



Role in Sex Determination and Identification in Varanasi Population

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Abstract

Cheiloscopy, the study of lip prints, and rugoscopy, the study of palatal rugae, are emerging tools in forensic identification. Lip prints form unique, lifelong patterns detectable from the sixth week of intrauterine life, while palatal rugae appear in the third month of embryonic development and remain stable even after death. Both exhibit sex-specific variations in pattern, shape, and branching, making them valuable markers when conventional methods such as fingerprinting are inconclusive. This study was undertaken to analyze lip print and palatal rugae patterns, their variations, and their role in sex determination and personal identification.

Keywords: Cheiloscopy; rugoscopy; sex determination; palatal rugae patterns

Introduction

The study of lip prints is called Cheiloscopy. Lip prints are characteristic patterns of fissures in the form of elevations and depressions present in the zone of transition between inner labial mucosa and the outer skin. It is unique and used for sex determination as it remains constant throughout the life. Pattern of lip prints is characteristically different in males and females as per Vahanwala's classification. They are said to be unique and they can be identified as early as the sixth week of intrauterine life. Palatal rugae are irregular, asymmetric ridges of mucous membrane extending laterally from incisive papilla and anterior part of median palatal raphe. Rugae are unique, unchanging and subject to classification. Characteristically males and females have different rugae patterns in shape, number, branching and unification. It appears in the third month of embryonic life and remains for several days after his/her death.

When identification cannot be established by fingerprinting or other method, lip prints can be considered for identification of sex. So the present study was undertaken to study the lip prints, their variations, their role in sex determination identification.

Material and Methods

The study sample is consisted of 400 subjects out of which 200 were Males and 200 were Females, reporting to the department of Oral Medicine and Radiology, Faculty of Dental Sciences, IMS, Varanasi. An informed consent was taken from all the subjects included in the study. Simple random sampling method was used for patients selected.

Exclusion Criteria:

All the subjects with evidence of developmental anomalies, history of Surgeries, Malocclusion, Inflammation, Trauma, Ulcers, Denture Wearers and Hypersensitivity to lipsticks were excluded from this study.

Inclusion Criteria:

Cooperative and apparently healthy subjects and all the subjects with no lesions on lips with normal lip mucosa were included.

Lip Prints Recording Procedure:

Care was taken to select individuals with no lesions on lips. Individuals with known hypersensitivity to lipsticks will not be included in the study. A dark coloured lipstick was applied with a single stroke.

The subjects were asked to rub both the lips to evenly spread the applied lipstick. After about two minutes, lips impression will be made on a strip of cellophane tape on the glued portion, the tape carrying lips print were pasted on white paper sheet. Each individual were given a serial number, While noting the name and sex of respective individual. At the time of analysis the sex of print were not be disclosed.

In this study we classified using the Tsuchihashi classification. It is as follows:⁵⁵

- **Type 1:** clear cut vertical grooves that *run across* the entire lip.
- **Type 1':** similar to type 1, but *do not cover* the entire lip.
- **Type 2 :** Branched grooves

- **Type 3:** Intersected grooves
- **Type 4:** Reticular grooves
- **Type 5:** Grooves do not fall into any of the types(1-4) and cannot be differentiated morphologically (undetermined)

The sex of individual was determined as per the descriptions given by Vahanwala et al ⁷⁶.

- **Type 1 and 1':** Pattern Dominant-*Female*
- **Type 2:** Patterns are Dominant-*Female*
- **Type 3:** Pattern Present-*Male*
- **Type 4:** *Male*
- **Type 5:** varied pattern- *Male*.

Same patterns in all quadrants- *Female*

Results

Age distribution	Female		Male	
	No. of subjects	Percentage	No. of subjects	Percentage
21-35	158	79.0	177	88.5
36-45	37	18.5	21	10.5
46-55	5	2.5	2	1.0
Total	200	100.0	200	100.0
Mean ± SD	30.3 ± 7.2		29.7 ± 6.1	
P-value	0.36			

Table 1: Distribution of subjects according to Age.

Here found that the mean age of the female group was 30.3 years and for the men group it was 29.7 years. In this study the majority 79% female subjects and 88.5% of male subjects were of the age group 21-35 years.

Type of lip print	Female		Male	
	No. of subjects	Percentage	No. of subjects	Percentage
1 & 1'	83	41.5	45	22.5
2	47	23.5	15	7.5
3	38	19	96	48
4	19	9.5	26	13
5	13	6.5	18	9
Total	200	100	200	100
Mean ± SD	2.1 ± 1.2		2.8 ± 1.2	
P-value	<0.0001			

Table 2: Distribution of subjects according to Type of lip print.

Here we found that the most common lip print in females was type 1 and in male most common lip print type was type 3.

Outcome according to lip print	Female		Male		P-Value
	No. of subjects	%	No. of subjects	%	
Female	130	65.0	60	30.0	<0.001
Male	70	35.0	140	70.0	<0.001
Total	200	100.0	200	100.0	

Table 3: Distribution of subjects according to lip print.

Here we found that 65% subjects in the female group were female according to lip print and 70% subjects in male group were male according to lip print analysis. There was a significant difference seen between these groups as p value was <0.05.

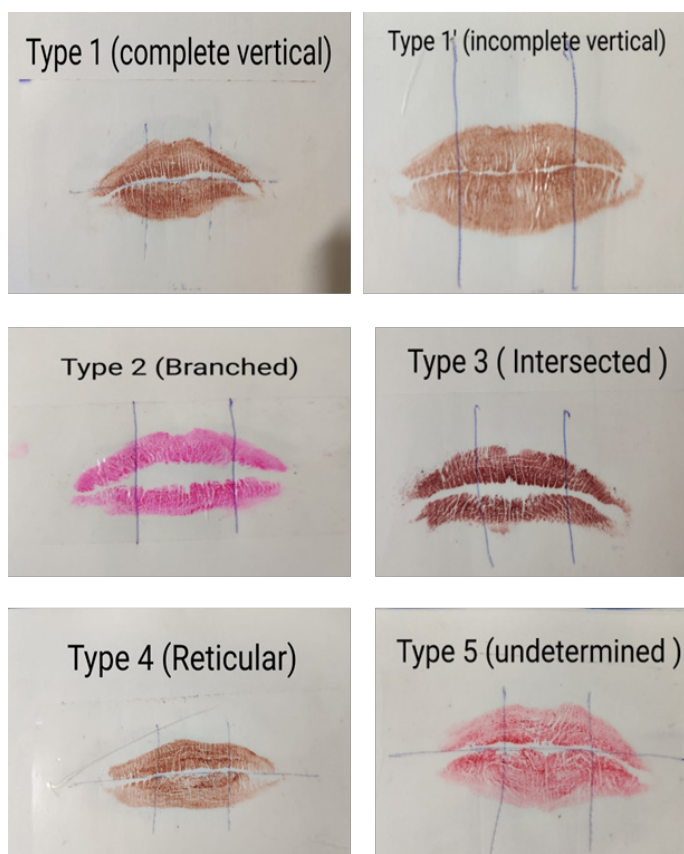


Figure 1: Lip Prints (a)Type 1, (b) Type 1', (c) Type 2, (d) Type 3, (e) Type 4, (f) Type 5.

Discussion

The positive identification of the living or deceased individual is using various dental and skeletal traits owing to their unique features with variations and stability against external factors remains to be the important sources of forensic investigations. The most common role of the forensic dentist is the identification of deceased individuals.⁷⁷

Lip prints bring added evidence to a crime scene that can be valuable, especially in cases lacking other evidence like fingerprints, although the credibility of lip prints is still not established in the court system. The study of lip prints is known as cheiloscopy. Cheiloscopy (from the Greek words cheilos meaning “lips” and skopein meaning “to see”) is the name

given to the lip-print studies. Like fingerprints and palatal rugae, the lip grooves are permanent and unchangeable. It is possible to identify the lip print patterns as early as the sixth week of intrauterine life. From that moment on, the lip groove patterns rarely change, resisting many afflictions and hence lip prints aid as a tool in human identification.⁵⁹

Lip prints can be obtained at the crime scene from clothing, cups, glasses, cigarettes, windows and doors.⁸⁰ Even the invisible lip prints can be used and can be lifted using aluminium and magnetic powder similar to fingerprints. Lip prints are invariable, permanent and allow establishing a classification.

Demographic Data

The mean age of the female group was 30.3 years and for the male group it was 29.7 years. In this study the majority 79% female patients and 88.5% of male patients were of age group 21-35 years. We found that 65% of patient in the female group were ascertained to be females according to lip print analysis and 70% of patients in male group were ascertained to be males according to lip print analysis.

Analysis On Lip Print

In this study we found that there were 200 female patients and 200 male patients present in this study. We tried to ascertain whether the lip-prints hold the potential for determination of sex of the individual from their configuration. Even though the lines and furrows are present, both in the upper and lower lip from one corner of the mouth to the other corner, only the middle portion in the lip is taken into account, since this portion is always visible in any trace. We labelled a particular pattern on the basis of numerical superiority of types of lines present, that is, vertical, intersected, branched or reticular. If more than one pattern predominates it is typed as undetermined.

In our study, Type I, I' & II were most commonly seen in females, whereas Type III, IV & V were seen most commonly in males and percentage accuracy for identifying sex was about 70% in male and 65% in female. There was a significant difference seen between these groups as p value was <0.05. In addition, we observed that no lip prints matched with each other and that lip print pattern was unique to every individual.

A study by Nagalaxmi et al⁶⁵ found that no two lip prints showed similar patterns and distribution in each quadrant by both the observers. They observed more than two patterns in each individual and the distribution of these patterns in each quadrant we divided also showed variations from each other. They found that both the observers showed the distinct patterns from each other where no two patterns were identical in compliance with other studies conducted by Tsuchihashi and Suzuki⁸¹ and also other authors^{82,83}. The biological phenomenon of systems of furrows on the red part of human lips was first noted by anthropologists, R. Fischer who was the first to describe it in 1902.⁸² Use of lip prints in personal identification and criminalization was first recommended in France by Edmond Locard.⁸²

Some researchers are trying to relate characteristic lip patterns with person's gender, and detected DNA in latent lip prints.⁸³ They also found that type I' pattern to be dominant in females and type III in males consistent with other studies. However, Dongarwar et al.⁸⁴ in their study found type IV and type V patterns to be dominant in males and type I and type I' patterns to be dominant in females with slight deviation from our study.

Conclusion

Hence based on the above findings it can be concluded that the pattern of lip prints in our population are individualistic to each person and sex identification can be achieved based on types of lip prints. Comparing the findings of present study with the similar studies done abroad and in Indian context it can be concluded that the lip pattern in our population is different from other populations and hence a database can be generated for local population in large scale which can serve beneficial for identification purposes. In the limited literature available on this topic, there is a clear lack of uniformity in nomenclature, making it more difficult to compare the results. Hence we suggest developing a standard and uniform method for evaluation of lip prints.

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