

## CHEILOSCOPY AND GENDER DETERMINATION - AN ORIGINAL RESEARCH

**\*Dr Tim Peter<sup>1</sup>, Dr. Laxmikanth Chatra<sup>2</sup>, Dr. Prashanth Shenai<sup>2</sup>, Dr. Deepthi Anna Cherian<sup>3</sup>, Dr. Tom Peter<sup>4</sup>, Dr. Betsy Thomas<sup>5</sup>**

<sup>1</sup>Senior Lecturer, Dept. of Oral Medicine and Radiology, KMCT Dental College, Manassery, Calicut, Kerala.

<sup>2</sup>Yenepoya Dental College, Mangalore, Karnataka.

<sup>3</sup>K V G Dental College, Sullia, Karnataka.

<sup>4</sup>A J Institute of Dental , Sciences, Mangalore, Karnataka.

<sup>5</sup>MCOODS, Manipal University, Manipal, Karnataka.

Article Received on  
22 July 2014,

Revised on 16 August 2014,  
Accepted on 10 Sept 2014

**\*Correspondence for  
Author**

**Dr. Tim Peter**

Senior Lecturer, Dept. of Oral  
Medicine and Radiology,  
KMCT Dental College,  
Manassery, Calicut, Kerala.

### ABSTRACT

Cheiloscopy is a forensic investigation technique that deals with identification of humans based on lip traces. The aim of this study was to throw light on the gender determination aspect of cheiloscopy.

Study group comprised of 500 individuals from Mangalore comprising of 250 males and 250 females of the age group 15-60 years. Materials used were digital camera in a photoshot stabilized tripod stand and cephalostat machine to stabilize the individual. Type 1 lip groove lines were found most common in all regions of lips in both males and females except for lower middle region where Type 1' lip groove lines are found more common. Certain lip groove lines may be found more common in specific region of both males and females. Even though

statistically highly significant values are there for certain types of lip groove lines, it is not possible to do the gender determination solely based on the lip groove lines. Cheiloscopy does promise to be a promising tool in personal identification, however its potential in gender determination is still under scrutiny.

**KEYWORDS:** Cheiloscopy, Gender determination.

## INTRODUCTION

Forensic science refers to the areas of endeavour that can be used in a judicial setting and accepted by the court and the general scientific community to separate truth from untruth. In forensic identification, the mouth allows for a myriad of possibilities. <sup>[1]</sup> Due to the distinctive features of teeth, dental identification is one of the most popular ways to positively identify an individual. In fact, teeth are known to have singular features and possess extraordinary resistance to extreme conditions. These properties enable fast and secure identification processes. <sup>[1]</sup>

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. Awareness of the modern techniques of crime detection has alerted the criminals for taking sufficient precautions like the use of gloves. In such circumstances, the identification of criminals using accurate methods like fingerprint analysis fails to establish a positive identity. The investigators can rely on cheiloscopy as supportive evidence in specific investigations.

This cheiloscopy study was carried out with the objectives of investigating and evaluating its potential in gender determination and their role in personal identification and for a particular lip groove pattern identification among Mangalore population.

## MATERIALS AND METHODS

After getting the Ethical Clearance certificate from Ethical Committee, Yenepoya Medical College and Hospital, Yenepoya University, Mangalore; the present study was conducted in individuals attending Department of Oral Medicine and Radiology, and among students and staff of Yenepoya University, Mangalore. 500 subjects (250 males and 250 females) were selected for the study after taking their informed consent, based on the following criteria.

### Inclusion Criteria

- 1) Individuals with normal lip profile.
- 2) Individuals aged between 15 and 60 years.

**Exclusion Criteria**

- 1) Individuals with traumatic injuries to lips.
- 2) Individuals with lesions affecting lips.
- 3) Individuals with cleft lip or any developmental disturbances affecting the lips.
- 4) Medically compromised patients.

Selected individual was made to sit in a stabilized chair with back and head well supported in PLANMECA PROMAX Extra Oral Imaging machine, at a fixed point in a plastic sheet laid on the floor in a well-lighted room. Digital camera in a photo shot stabilized tripod stand was placed at a fixed distance from the patient which is marked and an anterior lip profile photograph was made. With this fixed distance as radius, a semi-circle was drawn, over which camera with tripod was moved and right and left lateral lip profile photograph was made at an angle of 45° to the sagittal plane of the subject.

Lip groove pattern photograph thus obtained, with the help of Adobe Photoshop (Version C2) was grouped under Suzuki and Tsuchihashi classification. (Fig 1)

Both upper and lower lips were divided into three distinct regions each by dropping two perpendiculars from right and left philtrum areas, there by dividing the lips into upper right(UR), upper middle(UM), upper left(UL), lower left(LL), lower middle(LM) and lower right(LR) regions. The numbers of lip groove lines of different type according to Suzuki Classification of lip groove pattern in each region of lips were assessed.

**Suzuki and Tsuchihashi Classification (Fig 2)**

Type I - Clear cut grooves running vertically across the lips.

Type I' - Straight grooves which disappear half way instead of covering the entire breadth of The lips.

Type II - Grooves that fork in their course or branched groove or Y shaped groove.

Type III - Intersecting grooves or X shaped groove.

Type IV - Reticular grooves.

Type V - Grooves that do not fall into above categories and cannot be differentiated morphologically.

All the data obtained from the subjects were formulated into a master chart (Fig 3 a,b) which was subjected to statistical analysis.

## RESULTS

### Gender Wise Comparison

The comparison between lip groove lines among males and females in the entire sample size was made. Even though lip groove pattern was unique for an individual, certain lip groove lines were found with increased frequency in certain region of lips in gender wise distribution.

#### It was found that: (Table 1)

1. In upper right region, 182 (72.8 %) of the 250 males had Type I lines as predominant one & 173 (69.2 %) of the 250 females had Type I lines as commonest.
2. In upper middle region, 158 (63.2 %) of the 250 males had Type I lines as the predominant one & 159 (63.6 %) of the 250 females had Type I lines as the commonest.
3. In upper left region, 191 (76.4 %) of the 250 males had Type I lines as the predominant one & 171 (68.4 %) of the 250 females had Type I lines as the commonest.
4. In lower right region, 185 (74 %) of the 250 males had Type I lines as the predominant one & 179 (71.6 %) of the 250 females had Type I lines as the commonest.
5. In lower middle region, 123 (49.2 %) of the 250 males & 123 (49.2 %) of the 250 females had Type I' lines as the predominant lip groove line when compared to the other lip groove lines.
6. In lower left region, 187 (74.8 %) of the 250 males had Type I lines as the predominant one & 189 (75.5 %) of the 250 females had Type I lines as the commonest.

### Statistical Significance

Statistical analysis by Man Whitney test with estimated 'p' value was carried out to find the significance of comparison between lip groove lines among males and females.

Highly significant results with 'p' value of 0.000, 0.012 and 0.000 were obtained in relation to Type I, Type III and Type V lines respectively. Significant results with 'p' value of 0.032 were obtained in relation to Type I' lines. Non-significant results with 'p' value of 0.096 and 0.766 were obtained in relation to Type II and Type IV lines. A marked standard deviation was found in all types of lines which indicates the variation in frequency of distribution of lip groove lines from one individual to another, which explains the uniqueness of lip groove pattern for an individual.

**It was found that: (Table 2)**

1. Mean value of frequency of Type I lines in entire lip among males (37.78) were higher than that of females(34.52).
2. Mean value of frequency of Type I' lines in entire lip among males (30.32) were higher than that of females (28.80).
3. Mean values of frequency of Type II lines in entire lip among males (18.44) were higher than that of females (17.77).
4. Mean value of frequency of Type III lines in entire lip among males (16.62) were higher than that of females (14.73).
5. Mean value of frequency of Type IV lines in entire lip among males (2.14) were higher than that of females (2.13).
6. Mean value of frequency of Type V lines in entire lip among males (11.37) were higher than that of females (10.54).

Hence, the total numbers of lip groove lines among males in entire lip were higher than that of females, which is highly significant in Type I and Type V lines; significant in Type I' and Type III lines and non-significant in Type II and Type IV lines.

**DISCUSSION**

Dr. Vahanwala S P and Dr Parekh B K<sup>[2]</sup> (2000) conducted a study on lip groove patterns of 50 male and 50 female subjects in the age group of 19-21 years to promote the importance of cheiloscopy in forensic science identification. The results showed that Type I lines were common in females in lower lip, which was in accordance with the present study. Another result showing Type II lines were common in males, which was inconsistent with the present study.

A cheiloscopy study conducted by Saraswathi T R et al <sup>[3]</sup> (2009) on lip groove pattern among 100 individuals aged between 18 and 30 years, comprising of 50 males and 50 females showed that Type III lip groove lines were common in males (39.5 %) and females (36.5 %), which was inconsistent with the results of present study. Least common lip groove lines were Type IV in males (11 %) and females (13 %), which again was inconsistent with the results of present study.

Chandramani More et al <sup>[4]</sup> (2009) in his review article on cheiloscopy described that certain lip groove lines were prevalent in either gender groups. Type I and Type I' as dominant lip groove lines in right and left side of lower lip of females, which was in accordance with the

results of present study. Type II lip groove lines were found to be common in males in left side of upper lip, which was inconsistent with the present study. According to a study conducted by Malik R and Goel S<sup>[5]</sup> (2011), lip groove patterns serve as a deterministic aid for gender determination in forensic science including 100 students studying in a private coaching institute, 50 males and 50 females, in the age group of 20 to 30 years. The results showed that Type I and Type I' lip groove lines were common in females, which was in accordance with the results of present study. However, Type IV and Type V lines were found to be common in males, which was inconsistent with the results of the present study.

Naik et al<sup>[6]</sup> (2011) in an article on forensic odontology described the study on lip groove patterns among 40 students aged 20-30 years by impression method. Results showed that Type I and Type I' lines were seen in females, which was in accordance with the results of present study. However Type IV lines were commonly seen in males, which was inconsistent with the results of the present study.

**Table 1: Comparison between lip groove lines among males and females in different regions of lips.**

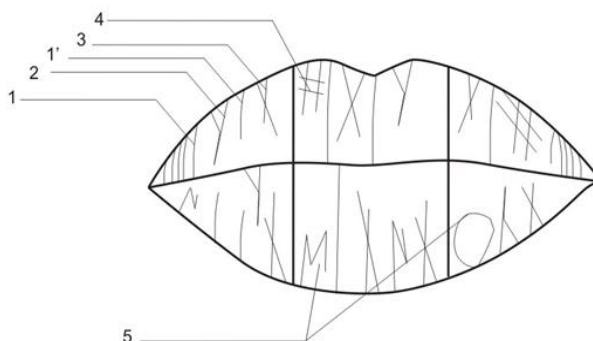
Region	Sex	Type						Total
		Type 1	Type 1'	Type 2	Type 3	Type 4	Type 5	
L L	Male	187	53	4	1	1	4	250
		74.8%	21.2%	1.6%	.4%	.4%	1.6%	100.0%
	Female	189	47	4	1	2	7	250
		75.6%	18.8%	1.6%	.4%	.8%	2.8%	100.0%
L M	Male	89	123	7	21	10	0	250
		35.6%	49.2%	2.8%	8.4%	4.0%	.0%	100.0%
	Female	106	123	3	13	5	0	250
		42.4%	49.2%	1.2%	5.2%	2.0%	.0%	100.0%
L R	Male	185	59	0	1	0	5	250
		74.0%	23.6%	.0%	.4%	.0%	2.0%	100.0%
	Female	179	62	0	2	2	5	250
		71.6%	24.8%	.0%	.8%	.8%	2.0%	100.0%
U L	Male	191	43	3	6	2	5	250
		76.4%	17.2%	1.2%	2.4%	.8%	2.0%	100.0%
	Female	171	60	10	3	3	3	250
		68.4%	24.0%	4.0%	1.2%	1.2%	1.2%	100.0%
U M	Male	158	76	7	4	5	0	250
		63.2%	30.4%	2.8%	1.6%	2.0%	.0%	100.0%
	Female	159	78	4	4	5	0	250
		63.6%	31.2%	1.6%	1.6%	2.0%	.0%	100.0%
U R	Male	182	56	1	0	1	10	250
		72.8%	22.4%	.4%	.0%	.4%	4.0%	100.0%
	Female	173	61	4	1	2	9	250
		69.2%	24.4%	1.6%	.4%	.8%	3.6%	100.0%
Total	Male	992	410	22	33	19	24	1500
		66.1%	27.3%	1.5%	2.2%	1.3%	1.6%	100.0%
	Female	977	431	25	24	19	24	1500
		65.1%	28.7%	1.7%	1.6%	1.3%	1.6%	100.0%

**Table. 2: Statistical significance of comparison between lip groove lines among males and females.**

Types	Gender	Min	Max	Mean	Stddevn	Manwhitney Test value	'p' Value
Type 1	Male	14	67	37.78	9.93	3.59	0.000 (HS)
	Female	3	66	34.52	10.64		
Type 1'	Male	10	61	30.32	8.06	2.14	0.032 (Sig)
	Female	4	53	28.80	8.12		
Type 2	Male	5	27	18.44	3.98	1.66	0.096
	Female	3	32	17.77	4.27		
Type 3	Male	0	36	16.62	7.86	2.50	0.012 (HS)
	Female	0	39	14.73	8.73		
Type 4	Male	0	37	2.14	5.33	0.30	0.766
	Female	0	62	2.13	5.94		
Type 5	Male	8	36	11.37	4.27	3.53	0.000 (HS)
	Female	6	30	10.54	3.09		



**Figure 1: Lip Groove Pattern Photograph.**



**Figure 2: Suzuki and Tsuchihashi Classification of Lip Groove Lines**

	A	B	C	D	E	F	G	H	I	J	K
	SI No	Sex	Age	Region	Type 1	Type 1'	Type 2	Type 3	Type 4	Type 5	Tot lines
1	1	M	37	UR	6	12	3	2	0	10	145
2	1	M	37	UM	7	5	3	0	0	0	
3	1	M	37	UL	4	12	3	2	0	9	
4	1	M	37	LR	2	11	5	0	0	8	
5	1	M	37	LM	3	10	2	0	0	0	
6	1	M	37	LL	5	7	5	0	0	9	
7					27	57	21	4	0	36	
9	2	M	27	UR	4	0	0	0	0	10	102
10	2	M	27	UM	0	0	0	10	4	0	
11	2	M	27	UL	0	0	0	5	0	6	
12	2	M	27	LR	5	8	4	3	0	5	
13	2	M	27	LM	3	4	2	5	0	0	
14	2	M	27	LL	2	12	0	0	0	10	
15					14	24	6	23	4	31	
16	3	M	26	UR	0	3	4	0	0	12	122
17	3	M	26	UM	3	6	10	0	8	0	
18	3	M	26	UL	5	3	2	0	0	10	
19	3	M	26	LR	2	4	2	0	0	8	
20	3	M	26	LM	0	4	0	12	0	0	
21	3	M	26	LL	4	5	3	7	0	5	
22					14	25	21	19	8	35	

Figure 3 a: Master chart

	A	B	C	D	E	F	G	H	I	J	K
	SI No	Sex	Age	Region	Type 1	Type 1'	Type 2	Type 3	Type 4	Type 5	Tot lines
1	1	F	40	UR	5	8	4	0	0	8	137
2	1	F	40	UM	8	14	6	0	0	0	
3	1	F	40	UL	0	12	0	5	0	6	
4	1	F	40	LR	5	6	3	0	0	10	
5	1	F	40	LM	8	3	2	0	4	0	
6	1	F	40	LL	4	3	3	0	4	6	
7					30	46	18	5	8	30	
9	2	F	36	UR	3	2	1	0	7	8	123
10	2	F	36	UM	0	10	3	0	6	0	
11	2	F	36	UL	5	8	3	0	0	5	
12	2	F	36	LR	2	8	2	3	0	8	
13	2	F	36	LM	0	4	0	10	4	0	
14	2	F	36	LL	5	6	2	2	0	6	
15					15	38	11	15	17	27	
16	3	F	42	UR	0	0	0	0	8	6	81
17	3	F	42	UM	0	12	0	0	10	0	
18	3	F	42	UL	0	6	3	0	0	7	
19	3	F	42	LR	3	2	1	0	0	3	
20	3	F	42	LM	0	3	3	8	0	0	
21	3	F	42	LL	0	4	0	4	0	6	
22					3	27	7	12	10	22	

Figure 3 b: Master chart

CONCLUSION

Human identification is the mainstay of civilization, and the identification of unknown individual has always been of paramount importance to society. Finger prints, post mortem reports and of late, Deoxyribonucleic acid (DNA) finger printing has been successful in personal identification in the field of forensic science. Lip prints are unique and do not change during the life of a person. Lip prints just like the finger prints if get registered at the vicinity of a crime can often be retained on the object. Studies show that cheiloscopy 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. With the current status of cheiloscopy in mind, this study was conducted to assess and establish the accuracy and usefulness of lip prints in personal identification and sex determination.

#### REFERENCES

1. Luntz L.L. The role of the dentist in identification of unknown bodies (An Introduction to Forensic Dentistry). J Conn State, D A, 1967; 4: 40.
2. Vahanwahal S P, Parekh D K. Study of lip prints as an aid to forensic methodology. J of Indian Dental Association. 2000; 71: 269-71.
3. Saraswathi T R, Gauri Mishra, Ranganathan K. Study of Lip prints. Journal of Forensic Dental Science. 2009; 1: 28-31.
4. Chandramani More et al. Cheiloscopy- A Review. Indian Journal of Forensic Medicine Toxicology. 2009; 3(1).
5. Malik R, Goel S. Cheiloscopy: A deterministic aid for forensic sex determination. J Indian Association of Oral Medicine and Radiology 2011; 23(1):17-9.
6. Satyanarayana Naik K, Ajay Prabhu, Reshma Nargund. Forensic Odontology: Cheiloscopy. Hongkong Dental Journal, 2011; 8(25).