Medical-legal identification methods with the aid of cheiloscopy

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Abstract: Detailed investigations regarding the measuring of lips, their color and differentiation between the color left by lipstick and a blood stain are very useful information for the criminal investigations. It was observed that the lip prints that were impregnated with lipstick are different from person to person. The cheiloscopy techniques have equal valor with other legal medicine techniques in the field of person identification. The subjects involved in this study were 100 subjects, students from the Dental Medicine Faculty of Constanța, with ages between 24 and 37 years old. Sex ratio was equal, and the duration of the study was 24 month. Subjects showing inflammations, malformations, surgical scars or any other lips associated pathology were excluded. In this study, the upper lip is characterized by the predominance of type III model (45.17%), followed by type II (25%), type IV (17.5%), type I (8.79%), type I’ (2%) and type V (1.54%). This hierarchy is different for the lower lip, where type III is more predominant, respective as 51.67%. Next is type IV (17.38%), type II (12.83%), type I’ (3.08%), type I (1.63%).

Lip prints are unique for each individual, the sex identification for the person involved from medical-legal point of view is rather easy due to the clear differences between the sexes. The upper lip has similarities for both sexes, as type III is prevalent and lower lip is different from the labial grooves percentage for the females, where type II is prevalent, and type I for males.

Key Words: medical-legal identification, cheiloscopy, labial prints.

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The lips are two carnal formations that encompass the mouth. They are externally bordered by skin and internally by mucosa. The skin is continued with the mucosa at the vermilion level, which represents a reddish zone covered by keratinous epithelium.

The contact line between the two lips (oral opening) is found exactly over the incision edges of the superior incisors. This opening forms, on each side of the labial commissure, the oral opening angle, usually in front of the first premolar. The vermilion epithelium presents a corneous layer, less developed than the skin one.

Labial mucosa and a part of the internal mucosa are not as smooth as the mucosa present in the rest of the oral cavity then the one on the skin level. This mucosa has more protuberances and grooves that form a characteristic model named “lip print”, which is examined by the science named cheiloscopy. The model of these sulci is named “figura linearum labiorum” which translates as “lip print”. Detailed investigations regarding the measuring of lips, color and the differences of color left by lipstick or a blood stain are very useful information for the criminal investigation. It was observed that the lip print of the lips previously impregnated with lipstick is different from person to person. The cheiloscopy techniques have equal
valor as other techniques of the legal medicine regarding person identification.

MATERIALS AND METHODS

We studied 100 subjects, students from the Dental Medicine Faculty of Constanța, with ages between 24 and 37 years old. Sex ratio was equal, and the duration of the study was 24 month. The 100 subjects, 50 males and 50 females where subjected to the lips printing test.

Their lip prints were recorded in a data base. Subjects showing inflammations, malformations, surgical scars or any other lips associated pathology were excluded.

Materials
- lipstick, glossy, colored red;
- white non-absorbent paper;
- magnifying glass;
- ruler;
- marker for labeling;
- cotton pads and lipstick remover.

Method

On a piece of paper we noted the name, age and gender, after the lip print was recorded. Before applying the lipstick the subject is asked to clean the lips thorough to remove any foreign substance. This is done using a wet tissue or by lips washing with soap and water. Then the subject is asked to wipe using a dry tissue. The lipstick is applied equal in a single motion, then the subject is asked to tug lips against each other to spread the lipstick evenly.

Figure 1. Applying the lipstick.

The next phase is pressing the lips on a piece of paper from one end of the lip to the other, the movement is being done only once. This maneuver is being executed very carefully to avoid lips sliding on the paper.

On another piece of paper the print is recorded again, this time with the paper folded inserted in the oral cavity and then pressed between the lips, and in that matter the transitional area is also recorded.

Figure 2. Pressing the lips against a piece of paper.

RESULTS AND DISCUSSION

It was seen that the medial and lateral parts of the lips frequently present different models. An attentive examination reveals the fact the each model type is not present by itself, but in combination with others. It was thus seen that types III and IV are the most common models, and also they are the most difficult to differentiate. In the present study the most frequent type from the study group, present in both lips, is type III. It represented 48.2% of all the models. It was followed by type II (18.92%), type IV (17.44%) and type I (11.10%) , type I’ (2.54%) and type V (1.58%).

Similar results were obtained by Suzuki and Tsuchihashi in a study that had 64 subjects of Japanese nationality. They saw that type III is the most common, followed by type I, II, IV and V. Their study considered that type I contains the sub-class of type I’, aiming to improve and divide further more this classification.

In 1975 Hirth observed that the model that presents ramifications is present more frequently on the upper lip, whilst the simpler model is characteristic to the lower lip. The results of the present study shows similar variations, type II being around 25% of the patterns present in the upper lip and 12.83% of the patterns characteristic for the lower lip. On the other side, types I and I’ together stand for 16.5% of all patterns of the lower lip and 10.79% of the upper lip patterns. The results of this study are different from the ones obtained by Vahanwala and Parekh in 2000, their study showing that types I and II are the most frequent ones in the right quadrant of the upper lip. They take in consideration that, in order to set a classification of the most frequent pattern encountered in a certain quadrant, whilst in this study the quadrants were divided in two segments.

In this study the upper lip is characterized by the predominance of the type II model (45.17%), followed by type II (25%), IV (17.5%), type I (8.79%), type I’ (2%) and type V (1.63%). This hierarchy is different
for the lower lip, where type II is the most predominant, respective in percentage of 51.67%, followed by type IV (17.38%), type I (13.42%), type II (12.83%), type I’ (3.08%) and type V (1.63%).

As for the upper lip, it can be declared that, conform to the study, type III and I were the most frequent ones in the lateral segments of the lip, comparing to the median ones. Also, types IV, V and I’ are more characteristic to the median zones of the segments that divided the lip, rather than the lateral zones of the same segments. In antithesis, the lower lip presents a predominance of the type I pattern in the median segments. Type III pattern has a percentage of 80% in the lateral segments whilst in the upper lip it has a frequency of less than 55% in the same segments. Medial segments of the upper lip show a preponderance of type III, followed by types IV and II. On the lower lip on the other side is characterized in the medial segments by the preponderance of type IV, followed by types I and III. Type II was more frequently found in the upper lip and has the same distribution area in all segments, whilst in the lower lip it is distributed more on the lateral segments zone than the median ones. The chi-square test result show a statistically significant difference regarding the patterns between the entire surface of the upper and lower lip and between the medial and lateral segments of each lip.

A comparison between the patterns present in men and women showed that type II is the most predominant, with a percentage of 49.15% and 47.78% from the total. The next pattern as percentage scale was type II (approximately 19%), followed by type IV, which is more frequent in women (19.15%) than men (15.45%). The chi-square test resulted in a significant difference between lip prints of men and women.

The upper lip, both in men and women, present the type II as being the most predominant, reaching 45.63% and 44.77% respectively from the total of patterns found. It was followed by type II (25.63% in men and 24.45% in women), type IV (14.82% in men and 19.84% in women) and type I (10.54% in men and 7.27% in women). Type IV pattern was more frequently found in the lateral segments of women than in men, whilst type I was more common in the lateral segments of men than women (Table 2).

The lower lip, both in men and women, present the type II as being the most predominant (52.68% in men and 50.78% women), followed by type IV (16.07% in men and 18.52% in women). In men type IV was followed by

**Table 1. Differences on class types for the four quadrants**

<table>
<thead>
<tr>
<th>Classes</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>16</td>
<td>4</td>
<td>22</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>Type I'</td>
<td>13</td>
<td>4</td>
<td>4</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td>Type II</td>
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<td>16</td>
<td>7</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>Type III</td>
<td>10</td>
<td>16</td>
<td>7</td>
<td>6</td>
<td>45</td>
</tr>
<tr>
<td>Type IV</td>
<td>0</td>
<td>10</td>
<td>13</td>
<td>6</td>
<td>39</td>
</tr>
<tr>
<td>Type V</td>
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<td>10</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Total A.</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>200</td>
</tr>
</tbody>
</table>

**Table 2. Distinction of lip print types of labial grooves depending on sex**

<table>
<thead>
<tr>
<th>Classes</th>
<th>Female sex</th>
<th>Male sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
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<td>52</td>
<td>80</td>
</tr>
<tr>
<td>Type I’</td>
<td>29</td>
<td>33</td>
<td>62</td>
</tr>
<tr>
<td>Type II</td>
<td>53</td>
<td>52</td>
<td>105</td>
</tr>
<tr>
<td>Type III</td>
<td>58</td>
<td>45</td>
<td>103</td>
</tr>
<tr>
<td>Type IV</td>
<td>13</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Type V</td>
<td>19</td>
<td>8</td>
<td>27</td>
</tr>
<tr>
<td>Total A.</td>
<td>200</td>
<td>200</td>
<td>400</td>
</tr>
</tbody>
</table>

**Figure 3. Different lip prints - types I and II. A-Lip print of a female individual - type I pattern; B-Lip print of a male individual - type I pattern; C-Lip print of a male individual - type II pattern; D-Lip print of a female individual - type II pattern.**
type II (12.14%) and type I’ (2.59%) and type V (1.96%). In women type IV was followed by type II (13.44%), type I (12.42%), type I’ (3.52%) and type V (1.33%).

The chi-square test results show that the differences between the lower lip prints in women and men for the lateral and medial segments have no important statistical difference (p<0.20 and p<1). Our test results are in concordance with the results obtained by Rubio and Villalain (1980), which found no differences based on sex, age and race as what the lip prints are concerned.

CONCLUSIONS

- The lip print is unique for each individual. Evidences as photographs, cigarette filters, glasses, cups, letter and other objects that come in contact with the lips will be studied with more attention in the future. A trace of this type contains a large information quantity which may be used in the setting of events and the suspect identification. Ever since 1950, Snyder suggested that the grooves and lines of the lips represent individual characteristics as the grooves of the finger tips are. Since then, a large number of studies offered clear evidence that the lip prints are unique and characteristic for each individual.

- The identification of the persons’ sex involved from a medical-legal point of view is quite easy, due to the clear differences between the sexes. More, both type IV and the reticulate one is more frequent in the case of females than males.

- The upper lip has similarities in both sexes, type III being preponderant in both.

- The lower lip is different from the point of view of labial grooves position, in females the type II is preponderant, whilst in males the type I.

- Medial and lateral lip parts frequently present different patterns.

- Each pattern type is not present alone, but in combination with others. It was demonstrated that types II and III are usually hard to differentiate one from another.

References