The Saudi Dental Journal (2014) **26**, 176–180

King Saud University

The Saudi Dental Journal

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

Cheiloscopy and blood groups: Aid in forensic identification☆

Bushra Karim, Devanand Gupta *

Department of Public Health Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, India

Received 20 February 2013; revised 27 January 2014; accepted 6 May 2014
Available online 15 July 2014

KEYWORDS

Forensic odontology;
Cheiloscopy;
Blood groups

Abstract *Introduction:* Every person has certain features that make them radically distinct from others. One such feature is lip prints. Lip prints remain the same throughout life and are uninfluenced by injuries, diseases, or environmental changes. Different individuals have specific blood groups according to the various antigen–antibody reactions in their bloodstream.

Aim: To determine the distribution of different patterns of lip prints among subjects having different ABO and Rh blood groups.

Objective: To determine the correlation between respective characteristics of subjects.

Methodology: In this study, lip prints were obtained from 122 subjects (62 males and 60 females), and associated blood-group matching was performed to determine the predominant lip print type and to determine any correlation between lip print types and blood groups. Tsuchihashi's classification of type I (complete vertical grooves), type I′ (incomplete vertical grooves), type II (forking grooves), type III (intersecting grooves), type IV (reticular grooves), and type V (indeterminate grooves) was used to compare with the ABO and Rh blood grouping systems.

Result: No correlation was found between lip prints and blood groups.

Conclusion: No significant correlation exists between blood group and lip prints. Lip prints play a vital role in identification because they are unique.

1. Introduction

Personal identification plays an inevitable role in forensic investigation of the unknown deceased in mass disaster cases or in missing person cases, as well as for inclusion, exclusion, or identification of criminal suspects. This is when fingerprints, DNA profiling, osteology, and odontology play an indispensible role (Budowle et al., 2005; Rai et al., 2007). Fingerprints and wrinkle patterns on lips have some individual characteristics that are unique for every individual. Identification of humans on the basis of lip wrinkles is a type of forensic investigation known as cheiloscopy. In the recent past, cheiloscopy

Abbreviation: DNA, Deoxyribonucleic acid.

☆ The paper was presented and got recognition in 10th Indian Association of Forensic conference.

* Corresponding author. Address: Department of Public Health Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Teerthanker Mahaveer University, Delhi Road, Moradabad, India.

E-mail address: drdevanandgupta@aol.com (D. Gupta).

Peer review under responsibility of King Saud University.

ELSEVIER Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.sdentj.2014.05.005

attracted the interest of many researchers for identification of humans in legal issues. As the lips are quite mobile, the appearance of lip prints may differ according to pressure, direction, and method of obtaining the lip prints. The importance of lip prints in human identification is much greater than previously thought.

In the zone of transition of the human lip, some lines and fissures are present that resemble wrinkles and grooves; these are known as lip prints (Caldas et al., 2007). Lip prints are important because of their uniqueness, except in monozygotic twins, and permanence (Tsuchihashi, 1974). Lip prints appear during the 6th week of intrauterine life (Castello et al., 2005; Domiaty et al., 2010; Hirth et al., 1975; Coward, 2007; Utsuno et al., 2005; Kasprazak, 1990). Synder (1977) commented on the possibility of using lip prints for personal identification. Santos (1967) divided the grooves into simple and compound types. Lip prints are divided into six types according to Suzuki and Tsuchihashi (1971).

Correlating lip prints with blood groups may be useful in forensic science for more accurate identification of an individual than with the use of lip prints alone. No evidence exists to correlate lip prints and blood groups in the literature, so the present study was conducted with the primary aim of determining the relationship between lip prints and blood group. A secondary aim was to determine the distribution of different lip print patterns among subjects having different ABO and Rh blood groups.

2. Materials and methods

122 (62 males and 60 females) Bachelor of Dental Surgery (B.D.S) students aged 18–24 years who belonged to the Ancestral North Indians or Indo-Aryan-speaking population of the northern Indian race were examined in the Department of Public Health Dentistry of the Teerthanker Mahaveer Dental College in Moradabad, Uttar Pradesh (U.P.), India. The study protocol was approved by the Institutional Review Board (IRB) of Teerthanker Mahaveer Dental College and Research Center. All subjects signed an IRB-approved consent form. A pilot study was conducted on five patients in each group to check the feasibility of the study. The results from this pilot study were not included in the final study. The materials used included microscopic glass slides, cellophane tape, a magnifying glass, and Lakmé red color lipstick, as shown in Fig. 1(a–c). A sample of 122 individuals (62 males and 60 females) was randomly selected for the study. Lips with normal transition zones and without any pathology were included. All of the participants were asked to complete the consent form, and ethical clearance from the institution was obtained to perform the study. All of the individuals' lip prints and blood groups were studied.

Lipstick was applied in a single direction. Each participant was instructed to open his or her mouth widely. Each subject was instructed to keep his or her mouth stationary while an impression was made with a 10 cm section of cellophane tape. The tape was carefully lifted after gentle pressure was applied for few seconds. The strip of cellophane was pasted on white bond paper to create a permanent record with a serial number (a code given while noting the name and sex of participants) written on the back. With the help of a magnifying glass, the lines and furrows of lip prints, as well as the pattern, were studied. The middle part of the lower lip is most frequently observed at the crime scene; thus, this portion was considered in this study.

The lip prints were studied based on the classification given by Suzuki and Tsuchihashi (1971) (Fig. 2):

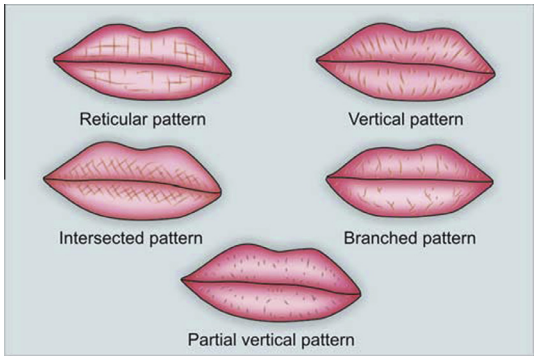


Figure 1 Type of lips.

Figure 2 (a–c) Diagnostic instruments used for the study. (a) Kidney tray, mouth mirror, explorer, tweezer, cotton, gloves, (b) white bond paper, cellophane tape, scissor and Lakme lipstick, (c) blood slide, anti-A and anti-B sera, magnifying glass.

Type I	clear-cut grooves running vertically across the lip
Type I′	the grooves are straight but disappear halfway
Type II	the grooves fork in their course
Type III	the grooves intersect
Type IV	the grooves are reticular
Type V	the grooves do not fall into any of the types I–IV

Blood groups of the subjects were analyzed by treating individual drops of blood on microscope slides with anti-A and anti-B sera, alone or in combination. A positive reaction (agglutination) of the blood upon treatment with anti-A sera is indicative of blood group A; a positive reaction with anti-B sera is indicative of blood group B; no agglutination is indicative of blood group O, and agglutination upon treatment with a combination of both antisera is suggestive of blood group AB. Similarly, a positive agglutination reaction upon treatment with Rh antigen is indicative of an Rh+ blood type; otherwise, an Rh− blood type is indicated (Graph I).

3. Inclusion criteria

Subjects with lips free from any active or passive lip lesions who gave consent and reported no hypersensitivity to lipsticks were included in the study.

4. Exclusion criteria

Subjects who underwent lip surgery or had a history of lip trauma or developmental anomalies were excluded from the study.

4.1. Statistical analysis

The results obtained were analyzed using Chi-square tests.

5. Results

5.1. Gender and lip print

A type I lip print pattern was exhibited by 15% of men subjects. A type I′ pattern was exhibited by 10% of men subjects and 2% of women subjects. A type II pattern was exhibited by 21% of women subjects. Men subjects did not exhibit type II or type III patterns. A type III pattern was observed in 25% of women subjects. Type IV and type V patterns were exhibited by 14% and 13% of men subjects, respectively, though neither of these patterns was observed in women subjects (Graph II).

Graph II shows the gender-wise distribution of lip prints: type III is most predominantly seen among female subjects and type II is predominant among male subjects.

5.2. Blood group and lip print

Blood group A+ve is predominant among individuals with type III ($n = 7$) lip prints, followed by type II ($n = 5$) lip prints, type I′ lip prints ($n = 5$), type V ($n = 3$) lip prints, type IV lip prints ($n = 2$), and type I lip prints ($n = 2$). 21 individuals with the B+ve and 25 individuals with the O+ve blood groups mostly exhibit type III lip prints ($n = 7$ and $n = 8$ individuals, respectively), type II lip prints ($n = 6$), type IV lip prints ($n = 3$), type V lip prints ($n = 3$), and type I′ lip prints ($n = 2$). Among 19 individuals of the blood group AB+ve, the most predominant type of lip print is type II ($n = 6$) followed by type IV ($n = 6$), type I ($n = 4$), type III ($n = 2$), and type V ($n = 1$).

Among 25 individuals of the blood group O+ve the most predominant lip prints were type III lip prints followed by type I Lip prints and the type V lip prints and type I′ and type II lip prints are same that is 2, respectively and least is seen in type IV lip prints that is 1.

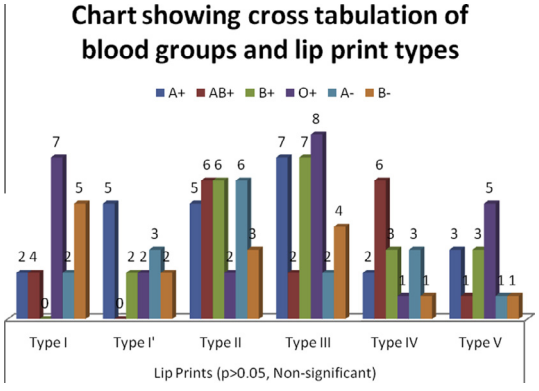
Among 17 individuals of the blood group A−ve the most predominant lip prints were seen in type II lip print (n = 6) followed by type I′ and type IV (n = 3), respectively and type I and type III ($n = 2$) followed by type V lip prints ($n = 1$).

Among the 16 individuals of the blood group B−ve the most predominant lip prints were type I ($n = 5$) followed by type III ($n = 4$) followed by type II ($n = 3$) followed by type I′ ($n = 2$) followed by type IV and type V lip prints.

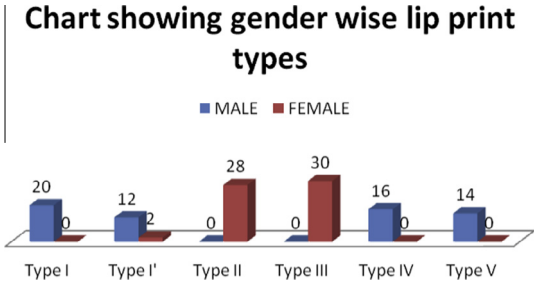
Among the 21 individuals of the blood group B+ve the most predominant lip prints were seen in type III ($n = 7$) followed by type II ($n = 6$) followed by type IV and type V lip prints respectively ($n = 3$) followed by type I′ ($n = 2$) type I was not seen in this blood group, as described below in Table I and Figs. 1 and 2.

6. Discussion

Detailed studies of each lip print have shown that each print is unique and remains unchanged during a person's lifetime (Singh et al., 2010; Vamsi Krishna Reddy, 2011; Sivapathasundharam et al., 2001; Vahanwalla and Parekh, 2000; Saraswathi et al., 2009; Gondvikar et al., 2009). Thus, lip prints may be used effectively for personal identification. Lip prints play a vital role in transfer of evidence and are considered similar to fingerprints in forensic and personal identification (Tsuchihashi, 1974). Criminal suspects may be easily detected by lip prints left at a crime scene. Lipsticks that are



Graph I Distribution of lip prints with blood groups.



Graph II Chart showing gender wise lip print types.

Table I Chart showing gender wise blood groups.

Blood group * lip prints cross tabulation							
Blood group	Lip prints						
	Type I	Type I′	Type II	Type III	Type IV	Type V	Type V
A + ve	2	5	5	7	2	3	24
AB + ve	4	0	6	2	6	1	19
B + ve	0	2	6	7	3	3	21
O + ve	7	2	2	8	1	5	25
A − ve	2	3	6	2	3	1	17
B − ve	5	2	3	4	1	1	16
Total	18	14	28	30	16	14	122

Chi square = 35.11, df = 25, $p > 0.05$, non-significant ($p = 0.96$).

currently manufactured do not leave any lip print on any objects and are referred to as persistent lip prints and may be easily lifted by aluminum and magnetic powder (Alvarez Segui et al., 2000).

In the present study, type II and type III lip prints were found to be the most predominant among female subjects, while type I, type I′, and type IV lip prints were the most predominant among male subjects**.** Results from the present study are in agreement with those from a previous study conducted by Rastogi (2011) and Patel (2010). However, the present study is not in accordance with the previous studies conducted by Vahanwala et al. (2005) who determined that type I and type I′ lip prints were predominantly seen in female subjects and that type II and type III lip prints were predominantly seen among males. Various studies in India have shown population-wise dominance. Sivapathasundharam et al. (2001) and Saraswathi et al. (2009) studied lip print patterns and found that type III was the predominant lip pattern in the Indo-Dravidian population. Lip prints are unique and are associated with the race and ethnic origin of a person (Verghese et al., 2010). The present study showed no significant correlation between lip prints and blood groups. This may be due to different areas or origins of lip prints and blood in intraembryonic life; however, further studies are needed to elucidate the reason. The results of the current study are similar to those of studies by Patel (2010) and Telagi et al., 2011, which showed no correlation between lip prints and blood groups.

7. Conclusion

From the current study, it was concluded that no significant correlation exists between blood group and lip prints. Lip prints play a vital role in identification because they are unique. The importance of this study is that lip prints may be of great use in criminal cases, similar to fingerprints. Different patterns of lip prints should be studied further, and their relation with blood groups must be studied well in large population samples.

To utilize the mammoth role of cheiloscopy in forensic investigations, it is mandatory to perform more studies on different population groups to analyze the variations and to establish a database. A dire need exists to standardize the protocol for lip print collection, development, preservation, and examination. It is essential to clarify aspects of personal identification by using cheiloscopy.

Conflict of interest

The author declares no conflict of interest.

References

Alvarez Segui, M., Miquel Feucht, M., Castello Ponce, A., Verdu Pascual, F., 2000. Persistent lipsticks and their lip prints: new hidden evidence at the crime scene. Forensic Sci. Int. 112, 41–47.

Budowle, B., Bieber, F.R., Eisenberg, A.J., 2005. Forensic aspect of mass disasters: strategic considerations for DNA based human identification. Legal Med. 7, 230–243.

Caldas, I.M., Magalhaes, T., Alfonso, A., 2007. Establishing identity using cheiloscopy and palatoscopy. Forensic Sci. Int. 169, 1–9.

Castello, A., Verdu, M.A., Lumenous, F.A., 2005. Lip prints as criminal evidence. Forensic Sci. Int. 155, 185–187.

Coward, R.C., 2007. The stability of lip print characteristics over time. J. Forensic Odontostomatol. 25 (2), 40–56.

Domiaty, M.A., Al Gaidi, S.A., Elayat, A.A., Safwat, M.D., Galal, S.A., 2010. Morphological patterns of lip prints in Saudi Arabia at Almadinah Almonawarah province. Forensic Sci. Int. 200, 179.e.1–9.

Gondvikar, Shailesh M., Indurkar, Atul, Degwekar, Shirish, Bhowate, Rahul, 2009. Cheiloscopy for sex determination. J. Forensic Dent. Sci. 1 (2), 56–60.

Hirth, L., Gottsche, H., Goedde, H.W., 1975. Lip prints – variability and genetics. Humangenetik 30 (1), 47–62.

Kasprazak, J., 1990. Possibilities of cheiloscopy. Forensic Sci. Int. 46, 145–151.

Patel, Shilpa, 2010. A study of lip prints in relation to gender, family and blood group. Int. J. Oral Maxillofac. Pathol. 1 (1), 4–7.

Rai, B., Anand, S.C., 2007. Role of forensic odontology in tsunami disaster. Internet J. Forensic Sci. 2, 1.

Rastogi, Prateek, 2011. Lip prints – an aid in identification. Aust. J. Forensic Sci., 1–8.

Santos, M., 1967. Cheiloscopy: A supplementary stomatological means of identification. Brazil. Int. Microform J. Leg. Med. 2, 66.

Saraswathi, T.R., Mishra, G., Ranganathan, K., 2009. Study of lip prints. J. Forensic Dent. Sci. 1, 28–31.

Singh, Narendra Nath, Brave, V.R., Khanna, Shally, 2010. Natural dyes versus lysochrome dyes in cheiloscopy: a comparative evaluation. J. Forensic Dent. Sci. 2 (1), 11–17.

Sivapathasundharam, B., Ajay Prakash, P., Sivakumar, G., 2001. Lip prints (cheiloscopy). Indian J. Dent. Res. 12, 234–237.

Suzuki, K., Tsuchihashi, Y., 1971. A new attempt of personal identification by means of lip prints. Can. Soc. Forensic Sci. J. 4, 154–158.

Synder, L.M., 1977. Homicide Investigation, third ed. Thomas CC, Springfield.

Telagi, Neethu, Mujib, Ahmed, Spoorthi, B.R., Naik, Rashmi, 2011. Cheiloscopy and its patterns in comparison with ABO blood groups. J. Forensic Dent. Sci. 3 (2), 77–80.

Tsuchihashi, Y., 1974. Studies on personal identification by means of lip prints. Forensic Sci. 3, 233–248.

Utsuno, H., Kanoh, T., Tadokoro, O., Inoue, K., 2005. Preliminary study of PM identification using lip prints. Forensic Sci. Int. 149, 129–132.

Vahanwala, S.P., Nayak, C.D., Pagare, S.S., 2005. Study of lip prints as aid for sex determination. Med. Leg. Update 5 (3), 93–98.

Vahanwalla, S.P., Parekh, B.K., 2000. Study on lip prints as an aid to forensic methodology. J. Forensic Med. Toxicol. 17 (1), 12–18.

Vamsi Krishna Reddy, L., 2011. Lip prints: an overview in forensic dentistry. J. Adv. Dent. Res. 2 (1), 17–20.

Verghese, A.J., Somasekar, M., Umesh, B.R., 2010. A study on lip print types among the people of Kerala. J. Indian Acad. Forensic Med. 32, 6–7.