

Review Article

Cheiloscopy

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ABSTRACT

Cheiloscopy has been fascinating from the time it took a prominent place in the field of forensic dentistry. This article aims at a review tracing the cheiloscopy studies conducted worldwide. It highlights the results achieved of each research work, and focus is made on the effect of the same. Cheiloscopy and dermatoglyphics with its various applications have immense potential, which are not fully explored till date, and it is necessary to channel the resources of cheiloscopy in a proper channel and henceforth maximum scientific benefit can be achieved with the same.

KEY WORDS: Cheiloscopy, forensics, lip print patterns

INTRODUCTION

The word “forensics” alerts the professionals who hear it, especially when it is clubbed with medical and dental fields. Among the different forensic techniques prevailing in the modern day scenario, cheiloscopy holds a prominent place in personal identification. The word “cheiloscopy” is derived from Greek words, “cheilos” which means lips and “skopein” which means “to see”.^[1]

Cheiloscopy (quiloscopy) can be defined as a method of identification of a person based on characteristic arrangement of lines appearing on the red part of lips or as a science dealing with lines appearing on the red part of lips.^[2] It is unique to an individual, except for monozygotic twins.^[3] Lip groove patterns can be identified from the 6th week of intrauterine life.

ANATOMICAL ASPECTS

Lips are sensitive mobile folds composed of skin, muscle, glands, and mucous membrane, which form the anterior boundary of the oral cavity. Upper and lower lips join at corners of the mouth, termed the commissures.

The region of the lip which is prominent in identification is the mucosal part, which is termed as Klein’s zone. It forms the region beholding the characteristic lip groove patterns.^[4]

CLASSIFICATION

Different classification systems have been proposed for lip groove patterns.

Lips can be classified based on its thickness and position into four groups: (1) thin lips (common in European Caucasians), (2) medium lips (8–10 mm, most common),

(3) thick lips (with an inversion of the lip cord and usually seen in Negroes), (4) mix lips (usually seen in Orientals).^[5]

Lip groove patterns based on its morphology is grouped in an internationally accepted Suzuki and Tsuchihashi Classification.^[6] Lip groove patterns are divided into six types: (1) Type 1 (clear cut groove running vertically across the lips), (2) Type 1’ (straight groove that disappear half way into the lip instead of covering the entire breadth of the lip or partial length of groove of Type 1), (3) Type 2 (grooves that fork in their course or a branched groove), (4) Type 3 (intersected groove), (5) Type 4 (reticular groove), and (6) Type 5 (grooves that do not fall into any of the above categories and cannot be differentiated morphologically).

Afchar Bayat lip groove pattern classification is another proposed mode. Lip groove patterns are divided into seven types: (1) A1 (vertical and straight grooves, covering the whole lip), (2) A2 (like the former, but not covering the whole lip), (3) B1 (straight branched groove), (4) B2 (angulated branched groove), (5) C (converging grooves), (6) D (reticular pattern grooves), and (7) E (other grooves).

Another classification of lip groove patterns is Renaud’s classification. Lip groove patterns are divided into ten types: Type a (complete vertical), Type b (incomplete vertical), Type c (complete bifurcated), Type d (incomplete bifurcated), Type e (complete intersecting), Type f (incomplete intersecting), Type g (reticulated), Type h (in the form of sword), Type i (horizontal), and Type j (other types).

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Dr. Santos^[7] had divided the lip grooves into simple and compound types. Simple type was further subdivided into (1) straight line, (2) curved line, (3) angled line, and (4) sine-shaped curve. Compound type was further subdivided into (1) bifurcated, (2) trifurcated, and (3) anomalous groups.

Based on the varied morphology and individual patterns seen on red area of the lips, 23 types or features have been enumerated in another classification. They are an eye, a hook, a bridge, a line, a dot, a rectangle-like, a triangle-like, a group of dots, a simple top bifurcation, a simple bottom bifurcation, a double eye, crossing lines, a closing bottom bifurcation, a delta-like opening, a simple opening, a closing top bifurcation, a pentagonal arrangement, a branch-like top bifurcation, a star-like bifurcation, a fence, a branch-like bottom bifurcation, a double fence, and a hexagonal arrangement.

Yet, another classification proposed by Kasprzak^[8] for lines on red part of the lips is as follows: (1) if the lines prevail, the pattern is described as linear, L; (2) if the bifurcation is dominant, it is termed bifurcate, R; (3) if the lines cross, the pattern is termed reticular, S; and (4) in case where no superiority can be established, pattern is named undetermined, N.

HISTORICAL REVIEW

R Fischer was the pioneer in the field of cheiloscopy in the early 20th century.^[2,8] In 1932, Edmond Locard, French criminologist, proposed cheiloscopy for personal identification.^[9] Until late 1950, anthropologists mentioned about the description of patterns and its practical uses were not focused on. The applied aspect of cheiloscopy for identification was proposed by Le Moyné Snyder.^[10] Thereafter, cheiloscopy was used in solving criminal cases.

Extensive studies have been conducted in cheiloscopy in the later half of 20th century; two Japanese scientists, Yasuo Tsuchihashi and Kazuo Suzuki concluded the individual specificity in morphological pattern of lip grooves.^[6]

Between the years 1985–1997, cheiloscopy has been successfully used in many cases across the globe including burglary cases, homicide cases, and cases of assault. In a good number of cases, the identification turned out to be positive which points to the fact that cheiloscopy is comparable to any other forensic identification procedure in the court of law.^[8]

The surge in quantum of research related to cheiloscopy is noteworthy in the last two decades. It is encouraging to see the amount of efforts put in by researchers in this field. The contributions by their studies have helped establish the features such as stability, gender determination, and variations in morphological patterns among different population groups.^[9]

There were multiple cheiloscopic studies both within and outside India with an effort to determine the common lip groove pattern, its gender determination potential and its other potential benefits, and relations with other aspects of forensic odontology. In India, different cheiloscopic studies were conducted in different geographical regions.

It was reported that no significant difference was observed between lip groove patterns and Type IV lip groove pattern

was found to be common in both genders among the Kerala population. However, it was reported that further studies are needed to establish any conclusion in this regard.^[11,12] Contradictory results were observed in Rajasthan population wherein lip groove patterns were found to be significantly different in males and females.^[13] Another study revealed that Type III lip groove pattern was most common in Rajasthan population.^[14]

Studies on Meerut population revealed that Type I, Type I', and Type II lip groove lines were dominant in females and Type III and Type IV lip groove lines were dominant in males, and cheiloscopy was considered more reliable than palatoscopy in gender recognition.^[15,16] Contradictory results of Type III lip groove pattern was common in females and Type II lip groove line in males in Maharashtra and North Indian population were also reported.^[17-19] Studies on Kanpur population revealed that Type III lip groove pattern was found common among both genders and Type IV lip groove pattern was the least common type.^[20]

Type IV and Type I lip groove patterns were identified as the common lip groove pattern among Karnataka and Punjab population.^[21,22] Contradictory results were also showed in Karnataka population, indicating that Type II lip groove line was found to be most common.^[23] Studies on Karnataka population had also reported that Type IV and Type V lip groove lines were common among males and Type I and Type I' lip groove lines were common among females.^[24] It was also reported that there was no statistically significant result between gender in relation to Punjab population.^[25] A study on Mangalore population revealed that Type II lip groove pattern was predominant in the population, which was contradictory to the other result.^[26]

Cheiloscopic study correlated with dermatoglyphics was conducted among Andhra Pradesh population which revealed that Type II lip groove pattern with arch, loop, and whorl pattern of the fingerprint pattern was found common in males and Type I lip groove pattern with arch and reticulate fingerprint pattern with whorl fingerprint pattern was found common among females.^[27] Similar correlational study was done among Mullana population which revealed contradictory results. Type III and Type IV lip groove pattern with whorl type of fingerprint were common among males. Type I pattern with loop pattern was found to be common among females.^[28] A correlational study among students using palatoscopy, rugoscopy, and dactyloscopy revealed that Type IV lip groove pattern with loop fingerprint pattern was found to be most common.^[29]

A similar correlational study on cheiloscopy and dermatoglyphics was conducted on Andhra Pradesh population which revealed that Type I lip groove lines with plain loop fingerprint pattern were found common and Type II lip groove lines with loop fingerprint pattern found common among females, which was contradictory with the previous results.^[30] The correlation was established between cheiloscopy and dermatoglyphics with the character of an individual.^[31]

It was reported that Type I and Type I' lip groove lines were common in females and Type IV and Type V lip groove

lines were common in males in Uttar Pradesh population.^[32] However, there are reports that Type I lip groove pattern was found common among females and Type III lip groove lines common among males in Uttar Pradesh population.^[33] Accuracy rate of 81% by examiners and statistically significant difference were observed between genders in Uttar Pradesh population.^[34] Yet, another study on Uttar Pradesh population revealed an accuracy 80.80% and 88% by three independent observers on Uttar Pradesh population.^[35] Contradictory results were found in Puducherry population that Type III lip groove lines were common among males and Type II lip groove lines were common among females.^[36] Studies also report that males do not exhibit Type II or III lip groove pattern in Uttar Pradesh population.^[37]

Digital studies on Goan population revealed that Type V lip groove pattern was common in all four populations and lip groove pattern was not affected by gender.^[38] Contradictory results were observed in Lucknow population that Type II lip groove pattern was the most common lip groove pattern among both males and females.^[39] Contradictory results of Type I lip groove pattern common in females of Lucknow population are also there.^[40] Studies on Chhattisgarh population revealed that Type I lip groove pattern was common among females and Type III lip groove pattern was found common among males.^[41]

Studies on Tamil Nadu population revealed that Type I and Type I' lip groove lines were common among females and Type IV and Type V lip groove lines were common among males.^[42] Similar results among females were observed in Rajasthan population.^[43,44] Studies among different subcastes of Delhi and Haryana revealed the specific lip groove pattern among specific groups of population.^[45]

Studies on Nagpur population revealed that Type I and Type I' lip groove lines were common among females and Type IV and Type V lip groove lines were common among males.^[46] Similar results among females and contradictory results among males were obtained in Modinagar population.^[47]

Roll lip print was considered the best method for taking lip groove pattern due to ease of access and pronounced feature.^[48] Cheiloscopic studies revealed that gender-wise differences were observed in Chennai population.^[49] A study on Chennai population revealed that Type II lip groove lines were common among males and Type I lip groove lines were common among females.^[50] Reports revealed that Type IV and V lip groove patterns were the most and least prevalent types in the Central Indian population. However, a cheiloscopic work on Marathi population revealed using digital impression method revealed that Type I and Type III lip groove pattern were found predominant in males and females, respectively.

Photographic method was carried out among Saudi individuals for cheiloscopy and the need for establishing a database in this regard was pronounced.^[51] Another study on Saudi individuals revealed that there was no statistically significant difference for lip groove pattern between gender of an individual.^[52]

Studies on Nigerian population revealed that Type V lip groove pattern was predominant type and Type I' was the

least common among males and females. It was reported that cheiloscopy behold the potential for gender determination. Studies revealed that Type I lip groove patterns were found to be common among Libya population^[53] and Bengaluru population.^[54]

A comparative study between Indian and Malaysian students revealed that Type I lip groove pattern was common among both the groups, and there was statistically no significant difference between both gender groups.^[55]

SCOPE OF CHEILOSCOPY

Research suggests that cheiloscopy has a potential role in successful comparison, analysis, and identification of a person in the crime scene. However, a cohesive cheiloscopic unit is found lacking in the field of forensic odontology. A lip groove pattern detected from the crime scene could be a basis for conclusion regarding the nature of the event, number of individuals involved, gender, cosmetics habits, occupational traits, and pathological changes in lips.

In 1966, cheiloscopic expertise was used in Poland in the scene of a burglary. The analysis revealed that trace of lip print revealed that it did not belong to the suspect and it helped in solving the case.^[10] Suzuki and Tsuchihashi in 1970 reported a rare case wherein cheiloscopy was used to identify the suspects based on the lip prints obtained on the envelope.^[56]

In the end of 1985, Dactyloscopy Division of Department of Criminalistics of the Civic Militia Headquarters, Denmark, proved its utility in court proceedings and a few cases were solved positive in the court of law in the subsequent year.^[2] In the middle of 1987, cheiloscopy had its role in a case of burglary in a grocery store. Lip prints were retrieved with tooth mark which was subsequently used to identify the burglar.^[10]

A forensic library of the antemortem records will serve as a referral board and will help cheiloscopy metamorphose to something which is extremely useful to humanity. The present literature shows the presence of lacunae and missing links in cheiloscopy. If these missing links can be fixed by the researchers in the years to come, cheiloscopy itself can act as a golden tool in forensic dentistry in the future.

CONCLUSION

During the past decade, numerous studies addressed the uniqueness of lip groove patterns and it was proved that it could be used for personal identification. It also has certain drawbacks. Lip groove patterns should be obtained within 24 h after death. Any pathology of the lip can change the lip print pattern transiently. Loss of support due to loss of anterior teeth also can cause changes in lip groove patterns transiently.

The tremendous research done in this field itself proves its worth as a unique entity, and it is often the sign of truth which is left at crime scenes turns out to be pivotal is solving the case when no other evidence prevails.

Cheiloscopy and dermatoglyphics behold immense potential in gender determination and identification. Even though multiple cheiloscopic studies advocate for and against gender

determination, a conclusive result regarding the gender predominance of lip groove and fingerprint pattern is still awaited. However, it promises to be one of the golden tools in forensic dentistry which can do wonders in future.

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REFERENCES

- Prabhu RV, Dinkar AD, Prabhu VD, Rao PK. Cheiloscopsy: Revisited. *J Forensic Dent Sci* 2012;4:47-52.
- Kasprzak J. Possibilities of cheiloscopsy. *Forensic Sci Int* 1990;46:145-51.
- Sivapathasundharam B, Prakash PA, Sivakumar G. Lip prints (cheiloscopsy). *Indian J Dent Res* 2001;12:234-7.
- O'Shaughnessy PE. Introduction to forensic science. *Dent Clin North Am* 2001;45:217-27, vii.
- Adams BJ. The diversity of adult dental patterns in the United States and the implications for personal identification. *J Forensic Sci* 2003;48:497-503.
- Tsuchihashi Y. Studies on personal identification by means of lip prints. *Forensic Sci* 1974;3:233-48.
- Williams TR. Lip prints-another means of identification. *J Forensic Sci Indent* 1991;41:190-4.
- Kasprzak J. Cheiloscopsy. *Encyclopedia of Forensic Sciences*. Vol. 1. London: Academic Press; 2000. p. 358-61.
- Warren H. Dental Identification and Forensic Odontology. London: Henry Kimpton Publishers; 1976. p. 22-3.
- Ball J. The current status of lip prints and their use for identification. *J Forensic Odontostomatol* 2002;20:43-6.
- Varghese AJ. A study on lip print types among the people of Kerala. *J Indian Acad Forensic Med* 2001;32:6-7.
- Augustine J, Barpande SR, Tupkari JV. Cheiloscopsy as an adjunct to forensic identification: A study of 600 individuals. *J Forensic Odontostomatol* 2008;26:44-52.
- Padmavathi BN, Makkad RS, Rajan SY, Kolli GK. Gender determination using cheiloscopsy. *J Forensic Dent Sci* 2013;5:123-8.
- Devi A, Astekar M, Kumar V, Kaur P, Singh N, Sidhu GK. The study of inheritance analysis and evaluation of lip prints in individuals. *J Forensic Dent Sci*. 2015;7:49-53.
- Sharma P, Saxena S, Rathod V. Comparative reliability of cheiloscopsy and palatoscopy in human identification. *Indian J Dent Res* 2009;20:453-7.
- Venkatesh R, David MP. Cheiloscopsy: An aid for personal identification. *J Forensic Dent Sci* 2011;3:67-70.
- Gondivkar SM, Indurkar A, Degwekar S, Bhowate R. Cheiloscopsy for sex determination. *J Forensic Dent Sci* 2009;1:56-60.
- Gupta S, Gupta K, Gupta O. A study of morphological patterns of lip prints in relation to gender of North Indian population. *J Oral Biol Craniofac Res* 2011;1:12-6.
- Raghav P, Kumar N, Shingh S, Ahuja NK, Ghalaut P. Lip prints: The barcode of skeletal malocclusion. *J Forensic Dent Sci* 2013;5:110-7.
- Saraswathi TR, Mishra G, Ranganathan K. Study of lip prints. *J Forensic Dent Sci* 2009;1:28-31.
- Varghese AJ. A study of efficacy of lip prints as an identification tool among the people of Karnataka in India. *J Indian Acad Forensic Med* 2011;33:200-2.
- Randhawa K, Narang RS, Arora PC. Study of the effect of age changes on lip print pattern and its reliability in sex determination. *J Forensic Odontostomatol* 2011;29:45-51.
- Telagi N, Mujib A, Spoorthi B, Naik R. Cheiloscopsy and its patterns in comparison with ABO blood groups. *J Forensic Dent Sci* 2011;3:77-80.
- Koneru A, Surekha R, Nellithady GS, Vanishree M, Ramesh D, Patil RS. Comparison of lip prints in two different populations of India: Reflections based on a preliminary examination. *J Forensic Dent Sci* 2013;5:11-5.
- Sandhu SV, Bansal H, Monga P, Bhandari R. Study of lip print in a Punjabi population. *J Forensic Dent Sci* 2012;4:24-8.
- Gaba R, Ahmed J, Ongole R, Ceena Denny E, Shenoy N, Binnal A. Scope of cheiloscopsy in gender identification. *Int J Biomed Res* 2014;5:423-6.
- Nagasupriya A, Dhanapal R, Reena K, Saraswathi T, Ramachandran C. Patterns – “A crime solver”. *J Forensic Dent Sci* 2011;3:3-7.
- Bansal N, Sheikh S, Bansal R, Pallagati S. Correlation between lip prints and finger prints in sex determination and pattern predominance in 5000 subjects. *J Forensic Odontostomatol* 2013;31:8-14.
- Mutalik VS, Menon A, Jayalakshmi N, Kamath A, Raghu AR. Utility of cheiloscopsy, rugoscopy, and dactyloscopy for human identification in a defined cohort. *J Forensic Dent Sci* 2013;5:2-6.
- Nandan SRK, Bandaru BK, Rajendra Santosh AB, Thankapan P, Venkata Chundru NS, Amudala R. A study on association and correlation of lip and finger print pattern analysis for gender identification. *J Dr NTR Univ Health Sci* 2015;4:176-81.
- Abidullah M, Kumar MN, Bhorgonde KD, Reddy DS. Cheiloscopsy and dactyloscopy: Do they dictate personality patterns? *J Forensic Dent Sci*. 2015;7:114-20.
- Malik R, Sumit Goel. Cheiloscopsy: A deterministic aid for forensic sex determination. *J Indian Acad Oral Med Radiol* 2011;23:17-9.
- Singh J, Gupta KD, Sardana V, Balappanavar AY, Malhotra G. Sex determination using cheiloscopsy and mandibular canine index as a tool in forensic dentistry. *J Forensic Dent Sci* 2012;4:70-4.
- Sharma V, Ingle NA, Kaur N, Yadav P. Identification of sex using lip prints: A clinical study. *J Int Soc Prev Community Dent* 2014;4 Suppl 3:S173-7.
- Srivastava S. Lip prints – An aid in individual identification: A Study to assess the uniqueness of lip prints. *Indian J Forensic Odontol* 2013;6:95-100.
- Kumar S, Vezhavendhan N, Vendhan P. A study of lip prints among Pondicherry population. *J Forensic Dent Sci* 2012;4:84-7.
- Karim B, Gupta D. Cheiloscopsy and blood groups: Aid in forensic identification. *Saudi Dent J*. 2014;26:176-80.
- Prabhu RV, Dinkar A, Prabhu V. A study of lip print pattern in Goan dental students – A digital approach. *J Forensic Leg Med* 2012;19:390-5.
- Dwivedi N, Agarwal A, Kashyap B, Raj V, Chandra S. Latent lip print development and its role in suspect identification. *J Forensic Dent Sci* 2013;5:22-7.
- Naeem A. Use of cheiloscopsy as a tool for gender dimorphism in a rural Indian population. *BJMMR* 2015;10:1-6.
- Multani S, Thombre V, Thombre A, Surana P. Assessment of lip print patterns and its use for personal identification among the populations of Rajnandgaon, Chhattisgarh, India. *J Int Soc Prev Community Dent* 2014;4:170-4.
- Mujoo S, Sakarde SB, Sur J Singh A, Khan F, Jain S, Deepalaxmi R. Cheiloscopsy and palatoscopy: A novel tool for sex

- identification. Chettinad Health City Med J 2012;1:146-51.
43. Kinra M, Ramalingam K, Sethuraman S, Rehman F, Lalawat G, Pandey A. Cheiloscopy for sex determination: A study. *Univers Res J Dent* 2014;4:48-51.
 44. Taura MG, Hamman WO, Ojo SA, Dahiru AU. Association of lip print and sex among Nigerians. *Niger J Basic Clin Sci* 2012;9:79-83.
 45. Vats Y, Dhall JK, Kapoor A. Gender variation in morphological patterns of lip prints among some North Indian populations. *J Forensic Dent Sci* 2012;4:19-23.
 46. Dongarwar GR, Bhowate RR, Degwekar SS. Cheiloscopy – Method of person identification and sex determination. *Open Access Sci Rep* 2013;2:1-4.
 47. Ranjan V, Sunil MK, Kumar R. Study of lip prints: A forensic study. *J Indian Acad Oral Med Radiol* 2014;26:50-4.
 48. Khanna S. Cheiloscopy: A frequency based approach for IV quadrant in female lip print. *J Forensic Res* 2015;6:1-8.
 49. Bharathi S, Thenmozhi MS. Cheiloscopy – Lip print, an determination of sex and individual. *Int J Pharm Sci Res* 2015;7:330-3.
 50. Shah KK, Gifrina Jayaraj. Cheiloscopy for sex determination among individuals aged 17-25 years. *Int J Pharm Sci Res* 2015;7:731-5.
 51. El Domiaty MA, Al-gaidi SA, Elayat AA, Safwat MD, Galal SA. Morphological patterns of lip prints in Saudi Arabia at Almadinah Almonawarah province. *Forensic Sci Int* 2010;200:179.e1-9.
 52. El Ghamry OR, AM Abdullatif, AK Ismail. Duration of reliability of lip print as physical evidence at scene of a crime. *Int Res J Appl Basic Sci* 2014;8:26-33.
 53. Peeran SW, Kumar PG, Abdalla KA, Azaruk FA, Manipady S, Alsaid FM. A study of lip print patterns among adults of Sebha city, Libya. *J Forensic Dent Sci* 2015;7:67-70.
 54. Kaul R, Padmashree SM, Shilpa PS, Sultana N, Bhat S. Cheiloscopic patterns in Indian population and their efficacy in sex determination: A randomized cross-sectional study. *J Forensic Dent Sci*. 2015;7:101-6.
 55. Nagpal B, Hegde U, Sreeshyla H, Arun. Comparative evaluation of lip prints among Indian and Malaysian students. *J Indian Acad Forensic Med* 2015;37:131-4.
 56. Suzuki K, Tsuchihashi Y. Personal identification by means of lip prints. *J Forensic Med* 1970;17:52-7.