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# The Effect of Vertical Skeletal Pattern in Lateral Negative Space during Posed Smile 

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## Introduction

Ideal soft tissues render balance in a face and confer beauty. Beauty is the phenomenon of experiencing pleasure through the perception of balance. ${ }^{1}$ Facial attractiveness has various essential components including balanced skeletal bases, harmonious soft tissues, proportionate relationship between hard and soft tissues and many others. The re-emergence of the soft tissue paradigm in clinical orthodontics has made smile analysis and designing, key elements in treatment planning. Conclusively, smile is an integral constituent of the facial attractiveness of a person.

Smile is considered the universal friendly greeting in all cultures. A wide attractive smile expedites easy psychosocial adjustability of the patient in the community around. It is expressed as a result of pleasure, emotional agreement, amusement, a friendly gesture and to convey compassion. The importance of physical and facial attractiveness in which the smile plays a major role, has been studied and related to job recruitment decisions, initial impressions, susceptibility to peer acceptance, voting
and juror decisions and social interactions. ${ }^{2,3}$ Gender, age and income among other factors have influenced people's perception of attractiveness of smiles. ${ }^{4,5}$

## Material and Methods

100 subjects were included in this study by random consecutive sampling keeping in mind the inclusion criteria ( $\mathrm{n}=100,40$ males and 60 female patients with excess, normal and insignificant buccal corridors).

Male and female patients of any age group seeking orthodontic treatment for all types of malocclusions with complete permanent dentition with no missing or supernumerary tooth (except third molars), symmetrical arch forms and normal upper lip length (19-22 mm) ${ }^{6}$ were included in the study. Patients with facial asymmetry, temporo-mandibular joint disorders, cleft lip and palate or any other syndrome, undergone orthognathic surgery, active periodontal disease or patients undergoing any surgical periodontal procedure, severe malocclusion / cant of maxillary plane were excluded from the study.

Informed written consent was taken from the selected patients who were to undergo orthodontic treatment after taking permission for this study from the ethical committee of the hospital. To control the bias each measurement was verified by a colleague. Lateral cephalograms were taken with patient's Frankfort Horizontal plane parallel to the floor, unstrained lips and teeth in centric occlusion. Radiographs were traced on $8 \times$ 10inch standard translucent acetate tracing paper, over a standard illuminated view box with a lead pencil . Ratio between lower anterior facial height to total anterior facial height ${ }^{7}$ were recorded on the patient's data form to establish the vertical skeletal relationship of the patient. This ratio was correlated with the increased or decreased buccal corridor show during posed smile by applying the Pearson correlation coefficient. Data was analyzed on statistical package for social sciences (SPSS version 22). Descriptive statistics were used.


Fig. 1 Facial height

## Results

Table 1. Buccal corridor area ((in mm on frontal smile)

| Buccal corridor area | Mean | SD |
| :--- | :--- | :--- |
|  | 1.782 mm | 0.98 mm |

The buccal corridor area show on frontal smile was measured, the minimum being 0 mm and
maximum being 4.51 mm . The mean buccal corridor area show was 1.782 with standard deviation of 0.98 mm

Table 2. Ratio of lower ant. facial height to total ant. facial height (in degrees)

| Ratio of lower <br> ant. facial height <br> to total ant. <br> facial height | Mean | SD |
| :--- | :--- | :--- |
|  | $56.34^{0}$ | $3.60^{0}$ |

The range of ratio of lower anterior facial height to total anterior facial height (in degrees) was $48^{\circ}$ to $66^{\circ}$ with a mean of $56.34^{\circ}$ and standard deviation of $3.60^{\circ}$ Table 3. Correlation of buccal corridor area show (in mm on frontal smile) with ratio of lower ant. Facial height to total ant. facial height (in degrees)

|  | Buccal corridor area show (in mm <br> on frontal smile) |  |
| :--- | :--- | :--- |
| Pearson <br> correlations | p -value |  |
| Ratio of lower <br> ant. Facial height <br> to total ant. facial <br> height <br> degrees) | $-146^{0}$ | 0.043 |

The correlation of buccal corridor area show (in mm on frontal smile) with ratio of lower anterior facial height to total anterior facial height (in degrees) was negative and statistically significant. The Pearson c orrelation coefficient was -0.146 (P -value < 0.05)

Table 4. Relationship of ratio of lower ant. facial height to total ant. facial height (in degrees) with buccal corridor area show (mm)

| Ratio of <br> lower Ant. <br> facial height | Mean buccal <br> corridor area <br> show <br> to total ant. <br> facial height <br> (in degrees) | SD <br> (in mm on <br> frontal smile) | p -value |
| :--- | :--- | :--- | :--- |
| Lesser than <br> normal | 2.38 | 0.61 | 0.013 |
| Normal | 1.92 | 0.93 |  |
| Greater <br> than normal | 1.62 | 1.03 |  |

The relationship of ratio of lower anterior facial height to total anterior facial height (in degrees) with buccal corridor area show (mm) was significant (P-value $<0.05)$. The results show that as ratio of lower anterior facial height to total anterior facial height (in degrees) increases the mean buccal corridor area show decreases.

## Discussion

A pre -treatment sample was selected for this study since it exemplified typical orthodontic patients requiring treatment. Since a pre-treatment sample was used, these subjects varied greatly. The variety in the sample provided a range of smiles and dentofacial discrepancies that was ideal in correlating the hard tissue structures to the resulting smile configurations. In this study more female subjects were present as the sample was not collected on the basis of gender.
As already mentioned, minimization of buccal corridor area show during posed smile is an integral component of problem list, treatment planning
and
goals. ${ }^{8}$ Smile is an important facial feature. It can be altered tremendously as a result of orthodontic treatment. Many studies have been carried out for the diagnosis and implications of buccal corridor area show during posed smile and the factors that increase or decrease it. Every effort should be made to minimize it.

Three groups were made on the basis of ratios of lower anterior facial height to total anterior facial height. Patients in which lower facial height to total anterior facial height ratio was $54 \%$ to $56 \%$ were put in normal group, patients having lower facial height to total anterior facial height ratio less than $54 \%$ were grouped in decreased LAFH and patients having lower facial height to total anterior facial height ratio more than $56 \%$ were grouped as increased LAFH.

For the values of the facial heights our values were less as compared to the values found in the study by Yang ${ }^{9}$ that came out to be $46.78^{\circ}$ with a standard deviation of $6.17^{\circ}$ whereas those found in McNamara's sample were slightly raised with a mean value of $59.7^{\circ}$ and a standard deviation of $7.5^{\circ}$. Lower anterior facial height values varied with the amount of buccal corridor area show. But they also found that the vertical skeletal pattern of the lower face contributed to the change in buccal corridor area show where as the upper facial height that also contributes to the over all vertical pattern does not effect this phenome non. One possible reason could be its relationship with the activities of the muscles of the lips which are only present in the lower half of the face. Hence it can be said that a longer face has lesser buccal corridor area show.

To standardize the subjects in normal anterior facial height group only those patients were included in this
group who had the ratio of lower anterior facial height to total anterior facial height within the range given by study on white American male and female subjects ${ }^{6}$ as norms of white Americans are still used as a standard in cephalometric analyses and measurements. As far as distribution of sample according to LAFH is concerned, patients with increased lower anterior facial heights were more as compared to the patients in the other groups. This finding should be considered during treatment planning and deciding about types of mechanics and appliance so that extrusive or intrusive mechanics can be applied for altering the lower anterior facial height if it is in the lower than normal range.

Extrusive mechanics should be done in case of low angle cases, which include mechanics for the eruption of molars. Banding of second molars should be done in case of decreased lower anterior facial height in order to enhance the effects of bite opening mechanics.

## Conclusions

There is significant effect of lower anterior facial height on the buccal corridor area show during posed smile and increased ratio results in a decreased buccal corridor area show during posed smile. By correcting lower anterior facial height, buccal corridor area show during posed smile can be brought into the normal range which ultimately results in the improvement of facial profile after orthodontic treatment.

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