

A Comparative Evaluation between Dermatoglyphic Patterns and Malocclusion of Siblings in Visnagar

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Abstract

Background: The aim of this study was to compare and evaluate dermatoglyphic patterns and malocclusion of siblings in Visnagar. This was an observational comparative cross-sectional study. **Materials and Methods** Families with two Children were selected. Occlusion was examined by angle's classification with photographs Fingerprints of the right and left distal phalanges and palms were recorded using ink and white paper. The finger print pattern was analyzed for different patterns such as whorls, loops, arches, and ATD angle. The patterns were compared among siblings, later correlated with malocclusion. Right and left ATD angles were compared using paired *t*-test and correlation of ATD angle between siblings was assessed using Pearson regression test. **Results:** There is statistically no difference between different malocclusion and between dermatoglyphics and malocclusion among siblings. There is statistically no difference between different malocclusion and the ATD angles. **Conclusions:** There is no correlation between dermatoglyphic patterns and malocclusion among siblings. However, ATD angle can be correlated among siblings but it does not have any correlation with malocclusion.

Keywords: Dermatoglyphics, Malocclusion, ATD angle.

INTRODUCTION

Every human has their own characteristic pattern which can be exhibited as dermal ridges in the palm, hands, and feet.^[1] Dermatoglyphics deals with the study of ridge patterns on fingertips and palms.^[2] Studies on dermatoglyphics shown great resemblance among monozygotic twins and strong inheritance among siblings.^[3] Hereditary and environmental factors lead to deviation from normal occlusion that may set off specific features in fingerprint thus reflecting the changes in dermal pattern.^[4]

This study aimed to compare and evaluate dermatoglyphic patterns and malocclusion among siblings. Objectives were to compare and evaluate dermatoglyphic patterns between siblings and correlate them with malocclusion.

MATERIALS AND METHODS

This is an observational comparative cross-sectional study in which families with two children were selected from Visnagar, Gujarat.

Inclusion criteria

- 7–12 years of age children
- 1st permanent molars should be erupted.

Exclusion criteria

- Patient treated with the orthodontic treatment
- Patients with burns or lacerations on fingers and palms.

15 Children with their siblings who are with mixed dentition were selected and divided in two groups: Group 1 – Elder siblings and Group 2 – Younger siblings. Occlusion was examined by angle's classification with photographs. Fingerprints of the right and left distal phalanges and palms were recorded using ink and white paper. The fingerprint pattern was analyzed for different patterns such as whorls, loops, arches, and ATD angle (Figure 1). The patterns were compared among siblings, later correlated with malocclusion.

Data were analyzed by SPSS version 20. The association between dermatoglyphics and occlusion was assessed using chi-square test. Right and left ATD angles were compared using

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paired *t*-test and correlation of ATD angle between siblings was assessed using Pearson regression test.

RESULTS

Table 1 there is statistically no difference between different malocclusion among siblings ($P \geq 0.05$).

Table 2 there is statistically no difference between dermatoglyphics and malocclusion among Group 1 subjects ($P \geq 0.05$).

Table 3 there is statistically no difference between dermatoglyphics and malocclusion among Group 2 subjects ($P \geq 0.05$).

Table 4 there is statistically no difference between dermatoglyphics and malocclusion among siblings ($P \geq 0.05$).

Table 5 the correlation between the right and left ATD angles is statistically significant ($r=0.8$ and 0.6 , respectively).

Table 6 there is statistically no difference between different malocclusion and the ATD angles ($P \geq 0.05$).

DISCUSSION

Dermatoglyphics is the study of ridge patterns of skin and their configurations on fingers, palms, and soles. Fingers, palm, and sole impressions are expressions of the environmental changes taking place and are inherited in nature. The dermal ridges take their origin from the fetal volar pads that appear in the 6–7th week of embryonic life, i.e., at the same time as that of tooth formation in intraembryonic life. This means

that the genetic message contained in the genome (normal or abnormal) is deciphered during this period and is also reflected by dermatoglyphics.^[5]

It is well-established fact that the orofacial structures are under genetic control. Most of the craniofacial abnormalities are multifactorial produced by a combination of many genes interacting with the environment.^[4] There may be variability in expression of malocclusion as a result of the interactions of genetic and environmental factors.^[6] Both orofacial structures and the epidermal ridges are derived from ectoderm of the embryonic tissue. The genetic message in the genome that may be either normal or abnormal, is interpreted during this critical time period and could be reflected through fingerprint pattern. Understanding this biology will aid progress toward effective treatment, prevention, thereby decreasing the burden of the condition of the orofacial region.^[7]

This study was done to assess the types of malocclusion, dermatoglyphic patterns and establish their association in siblings of Visnagar in which most of the individuals had Angle's Class I malocclusion, followed by Class II and Class III malocclusion which is similar to the finding of another study done in Malaysia by Heng *et al.* (2018) they revealed that Class I was the most common type of malocclusion. They found most predominant fingerprint was loop pattern and was associated

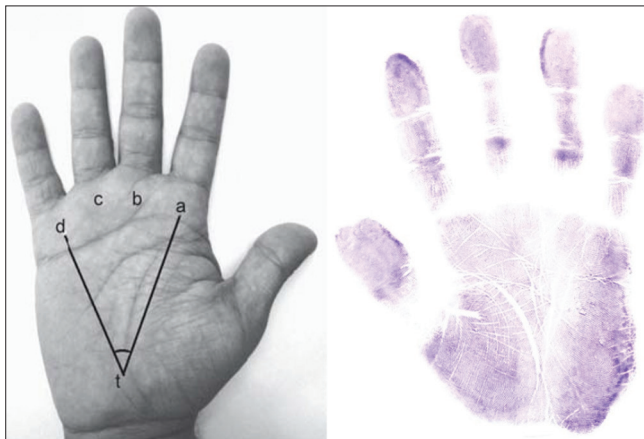


Figure 1: Measurement of ATD angle and Fingerprint analysis

Table 1: Comparison of occlusion between the siblings

	Group 2		P-value
	Class 1	Class 2	
Group 1			1
Class I	13	1	
Class 3	1	0	
Total	14	1	

Table 2: Comparison of dermatoglyphics and malocclusion among Group 1

Angle's classification	Right			Left		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Thumb						
Loop	7	-	0	8	-	1
Whorl	6	--	1	5	-	0
Arch	1	-	0	1	-	0
P value	0.5			0.7		
Index finger						
Loop	11	-	0	9	-	0
Whorl	3	-	1	4	-	1
Arch	-	-	-	1	-	0
P value	0.26			0.343		
Middle finger						
Loop	11	-	1	12	2	-
Whorl	3	-	0	2	1	-
Arch	-	-	-	-	-	-
P value	1			0.2		
Ring finger						
Loop	8	-	0	7	0	0
Whorl	6	-	1	7	0	1
Arch	-	-	-	--	-	-
P value	0.467			1		
Little finger						
Loop	11		0	10	0	-
Whorl				4	1	-
Arch	3		1	-	-	--
P value	0.267			0.333		

with Class I and II malocclusion.^[8] In this study, loop, whorl, and arch patterns were not significantly associated with a type of malocclusion among the siblings and study there is statistically no difference between different malocclusion among siblings ($P > 0.05$). However, in a study done in India by Deepti *et al.*, loop and whorl pattern of finger print were equally distributed in all 6–12 yr individuals with malocclusion.^[5]

In Malaysian study by Heng *et al.* (2018) reported the distribution of fingerprint patterns among the Malaysian population specifically on the right and left hands, gender, major ethnic groups, and siblings. Statistical analysis of their study indicated that right and left hands could be distinguished by whorl pattern. In their study Loops and whorls were the most predominant pattern in all studied ethnic groups which is similar to our study. Siblings demonstrated greater similarity of all fingerprint patterns than non-siblings except for the arch pattern in their study.^[8]

In the present study, there is a greater number of loop patterns followed by whorl and arch in all the fingers and thumbs but no correlation was found between malocclusion and siblings and there is statistically no difference between dermatoglyphics and malocclusion among siblings ($P > 0.05$). A study conducted by Reddy *et al.* (2013) compared the Dermatoglyphics parameters of individuals with normal occlusions and various classes of

malocclusions. In their study particular predictive occurrence of patterns was not found to be associated with each group. However, they found that some of the finger patterns, such as increase in twinned loops in class II malocclusions and absence of radial loops in class III malocclusions were found to be statistically significant.^[9]

Earlier study done by Ravindra *et al.* (2018) assessed correlation between different dermatoglyphic patterns with the terminal planes in deciduous dentition. They found that the Ulnar loop pattern was the most predominant dermatoglyphic pattern. The absence of arch pattern in the ring and little fingers of the left hand when compared to the right hand was related to the Mesial step. The presence of whorl pattern in both right

Table 4: Comparison of dermatoglyphics and malocclusion between siblings

Angle's classification	Right			Left		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Thumb						
Loop	16	1	0	19	0	1
Whorl	11	0	1	8	1	0
Arch	1	0	0	1	0	0
P value	0.685			0.581		
Index finger						
Loop	18	1	0	16	1	0
Whorl	9	0	1	10	0	1
Arch	1	0	0	2	0	0
P value	0.627			0.643		
Middle finger						
Loop	22	1	1	21	1	0
Whorl	6	0	0	6	0	1
Arch	0	0	0	1	0	0
P value	0.765			0.447		
Ring finger						
Loop	16	1	0	14	0	0
Whorl	12	0	1	14	1	0
Arch	0	0	0	0	0	0
P value	0.354			0.362		
Little finger						
Loop	23	1	0	21	1	0
Whorl	5	0	1	6	0	1
Arch	0	0	0	1	0	0
P value	0.115			0.447		

Table 3: Comparison of dermatoglyphics and malocclusion among Group 2

Angle's classification	Right			Left		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Thumb						
Loop	9	1	0	11	0	0
Whorl	5	0	0	3	1	0
Arch	0	0	0	0	0	0
P value	0.46			0.08		
Index finger						
Loop	7	1	0	7	1	0
Whorl	6	0	0	6	0	0
Arch	1	0	0	1	0	0
P value	0.626			0.626		
Middle finger						
Loop	11	1	0	8	1	0
Whorl	3	0	0	4	0	0
Arch	0	0	0	1	0	0
P value	0.605			0.75		
Ring finger						
Loop	8	1	0	7	0	0
Whorl	6	0	0	7	1	0
Arch	0	0	0	0	0	0
P value	0.39			0.333		
Little finger						
Loop	12	1	0	11	1	0
Whorl	2	0	0	2	0	0
Arch	0	0	0	1	0	0
P value	0.685			0.875		

Table 5: Correlation of right and left ATD between the siblings

	Group 2 right ATD	Group 2 left ATD
Group 1 right ATD		
Pearson Correlation	0.813**	
Sig. (2-tailed)	0.000	
Group 1 left ATD		
Pearson Correlation		0.617*
Sig. (2-tailed)		0.000

Table 6: Correlation of malocclusion and the ATD angles

	N	Mean	SD	95% Confidence interval for mean		Minimum	Maximum	P value
				Lower bound	Upper bound			
Rt ATD								
Class 1	28	48.2857	7.36286	45.4307	51.1407	37	62	0.882
Class 2 subdivision 2	1	45	.	.	.	45	45	
Class 3	1	50	.	.	.	50	50	
Total	30	48.2333	7.13748	45.5682	50.8985	37	62	
Lt ATD								
Class 1	28	48.9286	6.86876	46.2651	51.592	39	63	0.947
Class 2 subdivision 2	1	50	.	.	.	50	50	
Class 3	1	51	.	.	.	51	51	
Total	30	49.0333	6.64096	46.5536	51.5131	39	63	

and left middle finger and higher total finger ridge count in the left hand when compared to the right hand were related to distal step. Flush terminal plane was related to the absence of arch pattern in the ring finger of the left hand.^[10]

Mansata *et al.* (2019) compared different classes of malocclusion and the patterns of fingertips and they found an increased frequency of whorls was seen in students with Normal occlusion and Class 1 malocclusion whereas increased frequency of loops was found in students with Class 2 malocclusion. Class 3 malocclusion students had predominance of arches and whorls as compared to other classes of malocclusion.^[11]

A study conducted by Poudel *et al.* (2020) Revealed dermatoglyphic pattern commonly found was loop (1079), followed by whorl (785), and arch (236). Most of the individuals with class I and II malocclusion had at least one loop pattern than those with class III; their proportional difference being statistically significant ($P = 0.020$). They concluded that Class I was the most common type of malocclusion among the study participants. The most predominant fingerprint was loop pattern and was associated with Class I and II malocclusion.^[12]

In our study the correlation between the right and left ATD is statistically significant ($r=0.8$ and 0.6 , respectively) and There is statistically no difference between different malocclusion and the ATD angle ($P > 0.05$).

Study conducted by Jindal *et al.* (2015) suggested Although no fingerprint pattern was found to be specific for a particular class of occlusion, increased tendencies toward high frequencies of whorls in subjects with class II malocclusion and plain arches in those with class III malocclusion were observed. Significant differences in ATD angle were observed among malocclusion types ($P = 0.0001$).^[13] In our study the correlation between the right and left ATD angle of siblings is similar which is statistically significant ($r=0.8$ and 0.6 respectively) but there is statistically no difference between different malocclusion and the ATD angle ($P > 0.05$).

The limitation of the study was lack of stratification of samples to include Angle's Class I, II, and III malocclusion. This

may have provided greater insights into the relationship of dermatoglyphics and malocclusion among siblings.

CONCLUSION

Based on our study, it can be concluded that there is no correlation between dermatoglyphic patterns and malocclusion among siblings. However ATD angle can be correlated among siblings but it does not have any correlation with malocclusion.

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