



Comparison of lip prints in smokers and non-smokers

Mahalakshmi Loganathan, Prasad Hari Krishnan, Mahudeshwaran Sengottuvelu, Arthanaari Loganathan, Rajmohan Muthusamy
KSR institute of dental science and research, Tiruchengode, Tamilnadu

Introduction

Forensic odontology is the branch of dentistry which aids in identifying humans after homicides, accidents, wars, crimes or natural calamities (1). There were many challenges faced by man in the early days to prove the identity of an individual. However, in the past century, the discovery that finger print patterns are distinctive and permanent made it an ideal tool for forensic identification. It has also been used extensively in crime scene investigations to identify potential suspects/culprits. Since awareness regarding the use of finger prints in investigations has increased exponentially, sufficient precautions like the use of gloves by the culprits has also been on the rise (2).

As an alternative to finger prints for forensic identification, lip prints have also been studied extensively for personal identification based on lip tracings. The study of lip prints is known as cheiloscopy. Interest in cheiloscopy as a potentially indispensable tool in forensics has been increasing in the recent few decades. Lip prints are unique for each person and do not change during life and they are permanent and invariable (3). However lip prints are not very stable after death, and have to be obtained within 24 hours of death to prevent any of the erroneous data that would result from the post-mortem alterations of lip(4). Also, pathologies of the lip can interfere with lip print patterns. Cigarette smoking is a widespread deleterious habit that can have various local and systemic effects on an individual. Therefore, we designed a study to determine if there was any change in lip print patterns due to cigarette smoking, and to compare lip print patterns in smokers and non-smokers.

Materials and Methods

A total of 100 males were included in the study, out of which 50 were non-smokers and 50 were smokers. Subjects between 18 and 50 years of age were included in the study. Persons with scars on the lip, lip lesions, lip deformities and persons with known hypersensitivity to lipsticks were excluded from this study. Smokers were classified based on their smoking habit as mild smokers (subjects who used 1 – 2 cigarettes for at least two years), moderate smokers (subjects who smoked 1 – 5 cigarettes for at least five years), and heavy smokers (subjects who smoked more than 5 cigarettes for more than 5 years). Lip stick was applied uniformly using a

clean cotton swab and the subjects were asked to rub both the lips to spread the applied lipstick. Following this, lip impression was taken using the sticky side of a piece of cellophane tape by applying uniform pressure. The tape was then taken out in a single jerk motion and stuck on to a white paper, which then served as a permanent record. The middle part of the lip print of about 10 mm width (taking the philtrum as midpoint) was only considered for the analysis of prints because the lateral parts of the lip print have high chance of distortion (4). After acquiring lip prints, each of them was assigned a unique number for identification and was visualized and studied with a magnifying lens. Each print was then classified according to Suzuki and Tsuchihashi's (1970) classification as follows:(5)

Type I: clear-cut grooves running vertically across the lip

Type I': grooves are straight, but they disappear halfway instead of covering the entire breadth of the lip

Type II: branched groove

Type III: grooves intersect

Type IV: grooves are reticular

Type V: grooves that do not fall into any of the above types and cannot be differentiated morphologically.

To detect any local rise in temperature due to the heat produced by cigarette on the lips, a digital thermometer was used, and the surface temperature of the lip was noted in smokers just before and immediately after smoking.

Result

Examination of the lip prints patterns revealed that no two lip prints matched with each other, thus establishing the uniqueness of lip prints. The most predominant pattern in both smokers and non-smokers was type III (48%). This was followed by type I (18%), type II (12%), type IV (10%), type I' (8%) and type V (4%) (Figure 1). Twenty-four smokers (48%) also had cracking of Intersecting Type III (Non-smoker) grooves extending up to vermillion border.





Figure 1: Various lip print patterns noticed in smokers and non-smokers. Note the presence of vertical cracking in smokers (yellow circle)

Discussion

Cheiloscopy deals with the identification of a person based on the characteristic arrangement of lines appearing on the vermillion borders of lips. In case of crime detection, just like fingerprints, lip prints can also be used as an identifying tool in forensic sciences because each individual's lips have a unique pattern (2,6). Lip prints are considered as one of the methods of personal identification. The lip print pattern depends on whether mouth is closed or opened, while the pattern is recorded. In the closed mouth position, lips will exhibit well defined grooves, whereas in open mouth position the grooves are relatively difficult to interpret and are ill defined (7).

In this study we found that type III pattern was predominant both in smokers and in non-smokers, which was similar to the findings observed by Sivapathasundaram et al., Kundu et al. and Molano et al. (8-10). It was also found that type V was least predominant lip print pattern in this study, which was again consistent with findings of Suzuki et al.(5)

Our results differed from the findings reported by Verma et al. who concluded that type II was the more predominant lip print pattern. Similarly, Prabhu et al. (11) reported that the most predominant pattern was type V. Prabhu et al. also reported the following variants of type V pattern: trifurcations, bridge or 'H' pattern, horizontal lines, cartwheel and pineapple skin, and multiple branching appearance. No such patterns, however, were identified in our study.

We also observed cracking of grooves among smokers. None of the lip prints obtained from non-smokers had this feature. It could therefore be attributed to the heat produced by cigarette. This was confirmed by using a digital thermometer, which showed that there was a definite local rise in temperature ranging between 95.4° F - 95.9° F in smokers after 1 min of smoking. To the best of our knowledge, this is the first study to compare lip print patterns in smokers. (Google, and Pubmed databases searched with keywords - lip prints, cheiloscopy, smokers, smoking).

Lip prints at crime scenes are rarely mentioned because most crime scene investigators do not look for them. Cheiloscopy has not gained widespread acceptance or practical application till date. It is important to note that lip prints left at scenes of a crime such as drinking glasses, cigarette butts and clothing could eventually lead to the identity of a suspect, victim or a witness of crime. In most countries, efficient machinery in place for detection, recording and matching of fingerprints of an individual already exists. The same can be made use of for lip prints too, without the need for extensive investment in new armamentaria or infrastructure. This can greatly enhance the apprehension of suspects and their conviction in the courts of law (3,12).

Some studies suggest that lip prints patterns vary with ethnicity (3,12). One of the common problems encountered during the cheiloscopy is smudging and spoiling of lip prints which can lead to difficulty in identification of the lip print pattern among the individuals (13). Therefore, a uniform and standard protocol must be established for collection, development and recording of lip prints (14). To conclude, cheiloscopy has gained importance in the past few decades. Ongoing research on lip prints highlights the fact that it is possible to use vermillion border of lips to identify human beings. The findings of our study suggest that smokers have cracking of grooves extending to vermillion border, probably due to the heat produced by cigarette. This could help differentiate lip prints of a smoker from a non-smoker, which is a valuable finding, especially in forensic investigations.

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