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A Comparitive Study of Palatal Rugae amongst Kanpur Population

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Abstract:-

BACKGROUND: Palatal rugae analysis might play a significant role in the fields of dentistry like forensic odontology, prosthodontics and orthodontics as they remain consistent in shape, pattern, direction & unification. The other names used for palatal rugae are plica-palatinae transversae and rugae palatine which are epithelial ridges present on the anterior part of palatal mucosa, present on each side of the median palatal raphae and behind the incisive papilla.

AIM: The aim of the study is to draw identification and comparison of different types of rugae pattern in individuals of Kanpur, Uttar Pradesh.

MATERIAL AND METHODS: The study was carried out on a sample group of 100 individuals, consisting of 50 males and females respectively from Kanpur population. The age group was between 18-30 years. The images of the hard palate reflected in the mirror were visualized using the digital camera and examined by hand held magnifying lens.

RESULTS: In our study, we observed that palatal rugae have exceptional attributes and are of distinctive patterns that remain substantial. Palatal rugae in both genders showed wavy type followed by straight, curved and circular type of distribution.

CONCLUSION: The study will distinguish variance in distribution of several rugae patterns in non- identical individuals and affirmed that "wavy" and "straight" are the most commonly seen rugae patterns.

I. INTRODUCTION

The most significant role in forensic investigation is played by human identification that includes various methods like rugoscopy, cheiloscopy, bite marks, photographs, radiographs and molecular methods. Palatal rugae is unique and there is no similarity between the two palates in respect to their contour, shape & structure, once formed. The most optimal parameters of rugae includes i.e stability, uniqueness & postmortem resistance but with existing antemortem records.[1]

Numerous techniques are accessible for personal identification like – DNA comparison, dental juxtapositions, finger print investigation, palatal rugae, lip print, bite mark investigation, dental records, antero-posterior metric data, etc.

It was 'Winslow' in 1732, who was the first to delineate about palatal rugae. In 1889, 'Harrison allen' was the first to put forward the use palatal rugae for personal identification. Racial and gender discrimination in rugae patterns plays a very important role in personal identification process.

Rugae or plica transversae is unique, asymmetric with series of non- uniform mucosa folds that forms anterior 1/3rd of hard palate[2]. It commences to take shape in 12th-14th weeks of intra uterine life. Rugae succor as a tool for discerning in edentulous patients at the same time where teeth cannot be used for identification.

Palatal rugoscopy was first advocated by 'Trobo Hermosa' in 1932 which includes the research on rugae pattern for human identification. Rugae are encased from heat by tongue, buccal fat pads and also protected due to their central position in the oral environment. The function of rugae will include a] Involves in swallowing, b] Assists in speaking and ameliorate the contact of taste receptors, c] for immersion purpose in children.

Palatal rugae remain consistent throughout the life but few events may accord to changes such as-Orthodontic treatment, Effect due to tooth extraction, Sucking habits in children.

The rugae pattern were traced and analyzed by using '**Thomas & Kotze'** classification in year 1983 on the foundation of number, shape, length and unification:1]Based on number**:** 1,2,3,4, 2]Based on shape: curved, wavy, straight, circular3]Based on length:Primary rugae: 5-10mm, Secondary rugae: 3-5mm, Fragmentary rugae: less than 3mm4]Based on unification:converge, diverge.[3] The author investigated the principal pattern and association of rugae in male, female of different age group in this study.

In some specific conditions which are in relation to a criminal examination,and are essential in the procedure of human identification.

II. MATERIALS AND METHODS

This study was executed in the department of oral and maxillofacial surgery from july 2021 to august 2021 in Rama dental college hospital & research centre, Kanpur, Uttar Pradesh. Ethical approval was obtained from the Ethical committee of the Institutional Review Board and informed consent form was signed and taken from all the patients.

A total sample of 100 individuals were selected with equal division of male and female participants. The

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Volunteers were taken from OPD of Department of Oral and Maxillofacial surgery with detailed case history. Once after the informed consent intra oral rugae pictures were taken with the help of intra oral mirror, light reflector, digital camera and magnifying lens.

The study will include criteria such as- Healthy volunteers in the age group of 18-30 who were physically healthy and well oriented belonging to Kanpur. Subjects without braces, removable partial dentures, fixed partial denture with no history of skull and jaw trauma.

The author has excluded some of the valuable criteria as mentionedare-Individuals who underwent orthodontic treatment and related pathology [burns, injury, leprosy], Subjects with any developmental anomaly of lip and palate [cleft lip and cleft palate], impacted canine, orthognathic surgery and lastly those who are not willing to participate.

The subjects were seated on the dental chair and were clinically examined with the help of intra oral mirror under artificial illumination andthe images were reflected in the mirror which were envisioned with the assistance of digital camera and marked with serial number of the participant. A 48mp digital camera was used to compare and evaluate the required parameters such that to avoid any angular distortion, Photos were taken by the same investigator and are then transferred to the computer which can be used for printing and analysis.

These photographs were examined by hand held magnifying lens. Later, Final analysis of the required data was interpreted by the primary investigator and was also cross checked by different Oral and Maxillofacial Surgeons for confirmation of final interpretation.

Only the researcher was aware of the pictures and numbering and coding was done in order to ease comparison.

III. RESULT

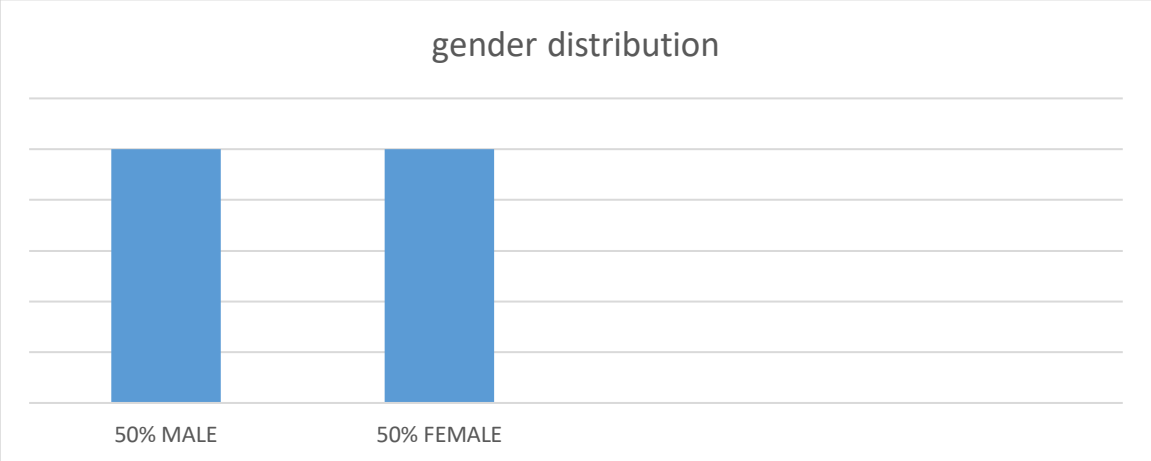
Theafore mentioned study was conducted in order to examine in human identification the genuinity of rugae pattern. There search was carried out on a sample group of 100 individuals consisting of 50 males and females respectively within the ages pan of 18 to 30.

The data was stated in number, percentage, mean and standard deviation. Statistical Package for Social Sciences (SPPS16.0) version used for statistical analysis.

In our study, the most common pattern of palatal rugae observed was wavy 60%, straight 24%, curved 8%,unification 5% and circular 3%. Although this sample size consists of 100 individuals but in general observation of population too this is the common pattern of palatal rugae observed.

Gender	Number	Percentage	P value
Male	50	50	0.87
Female	50	50	
Total	100	100	

Table 1: Distribution of patients based on gender
[p>0.05, no significant difference]



Age [years]	Number	Percentage[%]	P value
18-20	20	20%	0.04
21-25	65	65%	
26-30	15	15%	
Total	100	100%	

Table 2: Distribution of patients based on age:
[p<0.05 significant compared 18-20 years, p<0.05 significant compared 21-25 years with others]

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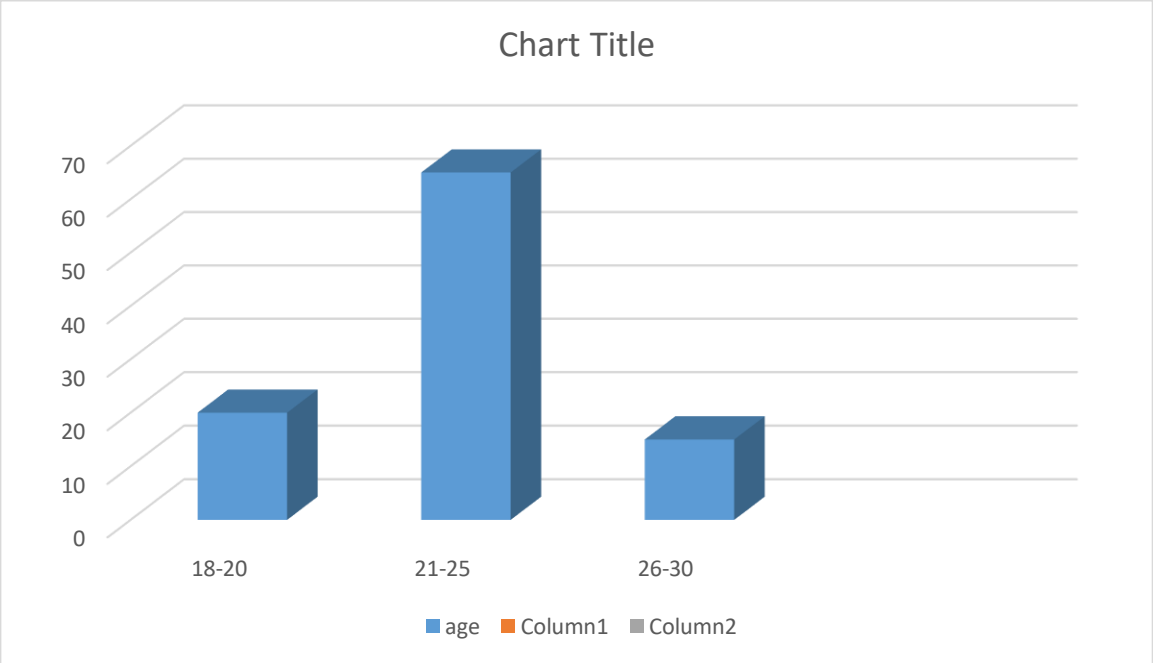
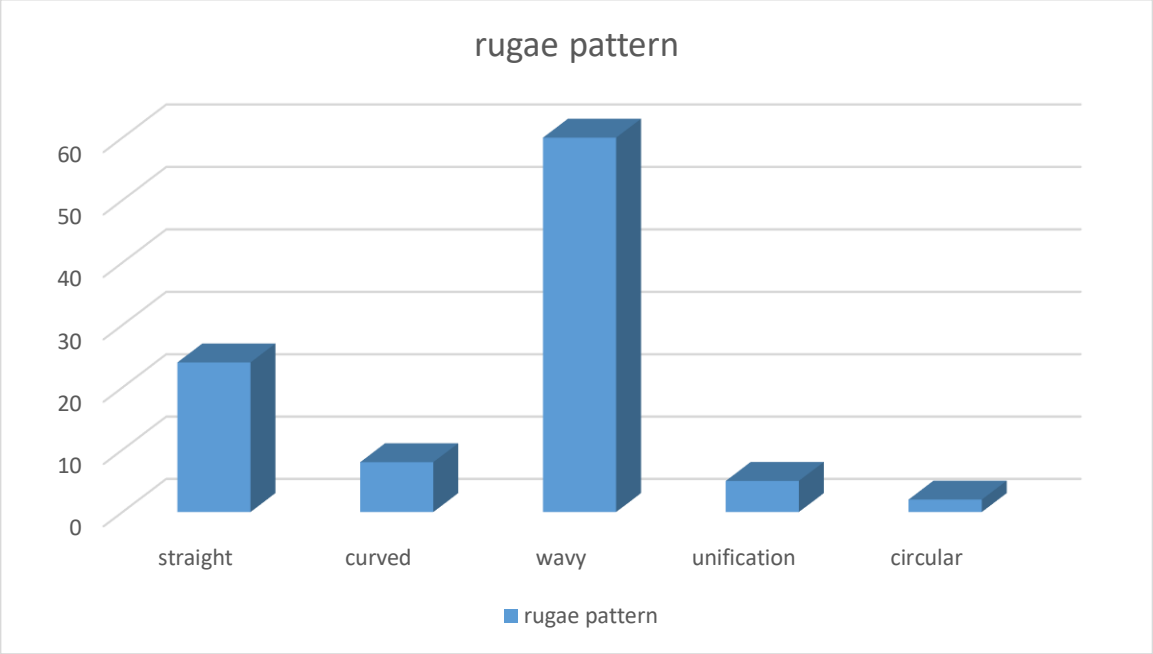


RUGAE PATTERN	NUMBER	PERCENTAGE[%]	P VALUE
Straight	24	24%	
Curved	8	8%	
Wavy	60	60%	
Unification	5	5%	
Circular	3	3%	0.02
Total	100	100%	

Table 3: Distribution of patients based on rugae patterns



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IV. DISCUSSION

Forensic science assists in seeking results that can be helpful in a judicial setting and are acceptable to the court as well as general scientific community to distinguish truth from untruth. Few of the personal identification processes are lip prints, DNA analysis, age determination, anthropometry, palatal rugae pattern, sex determination, post mortem, bite marks and finger print analysis.

Testimony of an eye witness serves as a source for establishment of identification in the absence of antemortem data. On account of forensic jurisprudence, ascertaining and recognizing the lip print might demonstrate as substantial proof at the site of calamity of any kind.

Palatal rugae serves as a helpful forensic tool. In 1889, Harrison Allen discovered this as a method of identification. The rugae survives post-mortem insults as its shielded from trauma and encased by the heat of the tongue. Slight changes occur in connection to rugae and teeth during the orthodontic tooth movement, although no vital changes observed in rugae's shape.

The most cardinal specimen in our study of palatal rugae was the wavy pattern and secondly the curved pattern, in accordance with other studies. Speaking of which, in Australian aborigines (Kapali*et al.*) and the Nepalese population (Shreenivas*et al.*)[4] a predominance of wavy pattern has also been observed.

In dissimilarity, Saraf*et al.* observed the converging pattern to be paramount, which was not considered in our study[5]. Thevariation in theseresults could be an outcome of difference in geographic background and ethnicities. Our research comprised of random selection of subjects with difference in background, it would be inapt to conclude the most common palatal rugae pattern. It's important to analyze the difference in population by assessing distinct variables such as rugae shape than the continuous variables like rugae length.

Since times immemorial, the finger print analysis has been considered as a method of identification. Even in a given individual no two finger prints have been found to have same ridge pattern and it remains unchanged throughout life. The analysis of finger print offers an excellent means of forensic investigations due to its distinctiveness in presentation. Automated finger print identification has been employed throughout the world today among the law enforcement agencies.

There was no significant statistical significance yieldedin comparison and correlation of the lip prints, palatal prints, and finger prints. These outcomes are in correlation with previous study. Consequently, the result perceived in our research was similar to the study of Mutalik et al[6].Nevertheless, one study has pointed out a notable connection between vertical type lip prints and arch type finger prints.We could not draw any correlation due to purposive sampling in our research and the same (purposive sampling) was undertaken with the sole objective of identification of individuals in a setup which comprises heterogeneous mix of population. Although, some clues of any correlation of these three unique patterns of identification may be provided by the continuation of this work including more subjects and further validation of results.

In the case of Forensic studies, it's usual to retrieve partial remains such asjaws, fragmented skull, and other bones of the body. One of the strongest human tissues being the teeth, are one of the most commonly recovered remains as well as are known to withstand a variety of ante-mortem and post-mortem insults. Inter- canine width,mesio-distal canine width, and mandibular canine index (MCI) have been utilized in order to ascertain gender in the past as well as supported by numerous researchers. However, in recent research by Acharya et al, Boaz et al its been discovered that these measurements do not determine the gender difference accurately[7].

In a research it was deduced that the mean inter-molar width in both maxilla and mandible and the mean inter-canine width in maxilla were distinctively higher in males in comparison with females. In another previous study the conclusion was drawn that the relationship between lateral dimension of rugae and inter-canine distance continued being constant in pre as well as post orthodontic treatment. This could be a possible outcome becausein most of the treatment modality the width of the inter-canine is maintained and the rugae is stable. Research and studies indicate that the shape of the rugae remain unaltered despite of orthodontic treatment and only changes in their length have been perceived.

Numerous categorizations have been evolved in order to distinguish arch forms, such as elliptical, parabolic, square, and U-shaped. Such schemes are defined poorly and are a significant cause of confusion within and among studies[8] as observed by Jacobson and others.A quantitative sense of arch form is provided by the palatal index. Changes in arch are very small within an individual. Consequently, no detectable systematic change in arch size can be noticed or form with age. As a matter of fact, each variable in present research was regressed on the basis of person's age, but none exhibited anywhere near a statistically significant age effect[9].

The conclusion drawn by De La Cruz et al. was that the arch form gravitated to bounce back to the pre-treatment shape after retention and that the great change, the greater the tendency for post retention change[10].Suggestion was indicated that the patient's pre-treatment arch form appears to be the best guide for the stability of future arch form, but also emphasis was posed on the factor that minimizing treatment change was not a guarantee of post retention stability.

Therefore, it sufficiently acts as adistinctive characteristic to distinguish between individuals because no two palates are alike in their configuration. On the basis of this proposition, it can be said that the palatal rugae can serve in forensic science as one of the effective tools for personal identification.

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V. CONCLUSION

The simplicity, reliability and cost effectiveness of palatal rugae makes it a preferred tool in forensic identification. Therefore, it can be adequately stated based on this proposition that to differentiate between individuals and for personal identificationpalatal rugae can emerge as one of the most significant tool in forensic science because no two palates are indistinguishable in their configuration.

The conclusion drawn on the basis of analysis of the research results, is that dissimilarity can be recognized in dispensation of various palatal rugae patterns in distinct individuals and established that “wavy” and “straight” are the most commonly seen rugae patterns in both males and females.

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