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Cheiloscopy, Dactyloscopy and Rugoscopy -A Tool for Gender Determination

[1]Dr Megha Chaudhary, Post Graduate Student, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

[2]Dr Kanika Sharma, Reader, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

[3]Dr Sanjeet Singh, Professor & Head, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

[4]Dr Paramjit Singh, Professor, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

[5]Dr Nishant Singh, Professor, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

Corresponding Author: Dr Megha Chaudhary, Post Graduate Student, Department of Oral Pathology, DJ College of Dental Sciences and Research, Modinagar

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Abstract

Introduction: Human identification plays an important role in forensic investigation. It is indeed challenging considering the fact that every individual has their own unique character. The aim of this study is to compare the efficacy of lip print, finger print and rugae impression in gender determination of an individual.

Methods: A cross-sectional survey was conducted involving volunteers from Ghaziabad. Lip prints, fingerprints, and rugae area prints were collected using cellophane tape. Statistical analysis was performed to compare the patterns and actual genders of the volunteers. This data was used to assess and analyze the accuracy of gender determination based on fingerprints, rugae area prints, and lip prints.

Results: This study found that overall accuracy of different methods in gender prediction which was 71% in males and 71.06% in females and the total accuracy was 70.88%. Based on the lip pattern the overall accuracy of gender prediction was 73.33% based on the lip pattern. Based on the Rugae pattern the overall accuracy of gender prediction was 65.35%. And based on the Finger Print pattern the overall accuracy of gender prediction was 74.00%. The study suggest that fingerprint pattern have overall more accuracy compared to lip pattern and rugae pattern.

Conclusions: This study highlights the importance of record-keeping, which will be critical in the identification of individuals in cases of crisis or crime. With the ever-increasing frequency of disastrous events and crimes, a small identification marker, such as a lip print or rugae area pattern recorded from a dental impression, can be life-changing in such situations. However, the standardization of techniques for recovering and analyzing cheiloscopic, dactyloscopic, and rugoscopic patterns is necessary to enhance their value as forensic evidence. Universal acceptance of lip prints, rugae area prints, and fingerprints as tools in forensic investigation will only become a reality after extensive studies are conducted using standardized recording techniques.

Keywords: Rugoscopy, Dactyloscopy, Cheiloscopy, Lip Print, Fingerprint, Rugae Area, Forensic

Introduction

Human identification play an important role in forensic investigation. It is indeed challenging considering the fact that every individual has their own unique character. This requires a combination of different procedures to individualize a person or object. Identity is a set of physical characteristics, functional or psychic, normal or pathological that define an individual.[1]There are many techniques available for personal identification. They are DNA comparisons, finger print analysis, lip print analysis, palatal rugae pattern and bite mark analysis, dental records, anteroposterior metric data, retinal scan, age, race, sex, stature etc. Among which DNA comparisons and finger print analysis are commonly used technique. Meanwhile other supportive evidences like tattoos piercings, associated clothing, eyewitness, documents and belongings also become inevitable because personal identification involves a combination of different techniques for identifying a person or object.[2] The word "Forensic," derived from the Latin word. "Forensis" means the art or study of public. So, forensic science refers to the area of endeavor that can be used in a judicial setting, accepted by the court and the general scientific community to separate truth from untruth.[1]

Aim

To study and compare the efficacy of lip print, finger print and rugae impression in gender determination of an individual.

Objective

1. To determine the finger print pattern, lip pattern and palatal rugae in males and females.
2. To determine the efficacy of finger prints, lip pattern and palatal rugae in gender determination.
3. To compare the efficacy of finger prints, lip pattern and palatal rugae in gender determination.

Materials and Methods

Source of the Data: This study was carried out in the Department of Oral and Maxillofacial Pathology, Modinagar, Uttar Pradesh

Methods of Selection of Data

Sample Size: Total number of subjects: 150

- Total number of female patients: 75
- Total number of male patients: 75

Selection of Cases

Inclusion criteria

- Healthy volunteers from Ghaziabad District in the age group of 6years to 60 years.
- Subject having full dentition.
- Eruption of last molar was ignored in classifying person with full dentition (as its eruption is variable).

Exclusion criteria

- Individuals who have undergone orthodontic treatment.
- Subjects with pathological lesions or scars on the fingers
- Subjects with any deformities of lips and palatal rugae or other abnormalities on lips and palatal rugae. [cleft lip andcleft palate]
- Subjects with known hypersensitivity to lipsticks and cello tape.

Parameters to be studied

1. Lip print pattern
2. Rugae pattern
3. Finger print pattern

Armamentarium:

1. For Rugoscopy

- Alginate
- Type III Dental Stone
- Rubber Bowl
- Spatula
- Perforated stainless steel stock trays (size U1-U4)
- Graphite lead pencil
- Magnifying Glass

2. For Lip Prints

- Dark Color Lipstick
- Brush
- Scissors
- Magnifying Glass
- Cellophane Tape
- White Bond Paper

3. For Recording Finger Prints

- Stamp Pad: Camlin Impression Delux
- A4 Sheet: Bond Sheet
- Magnifying Glass
- Cotton

Procedure

Cheiloscopy- The sex of the individual was determined by Suzuki and Tsuchihashi classification.[5]

Suzuki and Tsuchihashi classification (1970)[5]

Type i – complete vertical type i' – incomplete vertical

Type ii – branched

Type iii - intersected

Type iv – reticular pattern

Type v – irregular

For dactyloscopy: The analysis of finger print was done based on classification of **Cummins.**[7]

1. loop pattern
2. arch pattern
3. whorl pattern

Rugoscopy: The palatal rugae patterns were classified by Thomas & Kotze based on shape of rugae[10.]

1. Straight
2. Curve
3. Wavy
4. Circular
5. Unification

Result and Observation

The study sample consisted of 150 individuals from Ghaziabad District, in the age group of 6yrs to 60yrs who were healthy and free of congenital abnormalities, inflammation and trauma related to palate, lips or fingers. The study was divided into 2 groups:

Group 1: comprised of 75 males

Group 2: comprised of 75 females

The data was expressed in number, percentage, mean and standard deviation. Statistical Package for Social Sciences (SPPS 16.0) version used for statistical analysis. Chi square test applied to find the statistically significant. P value less than 0.05 ($p<0.05$) considered statistically significant at 95% confidence interval.

Statistical Analysis

Gender Prediction Based On Type of Lip Pattern

The overall accuracy of gender prediction among the males = 68%

The overall accuracy of gender prediction among the females = 78.66%.

The overall accuracy of gender prediction was = 73.33%

Gender Prediction Based On Type of Rugae

The overall accuracy of gender prediction among the males = 65.5%

The overall accuracy of gender prediction among the females was = 65.2%.

The overall accuracy of gender prediction was = 65.35%

Gender Prediction Based On Finger Print

The overall accuracy of gender prediction among the males = 78.66%

The overall accuracy of gender prediction among the females = 69.33%.

The overall accuracy of gender prediction = 74.00%

Overall Accuracy of Different Methods in Gender Prediction

There was statistically significant difference between the accuracy of Lip, Rugae and Finger Print Pattern in prediction of gender

Finger Print – 74% (Most significant)

Lip Pattern – 73.33%

Rugae Pattern – 65.35% (Least significant)

Summary & Conclusion

On analyzing the following conclusion was drawn.

- No two lip prints, rugae impression or finger print were identical. This showed different patterns in different individuals indicating uniqueness.
- Cheiloscopy, Dactyloscopy and Rugoscopy are a relatively new field among the large number of identification tools available to the forensic expert. They may be helpful in forensic Investigation in relation to each other.
- Most of the lip prints appeared as a combination of different groove patterns in each quadrant. However, single type of lip print pattern in any one quadrant was also interpreted in few individuals.
- Most commonly observed grooves were type III followed by type II, type I', type I, type IV and type V
- Most common finger print was whorl, loop followed by arch pattern.
- Most common rugae pattern were wavy, curvy, straight and circular.
- The findings of our study clearly indicated the uniqueness of cheiloscopic patterns and thus, their potential as valuable evidence in medico-legal cases. However, standardization of the technique for recovering and analyzing the cheiloscopic patterns is necessary in order to increase their importance as forensic evidence. Universal acceptance of lip prints as a tool in forensic investigation will be a reality only after extensive studies have been carried out using standardized recording techniques.
- Correlation between palatal rugae, lip prints and finger prints which shows significance between the three.
- The study shows that out of 3 methods, finger print method was more accurate followed by lip print and rugae pattern.

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