

Sexual Dimorphism from Visual Examination of Tongue in Satara District

Research Article

Shubham Avhad^{1*}, Vikram Hankare²

¹ UG Student, Department of Forensic Science, Yashwantrao Chavan Institute of Science (Autonomous), Satara, Maharashtra, India.

² Assistant Professor, Department of Forensic Science, Yashwantrao Chavan Institute of Science (Autonomous), Satara, Maharashtra, India.

Abstract

Tongue is a vital organ which performs multiple actions such as articulation of speech, perception of taste, and formation of food bolus. It is well protected from the external environment and enclosed in the oral cavity.

Introduction: Identification of an individual plays a significant role in criminal investigation. The morphological features of tongue may show variation from one individual to another even in twins and also between male and female. The morphological features of tongue can be studied on the basis of shape, fissures, length and width of the tongue.

Aim: To study sexual dimorphism from visual examination of tongue in Satara district.

Objectives: To examine morphological features such as shape, length and width, presence or absence of fissures on the tongue. To study sexual dimorphism on the basis of visual examination of tongue in Satara district.

Methodology: The study sample included 100 male and 100 female (11–30 years). The participants were subjected to visual examination and by obtaining a digital photograph of the tongue on maximum protrusion to study the morphological variation like shape, borders and fissures of the tongue. The statistical analysis done using the Chi-square test.

Result: U-shape tongue was common in males compared to females and V-shaped tongue was more common in females compared to males. A scalloped border was observed more in males compared to females, whereas smooth borders were observed more predominantly in females compared to males. A multiple fissures were observed more in females compared to males, whereas single fissures were observed more in males.

Conclusion: This study represents a preliminary method for analyzing the morphological characteristics of the tongue by visual examination in male and female in Satara district. The surface characteristics of tongue show significant variations in male and female and could serve as an aid in sexual dimorphism.

Keywords: Criminal Investigation; Sexual Dimorphism; Chi-Square Test; Fissures.

Introduction

Identification of an individual plays a very important role in any crime investigation, mass disaster, and deceased cases.[1] Human identification is one of the challenging areas, and it is based on unique physiological parameters is the central dogma of forensic identification and biometric authentication. Traditional biometrics like face, iris, fingerprint, palm print, and voice have been used in biometric authentication but has an inherent limitation in that they are easily forged.[2] The tongue is a vital organ which is well enclosed within the oral cavity, having its own blood and nervous supply and is composed of extrinsic and intrinsic muscles controlling its movement and also papillae which is characteristic. It is unique to each person in its surface characteristics mainly,

shape, surface texture, and size. This uniqueness of tongue may aid in individual identification and thus may serve as a new biometric tool.[3] The uniqueness of the tongue print is that no two tongues are the same, and studies have found that the tongue of identical twins also does not resemble each other. The tongue provides both static and dynamic features for authentication.[4] It presents both geometric shape information and physiological texture information which are potentially useful in identity verification applications. The shape of the individual tongue is constant, notwithstanding its instinctive squirm and its physiological textures are invariant even as the coating of the tongue changes. [5] With this background, a study was designed to classify variations in morphological characteristics of the tongue as observed on photographs and to assess the usefulness of tongue replica for

*Corresponding Author:

Shubham Avhad,
UG Student, Department of Forensic Science, Yashwantrao Chavan Institute of Science (Autonomous), Satara, Maharashtra, India.
Tel : 9762938422
E-mail : shubham.avhad777@gmail.com

Received: July 24, 2021

Accepted: July 28, 2021

Published: August 09, 2021

Citation: Shubham Avhad, Vikram Hankare. Sexual Dimorphism from Visual Examination of Tongue in Satara District. *Int J Forensic Sci Pathol.* 2021;8(4):441-445. doi <http://dx.doi.org/10.19070/2332-287X-2100093>

Copyright: Shubham Avhad[©]2021. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

personal identification.

Materials and Methods

A study was conducted in the setting of Department of Forensic Science, Yashwantrao Chavan Institute of Science (Autonomous), Satara, Maharashtra. For this study, a total sample of 200 study participants of Satara district were enrolled using a non-probability convenient sampling technique for the study.

Inclusion criteria

In total, 200 healthy subjects comprising of 100 males and 100 females in the age group of 11-30 years were enrolled for the study after taking informed and written consent.

Exclusion criteria

Subjects with preexisting tongue disorders and any systemic illness were excluded from the study.

Method of data collection

After taking the informed consent, the examination of the tongue was carried out after its prior cleaning together with abundant rinsing of the oral cavity. The tongue was subjected to visual examination following which digital photograph of the dorsal surface of the tongue was taken. In addition, subjects were asked to protrude their tongue and the camera was used to capture the images of the tongue. The digital photographs of the tongue were

taken under the same environment conditions and from a predetermined distance using a OPPO F17 Pro camera (48 megapixels quad-camera). The data collected were subjected to statistical analysis using the Chi-square test. In this study, three morphological characteristics were taken into consideration were the shape, borders, and fissures of the tongue.

Shape of the tongue

The reference points were considered to determine the shape of the tongue. The reference points included the region of the tongue in contact with the commissures of the lips (when protruded outside the mouth) and the tip of the tongue. The shape of the tongue was categorized as Bifid, U Shape and V shape [Figure 1].

Borders of the tongue

They were categorized as partially scalloped, scalloped and smooth. [Figure 2].

Fissures of the tongue

They were categorized as absence of fissure, multiple fissures and single fissure [Figure 3].

Results and Discussion

This study was designed to examine and classify variations in morphological characteristics of the tongue as observed on digi-

Figure 1. Shape of the tongue.



Bifid U Shape V Shape

Figure 2. Borders of the tongue.



Partially Scalloped Smooth

Figure 3. Fissures of the tongue.



Absent Multiple Single

tal photographs, to assess the usefulness of tongue replica for personal identification in forensic science. The three different morphological characteristics of the tongue considered were, i.e. shape, borders, and fissures of the tongue. The study was performed on 200 subjects, inclusive of 100 males and 100 females, with an adult age group. The total sample was grouped into 2 Groups.

Group I : It consists of 100 male subjects.

Group II : It consists of 100 female subjects

The data were collected, tabulated, and subjected to statistical analysis (Chi-square test). Out of 200 subjects, Group I consists of 100 male subjects and Group II consists of 100 female subjects [Table 1 and Graph 1].

Out of 200 subjects, in Group I, bifid tongue was noticed in 21 subjects, U-shaped tongue was noticed in 51 subjects, whereas V-shaped tongue was observed in 28 subjects. In Group II, bifid tongue was noticed in 26 subjects, U-shaped tongue was noticed in 29 subjects, whereas V-shaped tongue was observed in 45 subjects. The association between the shape of the tongue and gen-

der was found to be statistically significant ($P < 0.05$) [Table 2 and Graph 2].

U-shape was predominantly common in males compared to females. V-shaped tongue was more common in females compared to males. The reason for V-shaped tongue in females could be smaller mandible size as compared to males.

Out of 200 subjects, in Group I, a partially scalloped border was noticed in 39 subjects, a scalloped border was observed in 26 subjects, whereas a smooth border was noticed in 35 subjects. In Group II, a partially scalloped border was noticed in 44 subjects, a scalloped border was observed in 19 subjects, whereas a smooth border was noticed in 37 subjects. The association between borders and gender was not statistically significant ($P > 0.05$) [Table 3 and Graph 3].

The predominant border observed in the total sample was partially scalloped borders. A scalloped border was observed more in males compared to females, whereas smooth borders were observed more predominantly in females compared to males. The scalloped appearance of tongue is caused by pressing up against

Table 1: Gender distribution of total subjects in groups.

Groups	Males		Females	
	n	Percentage	n	Percentage
Group I	100	100	0	0
Group II	0	0	100	100
Total	100	100	100	100

Graph 1. Gender distribution of total subjects in groups.

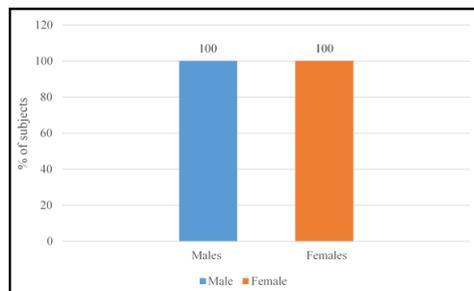
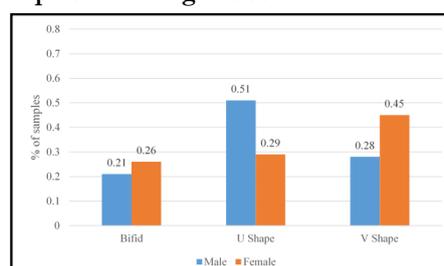


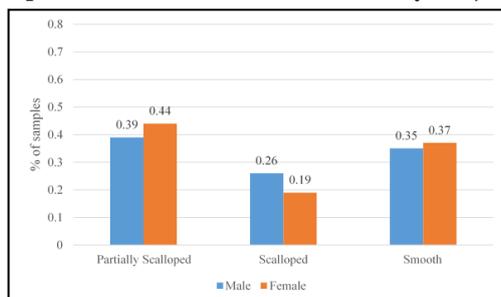
Table 2. Shape of the tongue.

Shape of tongue	Males		Females		χ^2	P
	n	Percentage	n	Percentage		
Bifid	21	21	26	26	10.541	0.005
U Shape	51	51	29	29		
V Shape	28	28	45	45		
Total	100	100	100	100		

Graph 2. Shape of the tongue observed in the study subjects.



Graph 3. Borders observed in the study subjects.



Graph 4. Fissures observed in the study subjects.

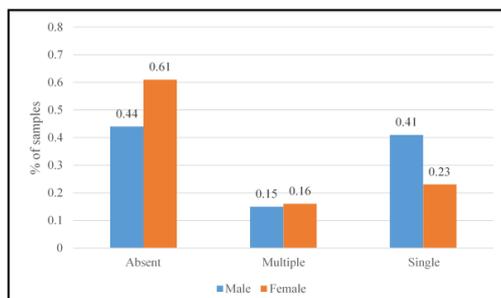


Table 3. Borders of the tongue.

Borders of tongue	Males		Females		χ^2	P
	n	Percentage	n	Percentage		
Partially Scalloped	39	39	44	44	1.446	0.485
Scalloped	26	26	19	19		
Smooth	35	35	37	37		
Total	100	100	100	100		

Table 4. Fissures of the tongue.

Fissures of tongue	Males		Females		χ^2	P
	n	Percentage	n	Percentage		
Absent	44	44	61	61	7.847	0.02
Multiple	15	15	16	16		
Single	41	41	23	23		
Total	100	100	100	100		

teeth. A scalloped tongue was observed more in males compared to females; the reason could be more parafunctional habits in males.

Out of 200 subjects, in Group I, fissures were absent in 44 subjects, multiple fissures were noticed in 15 subjects, whereas single fissure was observed in 41 subjects. In Group II, fissures were absent in 61 subjects, multiple fissures were noticed in 16 subjects, whereas single fissure was observed in 23 subjects. The association between fissures and gender was found to be statistically significant ($P < 0.05$) [Table 4 and Graph 4].

The predominantly fissures were absent in the total sample. A multiple fissures were observed more in females compared to males, whereas single fissures were observed more predominantly in males compared to females. Fissures are simply a variation of a normal tongue which appears on the dorsal surface of the tongue.

Fissures were more common in males compared to females, and this could be because of large tongue size in males compared to females.

Conclusion

The present study represents a preliminary method for analyzing the morphological characteristics of the tongue by visual examination and to assess the difference in these characteristics in male and female in Satara district. The surface characteristics of tongue show significant variations in male and female and could serve as an aid in sexual dimorphism. The lingual photographic image can enhance personal identification along with other techniques in forensic science. There are many biometrics have been used and developed, but there is not much work done on tongue for personal identification.

References

- [1]. Abarnalingam, Shubhalakshmi, Desai D, Christopher G. Comparison of Lip Prints, Rugae Pattern and Tongue Prints among Karnataka, Kerala and Tamil Nadu Population – A Short Study. *International Journal of Innovative Sci and Research Tech.* 2019; 4(7): 1182-87.
- [2]. Sreepadha C, Vaishali MR, David M. Tongue Replica for Personal Identification: A Digital Photographic Study. *Journal of Indian Academy of Oral Medicine & Radiology.* 2019; 31(1): 57-61.
- [3]. Jayan L, R. Bharanidharan, R. Ramya, N. Priyadharsini, A. Ramesh Kumar. Tongue morphometry: Evaluation of morphological variations in ethnic Tamil population. *SRM Journal of Research in Dental Sci.* 2019; 10(3): 139-144.
- [4]. Jeddy N, T Radhika, S Nithya. Tongue prints in biometric authentication: A pilot study. *Journal of Oral and Maxillofacial Pathology.* 2017; 21(1): 176-179.
- [5]. Johnson A, Gandhi B, Joseph S. A Morphological Study of Tongue and its Role in Forensics Odontology. *J Forensic Sci & Criminal Inves.* 2018; 7(5): 1-5.
- [6]. T. Radhika, Jeddy N, S. Nithya. Tongue prints: A novel biometric and potential forensic tool. *Journal of Forensic Dental Sci.* 2016; 8(3): 117-119.
- [7]. Kaur G, Singh D. A Novel Biometric System based on Hybrid Fusion Speech, Signature and Tongue. *International Journal of Computer Applications.* 2015; 119 (7): 30-39.
- [8]. Stefanescu C, Popa M, Candea L. Preliminary study on the tongue-based forensic identification. *Rom J Leg Med.* 2014; 23(4): 263-266.
- [9]. Nimbulkar G, Patil R. Tongue Prints: A Forensic Review. *Indian Journal of Forensic Medicine & Toxicology.* 2020; 14(4): 6802-6806.