ORIGINAL RESEARCH

Esthetic Visibility of Anterior Teeth in Operator Perspective: A Cross-sectional Survey

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ABSTRACT

Introduction: The study investigates the degree of visibility of maxillary and mandibular anterior teeth in subjects of different age groups when the lips are at rest and compares the results obtained from the esthetic perspectives of prosthodontists.

Materials and methods: A total of 120 dentate adults, within an age group of 35 to 65 years are selected in accordance with inclusion criteria. They are subdivided into three groups (35–45, 45–55, and 55–65 years). The visible portions of maxillary and mandibular anterior teeth, while the lips and lower jaw are at rest position, are measured using a digital caliper from the border of the lip to the incisal edge of anterior teeth. Lip length is also measured from the base of columella to the tip of philtrum. A questionnaire survey was conducted among prosthodontists to obtain their view on anterior teeth visibility.

Results: Females significantly displayed more of the maxillary central incisor (2.93 ± 1.57 mm; $p = 0.003$), lateral incisor (1.87 ± 1.12 mm; $p = 0.005$), and canine (0.59 ± 0.62 mm; $p = 0.031$). With increasing age, the amount of maxillary anterior teeth visible at rest significantly decreased ($p < 0.001$), and increased for the mandibular teeth ($p < 0.001$). Subjects with shorter upper lip significantly displayed more maxillary anterior incisor than subjects with longer upper lip ($p < 0.001$).

Conclusion: Females displayed significantly more of maxillary anterior teeth. The visibility of maxillary anterior teeth significantly decreased with increasing age and it increased for the mandibular teeth. As the upper lip length increased, the mean visible labial length of maxillary anterior teeth significantly decreased.

Keywords: Anterior visibility, Esthetic perspective, Lip length.

INTRODUCTION

Esthetics is the theory and philosophy that deal with beauty and the beautiful, especially with respect to the appearance of a dental restoration, as achieved through its form and/or color.[1] The major qualities of esthetics are beauty, harmony, naturalness, and individuality as stated by Young.[2] Denture esthetics is the effect produced by a dental prosthesis that affects the desirable beauty, attractiveness, character, and dignity of the individual[1] and is a predominant factor for complete denture success.[3] An acceptable cosmetic effect in any dental restoration has always been regarded important to good dentistry. A well-made prosthesis will fail if it is deficient in this respect. It is important that a dentist must visualize esthetics in relation to the patient and then translate that visualization into an acceptable esthetic result.

One of the most important aspect of esthetics of dento-maxillary system is vertical anterior tooth display.[4] It helps in determining the outcome of fixed or removable prosthodontic care, implant dentistry, operative dentistry, anterior esthetic procedures, and orthognathic surgery.[5,6] The dentofacial composition encompasses both the frontal and sagittal planes in two muscular positions, namely static and dynamic positions.[7] An individual is said to be in static position if the lips are slightly apart and the teeth are out of occlusion with the perioral muscles relatively relaxed. In this position, tooth exposure is influenced by multiple factors mainly lip length, age, race, and gender.[6-9]

The extent of tooth display at rest is greatly determined by the upper and lower lip positions and their movements during function. Maxillary anterior teeth are more displayed in individuals with short upper lip when compared to those individuals with long upper lip. In individuals with long upper lip, mandibular central incisors are more visible.[7]

Aging results in reduced tonicity of orofacial muscles and laxness of tegumental relief in the lower third of the face. This causes deepening of nasolabial and mental grooves. Thus there will be loss of elasticity of the upper lip.[10] The amount of maxillary tooth displayed is inversely proportional to increasing age whereas the amount of mandibular teeth is directly proportional to increasing age.[9] Hence, in a young individual maxillary teeth will be displayed more than mandibular teeth whereas in an older individual mandibular anterior teeth will be displayed.[8] Nearly 80% of the young individuals in the study by Tjan et al[11] displayed the entire length of the maxillary

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anterior teeth. Women show nearly twice as much maxillary central incisor as men (3.4–1.9 mm respectively) with the upper lip at rest.[8] Some authors feel that most clinicians pay attention to detail when providing fixed prosthodontic care, implant dentistry, and operative dentistry. At the same time, they frequently fail to pay similar attention to detail when providing removable prosthodontic treatment.[12] For complete denture patients maxillary occlusal rim is contoured and adjusted to establish the proposed positions of maxillary anterior teeth. Several guidelines were suggested to establish the lip length–incisal edge relationship and accordingly, the visible amount of anterior teeth.[13,14] The visible amount of anterior teeth can be one of the helpful guidelines for determining the appropriate vertical dimension of occlusion.

The aim of this study was to investigate the degree of visibility of maxillary and mandibular anterior teeth surfaces in subjects of different age groups when the lips are at rest and to compare the results obtained with the esthetic perspectives of various prosthodontists.

MATERIALS AND METHODS

It was a cross-sectional study conducted between April and June 2015 at the Department of Prosthodontics, Annoor Dental College, Muvattupuzha. A total of 120 subjects with class I molar relationship within the age group of 35 to 65 years were included in the study. They were subdivided into three groups (35–45, 45–55, and 55–65 years) with 40 individuals (20 males and 20 females) in one subgroup. Subjects having their maxillary and mandibular teeth with no caries, restorations, severe attrition, mobility, extrusion, or any obvious deformities were included in the study. Whereas, individuals with history of congenital anomalies, lip trauma, oral and maxillofacial surgery, or subjects who are undergoing or had orthodontic treatment were excluded from the study.

After taking consent, the subjects were seated in the dental chair with their head and back in an upright position and the measurements were recorded. This was done using a digital Vernier caliper (Elektronische digitale schieblehre) to the nearest tenth of a millimeter for specified measured dimension in each subject. The caliper had two edges, external and internal; the internal edges were used for the measurement to avoid lip distortion.

For recording measurements of maxillary anterior teeth in patients at rest position, the visible portions of anterior teeth were measured vertically from the lower border of the upper lip to the incisal edges of the incisors (cusp tip for the canines) at the midpoint of the tooth in the rest position (when the lips and the lower jaws were in the rest position) (Fig. 1).

Likewise for the mandibular teeth, measurements were made from the upper border of the lower lip to the

incisal edge of the incisors (the cusp tip for the canines) at the midpoint of the tooth in rest position (Fig. 2). The measurement was considered to be zero if the tooth could not be seen regardless of how short it was. Three measurements per tooth were made and the mean was calculated. The length of the upper lip was measured from the base of columella to the tip of philtrum at the midline of the face (Fig. 3). The results were statistically analyzed
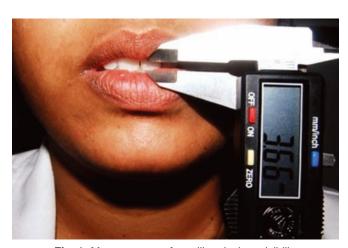

Fig. 1: Measurement of maxillary incisor visibility

Fig. 2: Measurement of mandibular incisor visibility

Fig. 3: Measurement of lip length

using unpaired t-test with Statistical Package for the Social Sciences (SPSS) software version 17 (Tables 1 to 3).

A questionnaire (Fig. 4) was prepared to conduct a survey among prosthodontists in Ernakulum district and postgraduate students in five colleges in and around Ernakulum district, Kerala, to evaluate the individual perspective of the amount of visibility maintained during jaw relation for different patients in these age groups according to their esthetic views. The survey was

Table 1: Comparison of lip length, mean maxillary visibility, and mean mandibular visibility among males and females in the age group of 35 to 44 years

Variable	Males	Females	p-value
Lip length	19.49±4.13	16.86±3.38	0.034
Mean maxillary visibility	1.67±1.62	2.75±1.19	0.021
Mean mandibular visibility	0.28±0.64	0.04±0.09	0.97

From the above table, it was found that the mean maxillary visibility in females under the age group of 35 to 44 years was significantly greater than males

Table 2: Comparison of lip length, mean maxillary visibility, and mean mandibular visibility among males and females in the age group of 45 to 54 years

Variable	Males	Females	p-value
Lip length	17.73±4.37	17.04±3.72	0.588
Mean maxillary visibility	0.25±0.12	0.56±0.55	0.016
Mean mandibular visibility	1.73±1.29	1.98±0.92	0.485

From the above table, it was found that the mean maxillary visibility in females under the age group of 45 to 54 years was significantly greater than males

Table 3: Comparison of lip length, mean maxillary visibility, and mean mandibular visibility among males and females in the age group of 55 to 65 years

Variable	Males	Females	p-value
Lip length	17.80±3.57	17.83±3.27	0.980
Mean maxillary visibility	1.50±0.95	1.80±0.75	0.262
Mean mandibular visibility	0.44±0.42	0.82±0.40	0.05

From the above table, it was found that the mean maxillary visibility in males under the age group of 55 to 65 years was significantly greater than females

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SERIAL NO:
SEX: M/F

ANNOOR DENTAL COLLEGE AND HOSPITAL
MUVATTUPUZHA
DEPARTMENT OF PROSTHODONTICS
Topic: Esthetic Visibility of Anterior Teeth in Operator Perspective: A Cross-sectional Survey
Years of Experience: a) 1 year
b) 1–5 years
c) 5–10 years
d) more than 10 years

Questionnaire

Anterior visibility of occlusion rims at resting lip position:

1. Do you consider lip length as a criteria in determining anterior visibility of maxillary occlusion rim?
   a) Yes
   b) No
2. Do you like to keep similar visibility for patients within the age range of 35–65 years.
   a) Yes
   b) No
3. Do you like to keep the visibility same for both male and female within the same age group.
   a) Yes
   b) No
4. If no, what will be the value for the visibility you will suggest for the following

		Male	Female
35–44 years	0 mm		
	1 mm		
	2 mm		
	3 or more		
45–54 years	0 mm		
	1 mm		
	2 mm		
	3 or more		
55–65 years	0 mm		
	1 mm		
	2 mm		
	3 or more		

5. Which of the following method, from your practical experience, will provide a more esthetic result if it is taken as a base value.
   a) Visibility at resting lip position
   b) Visibility during speech
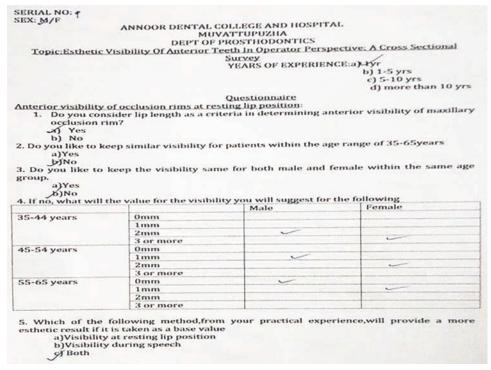   c) Both

Fig. 4: Questionnaire survey format

Fig. 5: Questionnaire survey

Table 4: Anterior visibility of maxillary occlusion rims according to the esthetic perspective among various prosthodontists

Age group	Males	Females
35–44	2 mm	≥ 3 mm
45–54	2 mm	2 mm
55–65	0 mm	2 mm

conducted through direct interview, telephone calls, and e-mails (Fig. 5) and the results were compiled, analyzed, and a conclusion was derived (Table 4).

RESULTS

There was a significant difference in the visible amounts of teeth with lips at rest between the sexes. The females significantly displayed more of the maxillary central incisor, lateral incisor, and canine. At rest, females significantly displayed more of the maxillary central incisor (2.93 ± 1.57 mm; $p = 0.003$), lateral incisor (1.87 ± 1.12 mm; $p = 0.005$), and canine (0.59 ± 0.62 mm; $p = 0.031$). Subjects with shorter upper lip significantly displayed more maxillary anterior incisor than subjects with longer upper lip ($p < 0.001$).

Also, as age advances, it was found that the visibility of anterior maxillary teeth significantly decreased ($p < 0.001$) and mandibular teeth increased ($p < 0.001$) at rest position.

According to the esthetic perspective among various prosthodontists, the anterior visibility of maxillary occlusion rims for 35 to 44 years males is 2 mm while for females it is ≥ 3 mm; for 45 to 54 years males and females it is 2 mm; for 55 to 65 years males is 0 mm and females is 1 mm (Table 4).

DISCUSSION

The present study was conducted to investigate the effect of parameters like gender, age, and lip length on the visibility of maxillary and mandibular anterior teeth surfaces in subjects of different age groups when the lips are at rest and to compare the results obtained with the esthetic perspectives of various prosthodontists and postgraduate students.

Variations in tooth display have been reported between subjects of different age and gender.[7] The amount of display of anterior teeth has been generally overlooked by restorative dentists as an element of esthetic assessment.[8] Al-Wazzan[6] and Al-Habahbeh et al[9] found no significant gender difference in the display of maxillary central incisor at rest.

In addition, it has been reported in a survey conducted in adolescents that females displayed more maxillary incisor clinical crown length compared to males, with lips at rest.[15] These findings were in agreement with the present study, although some variations may need to be explained by differences in measuring techniques and difference between the populations studied. In the present study, males displayed more of the mandibular anterior teeth at rest as compared to females; a similar result was found by Brundo.[8] Also in the present study, it was found that the amount of maxillary anterior teeth exposed significantly decreased with increasing age

(p < 0.001), and the amount of mandibular anterior teeth exposed significantly increased with increasing age (p < 0.001).

Esthetic considerations could become a major concern for patients seeking prosthodontic services in the future. Traditionally, prosthodontists have been taught to evaluate facial esthetics to restore overall harmony to the face. Anterior tooth selection and arrangement for removable dentures usually depends on the clinician's experience. The arrangement of the anterior teeth should be individualized to the patient's esthetic needs while considering patient's age, gender, race, and lip length.[6]

People with short upper lips display more maxillary tooth structure than people with long upper lips. This seems axiomatic, but surprisingly some dentists still set the anterior teeth to display 1 to 2 mm of the maxillary incisors regardless of lip length, since this is an accepted rule. This study showed people with short upper lips significantly displayed the maximum maxillary anterior teeth surface, while people with long upper lips displayed more mandibular anterior teeth. This is in agreement with previous studies.[6,8]

For complete denture patients, a guideline was suggested to adjust the vertical length of the maxillary occlusion rim in the anterior region by extending it approximately 2 mm below the relaxed lip to establish the lip length–incisal edge relationship and accordingly the visible amount of the anterior teeth. The visible amount of anterior teeth can be one of the helpful guidelines for determining the appropriate vertical dimension of occlusion.[16,17] Another point of view of treating all the patients using the same therapeutic values regardless of age differences is not acceptable, since it contributes greatly to the obvious denture look.[8]

This general guideline will be more accurate if the patient's age, gender, race, and upper lip length are considered as variables that may affect the visible amount of tooth at rest. Esthetic perception of smiles varies from person to person and is influenced by their personal experience and social environment. For this reason, professional opinion regarding evaluation of smile esthetics may not coincide with the perception and expectation of patients.[17,18] Gender and level of education also has an impact on esthetic perception.[19]

CONCLUSION

From the study conducted it can be suggested that anterior teeth visibility is influenced by various factors like age, gender, muscle, and esthetic perspective of different operators. These factors can be considered while providing esthetic prosthodontic treatment that involves replacement of anterior teeth.

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