The Contribution of Mandibular Positioned Variation to Facial Esthetics

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Specific knowledge of facial esthetics aids the orthodontist in diagnosing soft tissue as well as skeletal imbalance. Clear-cut information relative to what mechanics should be utilized is dictated by the facial type of the patient. Facial esthetic knowledge helps the clinician to treat the "total face" and not to be dependent on one reference line or one or two angular measurements.

Mandibular positional variations have been studied by various methods. In the past, cephalometric techniques have been used to quantitatively evaluate mandibular skeletal positions.[2] Also, photographs and the physioprint have been used to quantitatively evaluate mandibular soft tissue position, both horizontal and vertical.[1] With the introduction of the physioprint, a quantitative photographic evaluation of soft tissue chin position was made available.[3,4]

In the past, authors have attempted to use either their own opinions or those of outside observers as a means of relating soft tissue appearance and mandibular position.[5-8] Studies have also indicated that the vertical mandibular position varies in both males and females of the same age group.[9] Mandibular positional variability does exist in both the skeletal and soft tissue components and it has been shown that there is divergence of opinion concerning what is a "normal" or "average" facial appearance. The problem arises when an attempt is made to correlate the skeletal positional variations and the soft tissue appearance. It is the objective of this article to assess the influence of vertical and anteroposterior mandibular positional variations on total soft tissue facial esthetics.

METHODS AND MATERIALS

This study necessitated the evaluation of two areas: (a) mandibular positional variation (independent variable) which is the manipulated section of the experiment (stimulus), and (b) the opinion of facial esthetic variation (dependent variable) created by manipulating the position of the mandible.

The extrinsic factors of stimuli such as hair style, complexion, facial expression and make-up were neutralized by photographic control. Other factors including age, sex, and race were neutralized by sample selection. With all of the extraneous factors of the stimulus either neutralized or controlled, the main variable of interest was mandibular positional variation. This factor was manipulated by selecting a sample exhibiting: (a) a retruded lower jaw and (b) smaller lower anterior face height in comparison with upper anterior face height (Class II deepbite). The radiographic measurements were taken directly from the standardized, oriented lateral cephalometric tracing. The photographic measurements were taken from profile view slide projections enlarged to the identical size of the original lateral cephalometric tracing of each subject. The

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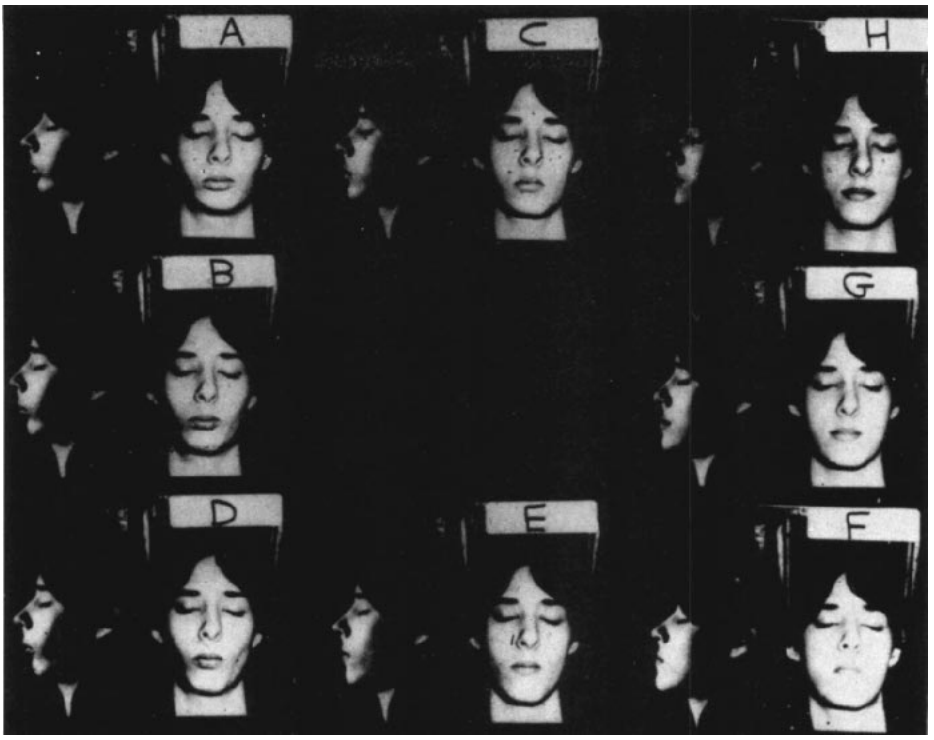

Fig. 1 A Class II deepbite subject (A) is positioned into seven other facial types by varying mandibular position: B—Class II normal vertical, C—Class I normal vertical, D—Class II deepbite, E—Class I openbite, F—Class III openbite, G—Class III normal vertical, and H—Class III deepbite. Class I deepbite could not be produced because advancement of the mandible caused opening of the bite.

Archial Analysis (Sassouni) was used to establish the original mandibular position of the subject. The criterion for selection was a mandible that was Class II deepbite in excess of four millimeters.[10]

The subjects selected showed mandibular retrusion and small lower anterior facial height, and could be positioned into the other seven desired mandibular positions (Fig. 1). These mandibular positions would represent the seven remaining racial types.[10] The repositioning was accomplished by having the patient bite on hard rubber blocks fabricated from vinyl thermoplastic mouthguard material. The blocks were 20 mm in length, 8 mm in diameter, and either 5 or 10 mm thick, depending on the vertical amount desired to establish normal or openbite skeletal patterns. The mandible was repositioned anteroposteriorly by using the original molar relationship as a guide. If the patient possessed a seven millimeter mandibular retrusion according to the Archial Analysis, the patient was positioned into a Class I skeletal relationship by anteriorly positioning the lower dentition seven millimeters. The predetermined vertical position was attained by having the patient bite on the rubber block while in this anterior relationship.

A sample of ten was chosen, all fulfilling the following criteria: (a) skeletal Class II deepbite, (b) female, (c) Caucasian, (d) age 12 to 17 (postmenarcheal), and (e) dental Class II.

TABLE I
Observer Sample

Group	*N*	*Age*	*Sex*	*Race*	*Educ. & Occ. Level*
Orthodontist	10	29-47	Male	Cauc.	Mean of 4.3 yrs. in practice
Artist	7	25-40	Male	Cauc.	45 hrs. min. of undergrad. art courses
	10		Female	Cauc.	
Peers	10	16	Male	Cauc.	Eleventh Grade H. S.
	10	16	Female	Cauc.	

These females were repositioned into seven mandibular positions plus their original position.

The method of measuring facial esthetic opinion was by means of "attitude scaling." Ten slides were shown having seven different facial pictures of the same person on each slide. For each slide the purpose was to judge each picture, identified as A through H, on a five point scale: 1 = very pleasing, 2 = pleasing, 3 = average, 4 = unpleasing, 5 = very unpleasing.

Only the position of the lower jaw as it influences the total facial appearance was judged. All other characteristics such as hair style, nose size, or complexion differences were eliminated. The only question of interest was how "pleasing" or "unpleasing" the seven facial types were to the judges.

In this type of experiment, selection of the observer is critical. Factors of the observer which could influence the psychological testing were age, educational and occupational level (cultural background), sex and race. The observer group was subdivided into three groups: the orthodontists, peers and artists (Table I).

The orthodontist group was comprised of ten male Caucasian orthodontists of the graduate faculty, University of Pittsburgh. The ages ranged from 29 to 47 years of age. The amount of time in private practice ranged from one year to fifteen years with the average number in practice being 4.3 years. The peer observer group was comprised of ten male and ten female Caucasians from the middle class economic level. These were high school eleventh grade students whose ages ranged from 16 to 17 years. The artist group was comprised of seven male and ten female Caucasians, ages ranging from 25 to 40 years. This group was University of Pittsburgh, Art Education graduate students possessing at least 45 hours of undergraduate art courses. All of these people had majored in art in college and most are teachers of art in the Pittsburgh school system.

Findings and Results

The findings were evaluated in two major areas: (a) variation of mandibular position (independent variable) and (b) variability of facial esthetic opinion (dependent variable).

The sequence of esthetic opinion findings was: (a) Findings of one judge's opinion relative to one mandibular position (Class II deepbite) for ten patients, (b) Assessment of findings of all judges within one group for one mandibular position (Class II deepbite), (c) Assessment of findings to see if three groups of judges (orthodontists, artists, and peers) had the same opinion of one mandibular position (Class II deepbite), (d) Steps (a), (b), and (c) were repeated for each mandibular position Class II normal, Class II openbite, Class I normal, Class I openbite, Class III normal, and Class III openbite. After the above steps were calcu-

lated, it was possible to assess the influence of mandibular positional variation on facial esthetic opinion.

After tabulation of the rank values per position for each group of judges, the rank values for each position between the three groups (orthodontists, artists, and peers) were compared for concordance.

The findings for the Class II facial types revealed that the Class II deepbite is the most pleasing of the three vertical retruded mandibular positions. The Class II openbite is the significantly more unpleasing of the Class II group. There was good concordance of opinion between all three judging relative to these findings.

The Class I normal facial type was unanimously chosen by all three judging groups as significantly the most pleasing mandibular position of all seven mandibular positions represented. The Class I openbite was given a rank value of #3 by the judging majority. This could indicate that even though the lower anterior facial height is longer than upper anterior facial height, the Class I anteroposterior position creates an acceptable facial appearance.

The Class III normal and Class III openbite facial types were judged by male and female as the most unpleasing anteroposterior positions. There was no significant difference between the Class III normal and Class III openbite positions so both could be documented as being the most unpleasing soft tissue types of the seven facial types represented.

The conclusions, concerning the comparison of lower anterior facial height to upper anterior facial height, must be that an average lower anterior facial height increase (soft tissue) of 5 to 10 millimeters is significant enough to create a more unpleasing facial appearance.

In comparing Class II normal, Class I normal and Class III normal facial types, the Class I normal was significantly most pleasing and the Class III normal was significantly most unpleasing. All judges were in agreement with these findings. The Class I normal was rated as #1 (most pleasing of seven possible positions), the Class II normal received a #4 rank value and the Class III normal was ranked #6 out of a possible seven.

Similar anteroposterior findings were derived from the three openbite facial type groups. The Class I openbite position was significantly more pleasing than the Class III openbite. There was no significant difference between the Class II openbite and the Class III openbite, both being equally unpleasing. In comparison to the normal vertical group, the openbite group generally received worse rank values for each anteroposterior position.

This would indicate that not only is it unpleasing to possess mandibular protrusion or retrusion, but it is also unpleasing to possess a soft tissue lower anterior facial height that is longer vertically in comparison with upper anterior facial height.

In comparing the original Class II deepbite facial type sample opinion values with the most pleasing facial type (Class I normal), the following information was derived: (1) In seven out of ten cases the average scale values showed at least a 1.1 scale value difference between the two facial types. The values ranged from a 1.10 difference to a 2.40 difference. Included in this group was one stimulus group that exhibited a larger scale value for the Class I normal view (2.70) as compared with the Class II deepbite view (1.50). (2) In two cases there was a 0.50 scale value dif-

ference between the Class II deepbite profile view and the Class I normal view. One of these showed the Class I normal view less pleasing than the Class II deepbite view by 0.50. (3) One stimulus group exhibited practically no difference in average scale values between the Class II deepbite position and the Class I normal position.

The conclusions that can be derived here are: (a) Ideally, the sample should show an obvious difference between the Class II deepbite and the Class I normal facial type, the Class II deepbite being less pleasing. (b) These findings substantiate the soft tissue measurement findings of sample variability. (c) This comparison could explain why the Class II deepbite sample was ranked #2, instead of the expected normal vertical position. (d) The facial esthetic opinion findings should be viewed with caution, since only seven out of ten cases show the desired amount of difference between the two mandibular positions.

Discussion

It is evident that variability of mandibular position does influence the esthetic opinion of observers, when all extrinsic variables are either neutralized or eliminated. The generalization that facial esthetic opinion is a subjective personal idea and cannot be scientifically evaluated has been the concept accepted by most people within the facial esthetic professions. The orthodontist for many years has used the objective measurements of the lateral roentgenographic cephalometer to dictate treatment objectives.

In this experiment, involving mandibular positional variation, the opinions of the judges varied with variation of the stimulus in a predictable manner. The mandibular positional changes, manipulated under controlled conditions, were sufficient to create variation of facial esthetic opinion of the observers.

The question of consistent judge opinion for each mandibular position was investigated in detail (intra-judge error). It was necessary to demonstrate that when the same stimulus position was projected more than once, the same judge opinion was attained for each judge involved.

A test-retest technique was used and revealed excellent consistency of opinion reproducibility when the same photographs were shown one month after the original test.

Observer reliability as a consistent judge was also assessed by repeating the same mandibular positional photograph (Class III normal) twice within the context of each photographic view projection.

Summary

In summary, it had been established from a review of the literature that mandibular positional variability does exist and that it is manifest in both the skeletal and soft tissue components. However, it was also established that there was a divergence of opinion concerning which mandibular position is considered "normal" or the most pleasing facial appearance. It was the objective of this study to assess the influence of vertical and anteroposterior mandibular variation on total soft tissue facial esthetics.

Seven different facial types were established by soft tissue measurement. These seven different facial types were evaluated by groups of orthodontists, artists, and a peer group. There was good consistency of opinion between the three groups when evaluating the soft tissue profile photographs.

The conclusions of this study are as follows:

1. The profile-frontal combination

soft tissue view induced severe confusion of observer (judge) opinion.

2. The profile soft tissue view was the most reliable in assessing mandibular positional variation influence.

3. Sassouni Archial Analysis was proven to be esthetically valid.

4. The most unpleasing facial type (mandibular position) is a Class III openbite, assessed from a profile soft tissue view.

5. The most pleasing facial type is a Class I Normal, assessed from a profile soft tissue view.

6. A longer lower anterior facial height as compared with upper anterior facial height (openbite) is more unpleasing facially than a vertical normal lower anterior facial height to upper anterior facial height proportion.

7. Mandibular protrusion (Class III) is more unpleasing facially than a normal (Class I) or retruded (Class II) mandibular position.

8. Vertical and anteroposterior variation of mandibular position does influence the opinion of observers relative to pleasing or unpleasing facial esthetics.

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