

### **Esthetic Evaluation of Incisor Inclination in Profiles during Smile**

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#### **Abstract**

**Objective:** The aim of the study is to determine the preferred maxillary incisor inclination in the smile profile of a subject with regard to different mandibular positions and to elucidate whether the raters’ profession and sex played a role in assessment of the preferred maxillary incisor inclination.

**Methods:** A smiling profile photograph of a patient is taken. which is altered by using an image editing software Adobe Photoshop CS. Orthodontists, maxillofacial

surgeons, prosthodontists, senior dental students, laypeople will assess these altered photographs and will rate the attractiveness of each photograph.

**Conclusion:** normal mandibular position, general dentists find mild inclinations of incisors attractive. In protruded mandible, proclination and retroclination of incisors were preferred by orthodontists and prosthodontists. While oral surgeons completely rejected protruded profile. retruded mandible, with proclined and retroclined incisors are attractive for oral surgeons, orthodontists and

prosthodontists.

**Keywords:** mandibular position, incisor inclination.

## **Introduction**

Orthodontists are the first in line in a decision-making process that ultimately affects a patient's appearance for the rest of his or her life.

It is essential for orthodontists to be aware of the desirable soft tissue profile as an individual treatment goal for each patient's facial type.

Aesthetic perception also varies from person to person and is influenced by their personal experience and social environment. For this reason, professional opinions regarding evaluation of facial aesthetics may not coincide with the perceptions and expectations of patients or lay people.

## **Aim & Objectives**

### **Aim**

- To develop a series of facial profile photographs based on the original ideal profile of a female subject to be evaluated by different groups of dental professionals, dental students, and laypeople.
- By altering the mandibular position and the maxillary incisor inclination in the smiling profiles, determine the most desirable and the least favorable of the aforementioned combinations as a whole.
- To elucidate whether the mandibular position and the rater's profession and sex are key factors in ranking the preferred incisor inclination.

### **Objectives**

- To determine the preferred maxillary incisor inclination in the smile profile of a female subject with regard to different mandibular positions.
- To elucidate whether the raters' profession and sex played a role in the assessment of the preferred maxillary incisor inclination.

## **Materials and Method**

A male patient (age, 23 years) was chosen based on the following clinical and cephalometric criteria:

- (1) Class I canine and molar relationships with adequate overjet and overbite superimposed on class I skeletal pattern,
- (2) well-positioned maxillary incisors according to cephalometric standards,
- (3) facial convexity angle should be normal and vertical height ratio as described by Legan and Burstone,
- (4) soft tissue cephalometric analysis should be normal (Ricketts' E-line and Merrifield's z-angle), and
- (5) facial angle and H-angle within the normal range as described by Holdaway and nasolabial angle and maxillary lip angle within the normal range as described by Arnett and Bergman.

A right lateral profile photograph with the patient in natural head position with a green background at a distance of 1.5 m from the camera and a speed of 1/125 was taken with a digital camera (Nikon, D-3100, 18-55 VR Kit) under standard conditions.

The subject was asked to sit down. With the help of ear positioners of the cephalostat both the Frankfort plane and the pupillary plane were parallel to the ground.

The image was taken with the subject in a posed smile. A small ruler was fixed above head on the facial sagittal plane.

The ruler and ear positioners were erased digitally.

The smiling photograph was altered using a commercially available image editing software program (Adobe Photoshop CS, version 6.0).

In the first step during alteration, only one parameter was changed. The anteroposterior position of the mandible. The mandibular prominence of the subject's facial profile was altered in 5-mm decrements and increments.

The position of the mandible in the horizontal plane is changed relative to the true vertical line that crosses the glabella (defined as the most prominent anterior point in the midsagittal plane of the forehead), and three profiles, retruded, normal and protruded were created.

The vertical height was kept constant.

In the next step, each profile group was further divided into 7 subgroups. The maxillary incisor inclination of each image was changed from +15° to -15° relative to the norm values of the subject in 5° decrements and increments to represent retroclined and proclined incisors. The crowns of the central and lateral incisors were separately cut in the Adobe Photoshop program, which helped to simulate the changes of incisor inclination.

For Each tooth the center of rotation was considered at the incisal edge. For the central incisor, center of rotation was at the incisal edge. Center of rotation for lateral incisor was set at midpoint of the mesiodistal width, which maintains symmetry. The vertical positions of the maxillary incisors were maintained by drawing horizontal lines tangent to the incisal edges. For sagittal repositioning of the lateral incisor, a vertical tangent was prepared medial to the maxillary canines as the distal limit.

Each simulation was made in 5° decrements and increments, and 3 modifications were produced to represent retroclined incisors and 3 to represent proclined incisors.

Thus, overall, 3 sets of images were reproduced with different mandibular positions, and each set comprised 7 different maxillary incisor inclinations (from most retroclined to most proclined positions).

Each series of images were placed randomly in a digitally created form. The images were created such that each photograph has the same dimensions. Which reduced the

bias caused by magnification or size reduction in the observer's perception?

The rating panel comprised 150 raters including 30 orthodontists, 30 maxillofacial surgeons, 30 prosthodontists, 30 general dentists and 30 laypeople. Among which 75 are males and 75 are females.

The laypeople selected were having following criterias, like no previous orthodontic or facial surgical treatment, no facial deformities, no history of facial trauma, and not a health care employee.

Each judge was asked to grade each profile based on his or her assessment of the subject's facial attractiveness.

For rating the photographs, a Likert-type scale was used. The judges were asked not to return to any previously rated photograph.

The photographs in each set were randomized.

Raters were asked to evaluate images and score them from 1 to 5: 1, very unattractive; 2, unattractive; 3, neither attractive nor unattractive; 4, attractive; 5, very attractive.

The questionnaire of the evaluators included other questions like name, age, sex, speciality etc.

### **Discussion**

Enhancement of smile attractiveness is a multifactorial process which can be achieved by proper positioning of the maxillary incisors. Both the inclination and the bodily position of these teeth should be favorable to ensure maximum facial harmony.<sup>11</sup>

According to Sérgio Pinho,<sup>a</sup> Carolina Ciriaco,<sup>b</sup> Jorge Faber,<sup>a</sup> and Marcos A. Lenzac<sup>10</sup>, noted that many esthetic concepts about the face and the smile are based on authors' opinions rather than on sound scientific methods. In this study, a series of facial profile photographs were developed based on the original ideal profile of a male subject and evaluated by different groups of dental professionals, dental students, and laypeople. We determined the most desirable and the least favorable of

the aforementioned combinations as a whole and to elucidate whether the mandibular position, by changing mandibular position and the maxillary incisor inclination in the smiling profiles and the rater's profession and sex are key factors in ranking the preferred incisor inclination.<sup>12</sup>

We used the image of an adult to remove any confounding factors such as growth potential and growth-related profile changes.<sup>13</sup> In this study, the profile reproduction method was used; it retains the key features of each photographic model with the help of digital images, and Adobe Photoshop CS only altered the incisor inclination of each facial profile.<sup>14</sup> With this method, the confounding variables were also controlled.

**In our study, with the mandible in a normal position,** the 5° lingual inclination and 5° labial inclination were rated, attractive by general dentists.

10° proclination was preferred by orthodontists.

10° retroclination was preferred by general dentists.

15° proclination was preferred by prosthodontists and orthodontists.

15° retroclination was also preferred by prosthodontists and orthodontists.

**In our study, with the mandible in a protruded position,**

5° proclination was preferred by general dentists and prosthodontists.

10° proclination was preferred by orthodontists.

10° retroclination was preferred by prosthodontists and orthodontists.

15° proclination was preferred by prosthodontists and orthodontists.

15° retroclination was preferred by prosthodontists and orthodontists and lay people.

**In our study, with the mandible in a retruded position,** 5° proclination was preferred by oral surgeons.

10° proclination was preferred by orthodontists.

10° retroclination was preferred by oral surgeons and orthodontists.

15° proclination was preferred by prosthodontists, oral surgeons and orthodontists.

15° retroclination was preferred by prosthodontists, oral surgeons and orthodontists.

Between male and female assessors significant difference was found in normal mandible position with 5° proclination and 10° retroclination. Also in retruded profile with 5° and 10° proclinations.

According to Ghaleb et al,<sup>15</sup> the lingual inclination of the maxillary incisors is one factor that can negatively affect the smile and give the face an “old” appearance because of the loss of proper root torque. In this study, the digital method used to obtain different incisor inclinations was similar to the method used by Ghaleb et al, in which the incisor tip was kept in a constant position. Unlike the study of Ghaleb et al, complete profile photographs were used in our study to obtain a true evaluation of attractiveness.<sup>16</sup> The difference between our result and that of Ghaleb et al, related to the sex of the subjects, the methods of rating and the different populations of the panels.

In the study of the Cao et al,<sup>17</sup> orthodontists who practiced in the orthodontic department at the West China Stomatological Hospital and undergraduates from Sichuan University rated the smiling profile with 5° of lingual inclination as the most attractive. This is different from the results of Ghaleb et al<sup>15</sup> and our study. According to Cao et al, the 15° labial inclination is least attractive, profiles with 10° of lingual inclination were considered relatively esthetic.

In the study by Ghaleb, there was no significant difference in assessments between the professional and nonprofessional groups.

It has been proven that geographic conditions affect a region's local culture and have a great influence on the public's esthetic concepts.<sup>18,19</sup> The perception of esthetics affected by the educational and socioeconomic backgrounds of the raters.<sup>20</sup> also varies from person to person and between different social environments.<sup>21</sup>

Schlosser et al<sup>22</sup> reported a higher level of acceptance for dental protrusion than for retrusion among orthodontists and laypeople, and concluded that it is preferable to either leave a normally protrusive maxillary dentition as it is or advance rather than retract. Conclusion is that, in patients with mandibular deficiency where camouflage treatment is advised, lingual inclination of the maxillary incisor can compromise esthetics and should be avoided by maintaining appropriate torque during incisor retraction.

We found that there is no significant difference between the male and female assessors' ratings of the profile images. This finding is similar to the studies of Ghaleb et al<sup>15</sup> and Arqoub and Al-Khateeb.<sup>25</sup> It can be concluded that the concept of beauty is similar between male and female raters, also a similar standard for facial esthetics exists between the sexes. But Turkkahraman and Gokalp<sup>18</sup> concluded that sex had an effect on the profile preferences in the Turkish population, and significant differences were observed between the sexes.

In this study, we assessed the effects of mandibular position on the preferred incisor inclination, these results were obtained from 1 photograph. Several intrinsic and extrinsic factors can play roles in the perception of facial attractiveness and can hypothetically affect the final outcomes of the study.<sup>23,24</sup> The concept of beauty is affected by several characteristic and features.

### Conclusion

This study showed that in case of mandibular protrusion and retrusion, the ratings of the different incisor inclinations were nearly similar among all professional

groups except for lay people for protruded mandible and oral surgeons for retruded mandible.

In case of **normal mandibular position**, general dentists find mild inclinations of incisors attractive. Extreme proclinations and retroclinations like 15° are preferred by orthodontists and prosthodontists.

In case of **protruded mandible**, proclination and retroclinations of incisors were preferred by orthodontists and prosthodontists. While oral surgeons completely rejected protruded profile. Lay people found protruded mandible with severe incisor retroclination most attractive.

In case of **retruded mandible**, with proclined and retroclined incisors are attractive for oral surgeons, orthodontists and prosthodontists. While general dentists don't find this profile attractive.

Hence we can summarize that general dentists preferred normal and protruded mandible positions with mild incisor inclinations. Lay people appreciated protruded mandible with retroclined incisor as most attractive profile. Oral surgeons rejected normal and protruded mandibular positions. They found only retruded profile attractive. Prosthodontists and orthodontists found severe incisor inclinations attractive in all profiles.

Also, the raters' gender had no significant effect on ratings of the images. Which concludes that the concept of beauty is similar between male and female raters and a similar standard for facial esthetics exists between both genders

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