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Role of Lip prints in Personal Identification and criminalization

T.N. Uma Maheswari[1], N. Gnanasundaram[2]

[1]Assistant Professor, Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Chennai, India

[2]Professor & Head, Department of Oral Medicine and Radiology, Saveetha Dental College and Hospitals, Chennai, India

Contact: the corresponding author T.N. Uma Maheswari · umasamsi@gmail.com

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ABSTRACT

Lip prints are the normal lines and fissures in the form of wrinkles and grooves present in the zone of transition of human lip, between the inner labial mucosa and outer skin. Yasuo Tsuchihashi (1974) presented a standardized classification of his own, for different types of lip print. He has classified lip prints into five types, which forms the basis of categorizing lip prints.

Keeping the above classification as a basis, the present study was conducted to identify whether there are any other types of lip prints apart from these five types or to identify any subtypes available within these five types.

Among the outpatients and their accompanying persons who attended the Department of Oral Medicine and Radiology, Saveetha Dental College, Chennai, 750 (348 males and 402 females) individuals were selected for the present lip print analysis study.

From the present study it can be concluded that there are no new types of lip prints be identified, but there are subtypes present in Type II and Type V lip prints which can serve as an important tool in forensic dentistry for personal identification and criminal investigation.

Keywords: Lip prints, Forensic Odontology, Personal Identification, Cheiloscopy

Introduction

In the early 1950s Le Moyne Snyder[1] a forensic expert from California introduced a concept that utilized the wrinkles and grooves of the lips as a method of identification. Many researchers

observed these in 1960s and 70s. External surface of the lip has many elevations and depressions forming a characteristic pattern called lip prints, examination of which is referred to as Cheiloscopy. This is unique for individuals like the finger prints. The biological phenomenon of systems of furrows on the red part of the human lips was first noted and described by anthropologist Fischer[2]. However until 1930, anthropology merely mentioned the existence of furrows without suggesting a practical use for the phenomena. Edmond Locard[3] was one of the France's greatest criminologists who first recommended the use of lip prints in personal identification and criminalization.

Suzuki and Tsuchihashi[4] made some other important observations too. They examined 18 pairs of uni-ovular twins and found that there were considerable similarities in these twins. But one of the remarkable curiosities of nature is that even uni-ovular twins have different fingerprint patterns. Vahanwala and Parekh[5] have conducted a study of lip patterns of 50 male and 50 females subjects in the age group of 19-21 years to promote the importance of cheiloscopy in forensic science identification. The aim and objectives of the study were to confirm the permanence of lip pattern of the same individual over a period of time, to evaluate whether any peculiar pattern exist in relation to sex of an individual and also to discover the most common patterns in the Indian population. The lip prints were recorded using lipstick and paper with central portion dabbed first and then pressing it uniformly on both the corners of the lips and then studied with magnifying lens. Four-month follow up of the lip print was done to confirm the un-changeability of the lip pattern. The inference of the study is that lip prints are unique and that Y-shaped and end-to-end pattern is frequently seen in the first quadrant. The study has attempted to differentiate the lip pattern between the sexes by concluding that Type-I is dominant in females in 3rd and 4th quadrants and that Type-II is common in males in 2nd quadrant and not seen in upper lip. The study also revealed that 52% individuals had at least same pattern in two quadrants, equally distributed in both males and females. Individuals with all quadrants having different patterns were common in males and, in females same pattern in all quadrants were commonly seen.

Hirth et al[6] had conducted a study in 500 persons, including 76 families with 133 children, 22 mono and 17 dizygote twins. Lip prints were recorded for the study of variability and genetical basis of ridge pattern in the region of mucous membrane lips. It was observed that branched pattern is more frequently present in the upper lip and simple pattern in lower lip were commonly seen. It was also reported that 30% of the lip prints showed whirling figures at the upper lip, namely simple and median and in the lower lip double and para-median were observed. Investigations during several months showed stability against environmental factors. Applications of cheiloscopy to genetical investigation are reported based on the results of twins and families.

The present study has been aimed to study in depth of the lip prints of different individuals in different parts of the lips to establish further facts and truth and throw more lights on lip print with an object of providing further information about lip print to police, dental surgeon and investigator in the field of forensic dentistry, to help in law and justice.

Aim and objectives

DIFFERENT TYPES OF LIP PRINTS
Yasuo Tsuchihashi (1974)

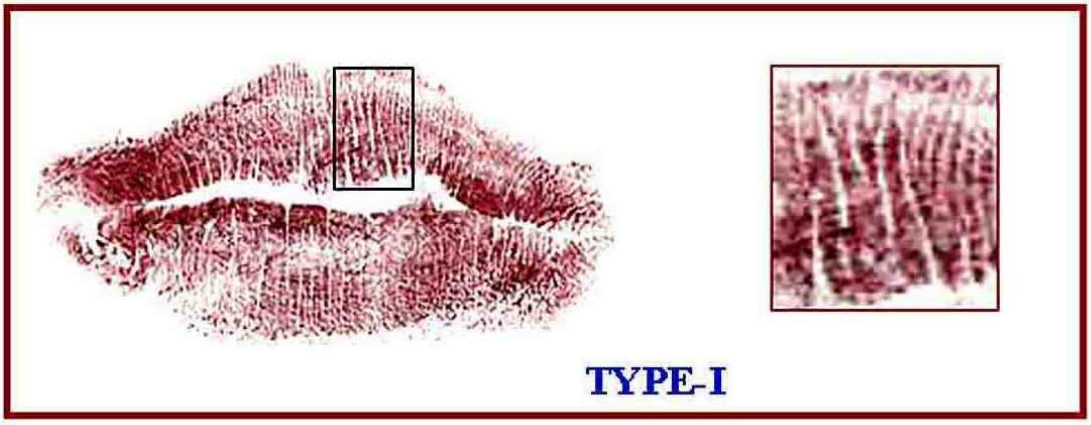
TYPE-I : **Clear-cut grooves running vertically across the lip.**

TYPE-II : **The grooves fork in their course.**

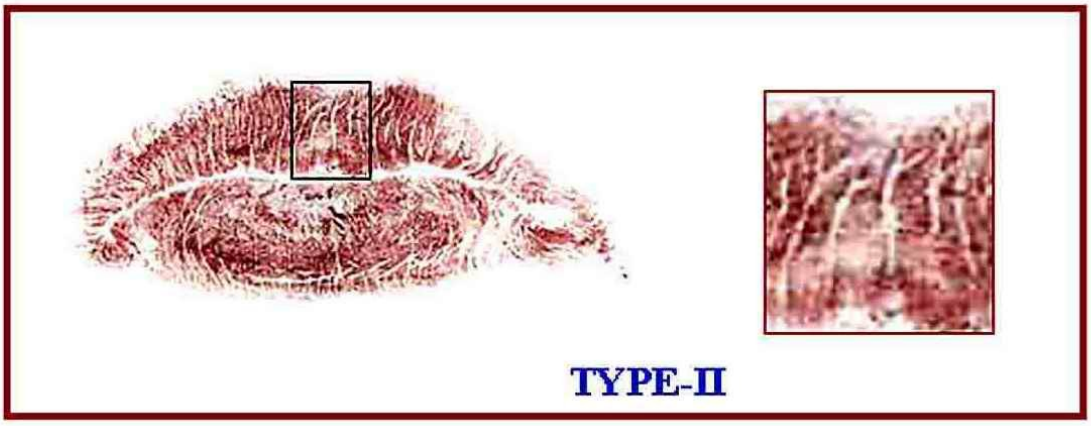
TYPE-III : **The grooves intersect.**

TYPE-IV : **The grooves are reticulate.**

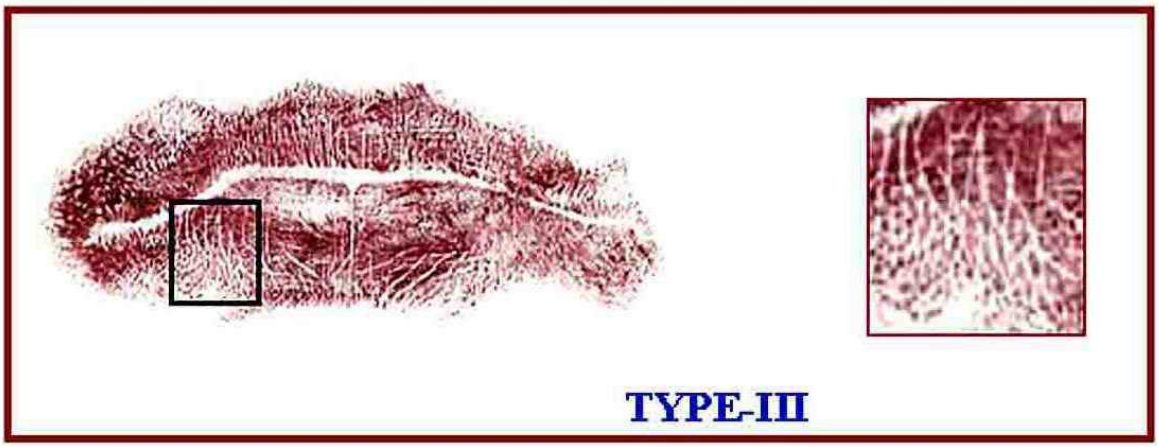
TYPE-V : **The grooves do not fall into any of the Types I - IV, and cannot be differentiated morphologically.**

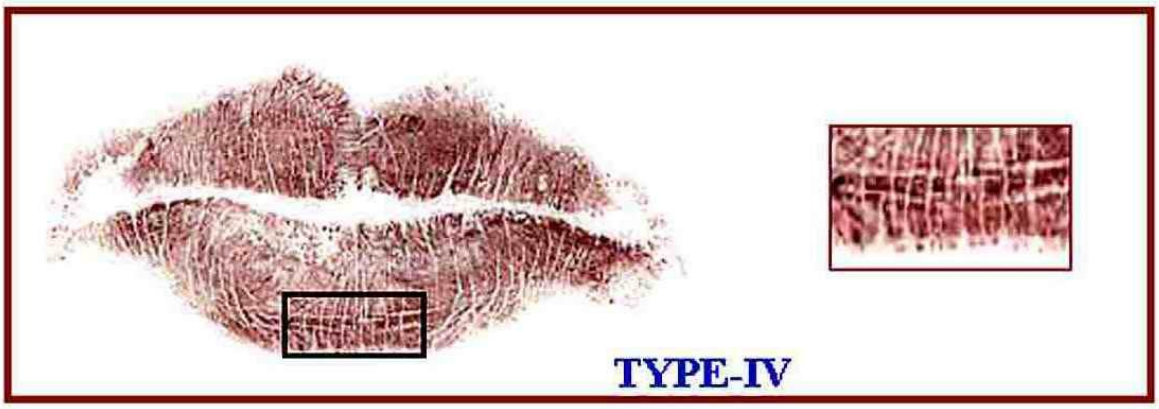


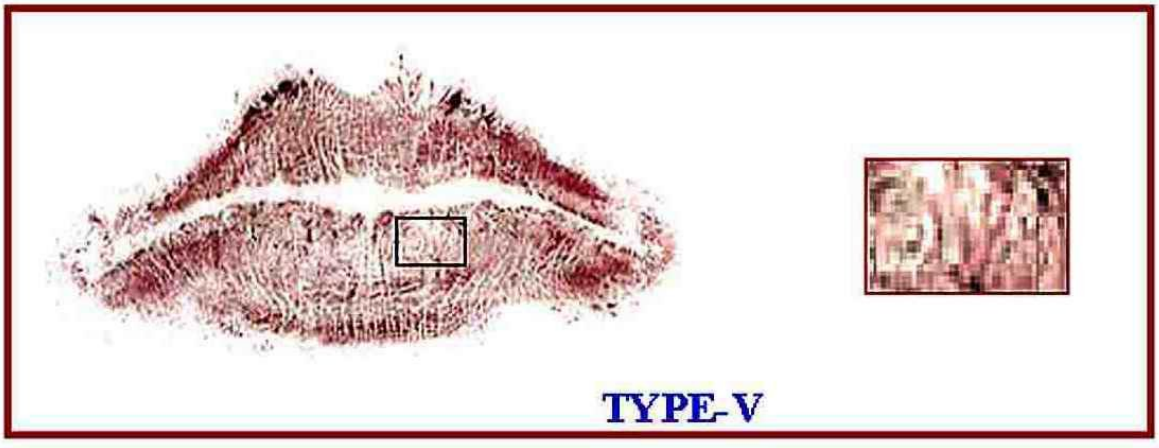
TYPE-I



TYPE-II







Figures 1 and 2. Different Types Of Lip Prints.

1. To find out where there is different types of lip prints in different parts of the lip.

2. To find out which type of lip print is commonest in each compartment of upper and lower lip.

3. To find out which type of lip print is commonest among the male or female.

4. To establish that there is no similarity of lip print between the parents and their twins or triplets.

5. To identify the lip prints in non-biological materials.

Materials and Methods

This study consists of 750 randomly selected subjects from the outpatients and their accompanying persons who attended the Department of Oral Medicine and Radiology, Saveetha Dental College, Chennai, India ,in which 348 were male with age ranging from 3 to 70 years, the remaining 402 were females with age ranging from 3 to 69 years .Careful examination was conducted during selection of subjects to eliminate those individuals who had developmental, morphological and pathological conditions of lip.

Subjects who had normal structure and function of lips alone were selected. These individuals were subjected to thorough medical examination to confirm whether they are free from any systemic diseases.

The subjects were divided into 6 groups as 0-10 yrs, 11-20 yrs, 21-30 yrs, 31-40 yrs, 41-50 yrs, 51 and above. In each age group, the individuals were further classified into Males and females.

In the present study, the classification formulated by Yasuo Tsuchihashi (1974)7 is taken as standard. The classification is as follows. (Fig -1,2)

TYPE I : Clear cut grooves running vertically across the lip.

TYPE I' : The grooves are straight but disappear half way instead of covering the entire breadth of lip.

TYPE II : Grooves fork in their course.

TYPE III : Grooves intersect.

TYPE IV : Grooves are reticulate.

TYPE V : Grooves do not fall into any Type of I-IV and cannot be differentiated morphologically.

In the present study only minimum number of Type I' subjects were found and they were merged with Type I.

A pilot study was conducted with twenty – five individuals to standardize the method of collection of lip print from the subjects using tracing paper, similar print studies were conducted for recording the lip prints in drinking glass and stainless steel tumbler to standardize the method of collection of lip prints from the subjects.

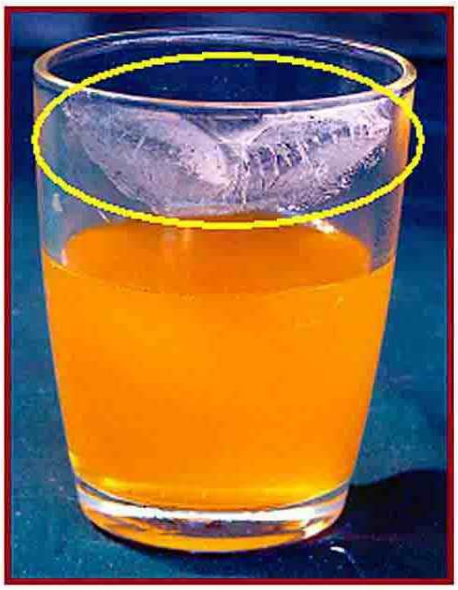
Recording of lip print was made both in the upper and lower lip. In the present study, the both upper and lower lip is divided in two halves, right and left. The right half is divided into three compartments, namely as right central, middle and lateral compartments. Left half is divided into three compartments namely, left central, middle and lateral compartments. The type of lip print was recorded in each compartment of upper and lower lip for comparison and finalization. Williams (1991)8 studied the lip prints which were recorded using lipstick or lip rouge or having the subject compress their lips.

In our study, the lips of each individual were cleaned with gauze soaked with saline solution and the lips were dried with sterile cotton. Brown colored lipstick was applied gently in the entire area of upper and lower lips, covering the entire zone of transition. A clean white colored tracing paper was prepared in a rectangular fashion measuring 9 cm x 6 cm and the lips were covered with the tracing paper, gentle pressure was applied and the lip print was traced in normal rest position of the lips. The paper is placed for a minute and then it was removed. After removing the paper, diluted 20% hydrogen peroxide was applied over the lips to remove the stains of lip and was cleaned with warm water. The tracing paper with lip print was dried and then the tracing paper with lip print, was examined with magnifying glass for recording the type of lip print in each compartment of lip.

Kasprzak (2000)9 in his study of cheiloscopy had conducted a microscopic examination of lip prints collected from 1500 individuals. He had stated that lip traces can only be revealed at the point of direct physical contact of the perpetrators lip with an object at the scene of a crime like on the surface of the windows, paintings, doors, plastic bags and cigarettes ends. Lip prints from these surfaces can be found and recovered using finger print powders.

To identify the lip prints in non-biological materials, in the present study, recording the lip print in drinking glasses were made. Two individuals were given aerated drink in glass and stainless steel tumblers for drinking respectively. The glass and tumbler were taken and the finger print powder was sprayed over the lip print area. The lip print was visible after the spray and contact of finger print powder with the lip print. The lip prints in glass and the stainless steel tumblers were photographed and the photographic print was prepared for further analyses. The lip print was traced using the tracing paper method for both the individuals. Finally the lip prints which were photographed and the lip prints which were collected using the tracing paper method were compared. The lip print was analyzed macroscopically using magnifying glass. (Fig-3)

LIP PRINT IN DRINKING GLASS TUMBLER



LIP PRINT OF THE GLASS TUMBLER

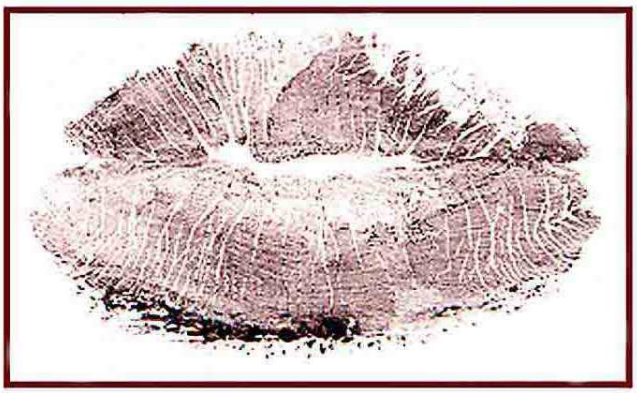


LIP PRINT OF THE INDIVIDUAL

LIP PRINT IN STAINLESS STEEL TUMBLER



LIP PRINT OF THE STAINLESS STEEL TUMBLER



LIP PRINT OF THE INDIVIDUAL

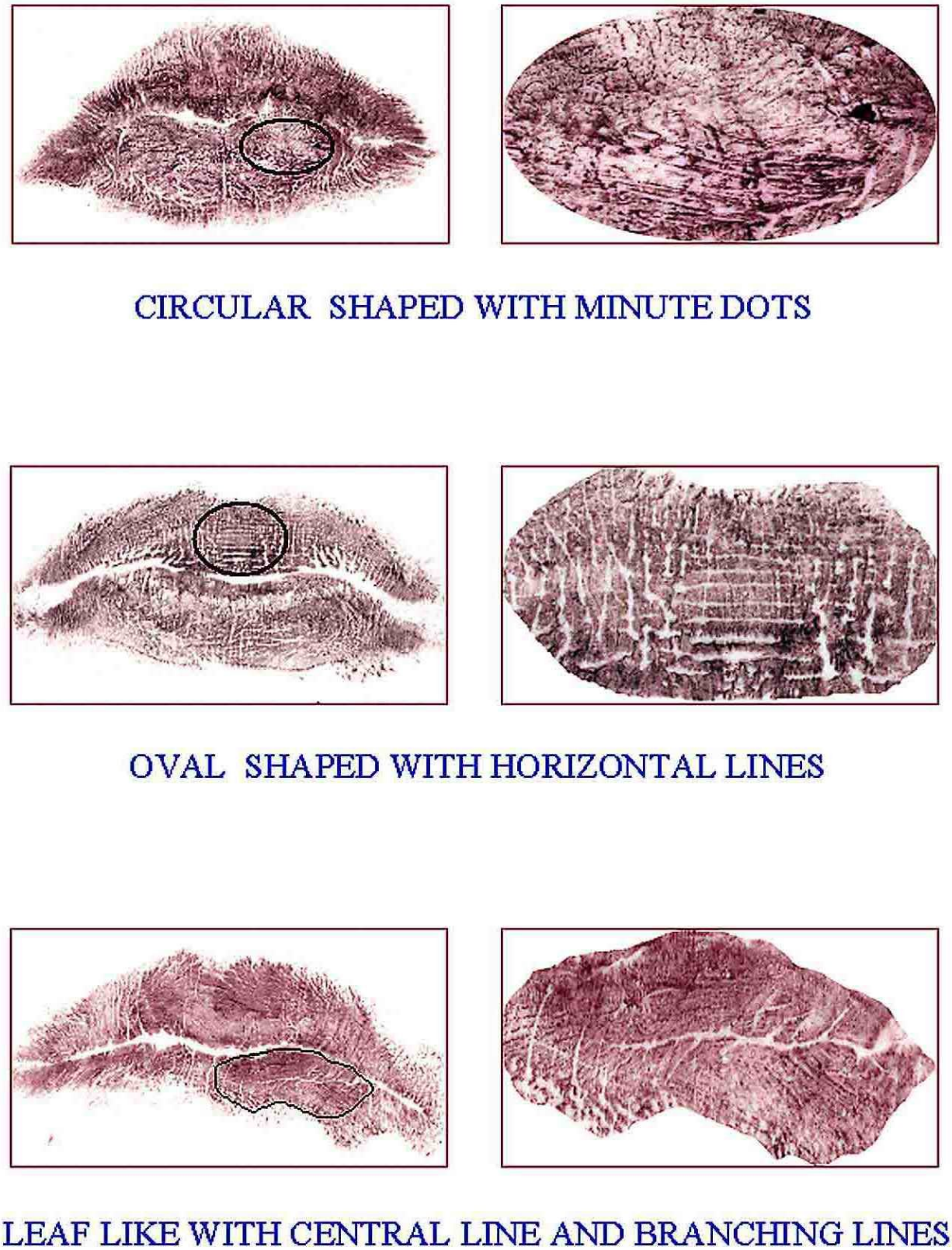


Figure 3. Lip Prints In Drinking Glass Tumblers; **Figure 4.** Different Varieties Of Type V Lip Prints.

Results

It was observed that each lip, either upper or lower have different types of lip prints in different parts of the lips. The Type I, II, III, and IV are clearly demarcated in the present study, whereas the Type V, which was described as other than four Types by Yasuo Tsuchihashi (1974)7 was studied in depth and different varieties in the fifth group were recorded

In the present study Type V lip prints were analyzed and it was found that Type V has the following appearances (Fig-4)

1. Circular shaped area with minute dots.

2. Oval shaped area with horizontal lines.

3. Small leaf like structure with a central line from which branching lines are seen.

In our observation Type II described by Yasuo Tsuchihashi[7] the vertical line with fork were seen, but there are variations in our study. Yasuo Tsuchihashi has described Type II lip print with vertical line, bifurcation towards upward in upper lip and towards downward in lower lip. In our study, vertical line in upper lip with fork upward and downward, vertical line in lower lip with fork upward and downward, horizontal and angular line with fork were also studied. (Fig-5)

In the present study, among males it is recorded that the maximum number of individuals have Type II lip prints (31.61%) and the minimum number of individuals have Type IV lip print (0.57%). It is recorded that among females maximum number of individuals has Type II lip prints (43.79%) and minimum of individuals have Type IV (0.99%).

Tsuchihashi[7] in her study of lip prints at regular monthly intervals for a period of 3 years for 3 males and 4 females ,concluded that the lip prints remains unchanged throughout life.

The appearance of lip prints was observed among ten individuals, six males and four females in every three months for a period of one year. In our observation, it was found that there was no change either in size or in shape of the lip print in three different periods. Thus the present study has established the fact that alterations of lip print during the life time does not occur and the lip print present at the end of fully matured lip, remains as it is throughout life. (Fig-6) In overall results and observations of this study, it can be recorded.

1. Lip print is found unique for each individual. No two individuals or group of individuals have similar lip print.

2. No changes in lip print in different periods.

3. No changes of lip print in different age group.

4. No familial or genetic similarities of lip print between parents and children.

5. No similarity of lip print between parents and twins or between twins.

6. No similarity of lip prints between parents and triplets and among triplets.

7. No peculiarity of lip print was established in males and females.

8. Lip prints appear different in different compartments of lips.

9. Lip prints traced from non-biological materials matches with the lip print of the individuals who used these non-biological materials.

Discussion

In this study it is observed that the maximum number of male subjects have Type II lip prints (31.61%) and the minimum number of subjects have Type IV lip prints (0.57%). It is observed that the maximum number of female subjects have Type II lip prints (43.79%) and the minimum number of subjects are having Type IV lip prints (0.99%) (Fig-7). However, this study reveals that Type III may not be commonest in both males and females as it was reported by Tsuchihashi.[7]

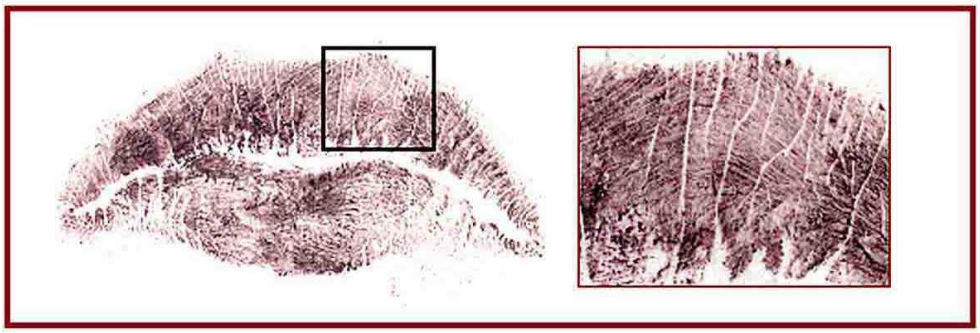
It was also observed that no two persons had similar lip prints, either the same type or different types. It was further noticed that not even a single person had one particular type of lip print in the upper lip or lower or in both. Thus the statement of Tsuchihashi[7] is true and can be justified in stating that each of the 750 subjects has his own or her own lip print.

In the present study, analysis of lip print between twins and their parents and between the twins themselves were studied, the observation is that neither the twins, nor the twins with their parents have similarity of lip print. This observation of the present study is in contradiction to the study made by Tsuchihashi[4]. In her study, twins frequently showed patterns extremely similar to those of their parents. At the same time the present study agrees with the study of MacDonell[3] who described two identical twins who seemed to be indistinguishable by every other means but lip prints in these twins differed.

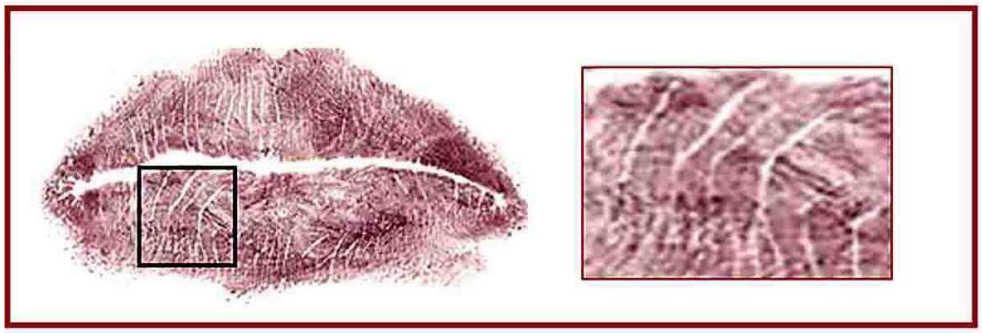
DIFFERENT VARIETIES IN TYPE II LIP PRINT



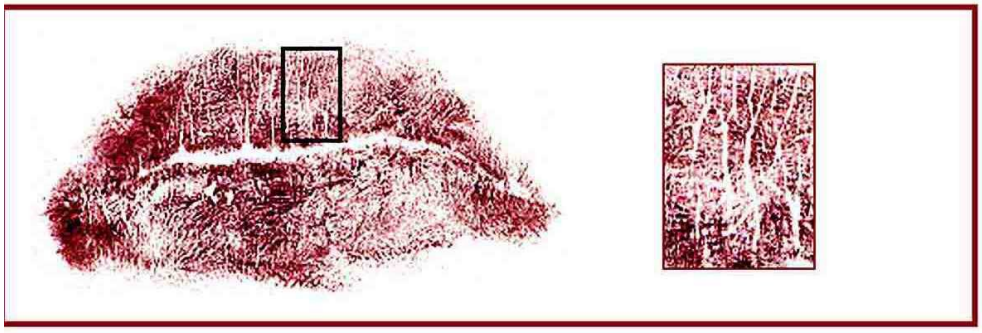
HORIZONTAL OR ANGULAR LINE WITH FORK



UPWARD FORK



DOWNWARD FORK



UPWARD AND DOWNWARD FORKS

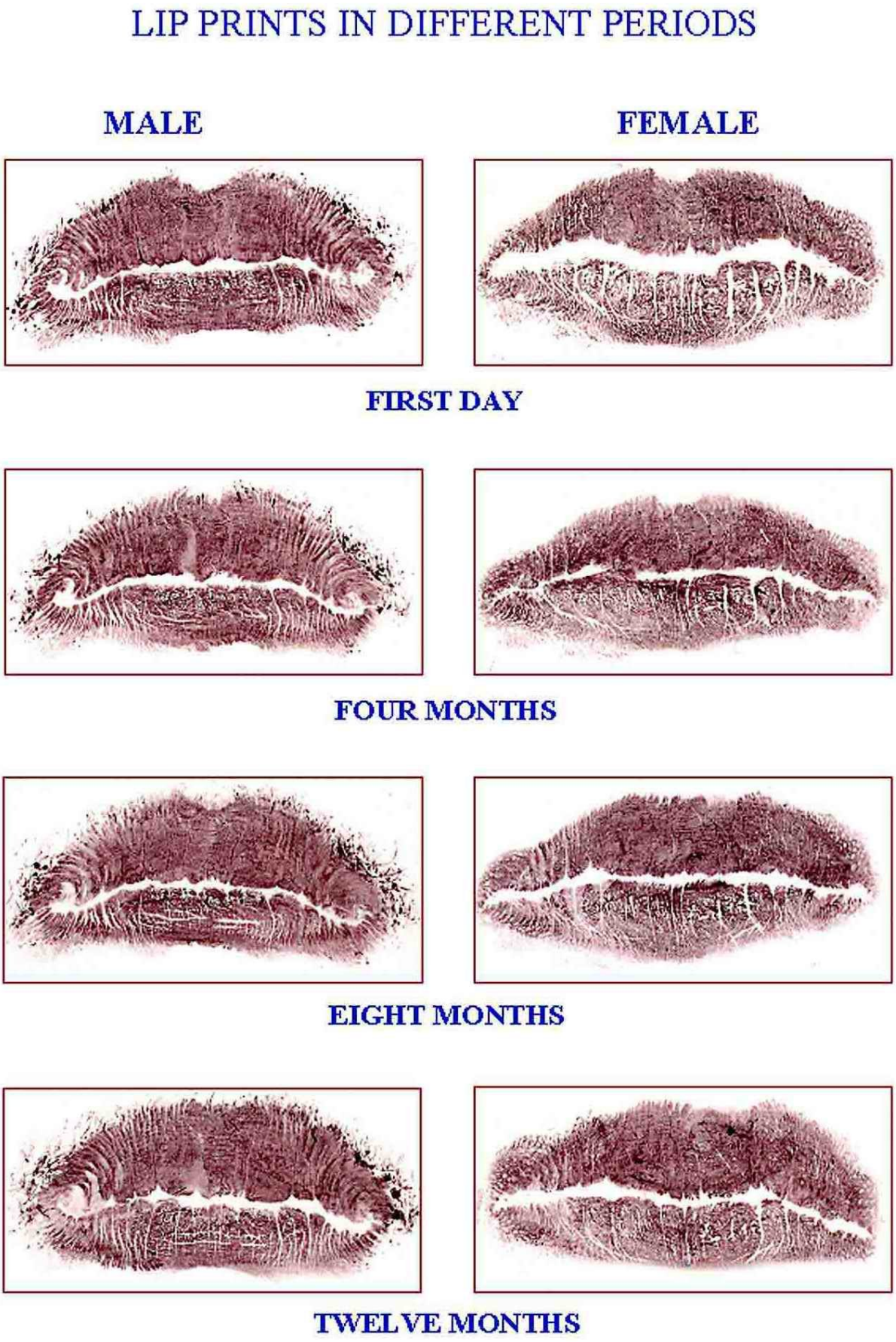


Figure 5. Different Varieties Of Type II Lip Prints; **Figure 6.** Lip Prints at Different Periods.

The present study for the first time made a study with the family with triplets, such studies are not so far not found in the literature survey. It is proved that there is no similarity of lip print among the triplets and with that of their parents also. Hence the lip print cannot be used for the identification in comparing the familial identification. It shows that lip print cannot be used as a genetic marker to compare with the parents in personal identification in forensic dentistry.

The study proved that the structure of the lip print area does not undergo any changes as age advances, though they have physiological function of cell exfoliation. As to the permanence of the lip print the present study agrees with that of the study carried out by Tsuchihashi[10] and his statement "in a criminal search, where the unchanged pattern even for a 6 months period would be helpful" is justified. Ball[11] had reported the history of lip prints and importance of its evidence in the courts and the status of lip prints as a source of Forensic evidence. She had also stated that latent lip prints would be available at all crime scenes as the vermilion borders of lips have minor salivary glands and sebaceous glands with the latter being principally present around the edges of the lip associated with hair follicles, sweat glands in between and secreting oils. It is these secretions and continual moisturizing by the tongue due to occasional sebaceous glands present on the lip to alveolar mucosa, crossing the transitional zone, there are chances for the presence of the latent lip prints on items such as glasses. Through the research carried out by Petersen[12] it was evident that lip prints at crime scenes are rarely mentioned simply due to the fact most investigators or crime scene examiners do not look for them. On the numerous occasions when a smear or a smudge is discovered, most crime scene personnel disregard it as being a fingerprint that is unidentifiable. It is important to note though, lip prints left at scenes of a crime are more prevalent than one thinks. Articles such as drinking glasses, letters, cigarette butts, clothing, napkins and even skin may possess lip prints that could eventually lead to the identity of a suspect, victim or a witness of a crime. In the present study the recording of lip prints in non–biological materials namely in drinking glasses were carried out and the comparison of photographs of the lip prints taken from the glasses and the lip prints collected using the tracing method are found to be the same for the same persons under study. It reveals that the methodology of tracing lip print in glass and stainless steel tumblers using finger print powder is justified.

Conclusion

Recording of teeth and restorations as anti mortem records may lead to difficulty in comparing the anti mortem records and post mortem records in cases of loss of teeth and destruction of restorations.

Apart from the teeth and restorations, soft tissues of oral cavity may help for personal identification. Anatomical structures like Palatine Rugae and lip prints, remain constantly and this can be included in the anti mortem records and can be recorded and used as evidence in personal identification and criminalization.

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