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Lip prints – an aid in identification

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Mangalore, India*

Lip prints are unique to each individual. They remain the same throughout life and are uninfluenced by environmental changes, diseases and trauma. The present study was conducted at Kasturba Medical College, Mangalore, India among 200 randomly-selected medical students belonging to age group of 18–25 years. The sample consisted of 100 north Indians (50 males and 50 females) and 100 south Indians (50 males and 50 females). The lip prints were documented as per Suzuki's classification. Type II was the most commonly occurring lip print pattern and type V was the rarest. Type I and type I' patterns were more common in males and Type II, type III, type IV and type V patterns were more common in females. Type III and type IV patterns were predominant in north Indians while type II was predominant in south Indians. No significant relation exists between the lip prints and blood group pattern of an individual. Results of the study showed that lip prints are individualistic, and bears a relationship with sex and geographical distribution of the individual. Thus, lip prints can be useful as evidence in the court of law.

Keywords: lip prints; cheiloscopy; gender; identification; blood group; geographical distribution

Introduction

Identity is a set of physical characteristics, functional or psychic, normal or pathological, that define an individual¹. Human identification is one of the most challenging subjects and is based on scientific principles, the object of which is to identify and register individuals for both civil and criminal purposes. Personal identification is essential for unknown deceased persons in homicide, suicide and accidents. The identification of living persons is also required to assist with missing person inquiries and criminal investigation.

In forensic identification, the mouth allows for a myriad of possibilities. Collection of information from bite marks, lip prints and teeth in crime scenes such as murder and rape can play a major role in criminal investigations. Lip prints are the normal lines and furrows in the form of wrinkles and grooves present in the zone of transition of the human lip between the inner labial mucosa and outer skin, the study of which is known as cheiloscopy^{1,2}. Occasionally, visible or latent lip prints are found at a crime scene which can be developed, recorded and compared with the prints of suspected persons and the donor can be identified.

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The importance of cheiloscopy is linked to the fact that lip prints are genetic, once developed at the 6th month of intrauterine life they are permanent, unchangeable even after death, and unique to each person except in monozygotic twins¹⁻⁹. The present study is an attempt to bring into light the uniqueness of lip prints and their relationship with gender, blood group and geographical distribution of an individual.

Material and methods

The study was conducted among the medical students of Kasturba Medical College, Mangalore, India over a period of 2 months after obtaining clearance from the Institutional ethical committee. A total of 200 randomly-selected medical students of Indian origin, belonging to age group of 18–25 years were taken as subjects. The sample consisted of 100 north Indians (50 males and 50 females) and 100 south Indians (50 males and 50 females). Students with known hypersensitivity to lip sticks, with any active or passive lip lesions and non-resident Indians were excluded from the study.

Written informed consent of the subjects was taken. Lipstick was applied on the lips of the subject with a single stroke and the subject was then asked to rub his lips to spread the lipstick uniformly. Then with the help of a paper, the centre portion of lips were dabbed first and then left and right corners of lips were pressed, applying uniform pressure, taking care to avoid sliding of lips to prevent smudging of the print⁵.

After the lip prints were acquired, details such as sex, age, state of origin were documented. Blood group was noted from the college identity cards and each lip print was assigned a serial number. The lip prints were then studied by the help of a magnifying lens to analyse quadrant-wise distribution, denoting the type according to Suzuki's classification, which is as follows^{10,11} (Figures 1 and 2):

- Type I: Vertical, comprising of complete longitudinal fissures.
- Type I': Incomplete longitudinal fissures.
- Type II: Branching 'Y' shaped pattern.
- Type III: Criss-cross pattern.
- Type IV: Reticular, typical chequered pattern, fence like.
- Type V: All other patterns.

Each Lip print was compared manually with others using a magnifying glass to test the uniqueness of lip prints^{2-4,11-13}. Comparison was done by studying the number and position of different patterns in all four quadrants.

Statistical analysis was done using the SPSS (Version 14.0) software package. The chi-square test was applied and a *p*-value of <0.05 was considered as statistically significant.

Quadrant wise representation of lip prints (Figure 3)

Right upper lip Quadrant 1	Left upper lip Quadrant 2
Right lower lip Quadrant 4	Left lower lip Quadrant 3

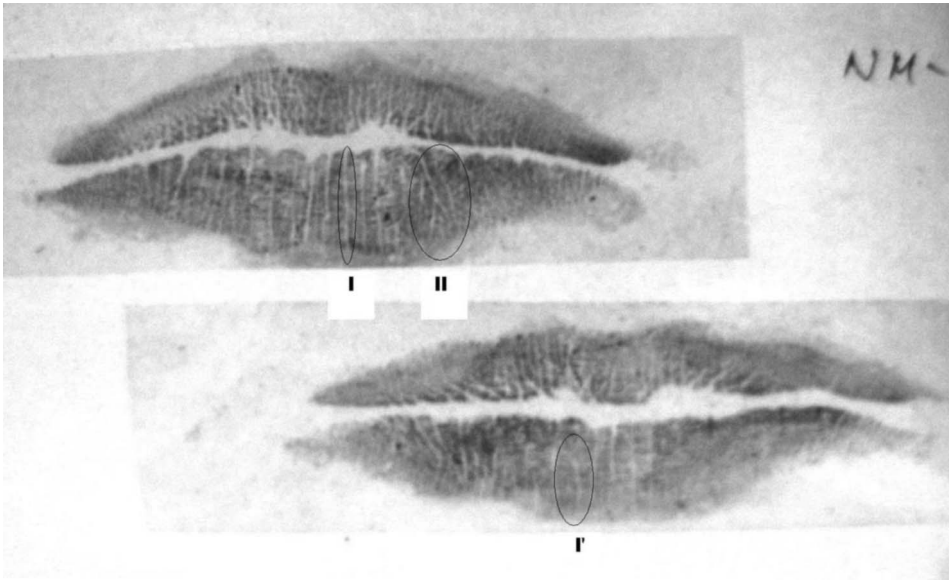


Figure 1. Lip prints – Type I, Type I' and Type II.

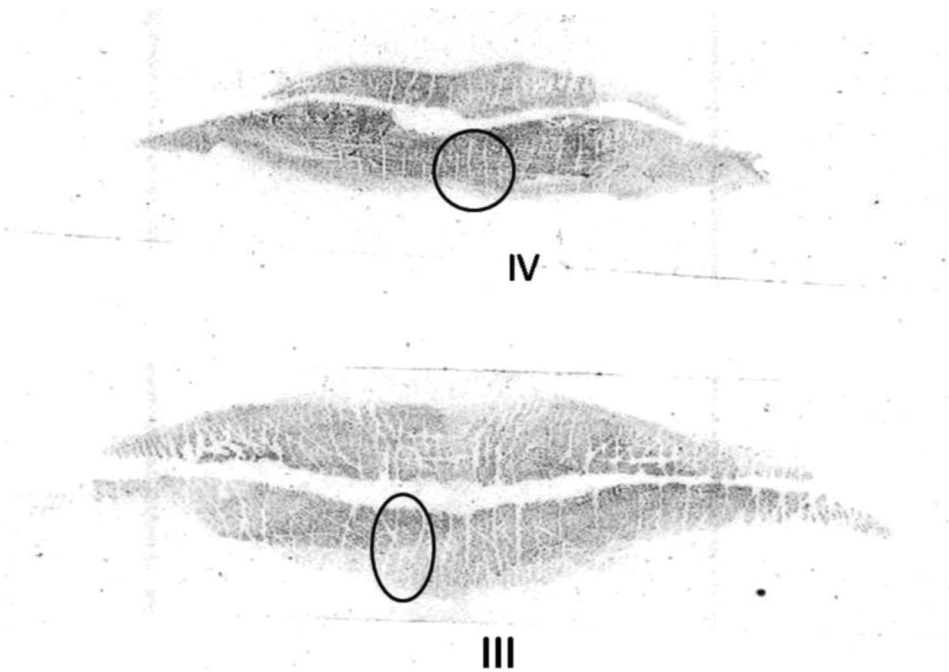


Figure 2. Lip prints – Type III and Type IV.

Results and discussion

A detailed study of each lip print showed that each print is unique. This supports the findings of the earlier studies regarding the uniqueness of lip prints^{2-4,10-14}. Thus, lip prints can be effectively used for personal identification.

According to Figure 4, Type II is the most common pattern, followed by Type III, Type IV, Type I, Type I' and Type V in all four quadrants. Type I is most common in quadrant 3, Type I' is found mostly in quadrant 1. Types II and III patterns are distributed almost equally in all the quadrants in most of the subjects. Type IV is most commonly seen in quadrant 4 while Type V (the least common of all patterns) is found in all four quadrants in almost equal distribution (Figure 1).

Table 1 shows the distribution of various types of lip print patterns in males and females. It is observed that Types I and I' are more common in males than in females in all the quadrants and the differences are statistically significant. Type II, type III, type IV and Type V are more common in females as compared with males in all the quadrants. The distribution pattern of Type II and Type III shows statistically significant differences in males and females in all quadrants. The distribution of Type IV shows statistically significant differences in quadrants 1 and 2 while Type V shows significant difference only in quadrant 2. Thus, our findings are in concurrence with findings of Sharma et al.¹⁴ who reports statistically significant differences between lip print patterns of males and females.

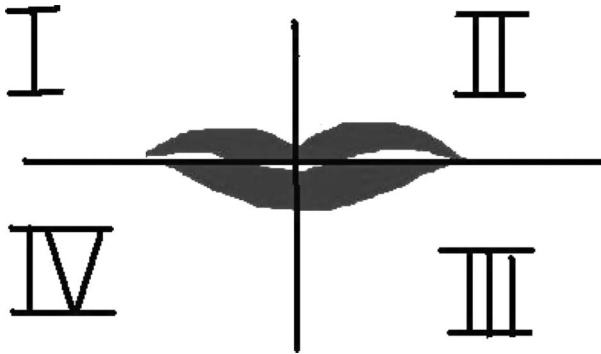


Figure 3. Quadrant-wise representation of lip prints.

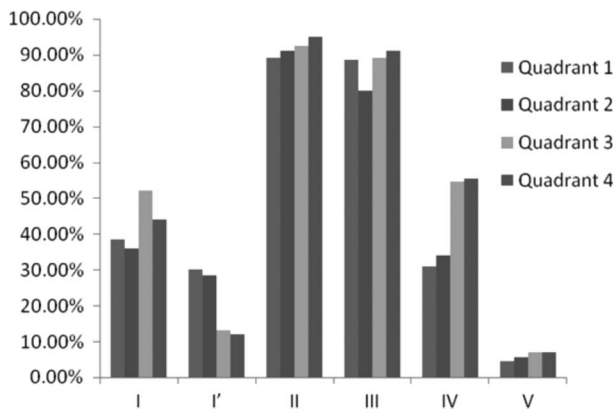


Figure 4. Frequency of various lip print patterns in different quadrants.

Table 2 shows the predominance pattern of various types of lip prints in the case of males and females. In this context, predominance means that the percentage occurrence of a particular type of lip print pattern is higher in a particular quadrant when compared between males and females. In both males and females the predominant pattern in quadrant 1 and quadrant 4 is Type II. In quadrant 2, Type II is predominant in females whereas Type I is predominant in males. In quadrant 3 in both males and females Type II is predominant and Type I' is absent. Thus, only the lip print patterns in quadrant 2 can be of some help in predicting the gender of an individual.

Type I is predominant in males in all the quadrants whereas Types II and III are more predominant in all quadrants for females. Type IV is equally distributed in both males and females in all quadrants except quadrant 2, where it is more in females. This is in opposition to the study done by Vahanwala and Parekh, which shows that Type I is commonly seen in the case of females and Type III is more common in males. Nevertheless, this study suggests that differences do exist in the predominance pattern of lip prints between males and females and thus some prediction regarding gender of a person can be made from the lip print.

Figure 5 shows the frequency of repetition of lip print patterns (i.e. combination of Type I–Type V) in all the four quadrants. Most of the individuals (56% males and 53% females) have a similar combination of pattern in at least two quadrants. It is seen that no male subject has the same lip print pattern in all four quadrants, while 24% of females have the same pattern in all four quadrants. Thus, if a similar pattern

Table 1. Frequency of lip print patterns in different quadrants in relation to gender.

Type	Quadrant 1		Quadrant 2		Quadrant 3		Quadrant 4	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
I	50.0	27.0	53.0	19.0	71.0	33.0	57.0	31.0
I'	50.0	10.0	50.0	7.0	17.0	9.0	19.0	5.0
II	81.0	97.0	84.0	98.0	86.0	94.0	91.0	99.0
III	80.0	97.0	70.0	90.0	82.0	96.0	86.0	96.0
IV	16.0	46.0	15.0	53.0	50.0	59.0	50.0	61.0
V	3.0	6.0	2.0	9.0	5.0	9.0	4.0	10.0

Table 2. Study of predominance of each lip print pattern in relation to gender.

Type	Quadrant 1		Quadrant 2		Quadrant 3		Quadrant 4	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
I	20.0	7.0	28.0	8.0	10.0	1.0	5.0	2.0
I'	2.0	1.0	2.0	1.0	0.0	0.0	0.0	0.0
II	23.0	56.0	23.0	47.0	42.0	57.0	41.0	56.0
III	21.0	31.0	23.0	30.0	32.0	33.0	32.0	35.0
IV	4.0	4.0	2.0	10.0	8.0	8.0	7.0	7.0
V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

in found in all four quadrants then the possibility of it being originating from a male suspect is negligible.

Table 3 gives us the distribution of different patterns in relation to geographical distribution. For studying the geographical distribution, the subjects are classified as north and south Indians depending on their state of origin¹⁵. According to the table, there is not much significant difference between north and south Indians in their lip print patterns except in two places. Type III is present in 95% of north Indians in quadrant 4 whereas it is seen in 87% of south Indians. Similarly, Type V is seen in 11% of south Indians in comparison to only 3% of north Indians. The differences between the two are statistically significant.

As it can be seen in Table 4, in quadrants 1 and 2, Type II is predominant in south Indians and Type III in north Indians. In quadrant 3, Type II is predominant in both north and south Indians. In quadrant 4, in the case of north Indians, Type I is predominant whereas in south Indians Type II is the most predominant type. In all quadrants, Type I, Type III and Type IV are more commonly predominant in north Indians as compared with south Indians, where Type II is predominant. Thus, we can say that a certain relationship definitely exists between the lip print pattern and geographical distribution.

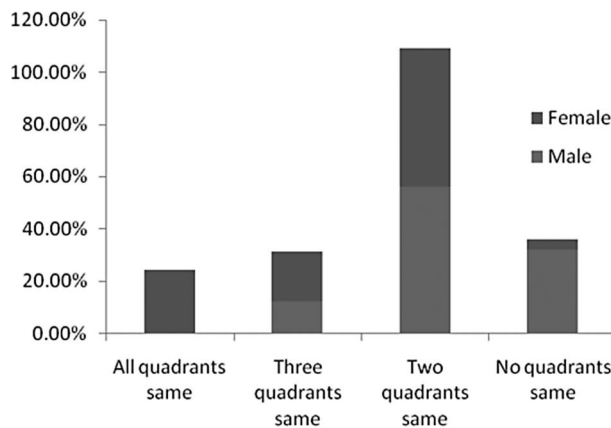


Figure 5. Frequency of repetition of lip print patterns in relation to gender.

Table 3. Frequency of lip print patterns in different quadrants in relation to geographical distribution.

Type	Quadrant 1		Quadrant 2		Quadrant 3		Quadrant 4	
	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)
I	34.0	43.0	32.0	40.0	55.0	49.0	49.0	51.0
I'	23.0	37.0	25.0	32.0	15.0	11.0	13.0	11.0
II	89.0	89.0	89.0	93.0	91.0	94.0	96.0	94.0
III	90.0	87.0	82.0	78.0	86.0	92.0	87.0	95.0
IV	30.0	32.0	33.0	35.0	49.0	60.0	50.0	61.0
V	3.0	6.0	4.0	7.0	11.0	3.0	10.0	4.0

Table 4. Study of predominance of lip print pattern in relation to geographical distribution.

Type	Quadrant 1		Quadrant 2		Quadrant 3		Quadrant 4	
	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)	South Indian (%)	North Indian (%)
I	9.0	18.0	13.0	23.0	4.0	7.0	2.0	50.0
I'	0.0	3.0	1.0	2.0	0.0	0.0	0.0	0.0
II	48.0	31.0	43.0	27.0	58.0	41.0	57.0	40.0
III	19.0	33.0	22.0	31.0	27.0	38.0	25.0	42.0
IV	5.0	3.0	4.0	8.0	4.0	12.0	5.0	9.0
V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Analysis of lip prints in relation to blood group revealed no significant relationship.

Conclusion and suggestions

Many studies have characterized lip prints in order to ascertain their unique features and characteristics, lip print types, forensic application of the technique and method of acquiring lip impressions at the crime scene having been studied^{3,16}. Searching for lip prints in a crime scene investigation can be of help in establishing the true nature of the facts¹³. Lip prints can help to link a subject to a specific location if found on clothes, body, eatables, or other objects, such as glasses, cups etc.

From the results of the present study it can be shown that each lip print is unique, hence can be used as evidence for identification in a court of law. Frequency of occurrence of various lip prints and their predominance pattern can help in determining gender and geographical origin of the donor, to a certain extent.

Thus, the study may help to add certain new aspects to the use of the lip prints in forensic practice. Since lip prints behold the potential for individual identification, the study of lip prints needs to be developed further to prove its use as an effective tool for identification, such as fingerprints. Although lip print identification has been utilized by courts in isolated cases, further studies need to be carried out on a larger sample size, preferably of different races to find the pattern of lip print distribution among individuals of different races and nations. Results, if significant, can be of help in establishing nationality or racial origin of an individual, especially, in modern scenarios where international and intercontinental travelling and mixing is common.

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