

## Research Article

### Scope of cheiloscopy in gender identification

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#### Abstract

**Introduction:** Personal identification by various means is an important aspect of forensic science. Apart from teeth, which holds valuable potential for human identification, the role of orofacial structures cannot be ignored. One of the areas to be considered is the study of lip prints (cheiloscopy).

**Aim:** The present study was carried out to investigate and evaluate the uniqueness of lip prints, their role in personal identification and for particular lip print pattern identification among different gender.

**Methodology:** Each subject was given a code number to hide the actual sex from the analyser. The lips of the subject were cleaned thoroughly and a dark coloured lipstick was applied with a brush in a single stroke, evenly on the vermilion border and let it dry for 2 minutes. A lip impression was made on the strip of cellophane tape on glued portion which was stuck to the white bond paper.

**Results:** It was observed that lip prints were unique to an individual and the patterns varied among males and females.

**Conclusion:** we infer that there is no denying the fact that cheiloscopy can serve as an indispensable tool in identification along with other traditional methods.

**Keywords:** forensic odontology, cheiloscopy, gender, identification.

#### 1. Introduction

Identification of an individual is one of the most important goals of forensic science. It is imperative to recognize not only deceased but also to identify suspects and criminals for legal investigations and proceedings.<sup>1</sup> Various methods have been identified which aids in identification of an individual such as DNA profiling, dental records, anthropometry, age estimation and sex determination etc. Forensic odontology uses three major criteria for identification of individual- teeth, jaws and orofacial characteristics.<sup>2</sup> Dental surgeons apart from providing services in various fields of dentistry are expected to provide a valuable role in forensic odontology for various personal, social and legal reasons.<sup>3</sup>

Identification of lip prints goes back in 1902 when Fischer, an anthropologist described them as the furrows on red part of human lips. Later in 1932, lip prints were recommended for personal identification and criminal investigations by famous Edmond Locard, a French criminologists.<sup>4</sup> In 1970, Suzuki K. and Tsuchihashi Y. studied lip print patterns in 107 families and gave a classification to identify different lip print patterns.<sup>5</sup>

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. Just like finger prints, lip prints are also unique to an individual and thus may form a potential source for positive identification.<sup>6</sup>

It has been observed that lip prints can be identified as early as sixth week of intrauterine life and they do not change during the life of an individual. Even after trauma, inflammation and diseases like herpes they recover and can be identified without any defect. Some studies have observed similarities in the lip print patterns in members of the same family supporting that hereditary factors also play a role in lip prints.<sup>7</sup> However, unlike finger prints, cheiloscopy still has not been accepted as a scientific basis for identification due to invariability in the results of various studies done so far. Although the fact cannot be ignored that lip patterns are unique, permanent and rarely change, resisting many afflictions and thus can act as a potential tool in identification process.<sup>8</sup>

The present study was carried out to investigate and evaluate the uniqueness of lip prints, their role in personal identification and for particular lip print pattern identification among different gender.

#### 2. Materials and methods

The study sample consisted of 40 healthy individuals of Manipal College of dental sciences, Mangalore, of which 20 were males and 20 females between the age group of 18-30 years. Individuals with any known lip pathology and known hypersensitivity to lipsticks were not included in the study. Individuals undergoing orthodontic treatment were also excluded from the study.

##### 2.1 Technique

Permission to conduct study was taken from the time bound ethics committee of the institution. After obtaining informed consent from the patient, clinical examination of the lips was done. Each subject was given a code number to hide the actual sex from the analyser. The lips of the subject were cleaned thoroughly and a dark coloured lipstick was applied with a brush in a single stroke, evenly on the vermilion border. The subject was asked to rub both the lips gently to spread the applied lipstick evenly and let it dry for 2 minutes. A lip impression was made on the strip of cellophane tape on glued portion which was stuck to the white bond paper. This served as a permanent record. The impression was then subsequently visualized with the use of magnifying glass. (Figure1-5)

Figure 1: Armamentarium used

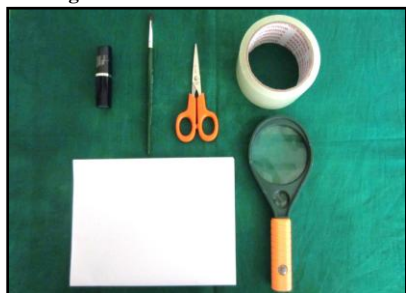


Figure 2: Application of lipstick



Figure 3: Drying of lipstick for 2 minutes



Figure 4: lip impression taken on cellophane paper



Figure 5: cellophane tape stuck on white bond paper



The patterns on the lips were seen in four quadrants: upper right, upper left, lower right, lower left and were categorized according to the classification proposed by Suzuki and Tsuchihashi.<sup>5</sup> (Figure 6)

Figure 6: Classification of lip prints by Suzuki and Tsuchihashi

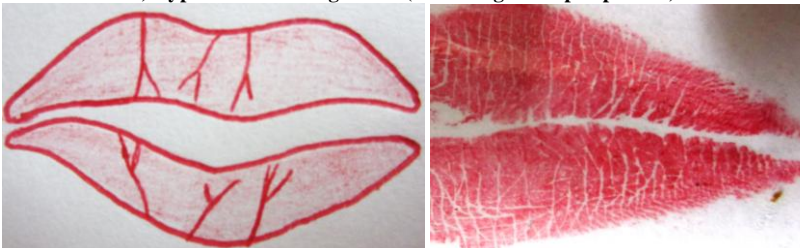
A) Type I: Clear-cut vertical grooves that run across the lips.



B) Type I': Partial length groove of type I.



C) Type II: Branched grooves (branching Y-shaped pattern).



D) Type III: Intersected grooves (criss-cross pattern).



E) Type IV: Reticular pattern.



F) Type V: Grooves that do not fall into any of the above categories and cannot be differentiated morphologically/undetermined.



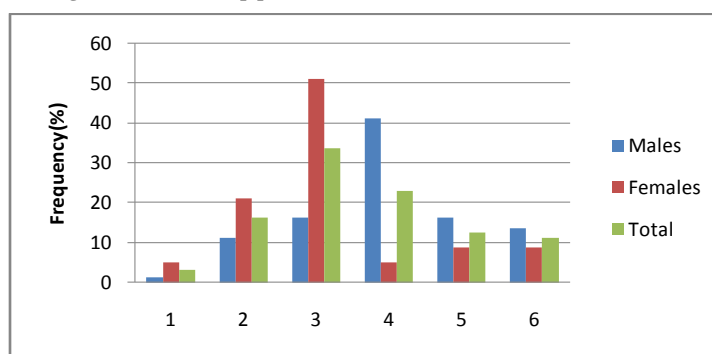
The sex of the individual was determined by the analyser as per the description given by Vahanvala *et al.*<sup>9</sup>

Lip print pattern	Site predilection	Gender predilection
Type I and I'	right upper lip	females
Type II	left upper lip	male
Type III	Never occurs in Lower lip	if so, only in male
Varied patterns	in all quadrants	male
Similar patterns	in all quadrants	female

### 3. Results

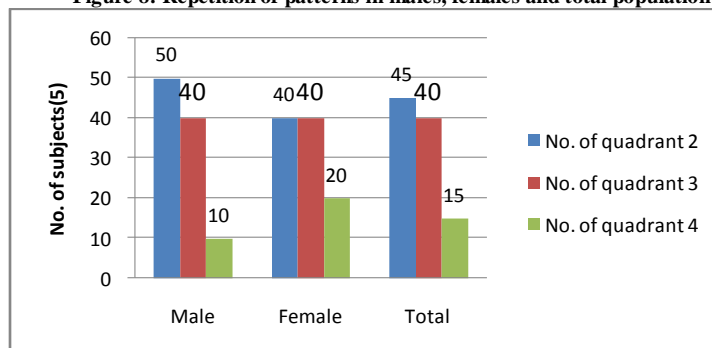
In the present study it was observed that lip prints are unique to an individual and no two or more individuals had similar type of lip print pattern. The most predominant pattern in the entire study population taking both the upper and lower lips together was type II (33.75%). This was followed in order by type III (23.12%), type I' (16.25%), type IV (12.5%), type V (11.25%) and type I (3.12%). In males the predominant pattern observed was type III (41.25%) followed by type IV (16.25%) and type II (16.25%) while in females type II (51.25%) was the most common pattern followed by type I' (21.25%). (Figure 7) According to the classification given by Vahanvala-Parekh for sex determination, 15 males and 16 females were correctly diagnosed by the analyser.

Figure 7: Common lip patterns in males, females and total individuals



When individual quadrant was considered type III pattern was common in all the quadrants in males while in females type II pattern was common in upper right, lower left and right quadrants and type I' in upper left quadrant. Also atleast two quadrants had similar type of lip print pattern in 50% of males as compared to 40% of females and all the quadrants had similar type of lip print patterns in 20% of females as compared to only 10% of males. (Figure 8)

Figure 8: Repetition of patterns in males, females and total population



#### 4. Discussion

In forensic identification, teeth have been proven to be a valuable source due to their distinctive features and ability to resist extreme conditions. However, in some particular cases there can be other crucial data available which can aid in identification process. Presence of soft oral and perioral prints such as lip prints at crime scene can form basis for evidence so as to number of people involved, presence or absence of a suspect and sex of an individual.<sup>10</sup>

Lip prints can be retrieved from various objects such as glasses, window panes, cutlery, cigarette butts and clothing etc. Due to the presence of minor salivary glands and sebaceous glands, latent lip prints can also be identified just like latent finger prints. They can be seen with the help of fluorescent dyes and sometimes with the help of materials such as aluminium powder, magnetic powder, silver metallic powder, silver nitrate powder, plumb carbonate powder, fat black aniline dye or cobalt oxide.<sup>8</sup>

In our study, it was observed that type II pattern (51.25%) was more common in females while type III pattern (41.25%) in males. The results of the present study are in agreement with those of Govindkar and Indurkar who observed lip patterns in 140 subjects (70 males and 70 females) and found that type II pattern (37.06%) was dominant in females while type III pattern (51.05%) was more common in males.<sup>11</sup>

A study by Vahanwala- Parekh on 100 subjects suggests that certain pattern trends were prevalent in either sex which is in concordance with our study.<sup>9</sup> Suzuki and Tsuchihashi (1970) conducted a study on Japanese families and concluded that lip prints are unique and permanent to an individual. Our study also demonstrated that each individual had a distinct lip print pattern.<sup>5</sup>

The problem with obtaining lip patterns is the mobile structures of the lips due to underlying musculature and thus variation may depend on the application of pressure and method used. However, the classification given is helpful in identifying the patterns as they don't overlap and point out distinct characteristics for positive identification when registered carefully.<sup>12</sup>

Some researchers have studied the possibility of obtaining DNA from latent prints makes these traces and to get a print maker's genetic profile.<sup>13</sup> Lip prints have been used by FBI in a case of robbery for positive identification of the suspect. Suzuki and Tsuchihashi also reported two criminal cases where lip prints were utilized as evidence.<sup>15</sup> Kasprzak in 1990 in his research on 1500 persons for five years elaborated the practical use of cheiloscopy.<sup>16</sup> Hence lip prints may prove as a valuable aid in identification in field of forensic science.

#### 5. Conclusion

The data obtained from the above study shows promising results and indicates the uniqueness and permanence of lip prints. They hold a conceivable potential to determine the sex of an individual. However, further studies should be conducted on a large number of individuals of different races, family members, twins, and siblings in order to achieve more accurate results. If a proper standardization will be achieved then cheiloscopy can act as a valuable tool in forensic science along with other methods of identification.

#### References

1. O'Shaughnessy PE. Introduction to forensic science. *Dent Clin North Am.* 2001 Apr;45(2):217-27.
2. Rothwell BR. Principles of dental identification. *Dent Clin North Am.* 2001 Apr; 45(2):253-70.
3. Sweet D. Why a dentist for identification? *Dent Clin North Am.* 2001 Apr; 45(2):237-51.
4. Saraswathi TR, Mishra G, Ranganathan K. Study of lip prints. *J Forensic Dent Sci.* 2009; 1:28-31.
5. Suzuki K, Tsuchihashi Y. New attempt of personal identification by means of lip prints. *J Indian Dent Assoc* 1970; 42: 8-9.
6. Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (Cheiloscopy). *Indian J Dent Res* 2001; 12:234-7.
7. Augustine J, Barpande SR, Tupkari JV. Cheiloscopy as an adjunct to forensic identification: a study of 600 individuals. *J Forensic Odontostomatol* 2008; 27(2):44-52.
8. Venkatesh R, David MP. Cheiloscopy: An aid for personal identification. *J Forensic Dent Sci.* 2011 Jul-Dec; 3(2): 67-70.
9. Vahanwala SP, Parekh BK. Study of lip prints as an aid to forensic methodology. *J Forensic Med Toxicol* 2000; 17: 12-8.
10. Castello A, Alvarez M, Verdu F. Luminous lip-prints as criminal evidence. *Forensic Sci Int* 2005; 155:185-7.
11. Gondivkar SM, Indurkar A, Degwekar S, Bhowate R. Cheiloscopy for sex determination. *J Forensic Dent Sci.* 2009; 1:56-60.
12. Ball J. The current status of lip prints and their use for identification. *J Forensic Odontostomatol.* 2002; 20:43-6.
13. Castello A, Alvarez M, Verdu F Just lip prints? No: there could be something else. *FASEB J.* 2004 Apr; 18(6):615-6.
14. Suzuki K, Tsuchihashi Y. Personal identification by means of lip prints. *J Forensic Med* 1970; 17: 52-7.
15. Tsuchihashi Y. Studies on personal identification by means of lip prints. *Forensic Sci.* 1974; 3:233-48.
16. Kasprzak J. Possibilities of cheiloscopy. *Forensic Science Int* 1990; 46:145-51.