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Original Article

Association of Lip Print Patterns with Saggital Malocclusions in District Solan Population

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ABSTRACT:

Introduction: Lips form an important component of the orofacial soft tissue profile. So they play an important role in orthodontic diagnosis and treatment planning. In recent past several research studies had established that lip prints can be used as evidence in personal identification and criminal investigation in forensic dentistry. Establishing a correlation between sagittal jaw relation and lip prints would benefit the clinician by predicting the type of malocclusion and can also provide additional information on individual personal identity. **Aim:** This study was designed to explore the possible association of lip prints with Skeletal Class I and Class II malocclusions with varying growth patterns. **Materials and Method:** A sample of 90 subjects in the age group of 18‑30 years,from Distt Solan,(H.P.) population were selected. Subjects were divided into two groups group I (Skeletal Class I) and group II (Skeletal Class II). Lip prints of all the individuals were recorded and compared between Skeletal Class I and Class II malocclusions with varying. **Results:** It was found that Branched lip pattern was most common in Distt Solan population with no sexual dimorphism. **Conclusion:** No statistically significant association of lip prints with Skeletal Class I and Class II malocclusion was revealed.

Key words: Lip prints, Orthodontic diagnosis, Skeletal malocclusion

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INTRODUCTION

Soft tissues are the most important aspect in orthodontic diagnosis and treatment planning.[3] Cephalometric analyses concentrate mainly on the measurement of hard tissue structures, which are not constantly related to the soft tissue of the face rewrite. It is now accepted that modern orthodontic treatment requires a shift away from Angle's paradigm of achieving ideal occlusion to the more esthetically focused soft tissue paradigm that is based on the patient's overall benefit.[4] Since lip and chin form an important component of the orofacial soft tissue profile so they play an important role in orthodontic diagnosis and treatment planning.[5]

There exist many diagnostic methods in which lips play a vital role.[2‑7]. These include Cephalometry, Anthropometry and Chieloscopy. The study of lip prints is referred to as Cheiloscopy. Initially the use of finger prints in personal identification and in criminal investigation was accepted part of forensic science. In recent past several research studies had established that lip prints can also be used as evidence in personal identification and criminal investigation in forensic dentistry. Chieloscopy has become the area of recent interest as far as the diagnosis is concerned. Lip prints consist of normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip between the inner labial mucosa and outer skin.

Fischer (1902) was the first anthropologist to describe the furrows on the red part of the human lips. However, it was Edmond Locard (1932), one of France's greatest criminologists, who recommended the use of lip prints in personal identification and criminalization. Synder (1950) reported in his book Homicide Investigation that the characteristics of the lips formed by lip grooves are as individually distinctive as the ridge characteristics of finger prints. Suzuki (1967), made detailed investigations of the

measurement of the lips. The relationship between the Skeletal malocclusions (Class I, II, III) and soft tissue facial morphology has been an arena of vast research in contemporary orthodontics. Kasprzak (1990) conducted a research for period of five years on 1500 persons to elaborate the practical use of cheiloscopy

The lip prints are unique to an individual just like the fingerprints and shows strong hereditary pattern.[8] Lip prints are established at a very early period in comparison to sagittal jaw relation and dental relation. [5],[6] Establishing a correlation between sagittal jaw relation and lip prints would benefit the clinician by predicting the type of malocclusion and can also provide additional information on individual personal identity. Therefore this pilot study was designed to explore correlation of lip prints with skeletal base relationship in Distt Solan(H.P.) adult population and if possible, to establish lip prints as relevant diagnostic and forensic tool.

MATERIALS AND METHOD

The study was done on a sample of 90 subjects from Distt Solan population who reported to the department of Orthodontics and Dentofacial orthopedics for fixed orthodontic treatment. Age of the subjects ranged between 18-30 years. Lateral cephalograms were taken for each patient. Criteria for sample selection included subjects having no lesions on the lips, no congenital facial defects, no congenitally missing teeth or extracted teeth (except third molars), individuals with known hypersensitivity to lipsticks and individuals with no history of previous orthodontic treatment or maxillofacial surgery. A written informed consent was obtained from all the subjects as prescribed and approved by ethical committee.

The subjects were divided into 2 groups (45 in each group) on the basis of their ANB angle[104], WITS appraisal[104] and AB plane angle[104] as follow

GROUPS	ANB angle (º)	WITS appraisal (mm)	AB plane angle (º)
Group I (Skeletal Class I) N=45	0º to 3	-2 to 2	0 to -9
Group II (Skeletal Class II) N=45	>3	>2	<-9

Each group in the present study was further subdivided into 3 subgroups (15 in each subgroup) on the basis of their FMA angle[104], Basal plane angle[104] and Y axis[104] as follows

Group I (Skeletal Class I)

SUBGROUPS	FMA(º)	Basal plane angle (º)	Y axis (º)
Group Ia (Normodivergent) N=15	17 – 28	18 – 27	53 – 66
Group Ib (Hypodivergent) N=15	<17	<18	<53
Group Ic (Hyperdivergent) N=15	>28	>27	>66

Group II (Skeletal Class II)

SUBGROUPS	FMA (º)	Basal plane angle (º)	Y axis (º)
Group IIa (Normodivergent) N=15	17 – 28	18 – 27	53 – 66
Group IIb (Hypodivergent) N=15	<17	<18	<53
Group IIc (Hyperdivergent) N=15	>28	>27	>66

Lipstick-cellophane technique was adopted in this study, which provides a good clarity and accuracy. The subjects were asked to sit at relaxed position on a dental chair, and the lips of the subjects were cleaned with the help of wet cotton. Then a portion of red colored lipstick was cut with the help of parker knife which was put into the dappen dish, from where it was applied on the lips with the help of lip brush. The subjects were asked to rub both the lips together to spread the lipstick evenly. Over the lipstick, the glued portion of the cellophane tape strip was placed and a lip impression was made by dabbing it first in the center and then pressing it uniformly towards the corners of the lips. The cellophane strip was then stuck to the white bond paper for permanent record and the lip impressions were subsequently visualized with the use of a magnifying lens. Every measure was taken to prevent any cross contamination [Figure 1].

Figure 1: Procedure for recording Lip prints of subjects

Lip print patterns recorded were classified on the basis of the classification given by Tsuchihashi. For classification, the middle part of the lower lip (10 mm wide) was taken as study area. The lip print pattern was determined by counting highest number of lines in this area having similarity to the Tsuchihashi[9] classification [Figure 2]:

Type I : Clear‑cut vertical grooves that run across theentire lips.
Type I' : Similar to type I, but do not cover the entire lip.
Type II : Branched grooves (branching Y‑shaped pattern).
Type III : Intersected grooves (criss‑cross pattern, transversegrooves).
Type IV : Reticular grooves.
Type V : Undetermined (grooves do not fall into anyof the type I‑IV and cannot be differentiated morphologically).

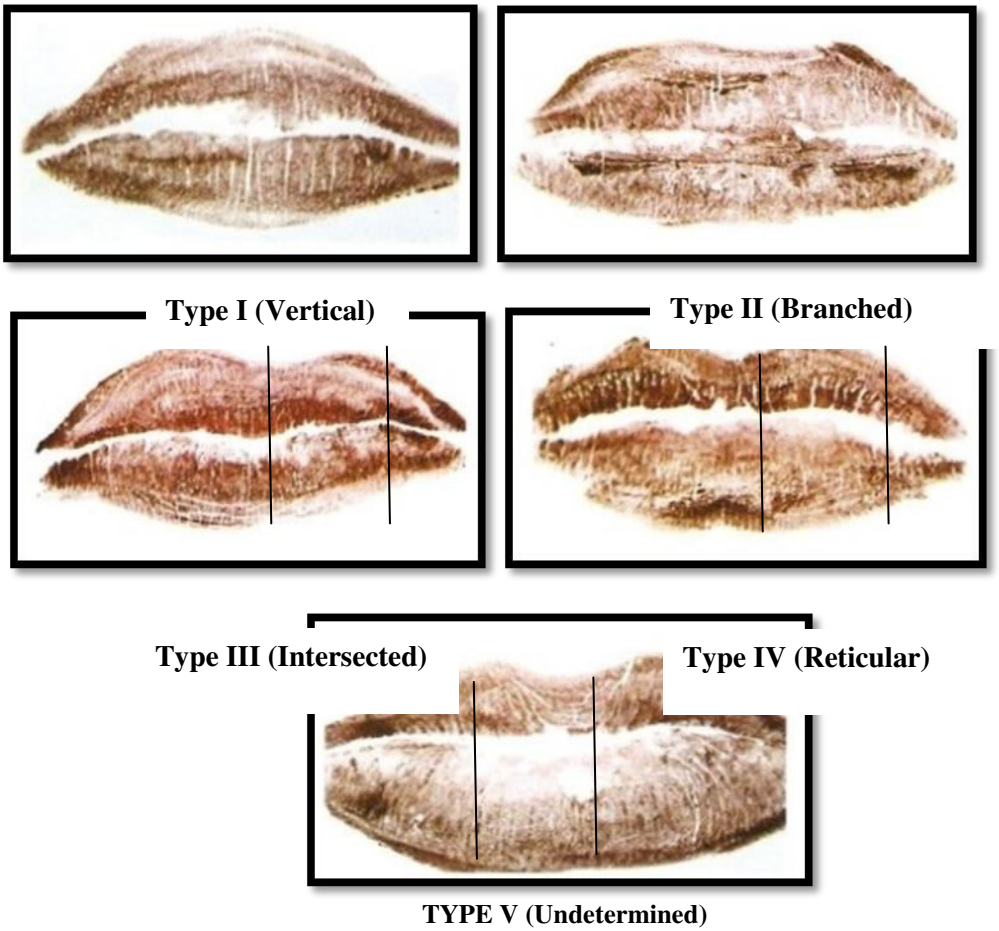


Figure 2: Different types of Lip print patterns

STATISTICAL ANALYSIS

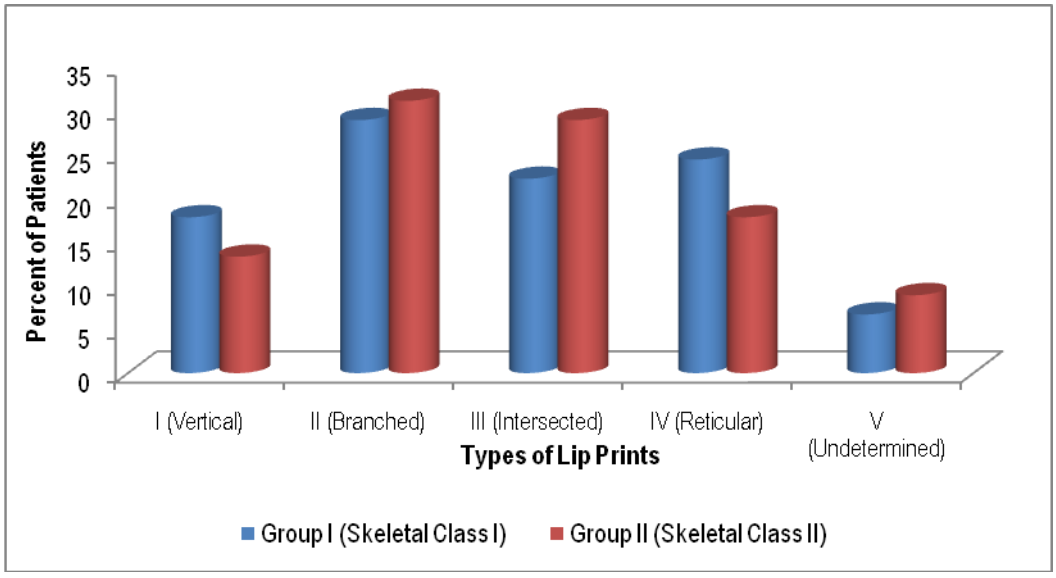
All the data obtained was analyzed using the Statistical Package for Social Sciences (SPSS) for Windows, Version 17.0 (SPSS Inc., Chicago, Illinois, USA). Mean and Standard deviation were calculated and One way ANOVA test was applied.

RESULTS

In the interpretation of lip print patterns of 90 individuals, it was found that Branched lip pattern(30%)was the most common, followed by Reticular lip pattern (25.6%), Intersected lip pattern(21.1%) ,Vertical lip pattern (15.6%) and Undetermined lip pattern (7.8%) as depicted in Table 1 and Graph 1.In overall Skeletal Class I group, Branched lip pattern was most prevalent (28.9%), followed by Intersected lip pattern (24.4%), Reticular lip pattern (22.2%), Vertical lip pattern (17.8%) and Undetermined lip pattern (6.7%) as shown in Table 1 and Graph 1. In overall Skeletal Class II group, Branched lip pattern was most prevalent (31.1%), followed by Reticular lip pattern (28.9%), Intersected lip pattern (17.8%), Vertical lip pattern (13.3%) and Undetermined lip pattern (8.9%) as shown in Table 1 and Graph 1.

TABLE 1:-Prevalence of lip print patterns in skeletal class I and class II malocclusions

Types of Lip Prints	Count of Lip Prints	Group		Total
		Group I(Skeletal Class I)	Group II(Skeletal Class II)	
TypeI (Vertical)	Count	8	6	14
	% within Lip Print Type	57.1%	42.9%	100.0%
	% within Group	17.8%	13.3%	15.6%
Type II (Branched)	Count	13	14	27
	% within Lip Print Type	48.1%	51.9%	100.0%
	% within Group	28.9%	31.1%	30.0%
TypeIII (Reticular)	Count	10	13	23
	% within Lip Print Type	43.5%	56.5%	100.0%
	% within Group	22.2%	28.9%	25.6%
Type IV (Intersected)	Count	11	8	19
	% within Lip Print Type	57.9%	42.1%	100.0%
	% within Group	24.4%	17.8%	21.1%
Type V (Undetermined)	Count	3	4	7
	% within Lip Print Type	42.9%	57.1%	100.0%
	% within Group	6.7%	8.9%	7.8%
Total	Count	45	45	90
	% within Lip Print Type	50.0%	50.0%	100.0%
	% within Group	100.0%	100.0%	100.0%



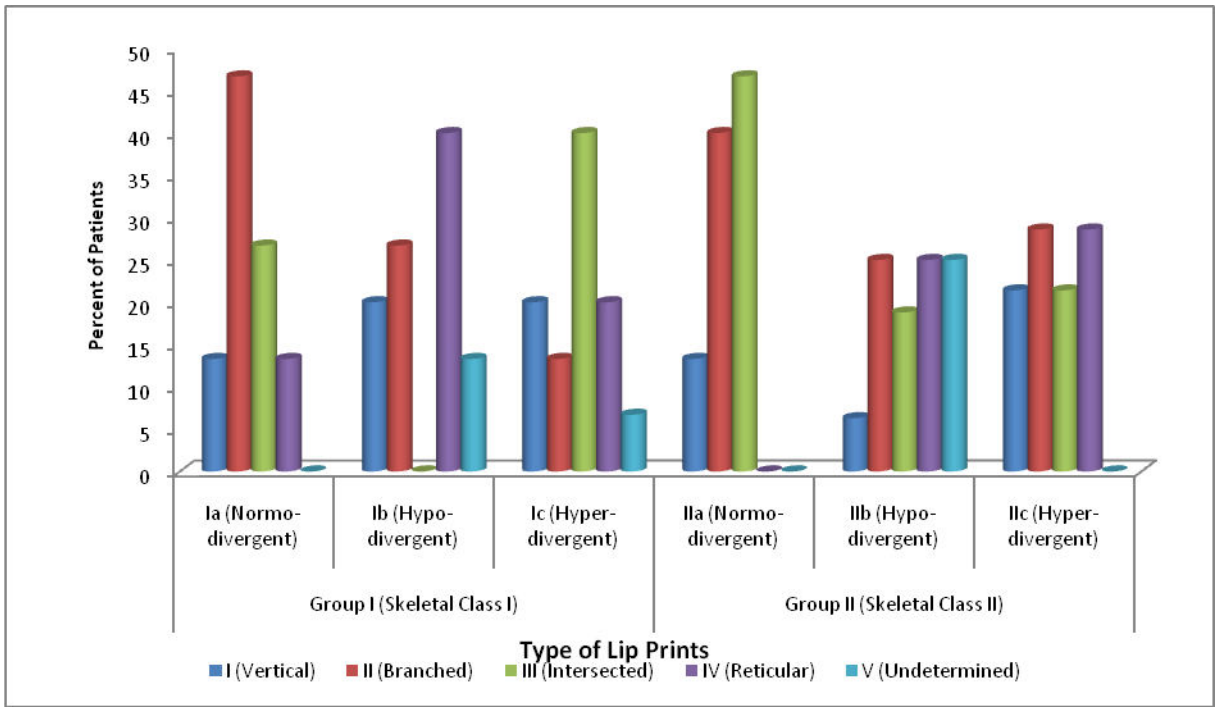
GRAPH 1: Prevalence of Lip Print Pattern in Different Skeletal Malocclusions

The Lip print patterns were evaluated in different growth patterns in Skeletal Class I and Class II malocclusions. In Skeletal Class I Normodivergent group, Branched lip pattern was most prevalent (46.7%), followed by Intersected lip pattern (26.7%) , Reticular lip pattern (26.7%) , Vertical lip pattern (13.3%) and Undetermined lip pattern (0%).In Skeletal Class I Hypodivergent group Branched lip pattern was most prevalent (46.7%), followed by Intersected lip pattern (26.7%) , Reticular lip pattern (26.7%) , Vertical lip pattern (13.3%) and Undetermined lip pattern (0%). In Skeletal Class I Hyperdivergent group Intersected lip pattern was most prevalent (40%), followed by Vertical lip pattern (20%) , Reticular lip pattern (20%) , Branched lip pattern (13.3%) and Undetermined lip pattern (6.7%) as depicted in Table 5 and Graph 2.

In Skeletal Class II Normodivergent group Intersected lip pattern was most prevalent (46.7%), followed by Branched lip pattern (40%) , Vertical lip pattern (13.3%) , Reticular lip pattern (0%) and Undetermined lip pattern (0%). In Skeletal Class II Hypodivergent group Branched lip pattern was most prevalent (46.7%), followed by Intersected lip pattern (26.7%) , Reticular lip pattern (26.7%) , Vertical lip pattern (13.3%) and Undetermined lip pattern (0%).In Skeletal Class II Hyperdivergent group Branched lip pattern (28.6%) and Reticular lip pattern (28.6%) was most prevalent , followed by Intersected lip pattern (21.4%) and Reticular lip pattern (21.4%) , Vertical lip pattern (13.3%) and Undetermined lip pattern (7.8%) as depicted in Table 1 and Graph 1

TABLE 2:- Prevalence of lip print patterns in varying growth patterns in different skeletal malocclusions

Lip print type		Group I(skeletal class I)			Group II(skeletal class II)			Total
		Ia N=15	Ib N=15	Ic N=15	IIa N=15	IIb N=15	IIc N=15	
Type I (Vertical)	Count	2	3	3	2	1	3	14
	% within Group	13.3%	20.0%	20.0%	13.3%	6.3%	21.4%	15.6%
Type II (Branched)	Count	7	4	2	6	4	4	27
	% within Group	46.7%	26.7%	13.3%	40.0%	25.0%	28.6%	30.0%
Type III (Intersected)	Count	4	0	6	7	3	3	23
	% within Group	26.7%	.0%	40.0%	46.7%	18.8%	21.4%	25.6%
Type IV (Reticular)	Count	2	6	3	0	4	4	19
	% within Group	13.3%	40.0%	20.0%	.0%	25.0%	28.6%	21.1%
Type V (Undetermined)	Count	0	2	1	0	4	0	7
	% within Group	.0%	13.3%	6.7%	.0%	25.0%	.0%	7.8%
Total Count		15	15	15	15	16	14	90
Total % within Group		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%



GRAPH 2: Prevalence of lip print patterns in varying growth patterns in different skeletal malocclusions

DISCUSSION

There exist many diagnostic soft tissue analyses in which lips play a vital role. In recent past several research studies had established that lip prints can be used as evidence in personal identification and criminal investigation in forensic dentistry. The relationship between the Skeletal malocclusions (Class I, II and III) and soft tissue facial morphology has been an arena of vast research in contemporary orthodontics. The lip prints are unique to an individual just like the fingerprints and shows strong hereditary pattern. Therefore this study was designed to explore correlation of lip prints with skeletal base relationship in District Solan population and if possible, to establish lip prints as relevant diagnostic and forensic tool. In our study, it was observed that prevalence of Branched lip pattern was most common in overall subjects (30%), and the least common was Undetermined lip pattern (7.8%).This is in accordance to the study by Pradeep Raghav (2013)[78] in which Branched lip pattern(32.46%) were most prevalent and Undetermined (2.63%) lip pattern were least prevalent. Verghese et al (2011)[62], in Kerala found that Reticular lip pattern showed the highest incidence. Tsuchihashi (1971)[7], in his study in Japanese population found that Intersected lip pattern was the most frequent. Sivapathasundharam (2001)[49], studied the lip prints of Indo Dravidian population and noted that Intersected lip pattern was predominant. [8] All these studies indicate that lip prints show regional differences. Our study also showed there was no significant difference in lip patterns of males and females in each of the groups (Skeletal Class I, Skeletal Class II), which probably indicates that there is no sexual dimorphism in lip patterns, this is in accordance with the study of Tsuchihashi(1971)[7], and Verghese (2011) in which there is no sexual dimorphism. But in studies of Vahanwal et al (2005), Babu et al (2009), Gondivkar (2009), Malik (2010), Prabhu (2012), Nagrale (2014), Verma (2015), Moshfeghi (2016) Ponnusamy (2017), there was a difference in lip patterns of males and females through which they determined the sex of the individual. These contrary results indicate that Cheiloscopy may be used as an adjunct method along with other methods for sex determination.

Among various growth patterns in Skeletal Class I malocclusion, it was found that the most common lip print pattern is Branched (46.7%) and least common lip print pattern is Undetermined(0%) in Normodivergent growth pattern. In Hypodivergent growth pattern the most common lip print pattern is Reticular (40.0%) and least common lip print pattern is Undetermined (13.3%). In Hyperdivergent growth pattern the most common lip print pattern is Intersected (40.0%) and least common lip print pattern is Undetermined (6.7%). Among various growth patterns in Skeletal Class II malocclusion, it was found that the most common lip print pattern is Intersected(46.7%) and least common lip print pattern is Undetermined(0%) in Normodivergent growth pattern. In Hypodivergent growth pattern the most common lip print pattern is Reticular (40.0%), Branched (40%) and least common lip print pattern is Undetermined (25%).

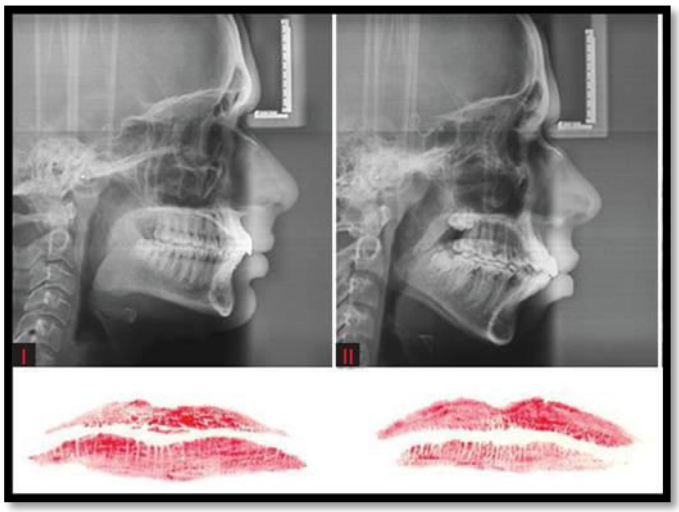


Figure 3: Lip prints in Skeletal Class I and Skeletal Class II malocclusion

In Hyperdivergent growth pattern the most common lip print pattern is Branched (28.6%)and Reticular (28.6%) and least common lip print pattern is Undetermined(6.7%).Although correlation of lip prints with Skeletal Class I and Class II malocclusion with varying growth patterns was not found to be statistically significant (p=0.675).

CONCLUSION

Skeletal Class I and Class II malocclusion relationship with lip prints was inconclusive. In our study the subjects were selected on the basis of ANB angle without considering the etiology i.e. heredity or environmental which may be a possible reason, for the absence of significant difference in lip patterns between subjects having skeletal class I and skeletal class II malocclusion.But the association of lip patterns with different skeletal malocclusion needs a extensive research with a large sample from varied ethnical groups for conclusive results. Hence, further research is needed for the evaluation of lip prints in a larger sample with specifically hereditary malocclusions to further validate the correlation between lip patterns and skeletal malocclusions.

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