

Cheiloscopy-Method of Person Identification and Sex Determination

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Abstract

Introduction: Cheiloscopy, the study of lip prints, is an upcoming tool for the identification of persons. The lip print of every person is unique and can be used to determine the personal identity and sex of the individual.

Aim: The main objective of the present study was to ascertain whether the lip prints behold the potential for determination of identity and sex of the person.

Materials and methods: This study was conducted on 40 subjects, which includes 20 males and 20 females. The lip prints were recorded by applying lipstick evenly on lips; print obtained on thin bond paper and on plain glass. Lip prints obtained on plain glass were retrieved and matched with the first one by two examiner to determine the sex and identity of the person.

Result: We found that 18 of the actual 20 lip prints of the females and 16 of 20 males were correctly diagnosed as females and males respectively. Lip prints of 38 of 40 individual were correctly matched, thus identification of the person.

Conclusion: The study revealed that the lip prints of all the experimental subjects did not match with each other. The study is able to convey that lip prints behold the potential of determination of the sex and identity of the person.

Keywords: Cheiloscopy; Lip prints; Sex determination; Personal identification

Introduction

In forensic identification, lip print patterns can lead us to important information and helps in person's identification. The grooves present on human lips (Sulci labiorum) are unique to each person and can be used to determine identity [1]. Lip prints are normal lines and fissures in the forms 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. This is unique for individuals, as finger prints [2]. Fingerprints, post-mortem reports, and of late, DNA fingerprinting, have been successful in person identification in the field of forensic science. Just as in these methods, lip prints can be instrumental in identifying a person positively and can be used to verify the presence or absence of a person at the scene of crime [3]. Lip print is an anatomical character of the human lips [4]. Cheiloscopic techniques have an equal value in relation to other types of forensic evidences for personal identification [5] and sex determination. One of the challenges faced by man in earlier days was to establish the identity of an individual. The concept of "identity" is a set of physical characteristics, functional or psychic, normal or pathological- that define an individual. Identification of humans is a prerequisite for personal social and legal reasons [6]. In a crime scene investigation, lip prints can link a subject to a specific location if found on cloths or other subjects, such as glasses, cups or even cigarette butts [7]. Analysis of the lip prints left at the scene of crime, and their comparison with those of suspected person may be useful for identification [8]. Dental identification remains one of the most reliable and frequently applied methods of identification, predominantly by the comparison of ante-mortem and post-mortem records [9]. Dentistry's fundamental and clinical disciplines have, from time to time, shed light on questions of civil and criminal law [10]. Article 6 of the Universal Declaration of Human Rights states that; everyone has a right to identify as a person, before the law [11]. Any process that possesses the possibility of assisting the forensic field in identifying a suspect should be pursued and, if discovered pertinent, utilizes in the act of criminal investigations and legal proceedings. The use of lip prints fall into this category and because they have been proved reliable and trustworthy to link a suspect to a crime, more emphasis should be given to this field [12].

Objective

The main objective of the present study was to ascertain whether the lip prints behold the potential for determination of identity and sex of the person.

Materials and Methods

Materials

1. A dark coloured frosted lipstick
2. Thin bond paper
3. Cellophane tape
4. Magnifying lens (10X)
5. Plain glass
6. Pen / pencil for labelling the individuals details
7. Starch powder modified by adding *Bukka* (a black coloured powder prepared from tale (a metal)).

Method

This study was carried out in Department of Oral Medicine and Radiology, after approval of Institutional Ethical Committee. All the participants were briefed about the purpose of the study and written informed consent was obtained from each of the participants. This study was conducted on 40 subjects, which includes 20 males and 20 females, in age group of 18-19 years. Care was taken to select individuals having no lesion, whether active or passive on the lips.

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Individuals with known hypersensitivity to lip stick were not included in the study. The lipstick was applied by the research personnel with a single stroke, evenly on the vermillion border. The subject was asked to rub both the lips to spread the applied lip stick. After two minutes, a first lip impression was made on the strip of cellophane tape which was then sticks to white thin bond paper which served as the permanent record. Second lip impression was taken directly on folded bond paper to record the vermillion border of the lip and third lip impression was taken on the plain glass; modified starch powder was then dusted on the respective lip print; excess powder was blown by using chip syringe and lip prints from glass were retrieved and transferred on another bond paper (Figure 1).

For sex determination

In this study, we followed the classification of patterns of lines on lips (Figure 2) given by Suzuki and Tsuchihashi [13].

1. Type i: clear cut vertical grooves that run across the entire lips.
2. Type ii: similar to type i but that do not run across the entire lip.
3. Type iii: branched groove (branched y pattern).
4. Type iv: intersected grooves.
5. Type v: reticular grooves.
6. Type vi: undetermined.

Because of numerically superiority of properties of the lines in the middle part of lower lip (10 mm wide), this fragment was selected for the study area. The sex of the individual was determined by vahanwala et al. [14,15].

1. Type i and i' pattern dominant: female
2. Type i and ii pattern dominant: female
3. Type iii pattern dominant : male
4. Type iv pattern: male
5. Type v patterns: male



Figure 1: a) First lip print b) Second lip print c) Retrieved lip print.

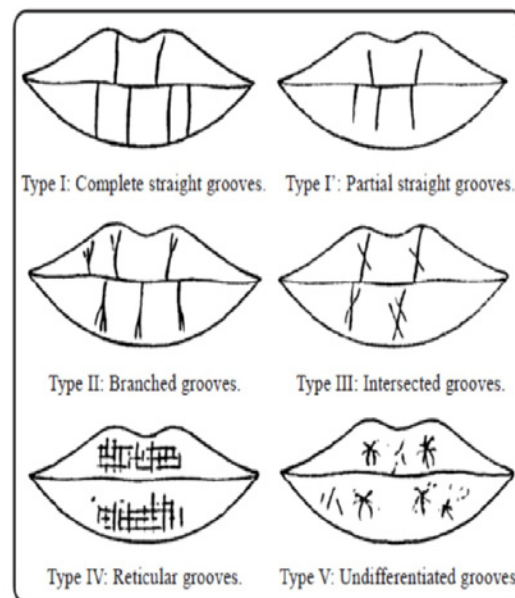


Figure 2: The pattern of lip prints by Suzuki and Tsuchihashi [13].

Varied patterns in all quadrants: male

Similar patterns in all quadrants: female

All the lip prints were subjected to both the examiners by hiding the identity of 40 subjects for determination of the sex.

For personal identification

The each lip print was measured for its length and divided into six equal parts as Upper Right (UR), Upper Middle (UM), Upper Left (UL), Lower Left (LL), Lower Middle (LM) and Lower Right (LR). Total numbers of horizontal lines, vertical lines, partial vertical lines, Y shaped pattern, intersected pattern, number of boxes and undetermined pattern were counted by using 10X magnifying glass in each part of every print of all 40 subjects and data tabulated for every subject. The same method was applied on retrieved lip prints. To avoid bias, all the lip prints were compiled, analyzed and interpreted by two examiners to determine the sex and identity of the individual.

Results

Our study revealed following observation.

1. Every lip print is different and unique.
2. No two lip prints were matched with each other.
3. Type I and I' were most common in females; type IV and V were seen most commonly in males. (Figure 3) The above data was statistically analyzed to see the difference in types in the two sexes that showed $\chi^2=22.19$; $df=5$; $p=0.00048$; Highly significant.
4. Total number of 18 females and 16 males were correctly recognized on the basis of their lip prints (Figure 4) $r=1$ (r denotes Pearson's correlation coefficient). Perfect correlation between the sex determination for male and female.
5. Out of 40 subjects 37 subjects were correctly identified which include 19 males and 18 females (Figure 5) $r=1$ (r denotes Pearson's Correlation coefficient). It indicates there is perfect correlation between person's identification among males and females.

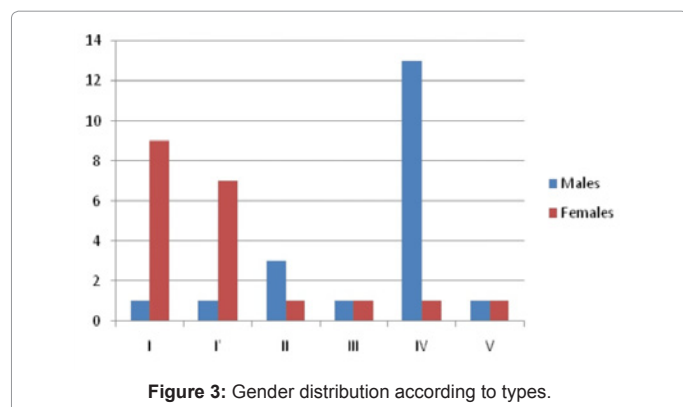


Figure 3: Gender distribution according to types.

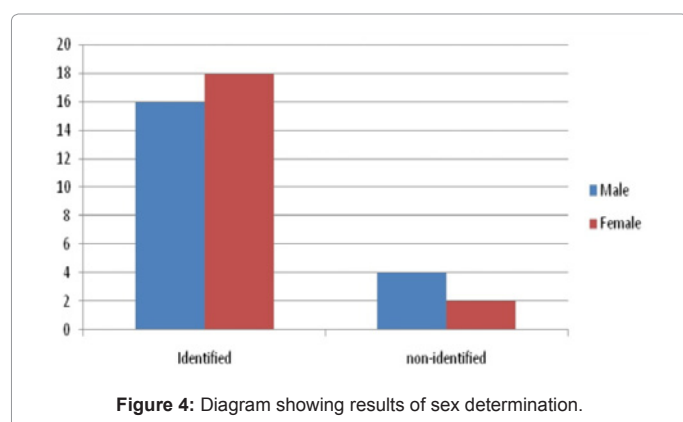


Figure 4: Diagram showing results of sex determination.

Discussion

Personal identification is necessary for unknown deceased person in homicide, suicide, accident, mass disaster, etc., and for living individual who are missing or culprits hiding their identity. If a definite description of the different parts of the upper lip and the lower lip are established for an individual by detailed study, this anti-mortem record can be used for matching the details of lip prints in post-mortem records for personal identification [2]. The lip print pattern is identifiable as early as the sixth week of intrauterine life. Lip pattern is unique for each of the examined individuals, even in twins and family relatives. This finding is hoped to be useful in the identification process, both in civil and criminal issues. It is suggested to establish a database for all individuals in a certain locality so as to be a reference in the criminal investigations [8]. In 1902, Fischer described the system of furrows on the red part of human lips [3]. The use of lip prints were first recommended as early as in 1932 by Edmond Locard, one of France's greatest criminologists. It is thought that hereditary factors may have some influence on the lip print patterns. Japanese doctor Suzuki is supposed to have done the greatest work on lip prints. In 1970, he recalled the attention of everyone on the fact that the possible use of lip prints in personal identification had been suggested in LeMoyne Snyder's above-mentioned book. In the same year he examined 107 Japanese females aged 20-36 and simplified the classification of lip prints. Perhaps the first person to systematically classify lip prints was Santos in 1967. He stated that the wrinkles and grooves on the lips could be divided into simple and compound types and sub-divided them into eight groups. Suzuki in 1970 after conducting the study on 107 Japanese women as mentioned above simplified the classification into five main types [3,16] (Figure 1). On May 12, 1999, an Illinois Appellate

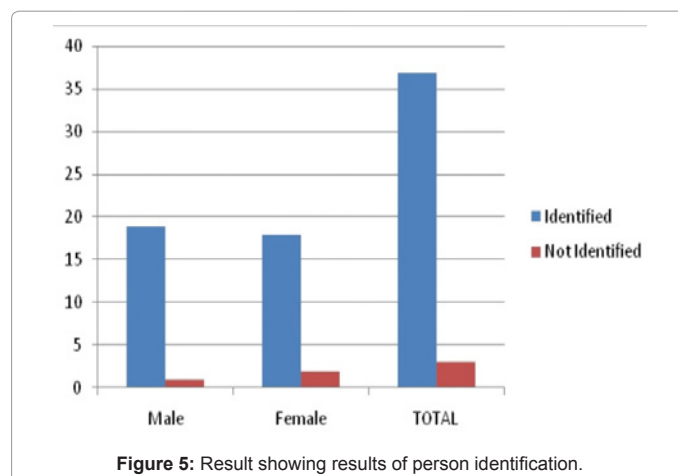


Figure 5: Result showing results of person identification.

Court accepted, in *People v. Davis*, No. 2-97-0725, the uncontroverted testimony of two state police experts (a fingerprint examiner and a questioned document examiner) that:-

1. Lip print identification is generally acceptable within the forensic science community as a means of positive identification because it appears in the field literature.

2. Lip print identification methodology, although seldom used, is very similar to fingerprint comparison and is a known and accepted form of scientific comparison.

3. There is no dissent in the forensic science community with regard to either the methodology used or the fact that lip prints provide a positive identification.

4. The F.B.I. and the Illinois State Police consider that lip prints are unique like fingerprints and are a positive means of identification [3,17].

In the present study, we aimed to find out the variations in lip patterns of 40 individuals. We tried to ascertain whether the lip prints hold the potential for determination of sex and identity of the individual. Even though the lines and furrows are present, both in upper and lower lip from one corner of mouth to other corner, only the middle portion of the lip is taken into account, since this portion is always visible in any trace. We labelled a particular pattern on the basis of the 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 the past some researchers have worked on lip prints to prove that the gender difference does exist in lip print. According to Vahanwala et al. [14] Type I and Type I' patterns were found to be dominant in females while type III, IV and V were dominant in males. In another study by Vahanwala and Parekh, it was shown that all four quadrants with the same type of lip prints were predominantly seen in female subjects and male subjects showed the presence of different pattern in a single individual [18]. Similar kind of results found to Sharma and Saxena [18], Malik and Goyal [1], Satyanarayan, Prabhu [3,18]. We also found type I and type I' patterns to be dominant in females while type IV and type V patterns were dominant in males. In addition, we observed that no lip prints matched with each other and that lip pattern was unique to every individual thus aid in personal identification. Singh [7] signify that vermilion and indigo being natural, non-toxic and cost effective can replicate the already existing chemical reagents like sudan black, sudan III, oil red O, Nile red, as the ability of these natural dyes to develop recent lip prints are comparable to sudan black.

Practical Applications

Suzuki and Tsuchihashi [19] reported two cases where lip prints have proven useful in identification of the criminal. In first case while the lip prints were identified on an envelope and with those of the suspects, the second case lip prints were noted on the undergarments and were studied with the help of colour test and ultraviolet rays. In 1987, FBI had successfully identified a male bank robber who used female disguises including lipstick. The FBI submitted the photographs and lifts of the lip prints that robber had left on the glass door while robbing a bank, which were identified to match with that of suspected robber [2]. LeMoyne Snyder in his book *Homicide Investigation* written as early as 1950 mentions the possible use of lip prints in the identification of individuals. He describes a very good case in which a woman was struck by an automobile striking her face on the left front fender of a car. The owner of the car denied that he had hit that woman. A lip print was lifted from the left front fender of the car. The print was matched with that of the woman and it was proved beyond any doubt that it was indeed the lip print of the woman who was hit. Thus it was proved that the car in question had indeed hit the woman! Really a remarkable case in which lip prints helped the crime scientists in an unusual way [16]. These cases suggest that lip print study can definitely be used for criminal identification.

Conclusion

Our study has proved that cheiloscopy hold the potential to identify the sex and identity of the individual, as they remain stable over time and unique to individual, even in twins and family relatives. Further studies concerning standardisation of the pressure applied to lip print during recording the prints is recommended and development for biometric system to allow fast and accurate assessment of lip print patterns.

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