ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 10, Issue, 12, pp.76472-76476, December, 2018

DOI: https://doi.org/10.24941/ijcr.33444.12.2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

CHEILOSCOPY: A SUCCOR IN INVESTIGATION AND IDENTIFICATION: A RECENT REVIEW

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ARTICLE INFO

Article History:
Received 20th September, 2018
Received in revised form
14th October, 2018
Accepted 16th November, 2018
Published online 31st December, 2018

Key Words:
Cheiloscopy, Forensic Science, Identification, Lip Prints, Quiloscopy.

ABSTRACT

As we become more civilised, there's been an gradual increase in crime rate leading to gross injustice owing to shortfalls in terms of identification. With advances in field of dentistry it aids in identification and providing evidences of the crime to the law firm. The pattern on the lips has individual characteristics. The finger prints in the beginning were the only means of identification but now investigators can also rely on cheiloscopy as evidence. Cheiloscopy also known as quiloscopy which is defined as a method of identification of a person based on characteristic arrangement of lines appearing on the red part of lips. The tremendous research done in the field of cheiloscopy highlight the fact that the possibilities to use the lips to identify a human being are wider than it is commonly thought.

***Citation: Shraddha Roy, Rajiv Ranajan, Yash Shah, Soumendu Bikash Maiti, Amit Jain Sangeeta Keshkar, Pavan Kumar Singh*, 2018.** "Cheiloscopy: a succor in investigation and identification: a recent review", *International Journal of Current Research*, 10, (12), 76472-76476.

INTRODUCTION

The challenges faced by man in early days to provide the identity of an individual. Identification of humans is prerequisite for personal, social and legal reason. The invention of finger print in the past century is the only reliable means of human identification (Sharma *et al*., 2009). In individuals, the finger print patterns are distinctive and permanent and hence considered as a tool for identification (Prabhu *et al*., 2012). However, the awareness of the advanced techniques in crime detection has alarmed the criminals for taking sufficient precautions like the use of gloves (Reddy, 2011). In such circumstances, the identification of criminal using accurate methods like fingerprint analysis fail to establish a positive identity. Thus investigator can rely on adjuvant technique such as cheiloscopy as supportive evidence (Prabhu *et al*., 2012).

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The introduction of fingerprints in the beginning of the past century as the only reliable means of human identification was due to the significant works of three distinguished persons – Sir William Herschel, Sir Francis Galton, and Sir Edward Henry. Fingerprint system was first used in India in 1858 by Sir William Herschel (Sharma, 2009). The pattern of wrinkles on the lips has individual characteristics as fingerprints. The wrinkles and grooves on the labial mucosa (called sulci labiorum) form a characteristic pattern called lip prints, the study of which is referred to as Cheiloscopy.[4] It can be defined "as a method of identification of a person based on characteristic arrangements of lines appearing on the red part of lips or as a science dealing with lines appearing on red part of the lips" (Prabhu *et al*., 2012). The lip prints being uniform throughout the life and characteristics of person can be used to verify the presence or absence of a person from the crime, provided there has been consumption of beverages, drinks, usage of cloth, tissues or napkin etc., at the crime scene.

However, studying in depth and establishing further facts and truth in lip prints will certainly help as useful evidence in forensic dentistry (Utsuno *et al*., 2005).

Personal Identification (Forensic Sciences): Finger prints, post mortem reports, and of late, DNA finger printing have been successful 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 absence of a person at the scene of crime (Sharma, 2009).

History

The biological phenomenon of systems of furrows on the red part of human lips was first noted by anthropologists; R. Fischer was the first to describe it in 1902.[6] In 1932, one of the France's greatest criminologist Edmond Locard, recommended the use of lip print for identification of a person.[7] The idea of using lip print for identification was first suggested by Le Moyne Snyder in the year 1950. He introduced a case in which lip prints helped the crime scientist in an unusual way (Prabhu *et al*., 2012). Dr. Martins Santos in 1960 proposed that these lip characteristics could be used in personal identification and devised a simple system for classifying lip prints (Prabhu *et al*., 2012). In 1967, Suzuki made a detail investigation of the measurement of lips, the use and the color of rouge and method of its extraction to obtain useful data for forensic application (Saraswathi *et al*., 2009). Later in 1971 Suzuki and Tsuchihashi, conducted a study and they devised their own classification (Prabhu *et al*., 2012). McDonell in 1972 conducted a study on lip prints between two identical twins and reported that two identical twins seemed to be indistinguishable by every other means but they had different lip prints (Saraswathi *et al*., 2009). Cottone in 1981, reported in his book Outline of Forensic Dentistry, that cheiloscopy is one of the special techniques used for personal identification (Saraswathi *et al*., 2009). In 1990, Kasprzak conducted research for the period of 5 years on 1500 persons to elaborate the practical use of lip prints (Kasprzak, 1990). It was during the period 2000-2012 that the study was carried out by several researchers from other countries and also in India. Different aspect of lip prints like stability, morphological patterns and sex determination among different groups of population. So all this research suggesting that the cheiloscopy can be used as an adjuvant technique in identification (Prabhu *et al*., 2012).

Scope of cheiloscopy: It is difficult to place the lip prints in the general system of traces. The unique properties of the lip print help in identifying a human being spatially when it is revealed as a stratified surface trace with visible elements of lines (Reddy, 2011). In the case where the lines are not clear, individual identification of a human being based on this trace is extremely difficult unless the trace contains more individual characteristics, e.g. scars, and often identification ends with group identification. In these cases, it is possible to examine the substance which constitutes the trace, e.g. saliva, as a biological trace and to determine the blood group in the ABO system (Prabhu, 2012; Reddy, 2011; Suzuki, 1970). There is a huge potential for DNA typing from the lip print. This process has not yet been attempted. When a lip print is found at the scene of a crime, the character of the event, the number of the people involved, sexes, cosmetics used, habits, occupational traits, and the pathological changes of lips can be concluded.

CURRENT RESEARCH

From the mid 1970s until 2000, research into conventional lip prints was carried out (Prabhu *et al*., 2012; Reddy, 2011; Kasprzak, 1990; Ball, 2002). Conventional lip prints refers to the lipstick smears that are often left as trace evidence and can link a suspect to a crime scene. In recent years, however, the cosmetic industry has been developing lipsticks which do not leave a visible smear or mark in contact and have been called persistent lipsticks (Utsuno, 2005; Reddy, 2011; Vahanwala *et al*., 2000). A Spanish group has looked into the latent lip prints (i.e. lip prints from protective lipstick or permanent or long-lasting lipstick that do not leave any visible marks) left behind by these new lipsticks and their possible use as forensic evidence. They suggested that with the introduction of new smearless or markless lipsticks, the possibility of latent lip prints should be considered (Utsuno, 2005; Reddy, 2011; Vahanwala, 2000).

Fingerprints are developed by a number of methods which rely on the fact that sweat and body oils which have been transferred from the body to an object react with a number of reagents to become visible (Prabhu *et al*., 2012). Fingerprint powders adhere to sweat and body oils, iodine when heated reacts with sweat, ninhydrin reacts with the amino acids in sweat, heated cyanoacrylate (Super Glue) reveals latent prints, and sweat fluoresces when illuminated by a laser (Suzuki, 1970). Alvarez *et al* tested developing the latent lip prints using a similar method. According to them, the vermilion borders of the lips have minor salivary glands and sebaceous glands. These glands are associated with hair follicles, with sweat glands in between, and secreting oils. With these secretions and continual moisturizing, it makes the latent lip prints available at most of the crime scenes (Suzuki, 1970; Vahanwala, 2000).

Williams also stated that lip prints could be recorded without the use of lipstick or other recording medium, provided a suitable (non- porous) surface had been used which was then developed for prints.[8] In the study of Castello *et al*. on luminous lip prints, Nile Red was considered as a potential developer for latent lip prints. They used a property of luminescence for latent lip print development. Luminescence is specially a useful property for the search of invisible evidences at the scene of a crime (Sivapathasundharam, 2001). A group of Korean authors, Kim *et al* conducted a study to show that a lip print is sufficiently used by the measurements of biometric systems. Lip print recognition has been less developed than the recognition of other human physical attributes such as the fingerprint, voice patterns, retinal blood vessel patterns, or the face. Lip print recognition by a CCD camera has the merit of being linked with other recognition systems such as the retinal/iris, eye, and the face. A new method using multi-resolution architecture is proposed to recognize a lip print from pattern kernels. A set of pattern kernels is a function of some local lip print masks. This function converts the information from a lip print into digital data (Molano, 2002).

Classification of lip print: Classification of the lip prints is based on the pattern of wrinkles or grooves on the vermillion border of the lips. Dr. Martins Santos in 1966proposed that these lip characteristics could be used in personal identification and devised a simple system for classifying lip prints (Saraswathi, 2009; Santos, 1967; Suzuki, 1971)

Simple Type

- A straight line
- A curved line
- An angled line
- A sine shaped curve

Compound Type

- Bifurcated
- Trifurcated
- Anomalous

Based on its thickness

- Thin lips seen amongst European people.
- Medium lips are 8-10mm in thickness. Commonly found in general population.
- Thick or very thick lips are the characteristics of African Population.
- Mixed type of lips was very commonly seen in oriental people.

Suzuki and tsuchihashi named the grooves as "figura linearum labiorum rubror um" i.e. in general "lip print" and thus evolved a new classification of lip prints. Suzuki and tsuchihashi's classification of lip prints (Santos, 1967; Suzuki, 1971):

- Type I A clear-cut line or groove running vertically across the lip
- Type I' Straight grooves that disappear half way into the lip instead of covering the entire breadth of the lip or partial-length groove of Type I
- Type II Grooves that fork in their course or a branched groove
- Type III An intersected groove Type
- IV A reticular groove
- Type V Grooves that do not fall into any of the above categories and cannot be differentiated morphologically.

A French scientist, Renaud studied 4000 prints of the lips and found that all were different except in case of uniovular twins and accordingly gave the classification (Alvarez *et al*., 2012).

Renaud's classification of lip prints

- 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
- Type j: Other types

Recording lip prints

Lip prints can be recorded in a number of ways.

- Photographing the suspect's lips (Williams, 1991).
- On a non-porous flat surface such as a mirror they can be photographed, enlarged and overlay tracings made of the grooves (Ball, 2002).
- 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 (Williams, 1991).
- Using a finger printer, preferably a roller finger printer (Prabhu *et al*., 2010).
- By having the subject impress his or her lips (without lipstick or other recording medium) against a suitable surface and then processing these prints with either conventional finger print developing powder or with a magna brush and magnetic powder (Williams, 1991).

Processing and developing of the lip prints: Provided the lip print is left on a suitable medium it can be developed using a number of different powders or cyano acrylate and photographed (Alvarez, 2002). The powders used are the same as for fingerprint development and the latent lip prints must be dry (Kasprzak *et al*., 2000).

Basic latent print dusting: For many crime scene investigators, more than half of the powder they use is regular, nonmagnetic powder. It can be used on windows, counter-tops, television sets and many other items moved or touched at residential burglary scenes. At commercial burglary scenes, it can be used on metal file cabinets, painted doors, broken glass and metal window frames (Prabhu *et al*., 2010). Regular powders are available in colors such as black, silver/gray, Bichromatic and white. Proper color is chosen to provide sufficient contrast with the background surface if a clear photograph of the latent print has to be obtained.

Developing the latent lip prints: To record lip prints using the magna brush method, the person should impress his or her lips against a glossy porous surface or a smooth nonporous surface (Sivapathasundaram *et al*., 2001). These lip prints should then be subjected to a heat source until they solidify or should be allowed to air dry. These prints should then be powdered using a magna brush and magnetic powder. Conventional powder methods are usually unsuitable for powdering lip prints, inasmuch as the brush tends to smear or leave streak marks on the print. These streaks may then be interpreted as false characteristics by the comparer. These magnetic powders and magna brush are costly as compared to that of conventional powders (Prabhu *et al*., 2010).

Lip print in crime detection: Lip prints are unique and do not change during life of a person (Sivapathasundaram *et al*., 2001). Traces of lips should be looked for on cutlery and crockery items, on the window or door glass and on photograph or letters. Lip print may also appear on side by side with tooth marks on food products. In practice, lip prints have also seen in the windows, painting, doors, plastic bags and cigarette ends (Prabhu *et al*., 2012). They can be most frequently seen during murders, rapes and burglaries.

Lip print in court: On May 12, 1999, an Illinois appellate court accepted, in people versus Davis, No 2-97-0725, the uncontroverted testimony of two state police expert (a finger print examiner and a questioned document examiner) that:

- Lip print identification is generally acceptable within the forensic science community as a means of positive identification because it appears in the literature.
- Lip print identification methodology, although seldom used is very similar to finger print comparison and is known and accepted form of scientific comparison.
- There is no dissent in the forensic science community with regards to either the methodology used or fact that lip printsprovide a positive identification.
- The Federal bureau of investigation (FBI) and the Illinois state police consider that lip prints are unique like finger prints and are positive means of identification (Sharma, 2009; Prabhu *et al*., 2010).

Cheiloscopic expertise

The first cheiloscopic expertise was made in Poland in 1966 when a lip print was revealed on window glass at the scene of a burglary. The examination was carried out and the expert concluded that the trace of lips revealed at the scene did not belong to the suspect (Utsuno *et al*., 2005). Kazuo Suzuki and Yasuo Tsuchihashi in 1970reported an extremely rare case in which the materials of criminal identification were drawn from the lip prints. The identification result obtained was that the lip prints on the envelope were not made by the suspects (Thomas *et al*., 1988). The fact remains, however, that in 1976, the first personal identification by means of a lip print was made. During the inspection of the place of burglary in Milanowek, a legible trace of the lips was found on the glazed picture. And behind this picture, the owners of the place had kept the money.

After the examination, it turned out that it was the lip print of the daughter of the owners. So, the cheiloscopic expertise itself, in this case, had an eliminatory character (Prabhu *et al*., 2012). Since the end of 1985, the Dactyloscopy Division of the Department of Criminalistics of the Civic Militia Headquarters has initiated elaborate methods, previously checked in laboratory conditions, and proved their usefulness in court proceedings. In the year 1986–1987, two methods of cheiloscopic expertise were performed with positive, categorical opinions (Prabhu *et al*., 2012). In 1988, till the middle of April, two more methods of expertise were performed and again the opinions were positive and categorical. It concerned a burglary in a grocery store in the vicinity of Plonsk on November 18, 1987. Lip prints were found along with the tooth marks on a piece of cake. Both examinations revealed that the person who had left the trace was one of the burglars. The expertise of tooth marks gave a probable result and the lip print expertise a categorical one. The example cited above proved the existence of large identifying possibilities of cheiloscopy. What must also be stressed is that lip prints often accompany tooth marks (Utsuno *et al*., 2005).

Conclusion

The procedure of lip print analysis is very simple and inexpensive. Lip prints can be used as a reliable aid to human identification in the field of forensic science. Further studies should be conducted on individuals to determine different races, family members, twins, and siblings for gender determination.

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