Original Article

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Cheiloscopy: A Deterministic and Non Invasive Tool for Personal Identification

Sandeep S Kadu[1], Gayatri N Toshniwal[2]

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Abstract

Aim: To establish the uniqueness of lip prints for personal identification & to find the reference of the technique in family inheritance.

Objective: Use & reliability of lip prints in personal identification and family inheritance.

Hypothesis: Not applicable observational study.

Material and Method: The research will be conducted on around 100 students (50 males and 50 females) in Dr. Vitthalrao Vikhe Patil Foundation's medical college. The people with congenital lesions, lip surgery or hypersensitivity to lipsticks will be excluded. The method of making lip prints will be noninvasive using simple materials like dark colored lipsticks, cellotapes and a magnifying glass.

Result: The uniqueness of lip prints as personal identification tool is proved by statistically analysing the data obtained from all the lip types some evidences of family inheritance can also be proven.

Conclusion: The inference of the study is lip prints are unique and permanent for an individual. Also lip prints have different patterns based on the grooves. Hence Cheiloscopy can be deterministic tool in personal identification

Keywords: Cheilosocpy; Identity; Crime.

Introduction

With subsequent increase in potential minded crimes and perfectly executed robbery, there is need to increase forensic techniques to rule out and find the true culprit the possibilities. It is very difficult and tedious job for a forensic expert to search for the criminal with no or false evidences. Various highly efficient identification techniques include DNA finger printing, dactyloscopy (finger printing), anthropometry, sex determination, age estimation, blood grouping etc

Cheiloscopy (Greek cheilos is lips) (e skopien is to see) is the study of lip prints by analyzing the sulci and grooves present on the labial mucosa of the lips.[1,1] The folds on the mucosa are permanent and unchangeable. They are unique for every individual except monozygotic twins. Also, the lip prints does not change after 3 months or according to seasons.[2]

The first ever evidence of use of lip prints was discovered by anthropologist Fischer R. In 1970,

Authors Affiliation: [1]Professor and Head, [2]III[rd] Year Student, Department of Forensic Medicine and Toxicology, DVVPF'S Medical College, Ahmednagar, Maharashtra 414111, India.

Corresponding Author: Gayatri N. Toshniwal, III[rd] Year Student, Department of Forensic Medicine and Toxicology, DVVPF'S Medical College, Ahmednagar, Maharashtra 414111, India.

E-mail: gtwal11@gmail.com

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Suzuki and Tsuchihashi discovered that wrinkles an grooves present on the lip show some pattern and designated it as ″sulci labiorum rubroum′′.[14] This led to new classification of lip prints. According to various studies lip prints are unique to every individual. By this fact, Suzuki and Tsuchihashi solved two cases where lip prints proved useful in criminal identification. The first case lip prints were identified on envelope while in the second case they were noted on undergarments in 1987, FBI identified a male robber dressed in female disguise using his lip prints

Aim: To prove the uniqueness, reliability of lip prints in personal identification, sex determination and family inheritance

Objective

1. To prove uniqueness of lip prints in individual and its reliability in identification using adobe Photoshop software
2. To check inheritance by analyzing similar grooves and pattern among individual in a family
3. To find the reference of this technique in sex determination

Materials and Methods

The study was conducted among hundred (50 males and 50 females)undergraduate students of age 17–24 after obtaining clearance from institutional ethical committee with their written informed consent. For the inheritance studies, lip print of 5 families which included father, mother, Child A, Child B (Child C if present) that is 22 people with their consent were studied.

Inclusion Criteria

- Participants having full dentition were included(eruption of third molar was ignored)
- Students consenting to give prints
- with age group 17 to 24 years
- For families, a nuclear family with random age was selected who were willing to give consent

Exclusion Criteria

- Participants with malformations, deformity, inflammation, trauma and surgical scars (eg. operation for cleft palate), active lesion of lips and other abnormalities of lip were excluded.
- Gross deformity of lips such as cleft lip, lip pits, ulcers, traumatic injuries on lip, angular chelitis, chelitis glandularis and chelitis granulonatosa
- Participants allergic to lipsticks.
- Participants unwilling to apply lipstick
- Participants with any other pathologic condition

Study Material

Lipstick: Eyetex dazzler lipstick shade 627 red, cellophane tape (2 inches), white paper, cotton swabs, scissors, lipstick brush, adobe Photoshop 0.7 software

Study type: Descriptive, cross sectional study

Duration of study: 9 august 2019 to 15 October 2019

Study site: Department of Forensic medicine and Toxicology, Dr. Vithalrao Vikhe Patil's Medical College and Hospital, Ahmednagar, Maharashtra, India.

Number of samples: 100 (50 males and 50 females).

Methodology

According to the procedure mentioned in Rashmi venkatesh study type (1), the following procedure was done. With the willingness of the participants, the lips were cleaned with cotton swab. Lipstick was applies to both the lips covering all edges in a single stroke with the lipstick applicator brush. The participants were asked to rub lips on each other to evenly spread lipstick. The participants were asked to keep the lips in relaxed position. Then, the cellophane tape's glued portion was placed on the resting position of lips. While making lip prints, subsequently less pressure was applied. The strip was removed gently and placed on white paper A4 sized for further analysis. (Each print numbered serially was studied under adobe Photoshop 0.7 software). Each impression was studies thoroughly and the data was complied.

The lip print was divided into four quadrants system based on the classification of Suzuki and Tsuchihashi. The right upper, The left upper, the left lower, the rights lower as Quadrant I, Quadrant II, Quadrant III, Quadrant IV respectively. If there were 2 dominant types in same quadrant, the most

dominant one was considered. The types were considered as in Fig. 1

Variable	Measurement scale	Measurement method
Age	Ratio	Interview
Gender	Nominal	Observation
Types of print	Ordinal	Examination of prints
Family type	Ordinal	Interview

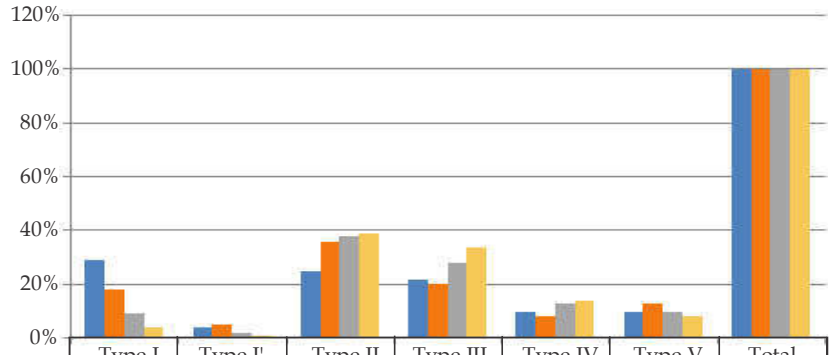
Type I	Clear-cut grooves running verically across the flip
Type I'	The grooves are striaight but disappear half-way instead of coverig the entire breadth of the lip
Type II	The grooves fork in their course
Type III	The grooves intersect
Type IV	The grooves are reticulate
Type V	The grooves do not fall into any of the Type I-IV and coanot be differented morphologically

Fig. 1: Suzuki and Tsuchihashi classification of lip prints (1)

Results

According to Suzuki and tsuchihashi's classification for cheiloscopy, six different types of prints were correctly identified among 100 individuals of age 17–24 years

1. All the prints were different and distinct. According to this study, Type II (33.6%) was the most predominant pattern seen followed by Type III (25%), I (14.6%), IV (13.4%) respectively. Type V and Type I was the least seen patterns among individual participated in this study.
2. Type II was 42% in male and 28% in female; followed by Type III 26% in male and 26% in female (equal). It was not possible to find the differentiation of type/pattern between genders in this study.
3. All the lip prints are unique as The Images were superimposed on each other and no two prints were found to match which prove the uniqueness of lip prints to an individual. The superimposition was done using the Adobe Photoshop software 0.7 version. This proves the uniqueness of lip prints.
4. In the family inheritance study although there were some patterns similar in the child and parents but the prints were not found to be same. The child has some unquiet combinations of pattern for himself but also shared some similar grooves like his parents. This suggests that there is correlation between family inheritances despite the child having his individuality.



	Type I	Type I'	Type II	Type III	Type IV	Type V	Total
Quadrant 1	29	4	25	22	10	10	100
Quadrant 2	18	5	36	20	8	13	100
Quadrant 3	9	2	38	28	13	10	100
Quadrant 4	4	1	39	34	14	8	100

Fig. 2: Distribution of different types in 4 quadrants according to Suzuki and Tsuchihashi classification.

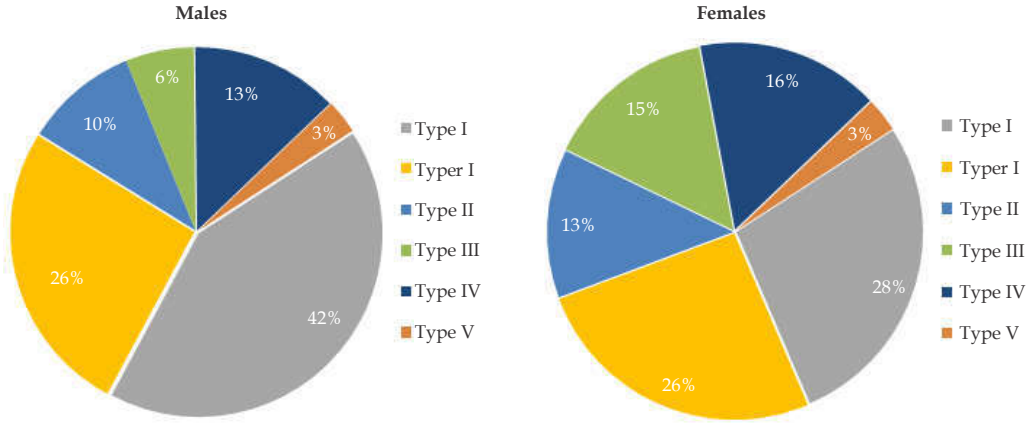


Fig. 3: Sex distribution

Discussion

With the increase in crime rates, it has become crucial for law personnel to relate the evidences attained at the crime site to the perpetrator. Lip prints are nothing but the normal lines and fissures in the form of wrinkles/grooves present in the zone of transition of human lip between the inner labial mucosa and outer skin.[1] The sebaceous and secretory glands of the labial mucosa release a secretory and sticky fluid. According to Locards principle of exchange of materials of contact, lip prints are formed when the lips touch some objects. Lip prints are found on cutlery, crockery items, on window/ door glass panes, Photographs, letters especially love letters, wine glasses, paintings, plastic bags, cigarette ends etc.[6] The prints also appear side by side with bite marks on the food items. In the cases of kidnapping lip prints are most certainly found on the tape used to cover the victim's mouth. In case of pushing the person on the wall there is chance that lip prints may remain on the wall. Three different types of lip prints are found in the crime scene; Visible, latent and 3D or plastic. These prints can be perceived as discernible prints by using Sudan black, Lysochrome, carbonate powder, and Nile red

Lip print patterns in all 100 individuals were found to be unique as they were non superimposable on the adobe Photoshop software. This implies that lip print is unique and can be used to aid personal identification in non-invasive ways.

In this study Type II was the most common type found in all the quadrants. This results match with the conclusion of Govindhkar et al.,[3] Naik et al., Rashmi Venkastesh et al.,[1] Vat J et al.[13]. But contradicts other studies like Sharma et al.[8] where Type IV is more common; In Vahanwala studies Type I and I' Were more common.[6,7] The results did not match with Randhawa et al.[11], Singh et al.[2]

Among the 50 male patterns, Type II was most common with 42% followed by Type III. The least common were Type IV (10%), V (6%) I'(3%). Govindhkar et al. also found Type II as most prevalent Type In males.[3] But in Vahanwala –Parekh studies, it was suggested that certain pattern tends were prevalent in either sex. Type I and I' were dominant in the females in 3rd and fourth quadrant and Type II in the second quadrant of Males in 50 females pattern,[6,7] Type II (28%) was most common followed by Type III (26%) the least common was Type I' with 3%. The results entirely match with Peter kiran, Shweta murthy showing Type II followed by Type III in both males and females. Unlike other studies, it was not possible to differentiate between the genders by using the types of grooves on lip prints. Augustine et al. found that the lip prints varied equally between the males and females and varied among age groups.[12] In studying the lip prints obtained from the families it was seen that the lip print of the child has some similar grooves resembling the parents present at different location but still the lip print was distinct showing individuality. Thus, further use of cheiloscopy should be done in solving family disputes, inheritance cases, posthumous child, etc.,

However there are few cons of cheiloscopy that doubt its uses as primary source of personal identification. It is not possible to detect the lip pattern in the pathological condition like chelitis, angular chelitis, cleft lip, scars or other deformity. Inflammation can change the lip print temporarily but the original pattern is retains after inflammation is reduced. Lip prints may vary on how was the position of lips whether the mouth was open or closed in open mouth the grooves are relatively ill defined and difficult to interpret. The

clarity may also depend on the pressure applied to the recording material, depending on the surface on which the print may be located etc. Where the lip prints can be lifted from body surface, clothes, inanimate object, or surroundings inanimate objects and can be matched to the victim or suspect and can lead to conviction

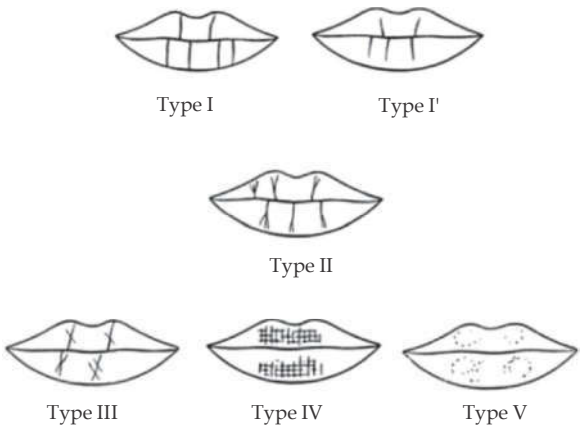


Fig. 4: Suzuki and Tsuchihashi classification of lip prints (pictorial representation)

Conclusion

Forensic sciences plays important role in criminal identification and crime solving. With the help of many ante mortem techniques like iris scan, fingerprinting, cheiloscopy is the most interesting and non-invasively cheap option.

On the basis of the data collected and analyzed in this study, the uniqueness of lip print in identification was proved. We could also find evidences of inheritance through the lip prints which can prove coordinating to family disputes cases. Also some studies show the use of cheiloscopy in gender determination. But the wide and enormous discussion of cheiloscopy must be extended by studying population of different states, races, geographical areas, families, twins. Also study must be conducted on the technique of taking lip prints to find universal technique used in practical purpose.

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