmed RH et al., [15] who found that caries free children had an ATD angle >56˚.

The present study compared the 1200 finger print patterns and 240 palmer patterns and found that the most expressed loop pattern had a mean ATD angle of 44.4˚, the medium expressed whorls had a mean ATD angle of 46.2˚ and the least expressed arch pattern had 46.5˚.

In the present study, on comparing the mesiodistal diameter of the maxillary deciduous second molars (55,65) and permanent first molars (16, 26), it was found that girls had a greater mesiodistal diameter compared to the boys. This finding was in contrast to Lysell L and Myrberg N [11] who stated that boys expressed a greater mesiodistal diameter of tooth than girls in both deciduous and permanent dentition. The mesiodistal diameter of the maxillary right deciduous molar had a statistically significant correlation between both the groups, whereas there was no statistically significant correlation between both the groups for the mesiodistal width of the maxillary left deciduous second molar and right and left maxillary permanent first molars. It means that right deciduous second molar expressed sexual dimorphism. There was no correlation between the mesiodistal diameters of deciduous second molars and the permanent first molars. This finding was in accordance to Lysell L and Myrberg N [11]. However, it was in contrast to Tahira H et al., [4] who found a correlation between the mesiodistal widths of the deciduous second molar and permanent first molar in Pakistani population. Bravo N et al., [16] conducted a cross-sectional descriptive study in 101 Spanish children and found that there was a significant correlation between the mesiodistal diameter of deciduous second molar and the permanent first molar [16].

In the literature, no study was found comparing the dermatoglyphics and the mesiodistal diameter of deciduous second molar and permanent first molar. This was the first study to compare both these parameters. In this study, ATD angle and the mesiodistal diameters of the deciduous second molars and the permanent first molars when compared found no statistically significant correlation. No statistically significant correlation was found with the comparison of finger print patterns and the mesiodistal diameter of the deciduous second molars and the permanent first molars. These parameters can be useful in detecting the tooth size discrepancies in the arch by just analyzing the dermatoglyphic patterns, which can be a less time consuming and children friendly method to assess the tooth discrepancies.

LIMITATION

A small sample size is one of the limitation of this study. Further studies with a larger sample size are needed to analyze the relation between the dermatoglyphics and mesiodistal width of the maxillary deciduous second molars and permanent first molars.

CONCLUSION

In this study maxillary right deciduous second molar expressed sexual dimorphism. There was no significant correlation between the finger print patterns, ATD angle and the mesiodistal diameter of the deciduous second molar and the permanent first molar.

REFERENCES

[1] Padma KB, Bhumika KB, Aruna CN, Sandhya C, Nithin NB. Dermatoglyphics- A new diagnostic tool in detection of dental caries among deaf and mute children. In Journal of Clinical Dental Science. 2011 Nov; 2(4):80-84.
[2] Saumya N, Dheera C, Suleman AK, Rahul KS, Nikita J, Pragati N, et al. The mystery of handprints: Assessment and correlation of dermatoglyphics with early childhood caries. A case control study. J Clin Diagn Res. 2015 Oct;9(10):44-48.
[3] Neha M, Kalpana B, Dayashankar RJB, Radhika C. Comparison of dermatoglyphic traits and dental anomalies associated with cleft lip or cleft lip and palate patients with normal healthy children. J Indian Soc Pedod Prev Dent. 2013; 31(4):260-64.
[4] Tahira H, Ghulam R, Fatima TZ, Umar H, Saira B. The relation between the mesiodistal crown widths of the deciduous second molars and the permanent first molars. Pak Oral Dental J. 2016; 36(1):71-74.
[5] Anitha C, Sapna K, Sunil RN, Kumar NC, Preetha P. Dermatoglyphics: A genetic marker for early childhood caries. J Indian Soc Pedod Prev Dent. 2015; 32(3):220-24.

[6] Jatti D, Kantraj YB, Nagaraju R. Role of dermatoglyphics in malignant and potentially malignant disorders of the oral cavity: A cross-sectional study. J Indian Acad Oral Med Radiol. 2014; 26:379-84.
[7] Madan N, Rathnam A, Bajaj N. Palmistry: A tool for dental caries prediction! Indian J Dent Res. 2011; 22(2):213-18.
[8] Garg V, Astekar M, Sapra G, Agarwal A, Agarwal A, Saxena R. Dermatoglyphics in oral and systemic diseases. J Dent Sci Oral Rehab. 2015; 6(3):109-14.
[9] Jensen E, Kai-Jen Yen P, Moorrees Cf, Thomsen So. Mesio distal diameters of the deciduous and permanent teeth in individuals. J Dent Res. 1957;36(1):39-47.
[10] Boggula RMR, Singaraju GS, Roy ET, Supraja G. A comparative study of dermatoglyphics in individuals with normal occlusions and malocclusions. J Clin Diagn Res. 2013; 7(12):3060-65.
[11] Lysell L, Myrberg N. Mesiodistal tooth sizes in the deciduous and permanent dentitions. Eur J Orthod. 1982;4:113-22.
[12] Tejero A, Plasencia E, Laniza A. Estudiobiometrico de la denticon temporal. Rev Esp Ortod. 1991;21:167-79.
[13] Atasu M. Dermatoglyphic findings in dental caries: A preliminary report. J Clin Pediatr Dent. 1998; 22:147-49.
[14] Sharma A, Somani R. Dermatoglyphic interpretation of dental caries and its correlation to salivary bacteria interactions: An in vivo study. J Indian Soc Pedod Prev Dent. 2009;27:17-21.
[15] Ahmed RH, Mohammed IA, Rania MH, Noura RH. Dermatoglyphic study on patients with dental caries restored with dental fillings and its correlation to apoptosis induced by dental fillings. Nat Sci. 2010;8:54-57.
[16] Bravo N, Facal M, Maroto M, Barberia E. Relationship between mesiodistal crown diameters of permanent first molars and deciduous second molars. EJPD. 2010; 11(3):115-21.

PARTICULARS OF CONTRIBUTORS:
1. Professor and Head, Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India.
2. Professor, Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India.
3. Postgraduate, Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India.
4. Senior Lecturer, Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India.
5. Senior Lecturer, Department of Paedodontics and Preventive Dentistry, Navodaya Dental College and Hospital, Raichur, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Naveen Kumar Ramagoni,
Professor and Head, Department of Paedodontics and Preventive Dentistry,
Navodaya Dental College and Hospital, Raichur-584102, Karnataka, India.
E-mail: ramagoni14@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jan 29, 2017**
Date of Peer Review: **Mar 22, 2017**
Date of Acceptance: **Jul 15, 2017**
Date of Publishing: **Aug 01, 2017**