

Cheiloscopy: An aid for personal identification

Rashmi Venkatesh,
Maria Priscilla David¹
*Department of Oral Medicine
and Radiology, K.M. Shah Dental
College and Hospital, Vadodara,
Gujarat, ¹M. R. Ambedkar Dental
College and Hospital, Bangalore,
Karnataka, India*

Address for correspondence:
*Dr. Rashmi Venkatesh,
Sr. Lecturer, Department of
Oral Medicine and Radiology,
K.M. Shah Dental College and
Hospital, Pipariya,
Waghodia Road, Vadodara Dist,
Gujarat - 391 760, India.
E-mail: drrashmivenkatesh@
gmail.com*

Abstract

Aim: Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lips traces. The aim of this study is to establish the uniqueness of lip prints which aids in personal identification. **Materials and Methods:** The study group comprised of 200 subjects. The materials used were dark-colored lipstick, paper, cellophane tape, a brush, and a magnifying lens. **Results:** This study shows that lip prints are unique and permanent for each individual, and the lip prints among family members and between twins revealed different patterns on the whole with few similar grooves suggesting the existence of heredity in the lip prints. **Conclusion:** Our study showed that lip prints are unique to each individual and can be used for personal identification.

Key words: Cheiloscopy, forensic science, lip prints

Introduction

Forensic science refers to the areas of endeavor that can be used in a judicial setting and accepted by the court and the general scientific community to separate truth from untruth.^[1] In forensic identification, the mouth allows for a myriad of possibilities. Due to the distinctive features of teeth, dental identification is one of the most popular ways to positively identify an individual. In fact, teeth are known to have singular features and possess extraordinary resistance to extreme conditions. These properties enable fast and secure identification processes.^[2]


The traditional methods for personal identification include anthropometry, finger prints, sex determination, age estimation, measurement of height, and differentiation by blood groups, DNA and odontology.^[3] Cheiloscopy (from the Greek word

cheilos which means lips) is the forensic investigation technique that deals with identification of humans based on lip traces.^[4] The biological phenomenon of systems of furrows on the red part of human lips was first noted by anthropologists. Fisher was the first to describe it in 1902.^[2,4-6] It is possible to identify lip patterns as early as the sixth week of intrauterine life. Thereafter, lip groove patterns rarely change, resisting many afflictions.^[3]

This study was carried out with the objectives of investigating and evaluating the uniqueness of lip prints, their role in personal identification and for particular lip print pattern identification among family members and twins and also in evaluating the permanence of lip prints.

Materials and Methods

The sample comprised of 200 subjects who were divided into four groups: group 1 consisted of 85 males and 85 females of the age group between 5 and 30 years; group 2 comprised of five pairs of twins; group 3 comprised of five families (father, mother, child A and child B in each family); and group 4 comprised of 10 males and 10 females, whose lip prints were recorded twice at the interval of 3 months. Subjects with inflammation of lips, trauma, malformation, deformity, surgical scars, and active lesions of the lips were excluded. The materials used were dark-colored lipstick, bond paper, cellophane tape

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(two inch wide), a brush for applying the lipstick, and a magnifying lens. After obtaining verbal consent, the lip print of each individual was recorded. The lipstick was applied with the brush in a single motion evenly on the lips of each individual. The subjects were asked to retain a relaxed lip position, and a lip impression was taken. The glued portion of the cellophane tape was used to make the impression, which was then stuck on to the bond paper. Minimal pressure was maintained while making the lip impression. The impression was subsequently visualized with the magnifying lens. The lip prints were divided into four quadrants; right upper as the first quadrant, left upper as the second quadrant, left lower as the third quadrant, and right lower as the fourth quadrant. The lip print patterns were analyzed following the classification of Suzuki and Tsuchihashi^[3] [Table 1 and Figure 1]. The data were compiled and the following results were drawn.

Results

All lip prints showed different patterns. The lip print did not consist simply of one type of groove alone, but appeared as a mixture of varying types [Figures 2-6]. In group 1, type II groove was most commonly seen and the second most common groove was type I' followed by type I. Types III and IV grooves were mostly seen in the upper lip and rarely seen in the lower lip, and type V was seen commonly in the lower lip [Figure 7]. All the four quadrants showed different patterns in 29% of males and 26% of females. Similar lip print patterns were observed in three quadrants in 14% of males and 11% of females. Similar lip print patterns were observed in two quadrants in 51% of males and 55% of females. Similarities among all the four quadrants were noticed in 7% of males and 6% of females [Figure 8]. The observation of lip prints of five pairs of twins (group 2) resulted in finding that although the lip print patterns of twins were extremely similar; in detail no two of them were exactly identical. Analysis of characteristics of lip prints of two-generations of five families (group 3) was carried out. Lip prints of all children within the five two-generation families possessed the same characteristics of the parents with the exception of two children. Although children showed similar lip grooves as their parents (either father or mother) which might indicate a familial inheritance; the placement of these grooves was in different locations. Therefore, the pattern created was completely different from their parents. Thus lip prints are hereditary yet considered to be individualistic, each possessing their own unique characteristics. The lip prints of the same individuals (group 4) were investigated twice at the interval of 3 months to look for any changes in the pattern over time. The second set of lip prints was identical to the first set. Stability showed by the prints throughout this period suggests the permanence of the lip print.

Discussion

Forensic odontology is a valuable component of forensic investigation in many countries. It involves dentist's participation in assisting legal and criminal issues. The application of dental sciences in criminal and legal investigations gathered momentum in the West during the 1950s and 1960s. Cheiloscopy is analogous to fingerprint analysis, and is a genuine subspeciality of forensic odontology.^[7]

Lip prints bring added evidence to a crime scene that can be valuable, especially in cases lacking other evidence, like fingerprints. Lip prints can be a factor in many different kinds of crimes, such as tape when a person has been bound or gagged, prints on a glass that a person drank from, prints on a cigarette butt, and prints on a glass/window if they were pressed up against it. All of these are potential places where lip prints may be found and used in the investigation of a crime. However, the use of lip prints in criminal cases is limited because the credibility of lip prints has not been firmly established in the court system.^[6]

Lip print patterns in all 200 subjects were distinct and none of the patterns were identical. This finding was compliance with results obtained in the similar studies conducted earlier by Tsuchihashi and Suzuki^[3] and various other authors.^[5,8,9] This proves that the lip print pattern is unique to each individual.

Lip print patterns did not simply comprise of one type alone, but appeared as a mixture of varying types as is also the case in a previous study conducted by Tsuchihashi.^[3] In this study, type II grooves were most commonly seen followed by Types I' and I. This finding was similar to earlier studies conducted in Indian population.^[5] Comparison of lip prints among family members and twins also showed different individual patterns although a few similar grooves could be recognized suggesting a genetic inheritance. This finding is comparable with results of various other studies.^[3,10]

To ascertain if lip patterns change with time, we recorded and analyzed the lip prints of 10 males and 10 females once again after 3 months. The lip print patterns were the same as before. This shows that the lip patterns remain unchanged during an individual's lifetime and confirms

Table 1: Suzuki and Tsuchihashi classification of lip prints^[3]

Type I	Clear-cut grooves running vertically across the lip
Type I'	The grooves are straight but disappear half-way instead of covering the entire breadth of the lip
Type II	The grooves fork in their course
Type III	The grooves intersect
Type IV	The grooves are reticulate
Type V	The grooves do not fall into any of the types I-IV, and cannot be differentiated morphologically

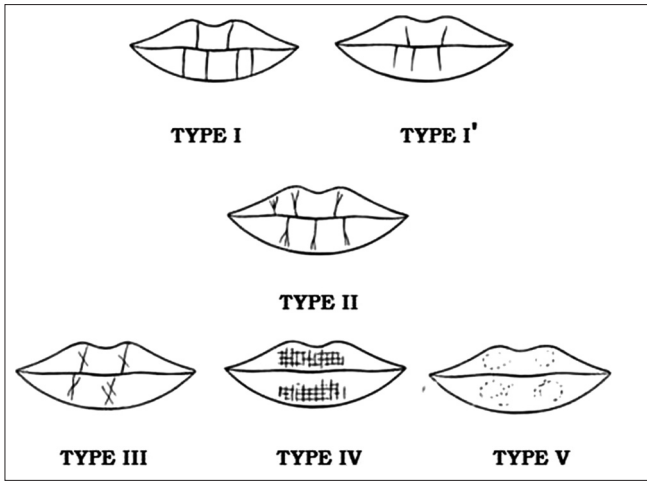


Figure 1: Suzuki and Tsuchihashi classification of lip prints (pictorial representation)



Figure 2: Lip print showing type I grooves in third and fourth quadrants medially



Figure 3: Lip print showing type II grooves in third and fourth quadrants



Figure 4: Lip print showing type III grooves in first and second quadrants



Figure 5: Lip print showing type IV grooves in third and fourth quadrants medially



Figure 6: Lip print showing type V grooves in third and fourth quadrants

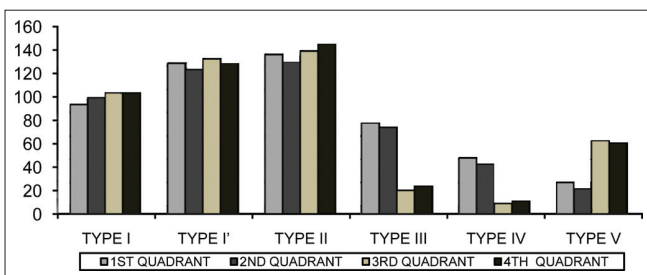


Figure 7: Distribution of lip groove patterns among quadrants

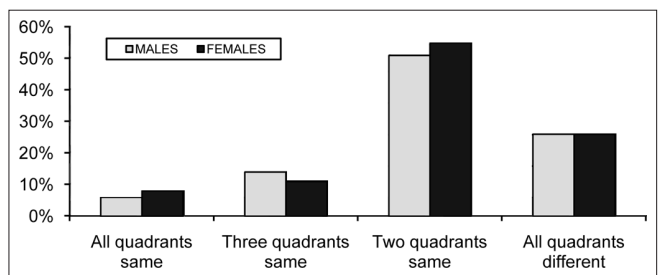


Figure 8: Similarity of lip print patterns among different quadrants

the permanence of lip prints. Even if environmental factors and pathologies affecting the lips could bring about changes in lip patterns, it has been observed that the lip prints reassume their former pattern on recovery.^[3] In fact, only those pathologies that damage the lip subtract like burns seem to rule out the cheiloscopy study.^[2]

Sometimes lip prints may be seen as lipstick smears. Lipsticks are complex substances, which have in their constitution, several compounds, oils, or waxes. When searching for lip prints, one must always consider that not all lipstick smears are colored; in fact, in recent years the cosmetic industry has been developing new persistent lipsticks which do not leave a visible smear or mark when they come in contact with different items. However, all lip prints are important, even the ones that are not visible. In fact, this complex process is not restricted to studying visible prints, but also the latent ones. The vermilion border of the lips has minor salivary and sebaceous glands, which, together with the moisturizing from the tongue, leads to the possibility of the existence of latent lip prints. The identification of latent print evidence is often considered the key in solving a crime.^[2] Many reagents such as magnetic oxides, aluminum oxides, and fluorescent dyes such as Nile blue and Nile red are used to develop latent lip prints similar to fingerprints.^[6,11,12] In this manner, latent lip prints should always be considered when processing a crime scene, even if there are no traces of lipstick. Satisfactory identification results by lip prints have been obtained even in sex determination^[13] and in postmortem studies.^[14]

Where identification is concerned, the mucosal area holds the most interest. This area, also called Klein's zone, is covered with wrinkles and grooves that form a characteristic pattern—the lip print. However, this is not the only area that deserves a careful study. In fact, in cheiloscopy, one should also analyze lip anatomy, considering their thickness and the position. The lips can be horizontal, elevated or depressed and, according to their thickness, it is possible to identify the following four groups: thin lips (common in the European Caucasian); medium lips (from 8 to 10 mm, are the most common type); thick or very thick lips (usually having an inversion of the lip cord and are usually seen in negroes); and mix lips (usually seen in Orientals).^[2]

From the above-mentioned findings, it is noteworthy that

the data obtained in this study are quite promising as it indicates the uniqueness and permanence of lip prints. Besides, the procedure of lip print analysis is very simple and inexpensive. Therefore, it may be recommended that the lip prints can be used as a reliable aid to human identification in the field of forensic science. However, further studies should be conducted on a large number of individuals of different races, family members, twins, and siblings and for gender determination. In addition, a standard and uniform procedure needs to be put forth for the collection, the development, recording, and computerized analysis of the lip prints.

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