Smile Esthetics: Age Related Changes, and Objective Differences between Social and Spontaneous Smiles

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Objective: *To evaluate the importance of age in orthodontic treatment by studying the dependence of smile and resting parameters on age and to expose differences between social and spontaneous smiles.* ***Materials and Methods:*** *Subjects consisted of 67 individuals aged between 17 and 55. The video recordings were transferred to a computer. 200 still frames were captured for each individual. 50 were captured in resting position, 50 during speech, 50 for social, and 50 for spontaneous smiles. One picture was selected from each group based on how pictures reflected the desired point ANOVA and Scheffe Post-hoc tests were performed on smile measurements.* ***Results:*** *In all the resting parameters, statistically significant differences were observed among age groups. Also, the response of these parameters to age differs between men and women. Statistically significant differences were found in some smile parameters among different age groups, for both smile types. We find significant differences between social and spontaneous smiles.* ***Conclusion:*** *Age related alterations should be taken into consideration during treatment planning, especially in women. Due to its high consistency, there are advantages with using a spontaneous smile in soft-hard tissue evaluations. We also emphasize the necessity to take dynamic registrations for a true functional evaluation.*

Keywords: *smile esthetics, spontaneous smile, Duchenne smile, social smile.*
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INTRODUCTION

The evaluation of variations in soft and hard tissue relationships is one of the most important issues in diagnosis, treatment planning and treatment success.[1-3] Apart from static assessment, dynamic registration of soft tissues during various functions (smiling, speech, etc) has gained prominence.[4-13] Smile appears in two forms in the literature: Social smile (also called conscious smile, posed smile, or forced smile) and spontaneous smile (also called unconscious smile, Duchenne smile, or smile of joy). Unlike a social smile, which is considerably influenced by emotional state, a spontaneous smile occurs only under specific emotions.[4] Therefore; its consistency is relatively high - while social smile has higher reproducibility.[4]

Apart from profile views, static and functional evaluations should also be made from vertical and frontal views in the evaluation of smile.[9,10] Changes that occur in soft tissues due to aging are very important in the evaluation of soft and hard tissue relationships, especially when smile esthetics are considered.[3,6,7,17]

Because of the increasing emphasis on soft tissues in recent orthodontic diagnosis and treatment practices, an effective recording method is needed for the evaluation of soft tissues. Therefore, video recording entered orthodontic practice. Videographic imaging enables the evaluation of speech and smile functions, in addition to oral and pharyngeal functions. Video recordings also provide the opportunity to select images that best reflect the specified function among numerous frames that are obtained over a period of time.[5,8,10-13]

The aim of this study is to evaluate the importance of age in orthodontic treatment by studying the dependence of smile and resting parameters on age. Another aim is to expose differences between social and spontaneous smiles.

MATERIAL AND METHOD

This study was conducted on 67 individuals from the Ege University staff and close relatives of patients treated by the Department of Orthodontics of the Faculty of Dentistry at Ege University aged between 17 and 55. Subjects were divided into three subgroups according to age: Group A (ages 17 through 25; 26 individuals, 14 men, 12 women), Group B (ages 26 through 37; 20 individuals, 10 men, 10 women) and Group C (ages 38 through 55; 21 individuals, 10 men, 11 women).

Inclusion criteria were: Individuals who (1) volunteered for participation with full information and consent; *and* those without (2) communication problems (who don't show

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any delayed response to verbal stimulants), without (3) skeletal abnormality; (4) missing teeth or prosthetic restoration in the smile zone; (5) face asymmetry and deformity; (6) heavy coloring, hypoplasia, and deformity on teeth; (7) abrasion, fracture or severe crowding of the teeth, and (8) scars or color variations on the face.

Before recordings were taken, subjects were informed and motivated about the process in order to help simplify the recording phase. Video recordings were taken under natural light during specific times of the day (10.30-14.00) so that light conditions could be standardized. All recordings of the same subject were taken on the same day, within a single recording session. The (digital) video camera (Sony Cybershot DSC- W 270) was mounted at about 1 meter distance from the subject. Recordings were made by focusing on the head area, keeping the lens of the camera at the mouth level. The lens was carefully kept parallel to the individual's estimated vertical plane which is perpendicular to the ground plane.[22] The calibration glasses were prepared to be as light as possible so that a spontaneous smile could be obtained ideally. During recording, the resting position, speech, social smile and spontaneous smile were captured. Videos of resting positions were obtained after few seconds of full relaxation, followed by pronunciation of the word 'EMMA'.[14]

A specific sentence is often utilized in the literature for the recording of social smile and speech.[5,9] We formed an equivalent of this sentence in the native language of the subjects. This sentence included almost all phonemes. Using full sentences is advantageous compared to using single words, since pronunciation of a given word isn't independent of the sentence it is used in (this is known as the coarticulation effect).

In order to obtain the subject's spontaneous smile, we made him/her repeat funny sentences immediately following a period of formal interaction, such as the recording of resting position. The aim was to render the funny sentences

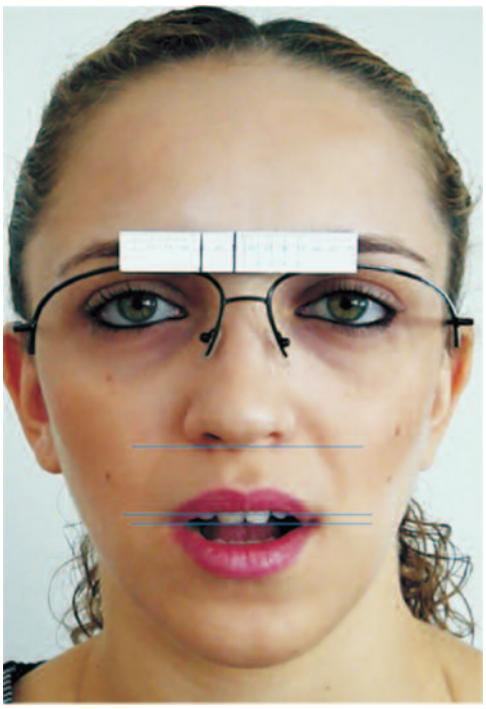

Figure 1. Measurements on the rest frame—Upper Lip Length at Rest, Maxillary Incisor Display at Rest, and Mandibular Incisor Display at Rest (It was considered 0 mm when it was not visible).

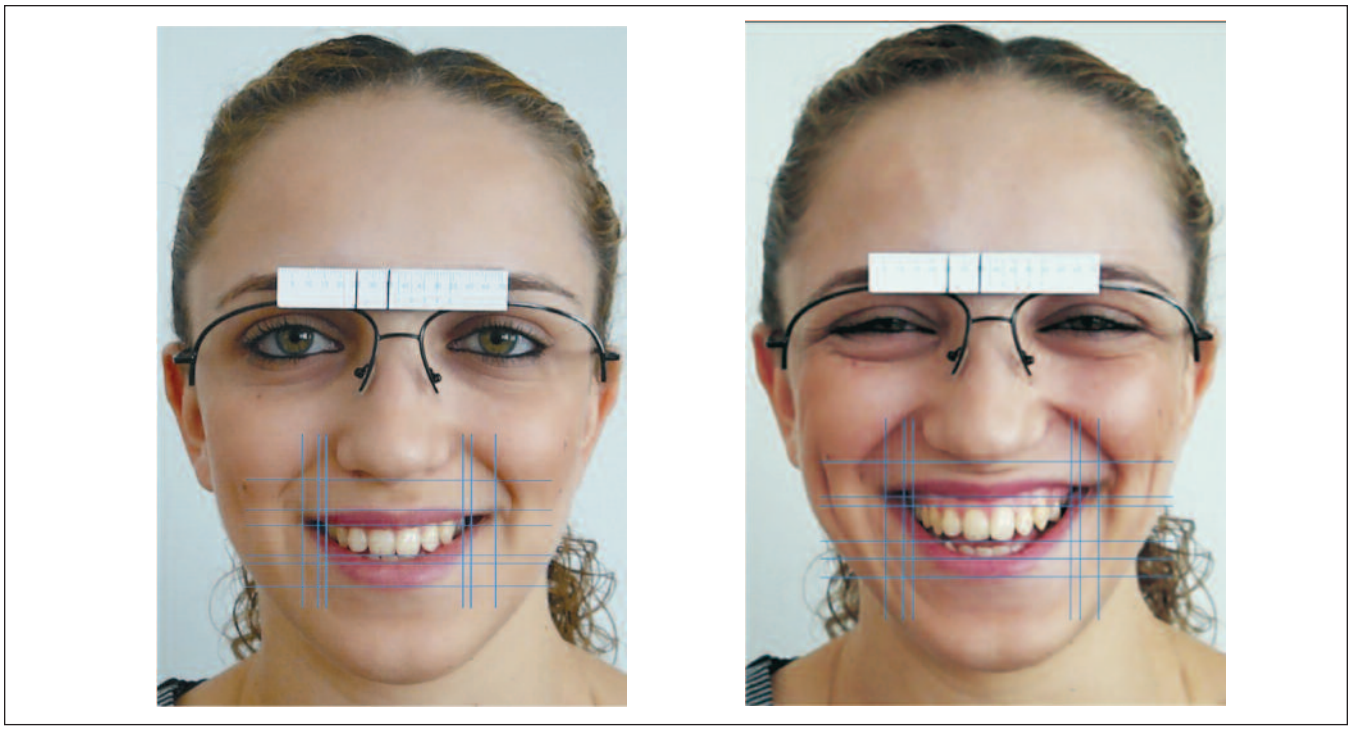

Figure 2. Measurements made on the social smile frame (Left) and spontaneous smile frame (right)—Upper Lip Length during Smiling, Upper Lip Thickness, Maxillary Incisor Display during Smiling, Smile Width, Inner Intercommissural Width, Buccal Corridor Left and Right, Maxillary Gingival Display, Lower Lip Thickness, Subnasale (Sn) to Maxillary Incisor Distance, Smile Height, Lower Lip to Maxillary Incisor Distance, Visible Dentition Width.

unexpected, and we have observed this procedure to be particularly effective for obtaining spontaneous smiles.

The video recordings were transferred to a computer and 200 frames were captured for each individual. 50 were captured in resting position, 50 during speech, 50 for social, and 50 for spontaneous smiles. One picture was selected from each group based on how pictures reflected the desired function (Figure 1 and Figure 2). These images were transferred to Dolphin Imaging V 10.5 (Dolphin Imaging and Management Solutions, Chatsworth, CA) and measurements were made (Table I). Additionally, abnormal soft-hard tissue relationships in various functions (tongue impulsion during speech, mandibular deviation during smile, phonetic problems) were noted.

Table I. Measurements used for comparing different smile types and changes within different age groups

Measurements on Rest Frames	***Description***
Maxillary Incisor Display at Rest	Amount of vertical display of the maxillary central incisors at rest
Mandibular Incisor Display at Rest	Amount of vertical display of the mandibular central incisors at rest
Upper Lip Length at Rest	With mandible and lips in rest position, distance from subnasale to inferior border of upper lip
Measurement made on Smile Frames	***Description***
Smile Width	Intercommissure width as measured by distance between left cheilion to right cheilion during smiling
Visible Dentition Width	Distance from the most lateral aspect of the most visible maxillary posterior tooth on the right and left sides
Visible Dentition Width / Smile Width	Visible dentition width divided by smile width
Smile Height	Interlabial gap as measured by distance from upper stomion to lower stomion during smiling
Smile Index	Smile width divided by smile height
Upper Lip Length during Smiling	Distance from subnasale to inferior border of upper lip during smiling
Upper Lip Length during Smiling / Upper Lip Length at Rest	Upper lip contraction during smiling: the ratio of upper lip smiling length to actual upper lip length
Upper Lip Thickness	Vertical distance from the most superior margin of the upper lip to the most inferior portion of the tubercle of the upper lip
Sn to Incision Distance	Distance from subnasale to incisal edge of maxillary central incisor
Upper Lip Length during Smiling / Sn to Incision Distance	Lip curtain over incisors during smiling: upper lip length during smiling divided by subnasale to incision distance
Maxillary Incisor Display during Smiling	Distance measured between most superior and inferior points on maxillary central incisor crowns during smiling
Amount of vertical display of the maxillary central	incisors during smiling
Inner Intercommissural Width	Horizontal distance between right inner commissure to left inner commissure
Buccal Corridor Ratio	Difference between visible maxillary dentition width and inner commissure width divided by inner commissure width
Lower Lip Thickness	Vertical distance from the deepest midline portion of the superior margin of the lower lip to the most inferior portion of the lower lip
Lower Lip to Maxillary Incisor Distance	Vertical distance from the incisal edge of the maxillary right central incisor to the deepest midline point on the superior margin of the lower lip
Buccal Corridor Right	Horizontal distance from the most lateral aspect of the right most posterior visible tooth to the right inner commissure
Buccal Corridor Left	Horizontal distance from the most lateral aspect of the left most posterior visible tooth to the left inner commissure
Commissure Corridor Left	Horizontal distance from the left inner commissure to the left outer commissure
Commissure Corridor Right	Horizontal distance from the right inner commissure to the right outer commissure

Table II. Descriptive statistics for the variables in the 67 subjects

Variables	N	Mean (mm)	SD
Smile Width	67	61.08	5.43
Visible Dentition Width	67	48.41	4
Visible Dentition Width / Smile Width	67	0.79	0.48
Smile Height	67	8.76	2.06
Smile Index	67	7.32	1.71
Upper Lip Length during Smiling	67	16.16	2.85
Upper Lip Length at Rest			
Upper Lip Length during Smiling /	67	0.78	0.1
Upper Lip Length at Rest	67	20.7	2.39
Maxillary Incisor Display at Rest	67	2.16	1.83
Maxillary Incisor Display during Smiling	67	7.26	1.8
Upper Lip Thickness	67	4.83	1.39
Sn to Maxillary Incisor Distance	67	23.38	3.26
Upper Lip Length during Smiling / Sn to Maxillary Incisor Distance	67	0.69	0.073
Lower Incisor Display at Rest	67	1.69	1.68
Maxillary Gingival Display	67	0.04	0.2
Intercommissural Width	67	53.47	4.25
Buccal Corridor Ratio	67	0.09	0.03
Lower Lip Thickness	67	8.74	1.34
Lower Lip to Maxillary Incisor Distance	67	1.66	2.02
Buccal Corridor Left	67	2.48	1.27
Buccal Corridor Right	67	2.71	1.35
Commissura Left	67	3.95	1.52
Commissura Right	67	3.72	1.38

Statistical Analysis

Statistical distribution of each of our parameters was analyzed. Skewness and kurtosis values were between -1 and +1, hence compatible with a normal distribution. A statistical significance (alpha) level of 0.05 was used for all statistical analysis. Numerous analysis of variance (ANOVA) tests were performed on our numeric measurements by using age group (A-B-C) as the between-groups factor with the dependent variables. When statistical significance was detected in ANOVA, a Scheffe Post-hoc test was performed in order to determine which groups caused the difference. The numeric measurements of either social or spontaneous smiles of 20 randomly selected subjects were repeated after 1 month by the same researcher. It was found that the Pearson correlations between the two sets of measurements were high, between 0.97 and 0.99.

RESULTS

The results of the study are presented in Tables II-VI. Descriptive statistics are reported in Table II.

In all the resting parameters, statistically significant differences were observed between age groups. The difference in upper lip length at rest between age groups -from 20.35 mm to 21.80 mm- was found to be statistically significant ($p=0.046$) (Table III). The upper lip length at rest in Group C was found to be highest. The most prominent difference was between Group A (20.35 mm) and Group C (21.8mm) ($p=0.034$).

Maxillary incisor display at rest decreased with age ($p<0.001$) and it was highest in Group A (2.96 mm). The

Table III. Rest frame analysis results for measurements by age group

Variables	Age Groups	N	Mean (mm)	SD	P Value	F	Post Hoc / P Value
	A: 17-25	26	20.35	2.31	0.046	2.569	A/C:0.082
Upper Lip Length at Rest	B: 26-37	20	20	2.76			B/C:0.034
	C: 38-55	21	21.8	1.75			
	A: 17-25	26	2.96	1.79	0.00001	8.635	A/C:0.0001
Maxillary Incisor Display at Rest	B: 26-37	20	2.51	1.77			B/C:0.005
	C: 38-55	21	0.84	1.13			
	A: 17-25	26	1.13	1,.38	0.005	6.120	A/C:0.037
Mandibular Incisor Display at Rest	B: 26-37	20	1.37	1.48			B/C:0.091
	C: 38-55	21	2.54	1.87			

Table IV. Social smile frame analysis results for measurements by age group

Variables	Age Groups	N	Mean (mm)	SD	P Value	F	Post Hoc / P Value
	A: 17-25	26	48.34	3.81	0.009	5.790	B/C:0.009
Visible Dentition Width	B: 26-37	20	46.56	3.2			
	C: 38-55	21	50.27	4.24			
	A: 17-25	26	52.85	3.72	0.015	1.920	A/C:0.089
Intercommissural Width	B: 26-37	20	52.32	4.43			B/C:0.045
	C: 38-55	21	55.35	4.27			

Table V. Spontaneous smile frame analysis results for measurements by age group

Variables	Age Groups	N	Mean (mm)	SD	P Value	F	Post Hoc / P Value
	A: 17-25	26	52.49	4.22	0.006	5.5	A/B:0.035
Visible Dentition Width	B: 26-37	20	49.39	3.77			B/C:0.008
	C: 38-55	21	53.17	3.38			
	A: 17-25	26	9.93	1.28	0.0002	9.59	A/B:0.0002
Maxillary Incisor Exposure during Smiling	B: 26-37	20	8.22	1.67			A/C:0.021
	C: 38-55	21	8.83	1.08			
	A: 17-25	26	1.87	1.49	0.023	4.02	B/C:0.019
Buccal Corridor Right	B: 26-37	20	2.48	1.43			
	C: 38-55	21	1.25	1.07			
	A: 17-25	26	0.06	0.03	0.055	3.05	B/C:0.084
Buccal Corridor Ratio	B: 26-37	20	0.08	0.03			
	C: 38-55	21	0.06	0.03			
	A: 17-25	26	0.55	0.07	0.007	5.41	A/B:0.006
Upper Lip Length during Smiling /	B: 26-37	20	0.61	0.06			
Sn to Maxillary Incisor Distance	C: 38-55	21	0.58	0.06			

Table VI. Differences between social and spontaneous smiles (JOY) for each variable

Variables	Smile Model	N	Mean (mm)	Std. Deviation	P Value
Smile Width	Social	67	61.085	5.43	***
	Joy	67	64.95	5.15	
Visible Dentition Width	Social	67	48.41	4	***
	Joy	67	51.78	4.1	
Visible Dentition Width /	Social	67	0.794	0.048	***
Smile Width	Joy	67	0.798	0.047	
Smile Height	Social	67	8.76	2.06	***
	Joy	67	15.15	4.05	
Smile Index	Social	67	7.32	1.71	***
	Joy	67	4.62	1.4	
Upper Lip Length during Smiling	Social	67	16.16	2.85	***
	Joy	67	13.87	2.34	
Upper Lip Length during Smiling/	Social	67	0.78	0.1	***
Upper Lip Length at Rest	Joy	67	0.67	0.08	
Upper Lip Thickness	Social	67	4.83	1.39	***
	Joy	67	4.13	1.38	
Upper Lip Length during Smiling/	Social	67	0.69	0.073	***
Sn to Maxillary Incisor Distance	Joy	67	0.58	0.073	
Maxillary Incisor Exposure during Smiling	Social	67	7.26	1.8	***
	Joy	67	9.07	1.52	
Maxillary Gingival Exposure	Social	67	0.04	0.26	**
	Joy	67	1.04	1.42	
Buccal Corridor Right	Social	67	2.71	1.35	***
	Joy	67	1.86	1.41	
Buccal Corridor Left	Social	67	2.48	1.27	***
	Joy	67	1.99	1.37	
Buccal Corridor Ratio	Social	67	0.09	0.039	***
	Joy	67	0.07	0.037	
Commissure Corridor Right	Social	67	3.72	1.38	
	Joy	67	4.54	1.69	***
Commissure Corridor Left	Social	67	3.95	1.52	***
	Joy	67	4.63	1.64	
Lower Lip Thickness	Social	67	8.74	1.34	***
	Joy	67	7.78	1.21	
Lower Lip to Maxillary Incisor Distance	Social	67	1.66	2.02	***
	Joy	67	6.24	3.94	

****p<0.001, **p<0.01*

difference between Group A and Group C ($p<0.001$) and the difference between Group B and Group C ($p=0.005$) were statistically significant.

Mandibular incisor display at rest increased with aging ($p=0.005$). The difference between Group A and Group C was significant ($p=0.037$) and the mandibular incisor display was highest in Group C (2.54 mm).

We also examined how the resting upper lip length changed with differences in gender and age. The increase due to aging was more in women ($p<0.001$), from 19.2 mm to 22.2 mm. The difference in upper lip length at rest was statistically significant between Group A and Group C ($p=0.001$) and also between Group B and Group C ($p=0.001$) in women.

The decrease with age in maxillary incisor display at rest was also more in women ($p<0.001$). While this decline was from 3.69 mm to 0.91 mm in women, it was from 2.35 mm to 0.73 mm in men. This decrease in women is statistically significant between Groups A and C ($p<0.001$) and between Groups B and C ($p=0.012$).

The increase of mandibular incisor display at rest differed between genders. This increase was more in men ($p=0.013$). While this increase was from 1.2 mm to 4 mm in men, it was from 1 mm to 1.7 mm in women. The increase in men was statistically significant between Group A and Group C ($p=0.015$) and between Group B and Group C ($p=0.043$).

As for smile parameters, the difference in visible dentition width ($p=0.009$) and inner intercommissural width ($p=0.015$) (Table IV) were statistically significant between age groups. The visible dentition width was highest in Group C. Also, the difference between Group B (46.5 mm) and Group C (50.2mm) was statistically significant ($p=0.009$). The increase in inner intercommissural width with age was significant as well ($p=0.015$). The increase between Group B and C was statistically significant ($p=0.045$) and the increase was from 52.32 mm to 55.35 mm (Table IV).

In all parameters, there was a statistically significant difference between social and spontaneous smiles ($p<0.001$). Some of these parameters increased, and others decreased with age. All details are provided in Table VI.

The differences in spontaneous smile parameters between different age groups are shown in Table V. Statistically significant differences were found in lip curtain over incisors ($p=0.007$), visible dentition width ($p=0.006$), maxillary incisor exposure during smiling ($p<0.001$) and buccal corridor right ($p=0.023$). Although not statistically significant ($p=0.055$), buccal corridor ratio decreased moving from group B (0.088) to C (0.061). The results of Post-Hoc analysis conducted to assess the source of these differences are shown in Table V.

DISCUSSION

Obtaining a spontaneous smile is nearly impossible using static methods (photographs). Using video recordings, the moment of smile can be precisely isolated. Hence, more accurate measurements can be taken using frames captured from video records. Therefore, videos have been finding more widespread use.[4-13,25] Sarver *et al*.[9,10] emphasized the importance of functional evaluation, and suggested that using video recordings increased reproducibility. Van der Geld *et al*.[28] obtained spontaneous smile using video recordings, which also enable functional analysis through the recording of speech, besides smile.[7,8] On the other hand, according to Schabel *et al.* a clinical photograph is adequate for analyzing the smile after orthodontic treatment. Regardless of whether static or dynamic records are used to capture smile, the resultant image is only as good as the clinician's ability to capture it accurately.[28] In our study, both spontaneous and social smiles were obtained using digital video records.

Although the methods previously used in the literature for obtaining spontaneous smile might seem efficient,[4,7,8,11] it is obvious that there is need for a faster and more effective method in the clinical process. In our study, ideal spontaneous smile was obtained by the pronunciation of funny sentences. This was in contrast to the previous practice of using funny videos. The usage of funny videos during recording[4,8,11] involves a longer process, makes the subjects self-conscious and causes them to conceal their genuine smiles. In studies of smile esthetics, reproducibility of social smile was increased using video recordings.[5,9,13,25] However, the fact that social smile is influenced by emotional state continues to raise concern.

According to Sarver,[3] the soft tissue relationships of the face in regard to underlying hard tissue are now primary determinants of the direction of the orthodontic treatment, so orthodontics and facial esthetics should be considered concurrently. Patients are examined in 3 different dimensions (frontal, sagittal and transverse) in orthodontic treatment planning. Recently, orthodontists have also focused on changes in soft-hard tissue relationships with aging as fourth dimension.

In orthodontic diagnosis and treatment planning based on soft-hard tissue relationships and their changes with age, some authors focus on resting position, whereas others emphasize the importance of changes observed in smile esthetics over time. Burstone preferred ideal resting incisor display (also known as youthful appearance) to smiling evaluations. According to Burstone, the reproducibility of a smile is low; forming an obstacle to efficient evaluation.[16] Dong *et al*.[18] stated that age related changes in maxillary and mandibular incisor displays in rest position were more dramatic than changes in smile parameters. Age related changes in incisor display during speech, or with relaxed lips are much more noticeable than age related changes in smile.[18] According to Van der Geld *et al*.[7] the decrease due to age in lip line height in spontaneous smiles was relatively small compared to the change in the same variable in natural position. In functions where more muscle activity is needed, such as spontaneous smiling, age related effects diminish.[24] We found statistically significant differences between age groups in 4 parameters (among 20) in spontaneous smiles (Table V) and in 2 parameters in social smiles.

The fibrous attachments positioned between the superfi-

cial layer of the lip and the bases of the nose and mentolabial folds involutes and weaken with age. This promotes lip lengthening.[20,15] Desai *et al.*[6] found an increase of 1.11 mm in resting upper lip length with increasing age. Similarly, we found a statistically significant increase (1.8 mm) in resting upper lip length due to aging (Table III). Formby *et al.*[23] observed a 0.83 mm increase in upper lip length at rest between 18-42 years. Ibiher *et al.*[19] analyzed changes in upper lip dimensions with the aid of MRI, and found that there was an increase of 2.5 mm in upper lip length and a decrease of 2 mm in upper lip thickness with increasing age. This was due to the proportional change in upper lip thickness and length, rather than a change in volume. We found an increase of 3 mm in resting upper lip length between the youngest and oldest group among women ($p<0.001$). This shows that the volumetric alterations in soft tissues occur faster and stronger in women.

An increase of 2.12 mm was observed in maxillary incisor display at rest ($p<0.001$). This finding conforms to Dong *et al*.[18] These authors found a 2.5 mm decrease with age in maxillary incisor display at rest. Vig and Brundo[17] declared that the maxillary incisor display at rest decreased gradually in between individuals younger than 30 years (3.5 mm) and older than 60 years (0 mm). Behrents[30] observed a clockwise rotation of the nasolabial complex, resulting in a longer upper lip. Also this leads to decrease in incisor display at rest and on smile. Maxillary incisor display at rest is different between men and women.[17,26] Although maxillary incisor display is greater in women than men at every age,[17] the decrease in maxillary incisor display due to aging is greater in women (2.78 mm decrease in women compared to 1.63 mm decrease men, $p<0.001$). This is perhaps due to the relative rapidness of aging in women. Dickens *et al.*[31] demonstrated a decrease in incisor display at rest over time in both males and females. But they found males experience greater loss of maxillary incisor display than females. Torlakovic *et al.*[27] found that aging of the soft tissue profile of women occur more between the second and third decades of life, but between the third and fourth decades of life in men. Despite this 10 year difference in aging, when the changes do occur, they are of greater magnitude.

Mandibular tooth display increased in the rest position where the least perioral muscle activity is present, due to sagging of the lower lip with age.[7] Vig and Brundo[17] stated that the mandibular incisor display increased with age, so that mandibular incisor display after age 60 almost equaled maxillary incisor display before age 30. Dong *et al*.[18] found that the increase in mandibular incisor display accompanies the decrease in maxillary incisor display. Our study verifies this, finding an increase of 1.41 mm. It was confirmed that mandibular incisor display is greater in men than women during the rest position.[17] Unlike other resting parameters, the change was more pronounced in men in terms of mandibular incisor display at rest.

An increase of 3.7 mm in visible dentition width, and an increase of 2.5 mm in inner intercommissural width during smiling between age groups was observed. This is in accordance with the results of Desai *et al*.[6] suggesting that smile widens transversely as a person ages. They also found that some vertical measurements of smile decrease with age. We found a 1.5 mm decrease in smile height, but this was not statistically significant. This can be explained by the decreased activity and function of the muscles which are involved in smile, due to aging. Kapagiannidis *et al*.[29] studied the effects of aging on premolar display during smiling. They found that there was no gradual decrease in premolar display during smiling with age.

There are some studies in the literature that reveal the differences between social and spontaneous smiles. The main difference of the current study is that we studied the effects of a larger number and a larger variety of parameters compared to previous studies. Van der Geld *et al*.[8] analyzed differences in tooth display, lip-line height, and smile width between the social smile and the spontaneous (Duchenne) smile. We studied and revealed this difference more comprehensively. Results are summarized in Table VIII.

It should be kept in mind that the evaluation of smile esthetics alone is not sufficient in orthodontic diagnosis and treatment planning. A comprehensive orthodontic diagnosis should be concluded with the aid of rest position and speech recordings.

CONCLUSIONS

- Esthetic goals should be long term for complete treatment success, and age related alterations should be taken into account both in resting and smiling, especially in women.
- There are important differences between social and spontaneous smiles. These differences should be kept in mind during decision making and smile evaluation.
- It is necessary to take dynamic registrations for a complete and precise functional evaluation.
- Due to its high consistency, there are advantages with using spontaneous smile in soft-hard tissue evaluations.

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