

Incidence of Lip Print Patterns among South Indian Population: An Anthropological Study

Hosmani Jagadish V*

Nayak Ramakant S**

Kotrashetti Vijayalakshmi S***

Pradeep S****

Babji Deepa*****

*Senior Lecturer, Oral Pathology, Maratha Mandal's N.G.H.I.D.S & R.C. Belgaum, India

**Professor & Head, Oral Pathology, Maratha Mandal's N.G.H.I.D.S & R.C. Belgaum, India

***Reader, Oral Pathology, Maratha Mandal's N.G.H.I.D.S & R.C. Belgaum, India

****Senior Lecturer, Oral Pathology, Maratha Mandal's N.G.H.I.D.S & R.C. Belgaum, India

*****Senior Lecturer, Oral Pathology, Maratha Mandal's N.G.H.I.D.S & R.C. Belgaum, India

Abstract

Background: The appearance of lip prints look like finger prints and are heritable and are supposed to be individualistic. Off lately studies of lip prints (cheiloscopy) has drawn attention of many forensic researchers in solving crime and legal related cases.

Aim: The present study was aimed to evaluate the lip print patterns of different individuals in four quadrants of lip and find out the incidence of most prominent pattern in the South Indian Population.

Materials & Methods: A total of 200 adult subjects (100 males and 100 females) were included in the study. Suzuki and Tsuchihashi classification devised in 1970 was used to classify the types of grooves and the results were statistically analyzed.

Results: Amongst all the lip prints studied, no identically similar lip-print pattern appeared in two subjects. In males Type I pattern was most prominent in all the quadrants (28.7%) followed by Type III pattern (27.7%). In males Type I was more prominent in upper right quadrant (38%) and lower left quadrant (21.8%) and Type III was prominent in upper left (28.2%) and lower right (31%). In females too Type I pattern was prominent in all the quadrants studied (34%). In females lower left quadrant showed the highest frequency of Type I (37%) followed by upper right quadrant (34.6%). Upper left and lower right quadrants showed Type I pattern in 33% respectively.

Conclusion: According to the present study lip prints are unique to an individual and can be very essential for identification of a person.

Keywords: Cheiloscopy; Lip prints; Forensic odontology.

Corresponding author: Dr. Jagadish V Hosmani, Senior Lecturer, Maratha Mandal's N.G.H.I.D.S. & R.C. Belgaum, R.S. No. 47A/2, Bauxite Road, Belgaum-590010.

Introduction

Personal identification acts as fulcrum in legal proceedings, mass disasters and at the

crime sites.[1] Fingerprinting and DNA profiling play a pivotal role in establishing a person's identity.[2] Gradually over the years dentist have gained a prime role in forensic and legal medicine and have been involved in various objectives like age and sex determination, personal identification of unknown deceased person, analyzing bite marks as evidence, participating in identification of corpse in mass disaster, giving evidence in child abuse and in civil and criminal litigation.[3]

Oral cavity owing to its unique environmental condition allows for myriad of possibilities as it houses both hard and soft tissues. Over the past decades the hard tissues of oral cavity particularly teeth have been source of forensic identification.[4]

In certain peculiar situations, mostly related to criminal investigations, there can be other data, which are important to the process of human identification. Some of those data result from soft oral and peri-oral tissue prints. Lip prints are 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, examination of which is known as cheiloscopy.[5]

Several studies have been done in the past using lip print patterns for human identification.[2,4,6] Analysis of the lip prints left at a scene of crime, and their comparison with those of the suspected person may be useful for identification.[4] Studies have dealt with the possibility of the presence of species and gender differences. These studies pointed out that if this uniqueness and specificity were proved, the lip prints might be an important tool for identification.[7] Santos suggested that the fissures and lines in the lips could be divided into two different groups, and each group was further subdivided into eight subtypes,[8] whereas Suzuki and Tsuchihashi considered six different types of grooves: complete vertical, incomplete vertical, branched, intersected, reticular and irregular pattern.[9] Renaud studied the lips in halves,

and classified the grooves according to their form into 10 types.[10]

The present study was aimed to evaluate the lip print patterns of different individuals in four quadrants of lip and find out the incidence of most prominent pattern in the given population of South India and create dental database which can be utilized whenever required.

Materials and Methods

A sample of 200 individuals comprising 100 males and 100 females were included in the study. All individuals were aged between 18-40 years. Lips free from any pathology, having absolutely normal transition zone between the mucosa and skin were included in the study. Consent of all the individuals was obtained for the study.

Red, non-persistent, non-glossy, non-metallic lip sticks were used to get clear lip prints. White chart papers were used to take the impression of the lips. A thin film of lipstick was applied onto cleaned and dried lips, left for 5 minutes, and then the impression of the lips were taken on the specified papers. The impression was taken by rolling the paper onto the lips with applying slight, gentle pressure onto the lip taking the print of the upper lip from one angle of the mouth to the other; then the print of the lower lip was taken starting from the other angle and rolled to the first one. The lips were kept relaxed and slightly separated during the manipulation. A cellophane strip was stuck to the white chart paper after the impressions were taken for permanent record purpose.

The obtained prints were examined by magnifying hand lenses with direct light focused on it. Each individual's lips were divided into four compartments, i.e., two compartments on each lip, and were allotted the digits 1-4 in a clock-wise sequence starting from the subject's upper right.

In order to classify the lip prints in this study, the scheme proposed by Suzuki and Tsuchihashi was used, which is as follows:

1. Type I-A clear-cut groove running vertically across the lip.
2. Type II-Partial-length groove of Type I
3. Type III-A branched groove.
4. Type IV-An intersected groove
5. Type V-A reticular pattern
6. Type VI- Other patterns

We slightly modified the classification and included Type II (partial length groove of Type -I) as Type I pattern

Results

All data were analyzed statistically for determining the frequencies of the pattern types in each area of the lip, frequencies of the pattern types in each sex and for comparison between males and females regarding upper and lower lip.

Throughout the whole study on 200 persons, no identically similar lip-print pattern appeared in two individuals.

When the overall pattern was evaluated among all the lip compartments of the study subjects, it was found that Type I pattern (A clear-cut groove running vertically across the lip) was most common, both among males and females having 28.7% and 34% respectively. Type III pattern was the next prominent pattern in both sexes with 27.7% of the males and 22.9% of females having this pattern. (Table 1)

Table 1: Frequency of lip prints in Males & Females

Lip Print Pattern (%)	Males (N=100x4)	Females (N=100x4)
Vertical	113 (28.7%)	135 (34%)
Branched	64 (16.2%)	53 (13.6%)
Intersected	109 (27.7%)	89 (22.9%)
Reticular	47 (11.9%)	37 (9.5%)
Undetermined	60 (15.2%)	73 (18.8%)

Table 2: Frequency of pattern types on different topographic areas of the lips

Lip Compartment	Lip print Pattern (%)	Males (N=100x4)	Females (N=100x4)
Upper Right	Vertical	38 (33)	36 (25)
	Branched	12 (18)	10 (18)
	Intersected	24 (22)	22 (24)
	Reticular	10 (21)	13 (35)
	Undetermined	16 (26)	19 (25)
Upper Left	Vertical	21 (18)	33 (21)
	Branched	25 (39)	17 (32)
	Intersected	29 (25)	14 (16)
	Reticular	8 (17)	14 (37)
	Undetermined	17 (28)	22 (30)
Lower left	Vertical	31 (25)	33 (21)
	Branched	11 (17)	16 (20)
	Intersected	28 (23)	23 (25)
	Reticular	15 (31)	10 (10)
	Undetermined	13 (25)	18 (24)
Lower Right	Vertical	25 (22)	35 (25)
	Branched	16 (25)	15 (28)
	Intersected	31 (28)	30 (33)
	Reticular	14 (23)	6 (16)
	Undetermined	14 (23)	14 (19)

Frequency of pattern types on different topographic areas of the lips (Table 2) is as follows:

Type I pattern: In males it was the most prominent pattern overall in the four quadrants but was more prominent in upper right quadrant (33%) and least prominent in upper left quadrant (18%). In females too Type I was most prominent amongst all quadrants but lower right quadrant relatively showed the highest percent (25%) of Type I pattern. In females the margin of difference in all the quadrants was very low compared to the males.

Type II pattern: In males upper left quadrant was predominated by type II pattern with 39% and lower left quadrant showed the least. (17%) Similar distribution was seen in females where Type II pattern was relatively high in upper left quadrant with 32% and was relatively low in lower right quadrant.

Type III pattern: Lower right quadrant in males showed highest prevalence of this pattern (28%) and upper right showed the least (22%). In females upper right quadrant had highest distribution of Type III pattern (33%) and upper left showed the least with only 15%.

Figure 1

Type IV pattern: In males lower left quadrant showed relatively high distribution (31%) of this pattern and upper left quadrant showed the least (17%) distribution. In females upper left quadrant showed relatively high distribution (37%) whereas lower left showed the least (10%) distribution.

18.8% of the lip prints in females were undetermined compared to males where 15.2% lip prints were undetermined.

Predominance of Lip print patterns in lip quadrants of Males

Upper Right	Type I	38%
Upper Left	Type III	28.2%
Lower Right	Type III	31%
Lower Left	Type I	21.8%

Predominance of Lip print patterns in lip quadrants of Females

Upper Right	Type I	34%
Upper Left	Type I	33%
Lower Right	Type I	33%
Lower Left	Type I	37%

Discussion

In the 1930s, the pioneer criminologist Edmund Locard-'The French Sherlock Holmes'-famously declared, "Every contact leaves a trace." Among the crime-scene contacts that Locard suggested might be used to uniquely identify a thief where the lip prints left behind on a drinking glass or a cigarette butt snuffed out in an ashtray. While cheiloscopy-the scientific study of lip prints has captured the imagination of many a detective, it remains a forensic work in

progress in need of standardized methodologies to systematize the collection and categorization of the uniquely patterned grooves, furrows, and wrinkles that comprise a human lip print.[11]

Lip prints can link a subject to a specific location if found on clothes or other objects, such as glasses, cups or even cigarettes' butts. Sometimes lip prints will be seen as lipstick smears.[12] Lipsticks are complex substances, which have in their constitution; several compounds, oils or waxes and the color of the lipstick is due to organic inks and inorganic pigments. However, all lip prints are important, even the ones that are not visible.[13]

Many Indian studies dealt with possibility of uniqueness of the lip prints, comparable with the fingerprints, and the possibility of the presence of species and gender differences. Aggarwal had reported that the fissures and the criss-cross lines on the lips are different in different people and could form a very important basis of identification at many times.[14] Saraswathi et al also studied the lip prints of different individuals in different parts of lip and found out the incidence of any particular pattern in the given age group in relation to specific gender using Suzuki and Tsuchihashi classification in Indian population. They found out that intersecting pattern was most common, both among males and females having 39.5% and 36.5%, respectively and the least common was the reticular pattern in both the sexes.[15] Singh et al ascertained the authenticity of lip prints as a tool for identification of individual and establish its identity value. They too used Suzuki and Tsuchihashi classification to categorize the lip prints. They observed that Type II pattern was most prominent in both sexes. They stated that no one had got single type of lip print in all compartments and no two individuals or more than two individuals have similar type of lip print.[16] In another study conducted by Vahanwala-Parekh, it was shown that all four quadrants having same type were predominantly seen in female

subjects and male subjects showed presence of different patterns in a single individual.[17]

However, data related to South Indian studies on lip prints are meager. Our study described five types of grooves in South Indian population constituting the lip pattern which were initially described by Suzuki and Tsuchihashi in 1970. The results of our study were in accordance with their study which reported that lip prints had different patterns that were apparently unique to the individuals. A similar kind of study was done in South India by Uma Maheshwari, who proved the individuality of lip prints in Chennai.[18] They reported that no one had a single groove type in all compartments of the lip whereas our study found similar grooves in more than one compartments in many individuals.

Our results revealed that Male had Vertical and Intersected Grooves as the most prominent lip patterns whereas Female had only vertical grooves as the most prominent pattern in all the compartments of the lip.

Various studies done in the past on lip prints echoed similar findings that lip print characteristics could be used for personal identification. These studies pointed out the possibility of uniqueness of the lip prints, comparable with the fingerprints, and the possibility of the presence of species and gender differences.

Most of these studies were population based, the researchers used one particular classification criteria to identify the prevalence of the most common lip pattern in that particular population at that particular time.

Our study was on similar lines as the previous studies conducted on lip prints. The basic intention of our study was to know the most prevalent lip print pattern in males and females using Suzuki and Tsuchihashi classification. We are designing a protocol of recording complete dental data of the individual and these lip patterns would be one of them. Digitalization of this complete dental data is our ultimate goal.

Our further study will be aimed to procure the invisible lip prints or latent lip prints from the same population analyzed in this study and later match it with lip print patterns recorded through lipsticks in this study and evaluate the success rate of correctly matching the print patterns.

We also encountered certain problems while recording lip prints like smudging or spoiling lip prints and these could be attributed to application of uneven pressure, mobility of the lips and prominent facial hair among men. Whenever we encountered improper lip prints we discarded them and recorded the lip print once again.

Conclusion

The study revealed a special pattern of lip prints for both the sexes. Our study reiterated the uniqueness of lip print for each individual. In near future software program can be developed which can possibly help us in identifying an individual by just entering the individuals lip print pattern. This software could help us solving crime scene investigations and personal identifications. This could be possible only when we make it mandatory to include complete dental data of an individual in the unique identification card (UID) which will be issued by most of the government bodies of the various countries.

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