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STUDY OF LIP PRINTS: A FORENSIC STUDY AT PATNA, BIHAR

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INTRODUCTION

The mouth has been identified as the organ system "where it all begins." Forensic odontology, or forensic dentistry, was defined by Keiser- Neilson in 1970 as "a branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings."[1] The traditional methods of personal identification include anthropometry, finger prints, sex determination, estimation of age, measurement of height, identification of a specific individual, and differentiation by blood groups.[2] The study of lip prints is called "cheiloscopy". The importance of cheiloscopy is linked to the fact that lip prints are unique to one person, except in monozygotic twins. Like fingerprints and palatal rugae, lip prints are permanent and unchangeable.[1] It is possible to identify lip patterns as early as sixth week of intrauterine life. From that moment, lip groove patterns rarely change, resisting many infections, such as herpetic lesions. Lip print identification is acceptable within forensic sciences similar to finger prints as a means of personal identification.[3]

Aim and Objective of Study

To study the lip groove patterns in all the quadrants of both male and female subjects of age group 18-40 years. To identify the sex based on the patterns of the grooves of the lip prints.

Inclusion and exclusion criteria

Inclusion criteria

Lip prints of both upper and lower lips were included in the study. Lip prints were recorded in both male and female subjects of age group 18-40 years.

Exclusion criteria: Subjects with inflammation, trauma, malformation, deformity, surgical scars, ulcers, other abnormalities of the lips were excluded from the study.

MATERIALS AND METHODS

This study was carried out in the Department of Oral medicine and Maxillofacial Radiology, The study group comprised randomly selected 200 subjects (100 male and 100 female) of either sex aged between 18 years and 40 years. The patients were informed about the procedure modality and they agreed and signed the consent form.

Patients were made to sit comfortably on a dental. Clinical examinations were carried out wearing sterile hand gloves and mouth mask with the patient seated appropriate to the procedure being performed.

The patient was examined properly to rule out any abnormalities such as inflammation, deformity, surgical scars, ulcers, burns, and other abnormalities of the lips.

Recording of data and clinical examination were carried out in a systematic manner at the first visit.

The upper surface of the lipstick was wiped clean by tissue paper prior to each use for hygienic purposes. The subject was asked to open the mouth and lipstick was applied in a single motion (REVLON made by Aero Pharma Pvt Ltd, Mumbai, India), evenly on the upper lip and then on the lower lip. The subjects were then asked to rub his/her lips together to spread the lipstick uniformly. The subject was asked to keep the mouth open till the procedure was completed. Lip prints were taken on a glass slide with center portion of the lip dabbed first and then pressing it uniformly to the left and right corner of the lips. Proper care was taken to avoid sliding of lips, to prevent smudging of the prints. After acquiring the lip patterns the personal data of the patient, as entered in the proforma (i.e. name, age, sex, phone number), were entered along with the code number

assigned to the slide. The slides were preserved in a slide box.

The slides were studied carefully with a 10× zoom magnifying lens to analyze the lip patterns quadrant wise by denoting the type according to Suzuki and Tsuchihashi's (1970) classification.

Classification schemes

In 1970, Suzuki and Tsuchihashi classified the lip prints into five types[8]

Type I- Complete vertical groove
Type I′- Incomplete vertical groove
Type II- Branched groove
Type III- Intersected groove
Type IV- Reticular pattern groove
Type V- Irregular groove

After analyzing the lip prints according to Suzuki and Tsuchihashi's criteria of classification, the type and number of groves was entered quadrant wise in the already recorded proforma of the subject. A master chart of all the subjects was then prepared after obtaining all the data.

RESULTS

Statistical analysis

All the values for different types of grooves in each quadrant are expressed in terms of ±SD for males and females, respectively. Further, Z test to test the significant difference between males and females for different types of grooves in each quadrant was applied at 5% level of significance. A significant difference (i.e. $P < 0.05$) was observed for each type of groove between males and females for all the quadrants, respectively. However, no significant difference was observed only for groove V in each quadrant (i.e. $P > 0.05$). Types I and I′ were observed significantly higher in females in each quadrant; however, Type II grooves were observed higher in males in first and second quadrants and Type IV grooves were observed higher in males in third and fourth quadrants. Further, no groove of Type III was observed in females in each quadrant [Tables 1-4]. In the present study, it was observed that grooves of Type I (complete vertical pattern) were observed in 83.4% in the first quadrant, 53.33% in the second quadrant, 82.62% in the third quadrant, and 62.04% in the fourth quadrant in females and Type I′ (incomplete vertical pattern) was observed in 76.92%, 91.67%, 66.67%, and 90.91% in I, II, III, and IV quadrants, respectively, in females. However, Type II (branched pattern) was observed higher in males in the first and second quadrants (i.e. 64.20% and 45.28%, respectively) and Type IV (reticular pattern) was observed higher in males in the third and fourth quadrants (i.e. 82.89% and 66.67%, respectively). Further, no groove was observed in Type III (intersected pattern) in females in any of the four quadrants. Type III patterns were observed in males in third and fourth quadrants.

Table 1: *P* value of male and female subjects of each quadrant: 1ST quadrant

Grooves	Male	Female	*P* value
Type I	3.2±4.44	19.8±26.44	P<0.05
Type I′	0.6±0.894	2.6±4.57	P<0.05
Type II	16.2±19.071	5.8±6.22	P<0.05
Type III	0±0	0±0	P>0.05
Type IV	9.4±11.0815	1.8±1.64	P<0.05
Type V	0±0	0±0	P>0.05

Table 2: *P* value of male and female subjects of each quadrant: 2ND quadrant

Grooves	Male	Female	*P* value
Type I	8.4±8.414	18±23.53	P<0.05
Type I′	0.2±0.4472	2.4±3.26	P<0.05
Type II	10.6±14.275	5.8±7.85	P<0.05
Type III	0±0	0±0	P>0.05
Type IV	10.4±12.4619	3.6±3.13	P<0.05
Type V	0±0	0±0	P>0.05

Table 3: *P* value of male and female subjects of each quadrant: 3RD quadrant

Grooves	Male	Female	*P* value
Type I	4.4±5.4130	24.8±31.21	P<0.05
Type I′	0.6±0.8944	1.8±2.16	P<0.05
Type II	9.4±11.5888	0.40±0.89	P<0.05
Type III	0.4±0.5477	0±0	P>0.05
Type IV	15.2±17.7116	2.6±2.96	P<0.05
Type V	0±0	0±0	P>0.05

Table 4: *P* value of male and female subjects of each quadrant: 4TH quadrant

Grooves	Male	Female	*P* value
Type I	8.2±10.059	21.6±29.46	P<0.05
Type I′	0.2±0.4472	2.2±2.77	P<0.05
Type II	10.6±14.1530	2.0±1.41	P<0.05
Type III	0.2±0.4772	0±0	P>0.05
Type IV	10.8±11.3446	3.6±3.28	P<0.05
Type V	0±0	0±0	P>0.05

DISCUSSION

Theory of uniqueness is a strong point used in the analysis of finger prints and bite marks to convince the court of law; likewise, even lip prints are unique to an individual. Lip print patterns appear to be genotypically determined, unchanged from birth.[9] The lips can be horizontal, elevated, or depressed, and according to their thickness, it is possible to identify the following four groups.

1. Thin lips (common in the European Caucasian),
2. Medium lips (from 8 to 10 mm is the most common type),
3. Thick or very thick lip (usually having an inversion of the lip cord and is usually seen in negroes),
4. Mix lips (usually seen in Orientals).[3]

Latent prints

Latent or invisible prints left at the crime scene have been a source of interest for some time. The development or extraction of lip prints is a matter of providing color contrast between the print and its background, so that it can be photographed or otherwise preserved for later comparison. Latent prints are developed by powders, chemical means, or laser-induced luminescence.[10] The powders most commonly used are aluminum powder, cobalt oxide and magnetic powder. It may be applied with an atomizer, or by brushing, being the generally accepted method. The material is spread with a brush of soft and extremely fine hair. This brush is dipped sparingly in the powder and a few light taps are given to shake off the excess material. Then the brush is drawn very lightly across the latent print. When sufficient material has adhered to the print, residue is brushed away and the print photographed. If the latent print cannot be satisfactorily photographed owing to its location, it can be "lifted" using a variety of pliable, adhesive materials. These can be pressed against the latent impression been dusted with powder and then covered with some transparent substance. Alternatively, transparent lifters similar to "scotch tape" may also be used.[10]

Methods of recording lip prints

Different workers have used various methods of recording the lip prints of a subject.

Method 1

A fingerprint roller is used to apply the special paper (used in fingerprinting) over the lips. The print is then traced on to cellophane paper and examined under a magnifying glass.[11]

Method 2

Half-size photographs of the lips are taken with a Medical Camera and enlarged to double its size, thus obtaining life-size photographs. It should be ensured that the subjects are calm so as to get a clear photograph. The advantage of this method is that it removes the inaccuracy associated with the strength and direction of the pressure applied in taking lip prints by other methods.[11]

Method 3

Conventional lipstick is applied with a single motion evenly on the lips. The subject is asked to rub his or her lips together to spread the lipstick more uniformly. A print is then taken on a paper with the center portion of the lips being dabbed fi rst and then pressed uniformly to the left and right corners of the lips.[11]

Method 4

This is a slight modification of the previous method, where the paper used to take the impression of the lips is well supported by cardboard.[12]

Method 5

This method also utilizes lipsticks, but the lip print is taken on a strip of cellophane tape which is glued on one side. This is then stuck on a strip of white paper which serves as a permanent record of the print.[13]

Method 6

Dental impression materials can be used to make casts of the lips, in order to record and study the grooves on them. These materials are employed for a variety of uses such as making study models for orthodontic treatment, casts for construction of maxillofacial prosthesis and dentures, etc.

Digital methods

Similar to the use of scanners to record fingerprints, computers can be used to record lip prints as well. Digital images of lip prints can be stored in a computer that may be compared with prints obtained from a scene of crime. The prints can then be analyzed using software for cheiloscopy.

SUMMARY AND CONCLUSION

The term "forensic" implies the "court of law." The importance of cheiloscopy is linked to the fact that lip prints are unique to one person like finger prints and palatal rugae and lip grooves are permanent and unchangeable. Lip prints can be obtained at the crime

scene from clothing, cups, glasses, cigarettes, windows, and doors, which help in identification of a person.

Forensic odontology is an accepted method in the criminal justice system worldwide. Cheiloscopy has been a subject of great interest to most researchers, it being the least invasive and easily available mode for study purpose. Presence of lip prints is conclusive of the fact whether the beholder was a visitor or is related to the site of crime or not. If the sex of the individual is known, it is easy to shortlist the array of suspects with the motive of the crime. Although the present study does not prove that lip prints can be conclusive in a crime scene, it does throw some light on the importance of lip prints in forensic dentistry. Further, more studies need to be carried out to determine the lip print patterns among a larger population to prove lip prints as a promising tool for personal identification.

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