Rugae pattern in a Saudi population sample of males and females

Faisal M. Fahmi,* BDS, MSc
Saleh M. Al-Shamrani,[1] BDS, MS
Yousef F. Talic, BDS, MSc

تهدف هذه الدراسة لمعرفة ومقارنة نمط التجاعيد اللثوية لقبة الحنك بين السعوديين من الذكور والإناث والتي ربما تكون طريقة اضافية لمعرفة هوية الأشــخاص في حـــالات الجرائم وحوادث الطيران . تم أخذ طبعات للفك العلوي لمجموعه مختارة من السعوديين وعددهم ٦٠ ذكرا و ٦٠ انثى بمادة الالجينات وتم صبــه بالجبــس لعمل مثال لكل منهم ، خال من الفقاعات الهوائية أو أي تشوهات ، خاصة في المنطقة الامامية من الحنك .أستعملت طريقة توماس وكوزي في عام ١٩٨٣م والتي تشــمل عدد وشــكل ودرجة التحــام التجاعيد باستخدام عدسه مكبره ومسطره بلاستيكية للقياس . تمت جميع القياسات عن طريق شخص واحد بالمليمتر .

أوضحت الدراسة أنه لايوحد فرق هام في عدد وطول التجاعيد بين الذكور والإناث ولكن وحدأن هناك فرقين هامين إحصائيا من حيث الشكل وهما :

تتميز الإناث بوجود تجاعيد ملتحمة للداخل ، بينما يتميز الذكور بوجود تجاعيد دائرية. وهذه المعلومات تمكن من إضافة نمط التجاعيد كإحدى الوسائل للتفرقة بين الإناث والذكور ، أو كوسيلة إضافية ، مع الوسائل الأخرى كالرؤية البصرية ، البصمات أو خصائص الاسنان في حالات حوادث الطيران أو الحروق وما شابهها.

The aim of this study was to identify and compare the rugae pattern in Saudi males and females, which may be an additional method of identification in cases of crimes or aircraft accidents. Alginate impressions of the palate of selected 120 Saudis, 60 males and 60 females, were poured in stone. The casts were free of voids and air bubbles. The method of identification of rugae pattern followed, was that of Thomas (1983) which includes the number, shape and unification of rugae. A magnified lens was used for identification and a plastic ruler was used for measurements. All measurements were in mm and were done by one examiner. The study revealed that there was no significant difference in the total number or length of rugae between the two sexes. The different types of rugae between the male and female were statistically compared. The female showed a significant difference in the converge type while the male had a significant difference in the circular type. It may be concluded that the rugae pattern can be an additional method of differentiation between the Saudi male and female in conjunction with the other methods such as visual, fingerprints, and dental characteristics in forensic sciences.

Introduction

According to the Glossary of Prosthodontics[1], rugae are anatomical folds or wrinkles (usually used in the plural sense); the irregular fibrous connective tissue located on the anterior third of the palate behind the incisive papilla. They are also called plica palatinae. Rugae patterns have been studied for various purposes mainly in the fields of anthropology, comparative anatomy, genetics, prosthodontics and orthodontics.[2,3] In forensic medicine, three main methods of identifications are used namely the visual, fingerprints and dental characteristics. In many instances, one or all of these methods may not be totally effective or conclusive.[4] Many criminal investigations and victims of aircraft[5,6] accidents have been identified by their dentition.[7,8] The use of human palatal rugae[9] was suggested as an alternative method of identification.[10] Rugae are protected from trauma by their internal position in the head and they are insulated from heat by the tongue and the buccal fat pads. In one study, it was reported that no two palates are alike in their configuration and that the palatal print did not change. Even between twins, the studies indicated that the patterns are similar but not identical.[11]

The purpose of this paper was to study the rugae pattern in a Saudi male and female sample, and to compare the patterns between the two groups, which may be an additional method of identification in cases of crimes or aircraft accidents.

Materials and Methods

A total number of 120 Class I dentate subjects, 60 males and 60 females were selected among the students of the Dental College, King Saud University, Riyadh, Kingdom of Saudi Arabia. Their ages were between 20-26 years with a mean of 22 years. All subjects were healthy individuals free of congenital abnormalities, inflammation, trauma or orthodontic treatment.

Address reprint requests to:
Dr. Faisal M. Fahmi
PO Box 60169
Riyadh 11545, KSA

The impressions

An irreversible hydrocolloid* was used as an impression material on an appropriate perforated metal tray for the upper dental arch for all subjects. All instructions by the manufacturers were followed such as water/powder ratios, vacuum mixing, and the use of a vibrator. The impressions were then poured into stone.** All casts were free of air bubbles or voids specially at the anterior third of the palate.

Method of identification

The method of rugae identification was based on the classification of Thomas et al (1983).[12] This classification includes number, length, shape and unification of rugae. The shapes are classified into curved, wavy, straight and circular. Fragmented rugae are those which have length less than 5 mm. Unification is divided into converge where two rugae originate away from the centre and unite towards it. While diverge ones are those rugae which originate from the centre and diverge away from it (Fig. 1). The rugae were highlighted by a black pen on the cast and a magnification lens was used for identification. Measurement was done using a plastic ruler (Kenson) in millimeters (Fig. 2). All the identification and measurements were done by one examiner and the readings were repeated three times for each cast. In this study, the fragmented type of rugae of a size less than 5mm were ignored, when the mean value of the total number of rugae was calculated. The fragmented types were studied separately for a comparative study purpose between males and females.
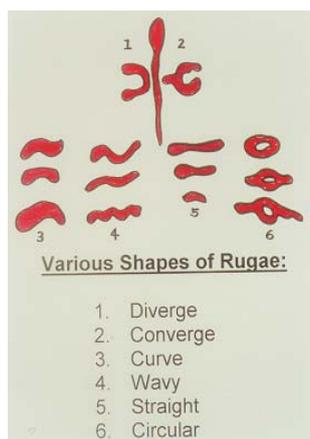

Fig. 1. The different shapes of the rugae.

Various Shapes of Rugae:

1. Diverge
2. Converge
3. Curve
4. Wavy
5. Straight
6. Circular

* Jeltrate, Dentsply Caulk, Dentsply International Inc., Milford, DE 19963-0359, USA
**Lab Stone, Dentsply International Inc., Fouk, PA 17405-0872, USA
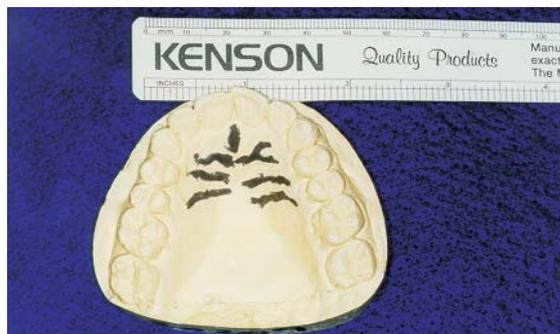
Fig. 2. The rugae highlighted together with the Kenson plastic ruler.

Statistical Analysis

Two-sample t-test and Chi-Square tests were used for comparison of means and relationship between the attributes. A significance level of 5% was considered as critical value.

Results

The total number of rugae and the mean value for male and females is illustrated in Table I. The distribution of different types of rugae as well as the descriptive statistics are shown in Table 2. There was a significant difference in the converge type of rugae which was found to be higher among females than males (P = .034). There was also a significant difference in circular type which was higher in males than females (P = .02). The number and difference in length of rugae are shown in Tables 3 and 4. The chi-square and t tests showed no significant difference between the two sexes.

Discussion

The method used in this study (Thomas et al, 1983)[13] was found to be the most practical and easiest to apply compared with other methods such as those of Houser et al[14] and of Reuer.[15] Many studies had been carried out on the rugae

Table I. Total number of subjects and the mean value of rugae in males and females.

Sex	Total number	Total number of rugae*	Mean	SD
Male	60	438	7.3	0.51
Female	60	432	7.2	0.46

* Fragmented types were excluded

Table 2. Descriptive statistics of % of different types of rugae categorized by gender.

	Sex	N	Mean	SD	P-value
Converge Pattern	M F	60 60	8.6 15.1	12.4 14.4	.036*
Diverge Pattern	M F	60 60	1.8 1.2	5.8 4.3	.612
Curve Pattern	M F	60 60	26.1 24.0	13.2 15.3	.507
Wavy Pattern	M F	60 60	45.4 43.7	13.8 18.5	.635
Straight Pattern	M F	60 60	12.0 14.1	11.0 12.6	.427
Circular Pattern	M F	60 60	5.8 1.7	10.1 4.6	.02*

Two sample t- test was performed.
(M) Male (F) Female
*Indicates significant difference

Table 3. Distribution of the length of rugae in the males and females.

Sex	Fragmented less than 5 mm (%)	From 5-10 mm (%)	More than 10 mm (%)	Total
Male	56 (11.3)	225 (45.6)	213 (43.1)	494
Female	63 (12.7)	212 (42.8)	220 (44.5)	495

χ^2=0.9106   P=0.6342

Table 4. Descriptive statistics of difference in the rugae length in mm between the males and females.

Type of rugae	Sex	Mean	SD	p-value
Fragmented	M F	1.37 1.58	1.09 1.34	0.442
From 5-10 mm	M F	3.76 3.35	1.02 1.27	0.116
More than 10 mm	M F	3.54 3.83	1.05 1.20	0.29

Two sample t-test
(M) Male (F) Female

patterns in black, caucasian and mixed populations in South African[12] and in the Japanese.[17,18] However, no single study has been done among Arab races such as Saudis. This study did not show any significant difference in the number of rugae between the males and females. The results do not conform with the results presented by Dohke and Osato[18] who indicated that among the Japanese, the females had fewer rugae than males. This finding may indicate that there is some racial and sex differences. However, a significant difference was found to be in two shapes of rugae in the present study. The first is that the converge type was found to be higher in females than males. This difference was found to be statistically significant. The other finding was that the presence of the circular type which was found to be statistically higher in males than in females. Those two differences could be factors for identification together with other methods of identification. Further research may be indicated with a larger sample size in order to substantiate the findings of the present study. In addition, examining the rugae patterns in other Arab nationalities may further corroborate our findings.

Conclusions

1. There was no significant difference in total number of rugae between male and female Saudis.
2. Significant differences were found in two shapes, the converge type which was found to be higher in females and the circular types were found to be higher in males.
3. The rugae pattern may be a useful additional method for post mortem identification.

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