

Rapid Communication

Sex Determination Using Cheiloscopy

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Abstract

Human identification is a process based on scientific principles of the theory of uniqueness. Theory of uniqueness is a strong point used in the analysis of fingerprints to convince the court of law. Likewise even the lip print is unique to an individual and hence beholds the potential for identification purpose. The external surface of lips has many elevations and depressions forming a characteristic pattern called lip prints, examination of which is known as 'Cheiloscopy'. The study group comprised of 15 male and 15 female subjects. The materials used were lipstick, lip-brush, cellophane tape, bond paper and a case Performa. This study showed that the lip prints are unique to an individual and can be reliably used for the recognition of the sex of an individual.

Keywords: Cheiloscopy; Sex determination; Lip print analysis

Introduction

Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lips traces. Lip Print may be revealed as a stratified surface trace with visible elements of lines (furrows) [1,2].

Finger prints, post-mortem reports, DNA fingerprinting have been successful in personal identification in the field of forensic science. Just like these methods, lip prints can be instrumental in identifying a person positively and can be used to verify the presence or the absence of a person at the scene of crime [3].

The main objective of the present study was to assess the inter-observer variability in sex determination with the help of lip prints.

Lip prints are unique to each individual and can be used for personal identification. The lip prints show differences according to the race and the ethnic origins of a person [4].

Identification of an individual is a pre-requisite for certification of death and for personal, social and legal reasons. The study of lip-prints (cheiloscopy) was thought of as a method of identification of a person [5].

Materials and Methods

The study sample comprised of 30 subjects including 15 males and 15 females within the age range of 19-30 years, who attended the outpatient department of D J College of Dental Sciences & Research, Modinagar, for various dental complaints.

Care was taken to select individuals having no lesion, whether active or passive on the lips. Individuals with known hypersensitivity to lipsticks were not included in the study. Informed consent was obtained from all subjects included in the study (Figure 1).

A dark coloured lipstick applied with a single stroke, evenly on the vermillion border and then the subject was asked to roll both the lips to spread the applied lipstick (Figure 2). The lip impressions were taken on the glued portion of the cellophane tape, stuck on a white bond paper and analyzed with the help of magnifying lens (Figures 3 and 4) [6].



Figure 1: Armamentarium.



Figure 2: Application of the Lipstick.



Figure 3: Transferring of lip prints on the glued surface of the cellophane tape.



Figure 4: Sticking the cellophane tape on bond paper.

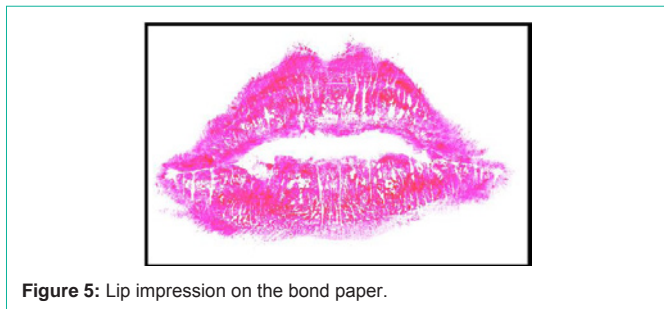


Figure 5: Lip impression on the bond paper.

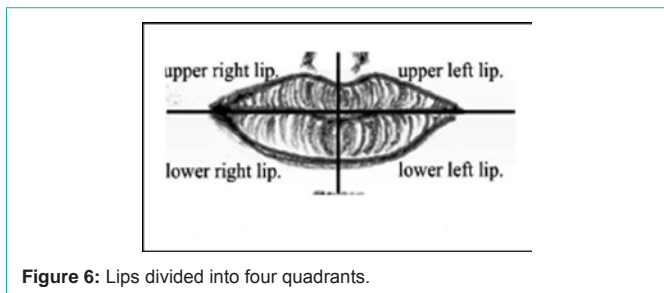


Figure 6: Lips divided into four quadrants.

Lip prints so obtained were coded, so that the name and sex of the individual was not known to observer (Figure 5).

For the ease of identification the lip prints were divided into 4 quadrants (Figure 6).

The lip print patterns so obtained were than analyzed by the 3 observers by using Suzuki & Tsuchihashi classification [7].

Suzuki and Tsuchihashi Classification of Lip Grooves

The classification of Suzuki and Tsushihashi Y which was given in 1970. They classified the natural lip marks/fissures in five types (Figure 7) [7,8].

After classification, the lip prints were interpreted as male or female on the basis of a study conducted by Vahanwala-Parekh, in which it was suggested that certain pattern trends were prevalent in either sex as mentioned in (Table 1) [8].

Sex interpretations were then finally based on the observations done by the three observers individually.

Results

The lip print did not consist simply of one type of groove alone, but appeared as a mixture of varying types.

Type II was most commonly seen groove while Type V was the

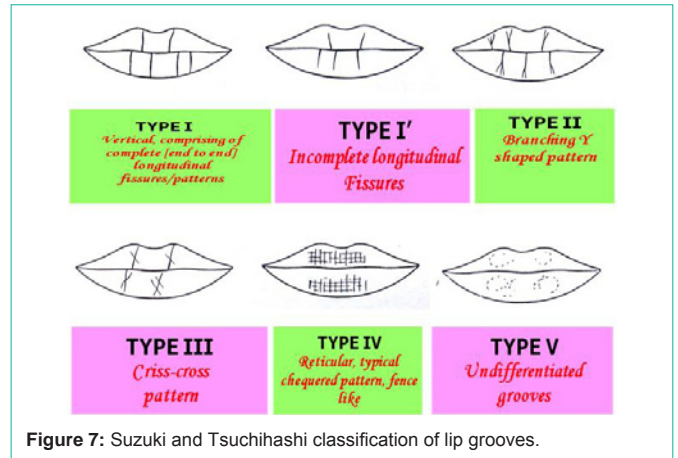


Figure 7: Suzuki and Tsuchihashi classification of lip grooves.

Table 1: Vahanwala-Parekh interpretation for sex determination.

Lip-pattern	Region of occurrence	Predominantly seen in
a. Type I & Type I'	1 st quadrant [right upper lip]	Female
c. Type II	2 nd quadrant [left upper lip]	Male
d. Type III	Never occurs in lower lip	If so then only in male
e. Varied patterns	in all quadrants	Male
f. Same [alike] patterns	in all quadrants	Female

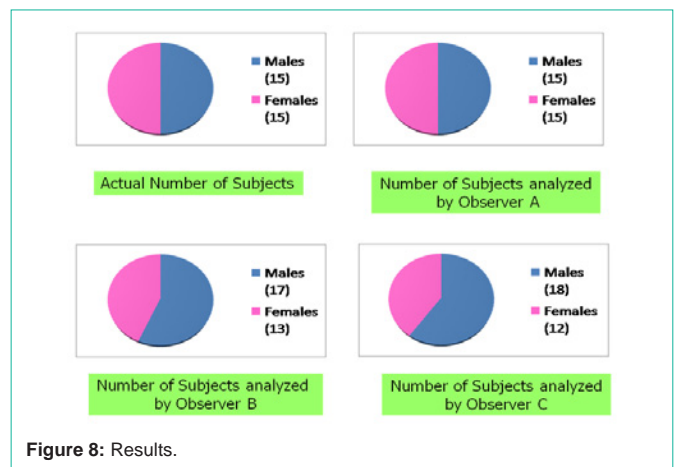


Figure 8: Results.

least commonly seen pattern (Table 2).

After interpretation of the above table, we can say that the total no. of subjects were 30, out of which 15 were males and 15 were females in actual.

15 males and 15 females were analyzed according to the 'Observer A'; 17 males and 13 females were analyzed by 'Observer B'; whereas 'Observer B' analyzed 18 males and 12 females (Figure 8).

In our study we observed that the lip print of an individual did not consist of any one single type of groove, but rather the lip print consisted of a combination of the different patterns.

Type II was most commonly seen groove pattern while Type V was the least commonly seen pattern.

On analysis of the data, which included 15 males and 15 females, we found that 'Observer A' identified 15 males and 15 females, while

Table 2: The actual interpretation and the interpretation of each of the three observers.

CODE	1 ST OBSERVER	2 ND OBSERVER	3 RD OBSERVER	SEX
1.	F	F	F	F
2.	F	F	F	F
3.	F	F	F	F
4.	M	M	M	M
5.	M	M	M	M
6.	F	M	F	F
7.	M	M	M	M
8.	F	F	F	F
9.	M	M	M	M
10.	F	F	F	M
11.	M	M	M	M
12.	M	M	M	M
13.	F	F	M	F
14.	M	M	M	M
15.	F	F	F	F
16.	F	M	M	M
17.	F	F	F	M
18.	F	F	F	F
19.	M	M	M	M
20.	F	F	M	F
21.	M	M	M	F
22.	M	M	M	M
23.	F	F	F	F
24.	M	M	M	M
25.	M	M	M	F
26.	M	M	M	M
27.	M	M	M	M
28.	F	F	F	F
29.	F	F	F	F
30.	M	M	M	M

‘Observer B’ interpreted 17 males and 13 females whereas ‘Observer C’ interpreted 18 males and 12 females.

Statistical analysis done for the study shows measure of agreement between A & B - 86.7%, between B & C - 79.5% and between A & C - 80%, which is significant (within the range of acceptable deviation) (Table 3).

Table 3: Statistical analysis done by using Kappa Score Test.

Observer	Crosstab		Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
A	13	2	86.7	86.7	86.7	86.7
	2	13				
B	14	3	80	82.4	92.3	93.3
	1	12				
C	14	4	73.3	77.8	91.7	93.3
	1	11				

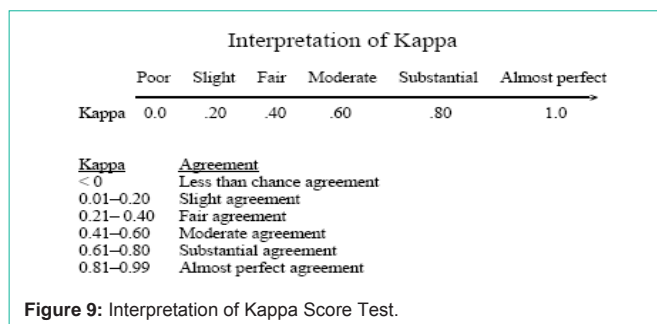


Figure 9: Interpretation of Kappa Score Test.

According to the ‘kappa score test’ as shown in the table below, the results of our study fall within the range of substantial agreement to almost perfect agreement, which is within the range of acceptable deviation (Figure 9) [9].

The overall percentage of Inter-Observer Variability: All observers showed same results for a total of 86.7% subjects while they showed different results for 13.3% subjects.

Discussion

The professional obligation of the dental surgeon to mankind is not only to serve in examination, investigation, diagnosis and treatment of oral and orofacial lesions of local origin, and oral manifestations of systemic diseases, but also to serve in other community services and legal matters as well.

Le Moyne Synder first described lip prints in 1950 [10]. R. Fisher (1902) was the first anthropologist to describe the biological phenomenon of systems of furrows on the red part of human lips. In 1932, Edmond Locard, one of France’s greatest criminologists, acknowledged the importance of Cheiloscopy [1,10].

It is possible to identify lip patterns as early as the sixth week of intra-uterine life [1].

Perhaps the greatest research of Cheiloscopy was done by the Japanese doctors Suzuki and Tsuchihashi between 1970 and 1974. They reported two cases where the lip prints proved useful in identification of the criminal [11].

In 1987, the FBI had successfully identified a male bank robber who used female disguises including lipstick. These cases suggest that lip print study can definitely be used for criminal identification. Suzuki and Tsuchihashi proposed a system for classification of lip prints for the purpose of gender identification [12].

According to study done by Sonal Nayak, ‘Type I’ & ‘Type I’ patterns were found to be dominant in females, while ‘Type III’ &

'Type IV' patterns are dominant in males. In another study conducted by 'Vahenwala Parekh', it was shown that all the four quadrants having same type were predominantly seen in females and male subject showed the presence of different patterns in a single individual. In this study, we labelled particular pattern on the basis of numerical superiority of types of lines present, i.e. vertical, intersected, branched or reticular. If more than one pattern predominates, it is typed as undetermined. As per our study Type I was more dominant in females whereas 'Type II' and 'Type IV' patterns were more prevalent in males [13].

According to the study done by Vahenwala Parekh in the year 2005-07 on 50 individuals, 92% individuals were correctly diagnosed, whereas the inter-observer variability was found to be only of 8% [7]. This was in accordance with our study [8].

While it is accepted that lip prints can be a good means for determining the sex of an individual, it is possible that inter-observer variability may be responsible for the poor reliability of this technique [8].

The various reasons for poor standardization of the technique of analyzing lip prints could be related to the inappropriate pressure, direction and method used in taking the print; subjectivity errors; inadequate or excessive amount of lipstick used; existence of some pathological conditions etc [1].

In our study however the inter-observer variability was not statistically significant, but the results are so much accurate with extremely high agreement because the lip prints recorded by a single person; coding done by one person only; and the interpretations done by three colleagues under same condition.

The sample data was analyzed by the observers using Suzuki & Tsuchihashi classification, which was mainly done on Japanese population. Few studies have been on Indian population applying the same classification [6,13-18]. Our study was carried out on a North Indian population group to determine the validity of the Suzuki and Tsuchihashi classification on different population groups.

Thus from our study we can conclude that cheiloscopy is a reliable method for sex determination under ideal conditions. It is important that dental personnel are trained in the correct method of recording lip prints, so that their analysis of lip prints is more accurate.

Conclusion

Cheiloscopy can be used as a reliable tool in forensics for sex determination with the interobserver-variability within the limits of

acceptable deviation. Under ideal conditions, and if conducted by trained personnel, cheiloscopy along with other forensic tools is an important method for determining the sex of an individual.

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