Reliability of lip prints in personal identification: An inter-racial pilot study

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Abstract

Context: Forensic science is a branch of science that deals with the application of science and technology in solving a crime and this requires a multidisciplinary team effort. The word "Forensic" is derived from the Latin word, "Forensis" which means the study of public. Dental professionals should develop interests in contributing to legal issues. **Aims:** To study the lip prints among people of different races. **Settings and Design:** Descriptive study. **Subjects and Methods:** The present study comprised of ninety subjects of which Group A comprised of Africans, Group B comprised of Dravidian, and Group C of Mongoloid race. Each group was then further divided into 15 males and 15 females for whom the lip prints were recorded and evaluated. **Statistical Analysis Used:** ANOVA test. **Results:** ANOVA statistical analysis was used to compare three races of African, Dravidian, and Mongoloid races. The observed data among male and female were found to be significant with a $P = 0.000492$. **Conclusion:** The present study showed a significant difference in lip pattern among the three races. Perhaps future studies with a larger sample size and comparison between many other races may be done for better personal identification.

Key words: Cheiloscopy, forensic odontology, personal identification, sex determination

Introduction

Forensic odontology is the science that deals with personal identification based on evidence from the dental and oral structures. The wrinkles on the labial mucosa are called as sulci labiorum which forms a typical pattern called as lip prints. The first person to describe the biologic phenomenon of furrows and lines on the red part of human lips was an anthropologist, R. Fischer in the year 1902.[1] Cheiloscopy is a forensic odontology technique that deals with the identification of human based on the lip prints owing to its uniqueness.

The aim of the present study was to evaluate the lip print pattern among different races including the Africans, Dravidian, and Mongoloids and also to evaluate reliability in gender determination.

Subjects and Methods

The present study comprised one hundred individuals for assessing the pattern of lip prints. The participants of the study were briefed about the purpose of the study and their lip prints were obtained with their consent. Lips with any disease or deformities of the lips and any known

hypersensitivity to the lipstick were excluded from the study.

Ninety subjects were selected and divided into three groups: Group A of thirty Africans, Group B of thirty Mongoloid, and Group C of thirty Dravidian. Each of this group was further divided into fifteen males and fifteen females.

The armamentarium to perform the procedure includes a lipstick of bright color, transparent cellophane tape, scissors, record book, and a magnifying lens. The subject's details were recorded in a log book. Then, the impression of lip print was made by asking the subject to keep the lips apart and lipstick was applied on the lips. The subject was asked to bring their lips together so as to spread the lipstick evenly without smudging. The subject was asked to leave the lips in resting and closed position during the procedure. A 10 cm length cellophane tape was cut and placed on both the lips together and held with an even pressure for a few seconds. Later, the tape was carefully lifted from the lips and stuck in a log book which served as a permanent record. The print was subsequently analyzed using a magnifying lens. The lip prints obtained were coded and at the time of analysis, the gender of the patient was not disclosed to the observer (two of the authors). For evaluation, the middle part of the lower lip was included as this part is most frequently found at a crime scene.

Based on the research done by two Japanese Scientists, Tsuchihashi and T. Suzuki, it was established that the pattern of lines and grooves on the human lips is unique for each human being.[2] In this study, we followed the classification of patterns of the lines on the lips proposed by Suzuki and Tsuchihashi, which is the most widely used classification in literature.[3]

- Type I: Clear-cut vertical grooves that run across the entire lips [Figure 1]
- Type II: Branched grooves [Figure 2]
- Type III: Intersected grooves [Figure 3]
- Type IV: Reticular grooves [Figure 4]
- Type V: Grooves that do not fall into any of the Types I–IV and cannot be differentiated morphologically (undetermined) [Figure 5].

The gender of the individual was determined as per the classification by Vahanwalla *et al*.[2]
- Type I: Patterns dominant - Female
- Type II: Pattern dominant - Female
- Type III: Pattern dominant - Male
- Type IV: Pattern dominant - Male
- Type V: (Varied patterns) Pattern dominant - Male, same patterns in all quadrants: Pattern dominant - Female.

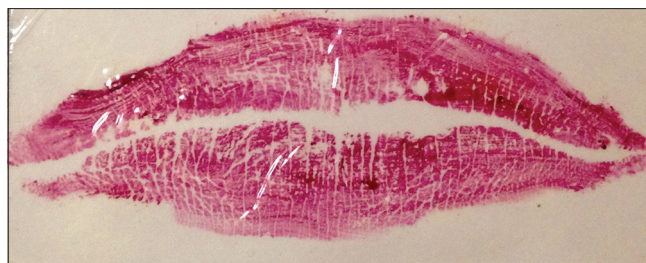The frequency of each type of lip print was tabulated and the result was calculated.

Figure 1: Type I: Clear-cut vertical grooves that run across the entire lips

Figure 2: Type II: Branched grooves

Figure 3: Type III: Intersected grooves

Results

In our study of ninety subjects, African males commonly have Type IV and females have Type I lip pattern. Dravidian males have Type IV and females have Type II lip pattern predominant. Mongoloid males have Type IV and females have Type I pattern predominant [Table 1]. Using ANOVA statistical analysis, on a comparison of three races in observed data - male and female were found to be significant with a $P = 0.000492$.

Discussion

Cheiloscopy records the impression of the upper and lower lip for an individual; then this ante mortem record can be used for matching the details of lip prints with that of the postmortem records for personal identification.[4]

Lip prints are commonly left behind in crime scenes that can be easily identified and traced using aluminum and magnetic powder.[5] This is based on the fact that lips have sebaceous glands and sweat glands which secrete
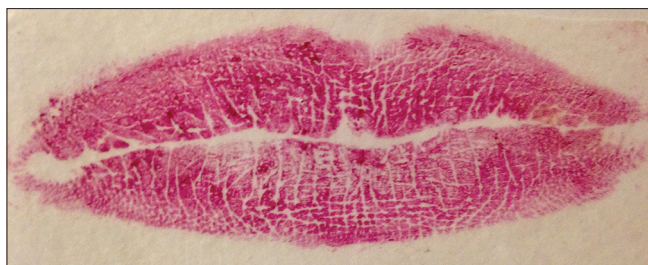
Figure 4: Type IV: Reticular grooves

Table 1: Comparison of three races in observed data

Type	Sex	African	Mongoloid	Dravidian
Type I	Male	3	5	0
	Female	6	9	4
Type II	Male	1	2	0
	Female	4	3	7
Type III	Male	3	1	6
	Female	0	0	2
Type IV	Male	7	6	9
	Female	3	2	2
Type V	Male	1	1	0
	Female	2	1	0

Using ANOVA statistical analysis, on comparison of three races in observed data - male and female was found to be significant with a $P=0.000492$

of oil and moisture leading to the formation of latent lip prints.[6]

In the present study, the lip prints were recorded in relaxed, closed position, and open mouth. According to Sivapathasundharam *et al.*, the uniqueness of the lip patterns depended on the way the lip muscles are relaxed so as to produce a particular lip pattern.[7] This pattern is subjected to changes in the open mouth and closed mouth state. In closed mouth position, the lip exhibits well-demarcated lines. However, in the open position, the grooves are relatively ill-defined and thus difficult to evaluate. Thus, we included only closed mouth lip prints for analysis. He also studied the lip prints of Indo-Dravidian population and concluded that a Type III pattern is predominant among them.

According to a study conducted by Randhawa *et al.*, the most predominant lip pattern in females was Type I followed by Type II and Type III, whereas in males, Type III lip pattern was predominant, followed by Type I and Type IV.[8] Verghese *et al*. demonstrated a study of lip prints among Kerala population and found that the most common pattern among them was Type IV.[9]

According to Jaishankar, the patterns were unique even in twins and unique for each individual. Each individual appeared to have a combination of different patterns in all the quadrants. Moreover, there was no particular pattern specific to any sex or any quadrant or any age.[10]
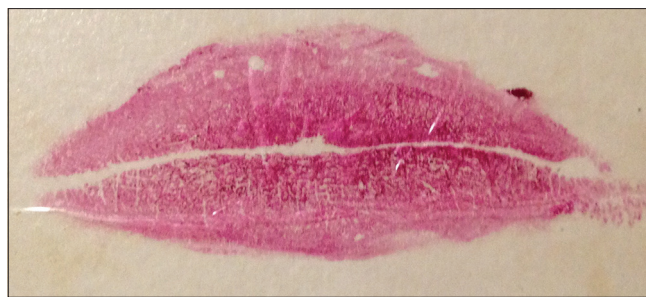

Figure 5: Type V: Grooves do not fall into any of the Types I–IV and cannot be differentiated morphologically (undetermined)

Similarly, in our present study, no two lip prints were identical or similar. Thus, lips prints are unique, however can be used only as an adjunct in personal identification as soft tissue is subjected to changes.

Conclusion

Identification of an individual either alive or not is based on the prime theory each individual is unique. The current criminal investigation has reached a point of sophistication so as to solve a crime. From our current study, it can be said that the lip print pattern has a significant difference interracially. However, it can be used only as an additional tool for personal identification because of their uniqueness despite its limitations.

Conflicts of interest
There are no conflicts of interest.

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