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A Review on Lip Prints

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I. INTRODUCTION:

Forensic dentistry deals with the processing, review, evaluation and presentation of dental evidence intending to bring scientific and objective data to court proceedings. (1)

Forensic dentistry requires knowledge that spans multiple disciplines. Comparison of teeth, fingerprints, and DNA are perhaps the most common techniques that allow a rapid and reliable identification process. Today, however, investigators may also rely on lip prints to identify possible suspects or to substantiate evidence obtained in a particular investigation. (2)

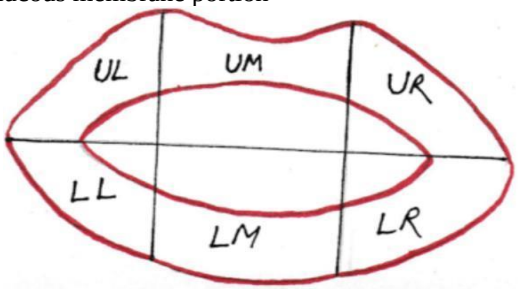
"Human lip recognition," also known as Cheiloscopy (3,4,5), is one of the most exciting emerging fields, with its roots in criminal and forensic practice.

LIPANATOMY

The upper lip lies between the nose and mouth opening. Laterally, the lips are separated from the cheeks by nasolabial grooves that start from the nose and run about 1 cm laterally to the corners of the mouth. The upper lip has an intranasal depression, a groove that extends from the outer nasal septum and divides the nostrils to the red rim - a sharp boundary between the coloured edge of the lip and the surrounding skin. The lower lip lies between the mouth and the labiodental groove that separates the lower lip from the chin (4).

The upper and lower lips are continuous at the corners or corners of the mouth. In adults, the skin of the outer lip is thicker and contains hair, sweat, and oil glands. The edges of the lips are covered with a reddish skin called Vermillion, which contains many furrows and is richly supplied with sensitive nerve endings. Vermillion is the transitional layer between the outer, hairy tissue and the inner mucous membrane.

Also known as labia
Formed externally by the skin and internally by the mucous membrane.
Commissure: the angle at the corner of the mouth where the upper and the lower lip meet.
Vermillion border: the red free margins representing the transition from skin to the red mucous membrane portion



The abovediagram shows compartments of lips
UL - Upper Left; UM - Upper Middle; UR - Upper Right;
LL - Lower Left; LM - Lower Middle; LR - Lower Right.

LIP PRINTS

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Cheiloscopy is acquired by two Ancient Roman words 'cheilos'- lips and 'skopein-study'(6,7,8,9,10). The characteristic pattern of elevations and depressions (i.e. crinkles and fissures) on the mucosal membrane of lips called"sulcilabiorumrubrorum" make a special design on lips and investigation of these lip designs are named as cheiloscopy.

Lip patterns are unique, permanent, and unchangeable i.e. they resist adversity and recover from inflammations, trauma and diseases like herpes or any environmental changes: all these make lip print a potent and immaculate tool in the identification process. Lip prints are used as an adjunct tool at the site of the crime to verify the absence or presence of a person (6)

1. **Visible lip prints:** Traditionally the use of lipstick was essential to leave behind coloured traces of lip prints. These are visible lip prints.
2. **Persistent lip prints:** Marks made by invisible lipsticks on various surfaces may be required days after being produced, using agents such as Aluminium powder and magnetic powder. These are termed persistent lip prints.
3. **Latent lip prints:** Marks made by the secretion of oil and moisture from minor salivary glands, sebaceous glands and sweat glands at the edges of lips which may be developed are called latent lip prints.

CLASSIFICATION (6,7,10,11)

1. Clauco Martin Santos lip print classification:

SIMPLE	**COMPOSITE**
straight line	bifurcated
curved line	trifurcated
angled line	anomalous
sign like curve	

2. Suzuki's and Tsuchihashi's classification (1970):

Type 1	A definite streak or furrow runs in an upright direction over the entire lip
Type 1'	Straight furrow which disappears halfway rather than enveloping the whole thickness of the lip or half-extent furrow of type 1
Type 2	Fork furrows in their route or subdivided furrows or branched y pattern
Type 3	Intersecting groves
Type 4	Reticular groves
Type 5	Undermined

3. Raynaud's Classification of lip designs:

Type a	complete vertical
Type b	incomplete vertical
Type c	complete bifurcated
Type d	incomplete bifurcated
Type e	complete branched

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Type f	incomplete branched
Type g	reticular pattern
Type h	x or coma pattern
Type i	horizontal
Type j	other forms (ellipse, triangle)

4. Afchar - Bayat classification (1979):

A	vertical and straight grooves covering the whole lips
A1	vertical and straight grooves but not covering the whole lips
B	straight branched grooves
B1	angulated branched grooves
C	converging grooves
D	reticular pattern grooves
E	other grooves

5. Vahanwala et al classification

LIP PATTERN	SITE	GENDER
Type 1	Predilection	Predilection
Type 1’	Quadrant	Male
Type 2	Second quadrant	Female
Type 3	Never occurs in the lower lip	If so, only males
Varied pattern type	In all quadrant	Male
Similar pattern type	In all quadrant	Female

6. Classification of lips based on the thickness

1. Thin (common in European Caucasians)
2. Medium(most common type)
3. Thick(seen in blacks)
4. Mix lips(usually seen in orientals)

7. As for the basis of classification, only a 10mm portion of the middle part of the lower lip was taken and illustrated as follows

1. Linear “L”-if the lines prevail
2. Bifurcation “R”-if the bifurcation is dominant
3. Reticular “S”-if the line cross
4. Undermined “N”-when no superiority can be established

8. Kasprzak’s classification:

1. An eye
2. A hook
3. A bridge
4. A line
5. A dot
6. A rectangle like
7. A triangle like
8. A group of dots
9. A simple top bifurcation
10. A simple bottom bifurcation

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11. A double eyes
12. A crossing lines
13. A closing bottom bifurcation
14. A delta-like opening
15. A simple opening
16. A closing top bifurcation
17. A pentagonal arrangement
18. A branch like top bifurcation
19. A star-like bifurcation
20. A fence
21. A branch-like bottom bifurcation
22. A double fence
23. A hexagonal arrangement

I. METHODS

Lip prints can be recorded in several ways.
1. Photographing the suspect's lips.
2. Applying lipstick, lip rouge, or other suitable transfer mediums to the lips and then having the individual press his or her lips to a piece of paper or cellophane tape or similar surface. (12)
3. Using a fingerprinter, preferably a roller fingerprinter. (13)
4. (Without lipstick or another recording medium) against a suitable surface and then processing these prints with either conventional fingerprint developing powder or with a Magna brush and magnetic powder. (14)

USES OF CHEILOSCOPY:

1. **For Personal identification:** The specific grooves on the Human Lips play a great role in the identification of a Human being and many studies have proven that(15)
2. **In Sex Determination:** It was suggested that certain pattern trends were prevalent in either sex. (16,17)

- Type I and I' are dominant in Females in the third and fourth quadrants i.e. lower lip.
- Type II is common in Males in the second quadrant i.e.upper lip, left side.
- Individuals with all quadrants having different pattern were common in males whereas having the same pattern in all quadrants were seen in females

MERITS

1. Remain stable over some time
2. Plays a vital role in sagittal jaw relations as a market
3. Used to determine the age gender and race of individual
4. The technique followed for the correction of lip prints using lipstick as recording media and scotch tape as transferring media with proper stabilisation of lips while recording can be adopted as a good technique to obtain a definable lip print as an image.
5. The digital method of analysing the lip prints images can serve as an ideal method of permanently storing the data which will help in keeping an ante mortem record of an individual.

DEMERITS

1. Soft tissues change after death so lip print should be taken within 24 hours
2. Position of mouth i.e., open and closed mouth position alter the lip prints
3. Pathology may alter lip prints like Lymphangiomas, Congenital Lip Fistula, Lip Scleroderma, Melkersson – Rosenthal syndrome, Syphilis, Lip Cheilitis etc. can invalidate the Cheiloscopic study
4. The anatomic position of lip grooves on the zone of transition close to the vermilion border may vary as the zone is extremely mobile. So print may vary depending upon the amount and direction of the pressure applied.
5. Surgical alteration of lips.

II. CONCLUSION

Lip impression analysis is the least invasive and inexpensive. Lip prints can be used to determine a person's age, gender and race and to solve crimes. Therefore, lip prints help identify a person. Cheiloscopy can be used as an additional tool for forensic identification purposes. It should be attributed to the unique property of the imprint of the lips. Despite all the available literature and the uniqueness of lip impressions, more research is needed.

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