

AAO Foundation Award Final Report

Type of Award	Biomedical Research Award
Principal Investigator	Nada M. Souccar
Title of Project	Volumetric Analysis of the midface and lips at rest and upon smile in females and males of various ages and ethnic backgrounds
Period of AAOF support	7-1-2016 to 12-15-2017 (no cost extension granted in 5-2017)
Amount of Funding	\$30,000
Summary/Abstract (250 words max)	<p>Objectives: The objective of this study was to perform a volumetric analysis of the face at rest and upon smile in adult females (f) and males (m) of African American (AA) and Caucasian (C) descent.</p> <p>Methods: The faces of 100 AAf, 100 Cf, 100 Cm and 100 AAm equally distributed in five age groups [20-30], [31-40], [41-50], [51-60], [61-70] were studied. Three-dimensional surface images were acquired (3dMD system-3dMDface, Atlanta, Ga). The upper lip, lower lip, right midface and left midface at rest and at smile were extracted on each subject, and their volumes calculated using the Aging Evaluation Analysis software (Eotech, Paris, France). Additionally, linear lip dimensions at rest and upon smile as well as incisor crown and gingival display upon smile were measured (3dMDvultus, Atlanta, GA) for a smile analysis. Descriptive statistics for all variables and groups were calculated. A two-way ANOVA was used to evaluate the effects of age, race and their interaction on the outcomes of interest including lip volumes, linear lip/teeth dimensions and midface volumes. All post-hoc tests were conducted using a Tukey-Kramer method. The changes of these outcomes from rest to smile were also examined using the method described above.</p> <p>Results:</p> <p>Lip volume</p> <p>In females, race was associated with lower lip volume at rest and upon smile ($p < 0.0001$), with AAf having overall larger lip volumes than Cf. Both age and race were significantly associated with upper lip volume at rest and upon smile ($p < 0.05$). The upper lip volume increased with age for both races but and was overall smaller for Cf. There was a significant difference in the change of upper lip volume from rest to smile among age groups ($p < 0.05$) but not between races. A greater degree of change was observed in age groups 20-30 and 31-40 as compared to 61-70. Lower lip volume from rest to smile was significantly associated with both race and age ($p < 0.05$). AAf showed a greater change than Cf, and a decreasing trend was</p>

observed with age.

In males, both race and age were associated with upper and lower lip volumes at rest and upon smile ($p < 0.05$). AAm exhibited much larger lip volumes than Cm at rest and upon smile, and a positive trend between age and lip volumes at rest and upon smile was observed. The upper lip volume change from rest to smile was significantly different between races, with African Americans showing a greater degree of change ($p = 0.016$). Both race and age were significant for lower lip volume change ($p < 0.05$). The change in volume tended to decrease with age and was greater in AAm.

Smile Analysis

In females, significant racial differences were observed for upper lip length, mouth width and lower lip length at rest and upon smile ($p < 0.0001$). AAf exhibited longer lip lengths and mouth widths than Cf. Both age and race affected gingival display ($p < 0.05$), however crown length was affected only by age ($p < 0.0001$). Gingival display and crown length showed a general decreasing trend with age, with Cf displaying longer crown length than AAf. The change in mouth width from rest to smile was different between age groups but at marginal significance ($p = 0.048$).

In males, upper lip length and mouth width at rest differed between age and racial groups ($p < 0.05$). Lip length changed with age and mouth width was broader in AAm than in Cm. The interaction between race and age was significant for lower lip length at rest ($p = 0.003$). AAm showed a longer lower lip length than Cm for different age groups. Upon smile, age was significantly associated with upper lip length and crown length ($p < 0.01$), with an increasing trend with age. Gingival display was affected by both age and race ($p < 0.01$), and decreased with age. AAm presented a greater amount of display than Cm. Cm had a significantly shorter lower lip length than AAM ($p = 0.04$). There was a significant change in upper lip length from rest to smile for both age and racial groups ($p < 0.01$). A greater change in upper lip length was seen in AAm and in the youngest age group (20-30).

Midface volume

In females, all interactions between race and age were significant for midface volume at rest and upon smile for both left and right sides of the face ($p < 0.05$). Midface volume at rest or upon smile was different between races for varying age groups the right and left sides of the face. AAf have a significant higher volume than Cf in age groups 20-30, 31-40 and 41-50 ($p < 0.001$). There was no apparent difference between races or age groups for the change in midface volumes from rest to smile.

In males, significant interactions between race and age were observed for midface volume only at rest for both sides of the face ($p < 0.05$). Cm midface volumes were similar to AAm in all age groups except for age group 61-70. Upon smile, race was significantly associated with midface

	<p>volume for the right and left sides of the face ($p < 0.05$). The volumes were smaller in Cm as compared to AAm, with the right side showing a significant increasing trend with age ($p = 0.02$). No apparent difference in the change of midface volumes from rest to smile was seen between races or age groups.</p> <p>Conclusions: The overall timing and magnitude of the volumetric changes observed in the lips and midface vary between genders and ethnic backgrounds. The results of this study differ from previously published reports, probably because of the method used to extract the lip and midface volumes. The values recorded in this study could serve as references for future research and clinical applications.</p>
<p>Were the original, specific aims of the proposal realized?</p>	<p>The specific aims of the proposal were to:</p> <ol style="list-style-type: none"> 1. Evaluate and compare midface and lip volume at rest and upon smile in 2 ethnic groups (Caucasian and African American), each subdivided in 5 age groups and stratified by gender (female and male). 2. Analyze the smile components in each of the groups 3. Establish a volumetric soft tissue data base of norms of the face for each ethnic group and gender. <p>The aims of the original proposal were completed.</p>
<p>Were the results published? a.) If so, was AAOF support acknowledged. b.) If not, are there plans to publish? If not, why not?</p>	<p>Manuscripts are currently in preparation. The AAOF support will be acknowledged.</p>
<p>Have the results of this proposal been presented? a.) If so, when and where? And was AAOF support acknowledged. b.) If not, are there plans to do so? If not, why not?</p>	<p>Yes, abstracts have been submitted to AADR meetings. The AAOF's support was acknowledged.</p> <ol style="list-style-type: none"> 1. Souccar NM, Bowen DW, Syed Z, Lin CP, Kau CH, Sarver DM. Aging of the Lips and Smile in Caucasian and African American Females: A 3D Study (ID 2640751). AADR/CADR Annual Meeting & Exhibition 2017, San Francisco, Calif., USA 2. Souccar NM, Vegrzyn JT, Lin CP, Kau CH, Sarver DM Volumetric Analysis of the Lips in Aging Caucasian Males (ID 2857027). AADR/CADR Annual Meeting & Exhibition 2018, Ft. Lauderdale, Florida, USA. <p>More results will be presented at the 2018 COAST meeting.</p>
<p>To what extent have you used, or how do you intend to use, AAOF funding to further your career?</p>	<p>I feel truly blessed for the support that the AAOF has given me through the 2016 Fred and Dianne Garrett Biomedical Research Award. The funding allowed me to complete my research plan and the results will be presented at national meetings as well as in publications. I am grateful for the AAOF's commitment to support faculty members for the advancement of their careers and the profession.</p>