Bulletin of Health,
Science and Technology
BHST
ISSN 0858-7531
Volume 13, Number 2, 2015 : 67-74

EFFECT OF INCISOR POSITION AND INCLINATION ON SMILING PROFILE ATTRACTIVENESS

Hataichanok Charoenpong[1], Auksorn Kittisathakul[2], Kulapatch Engkatanachai[2], Chachavudh Patimaarak[2], Glit Chanchaichujit[2], Cheerana Chotesmithkul[2], Weerawat Sunthonkitjarak[2], Pusaji Boonlee[2] and Phimnaphat Akkaraitthiphong[2]

[1]Lecturer at Faculty of Dental Medicine, Rangsit University, Pathum Thani 12000, Thailand
[2]Undergraduate student at Faculty of Dental Medicine, Rangsit University, Pathum Thani 12000, Thailand

*Corresponding author : E-mail : Or_noknok@yahoo.co.th

Abstract: Incisor position and inclination not only affect tooth function but also affect facial attractiveness which is the major concern of patient seeking orthodontic treatment nowadays. This study aimed to evaluate facial attractiveness in smiling profile view with different incisor position and inclination in Thai people. The photograph in smiling profile view of chosen Thai model was modified using Photoshop to obtain 8 additional photos with 2 different positions (-3 and +3 mm) and 2 different inclinations (-6 and +6 degree). Therefore, the total of 9 images was created. The 402 Thai subjects were asked to evaluate attractiveness of each image using visual analog scale.The results showed that normal position and 3 mm retrusion received higher attractiveness score than 3 mm protrustion. Normal inclination or +6 degree proclination received higher score than retroclination. The results showed that normal position and 3 mm retrusion received higher attractiveness score than 3 mm protrusion. Normal inclination or +6 degree proclination received higher score than retroclination. When considering position together with inclination, the results showed that either protrusive or retrusive incisor position, normal inclination had significantly higher attractiveness score compare to proclination or retroclination. These results suggested that protrusion of upper incisors in Thai caused reduction in facial attractiveness. Normal inclination or slightly proclined upper incisor had better attractiveness compared to retroclined upper incisors. When incisor position is changed into more protrusive or retrusive position, the inclination should be kept normal in order to maximize facial attractiveness.

Keywords: Incisor position; Incisor inclination; Facial attractiveness; Smile profile view.

บทคัดย่อ ตำแหน่งและแนวแกนของฟันหน้าไม่เพียงส่งผลต่อการใช้งานของฟัน ยังส่งผลถึงความหน้าสวยงามของใบหน้า ซึ่งเป็นเหตุผลหลักที่ผู้ป่วยตัดสินใจมาจัดฟันในปัจจุบันด้วย การศึกษานี้มีจึงวัตถุประสงค์เพื่อประเมินความสวยงามใบหน้าด้านข้างขณะยิ้ม ในตำแหน่งและแนวแกนของฟันที่ต่างๆกัน โดยภาพถ่ายใบหน้าด้านข้างขณะยิ้มของคนไทยที่ได้รับการคัดเลือกแล้ว ถูกนำมาปรับเพิ่มอีก **8** ภาพ ผ่าน ให้มีตำแหน่งและแนวแกนฟันที่แตกต่างกันอีก **2** ตำแหน่งและ **2** แนวแกน **(+3,-3** ม+และ **.6,-6** องศา) รวมทั้งหมดจะมี **9** ภาพ ภาพทั้งหมดจะถูกนำไปให้คะแนนความสวยงาม โดยอาสาสมัครคนไทย จำนวน **402** คน โดยใช้ **visual analog scale** ในการให้คะแนน ผลการศึกษาพบว่า ฟันหน้าในตำแหน่งปกติและหลังกว่าปกติได้รับคะแนนความสวยงามมากกว่า ฟันยื่น ส่วนมุมพบว่ามุมปกติ และเอียงออก ได้รับคะแนนความสวยงามมากกว่ามุมเอียงเข้า และเมื่อนำมาพิจารณารวมทั้งตำแหน่งและมุมพบว่า มุมเอียงปกติจะได้รับคะแนนความสวยงามมากกว่ามุมเอียงเข้าหรือมุมเอียงออก ทั้งในตำแหน่งที่ยื่นหรือถอยโดยสรุปผลการศึกษาชี้ให้เห็นว่าตำแหน่งฟันหน้าที่ยื่นในคนไทยทำให้ความสวยงามลดลงอย่างมีนัยสำคัญ เมื่อเทียบกับตำแหน่งปกติ หรือตำแหน่งถอยกว่าปกติ ส่วนแนวแกนที่ปกติ หรือเอียงออกเล็กน้อยจะให้ความสวยงามมากกว่าแนวแกนเอียงเข้า ถ้ามีการปรับเปลี่ยนตำแหน่งของฟันหน้าไป ไม่ว่าจะเป็นยื่นไปข้างหน้าหรือถอยหลัง ควรรักษาแนวแกนฟันที่ปกติไว้ เพื่อให้เกิดความสวยงามมากที่สุด

คำสำคัญ: ตำแหน่งของฟันหน้า, แนวแกนของฟันหน้า, ความสวยงามของใบหน้า, ใบหน้าด้านข้างขณะยิ้ม

INTRODUCTION

Position and inclination of the incisor teeth are among the most important factors to be considered in orthodontic treatment planning. Incisor position and inclination not only affect tooth function but also affect facial attractiveness which is the major concern of patients seeking orthodontic treatment (Xiao-Ting, Tang et al. 2010).

There are many cephalometric analyses proposed to standardize incisor teeth positions and inclination (Steiner 1953; Steiner 1959; Tweed 1962; McNamara 1984). Mostly, these values are obtained from lateral cephalometric radiographs which are taken in resting position of lips. The esthetic evaluation of profile view is then assessed through the soft tissue covering the teeth for example the assessment of Nasolabial angle, Holdaway angle and lower lip to E-line (Holdaway 1983; Fernandez-Riveiro, Smyth-Chamosa et al. 2003). Andrews proposed that the upper incisor in smiling profile view should be placed on the Goal Anterior Limit Line (GALL) (Andrews 2008).

However, in some situation, incisor position needs to be altered from the exact standard value. Changing the position of the incisors can affect facial profile and may require tooth extraction. In extraction guideline, -5 to -9 mm arch length discrepancy, can be treated with or without tooth extraction (Proffit, Fields et al. 2013). If the plan is to extract the teeth, incisors are usually moved backward or left in the original position. On the other hand, in non-extraction case, the space must be provided by other means. Moving incisors forward is likely in these cases. The inclination of the incisors can be changed in orthodontic treatment especially when changing incisor position. Torque control can be applied to obtain the inclination required.

Changing incisor position and inclination can affect facial esthetic. Smiling profile view gives most obvious display upper incisors position and inclination. Therefore changing upper incisor position and inclination could have the most effect on facial attractiveness in this view. There are only a few studies regarding the relationship between esthetics and the position of incisors in profile view of smile (Schlosser, Preston et al. 2005; Ghaleb, Bouserhal et al. 2011). These studies, however, were performed in ethnicities besides Asian.

The difference in skeletal and facial form makes the norm available for each ethnicity (Sharma 2011). The proper position for incisors for each ethnic group could be different due to the differences in these facial forms. Moreover many studies have showed that racial difference can affect perception and preference of facial esthetic (Polk, Farman et al. 1995; Johnston, Hunt et al. 2005; Mejia-Maidl, Evans et al. 2005; Soh, Chew et al. 2005; Soh, Chew et al. 2005). Although, study has found that people from different countries within the same continent, have similarity in profile preferences (Soh, Chew, & Wong, 2007), in larger scale racial difference such as Caucasian and Maxicans, this preference could be significantly different (Mejia-Maidl, Evans et al. 2005).

In this study, the aim was to evaluate facial attractiveness in smiling profile view when changing upper incisor position and inclination in Thais.

MATERIALS AND METHODS

Model

The model was chosen from Thai undergraduate dental students in the faculty of Dental Medicine, Rangsit University using the following criteria; having skeletal, dental and soft tissue configuration measured from cephalometric radiographs within Thai norms (Suchato and Chaiwat 1984; Sorathesn 1988), good alignment of upper anterior teeth (Arch length discrepancy (ALD) = 0 in upper arch), normal overjet and overbite and normal gingival display on smiling and normal upper incisor position relative to forehead as described by

Andrews (Andrews 2008) The cephalometric values of the model and their norms are shown in table1

Table 1. The cephalometric values of the model

Cephalometric parameters	Thai norm	Model's cephalometric value
SNA	83±4	80
SNB	79±3	77
ANB	4±2	3
SN-GoGn	34±6	35.5
FMA	25±4	28
Li-APog (mm)	5±2	4
LI-NB	32±6	23
LI-NB (mm)	6±2	6
UI-NA	28±4	26
UI-NA (mm)	6±2	6
ADH (mm)	29 ± 3	28
PDH (mm)	19 ± 2	19
NLA (nasolabial angle)	89±11	93
FCA (facial contour angle)	9±4	11
UFH (upper face height)	48±3	41
LFH (lower face height)	69±3	64
ULL (upper lip length)	23±2	23.5
LLL (lower lip length)	46±3	40.5

Image taking and alteration

Photographs of the model taken in smiling profile view in natural head position was taken and then altered using Photoshop program to obtain 8 additional photos with 2 different positions and 2 different inclinations. Therefore a total of 9 images were created as listed in Figure 1 and Table 2 (0 is the original position and inclination).

Table 2. Position and inclination obtained from image alteration

Inclination / Position	-3	0	+3
-6	Position -3 / inclination -6 (-3,-6)	Position 0/ inclination -6 (0,-6)	Position +3/ inclination -6 (+3,-6)
0	Position -3/ inclination 0 (-3,0)	Position 0/ inclination 0 (0,0)	Position +3/ inclination 0 (+3,-0)
+6	Position -3/ inclination +6 (-3,+6)	Position 0/ inclination +6 (0,+6)	Position +3/ inclination +6 (+3,+6)

To change the position of the teeth, the initial position was measured relative to reference vertical line. The teeth were then cut and move forward or backward at the distance indicated. To change the inclination, the initial inclination was measured relative to reference vertical line. The teeth were then cut and rotated until obtaining the indicated inclination with the incisal edge fixed in point (so that the position was maintained)

Subjects

A total of 402 Thais (198 males and 204 females) were randomly selected by multi-stage sampling method. The number of subjects from each sector of Thailand was allocated by quota sampling. Simple random procedure was used to select the province in each sector and to randomly select subjects aged between 18-35 years for interviewing. Dental professional or person involving in dental practice and subjects with severe vision compromised were excluded from the study.

Figure 1. Image alteration into two additional positions (+3 and -3 mm) and two additional inclinations (+6 and -6 degree)

Evaluation of facial attractiveness

Attractiveness was evaluated using VAS score. Subjects were presented with all of the images to be scored once before scoring. Then the images were present in random order for scoring. The subjects were asked to assess the attractiveness of smile in each image by mark the vertical line on 200 mm of visual analog scale. At 5 points of the scale, there were the descriptors "very unattractive', 'unattractive', 'average', 'attractive', and 'very attractive".

Ethic consideration

This study was approved by Rangsit University Ethic committee. Informed consent was obtained from model and for each subject before data collection.

Data analysis

One way ANOVA was used to compare the mean score different position and/or inclination. The *P*-value of < 0.05 was considered statistically significant**.** A multiple

comparison was performed using Turkey and Dunnett T3 test if there was the homogeneity and non-homogeneity of the variance respectively.

RESULTS AND DISCUSSION

General information

Item Objective Conguence Index (IOC) of each picture was 1. Cronbach's alpha coefficient was 0.829.

The subjects comprised of 198 males (49%) and 204 females (51%) with the average age of 22.9 years. The number of subjects from each sector was distributed corresponding to the ratio of Thai population in each of those. There are 132 subjects (33%) from northeast sector, 86 subjectss (21%) from center sector, 59 subjects (15%) from south sector, 39 subjects (10%) from north sector, 36 subjects (9%) from Bangkok, 30 subjects (7%) from east sector and 20 subjects (5%) from west sector.

The effect of changing position on attractiveness of smiling profile view

To determine the effects of changing position on the attractiveness, the sum of the scores from pictures with the same position (regardless of inclination) were used (eg. Score of position "0" was from the sum score of picture 0/-6, 0/0 and 0/+6)

Figure 2 shows the attractiveness score of different positions of upper incisor. It was found that in, the normal position was the position that is the most attractive. Changing position into more retrusive position resulted in reduction in attractiveness score although there is no significant different. Protrusion causes a significant reduction of attractiveness score when compared to normal position.However, there was no significant difference when comparing protrusive and retrusive positions (Figure 2).

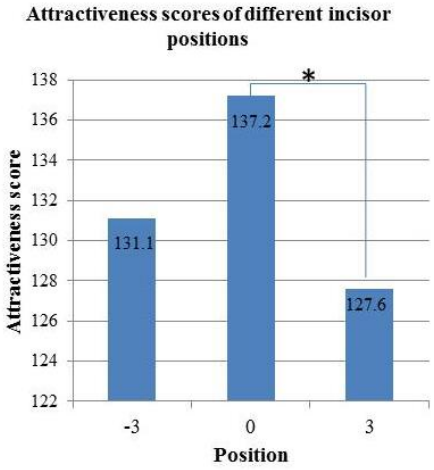

Figure 2. Attractiveness score of different incisor positions. For each position, the score presented was the sum scores from three pictures with the same incisal position regardless of inclination. (eg. Score of inclination "0" was from the sum score of picture 0/-6, 0/0 and 0/+6)

The effects of changing inclination on attractiveness of smiling profile view

To determine the effects of changing the inclination on the attractiveness, the sum of the scores from pictures with the same inclination (regardless of position) were used (eg. Score of inclination "0" was from the sum score of picture -3/0, 0/0 and +3/0)

The results indicated that normal inclination was the most attractive inclination. Changing position and inclination into more proclined incisor caused slightly reduction in the

attractiveness score with no significant difference found. Changing position into more retroclined inclination caused significant reduction in facial attractiveness when compared to normal inclination or proclination. (Figure 3)

The effects of changing incisal inclination in different incisor position on the attractiveness of smiling profile view

Retrusion and protrusion of upper incisors resulted in decrease in facial attractiveness when compared to the original position with significant reduction in attractiveness found for protrusion as described in earlier part. (Figure 2) When considering the inclination together with position, the result showed that retrusion with the inclination kept normal, has significantly better attractiveness than protrusion with proclination and protrusion with retroclination. These results were the same for retrusion position in that retrusion with normal inclination have significantly higher attractiveness score comparing to retrusion with retroclination and retrusion with proclination (Figure 4). In normal position, however, it was surprising that proclination of incisors tend to have higher attractiveness score when compared to normal inclination or retroclination.

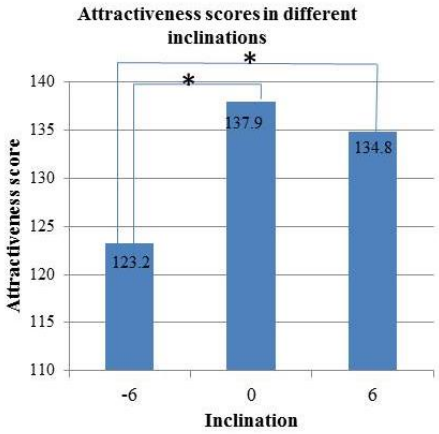

Figure 3. Attractiveness score of different incisor inclinations. For each inclination, the score presented was the sum scores from three pictures with the same incisal inclination regardless of position (eg. Score of inclination "0" was from the sum score of picture -3/0, 0/0 and +3/0)

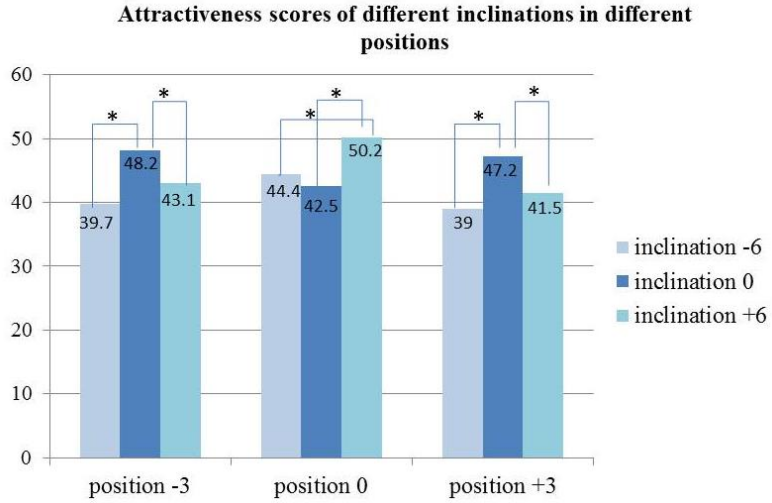

Figure 4. Attractiveness score of different incisor inclinations in protrusive (+3) or retrusive (-3) position

DISCUSSION

To evaluate the attractiveness of the photographs of different positions and inclinations of incisors, the visual analogue scale score was used. This method has been proved to be a valid and reliable method to measure dental and facial attractiveness (Howells and Shaw 1985) and has been used by many previous studies (Faure, Rieffe et al. 2002; Kiekens, Maltha et al. 2005; Johnston, Hunt et al. 2010).

The extraction guideline (Proffit et al. 2013) suggest that the space discrepancy of less than 4 mm can be treated without extraction and more 10 mm or more of arch length discrepancy requires treatment with extraction. However, arch length discrepancy of 5 to 9 mm of can be treated with or without extraction. Therefore, 3 mm protruding was chosen because it is the amount of forward movement required for correcting 6 mm arch length discrepancy without extraction. On the other hand, if extraction treatment plan is planned, the incisors may move backward approximately 3 mm with the moderate control of anchorage. The inclination of +6 and -6 degree were chosen corresponding to the amount of +3/-3 changing position, if the teeth are moved by pure tipping.

The results of this study showed some differences in preference of incisal position when compared to study of Schlosser et al. (2005) in New York. In the study of Schlosser et al., in which the model was an American, peopleprefer 1-4 mm protrusive position of the incisors followed by normal position. Retrusion of any amount from 1 mm onward resulted in less facial attractiveness in that study. However, the results in Thais were different. The present study found that protrusion of incisors resulted in significantly less attractiveness in Thai model. Retrusion, on the hand had better score than protrusion.

The study in Asian population, however, showed more similarity of facial preference with our study. Soh et al. (2005a, 2007) studied in Chinese people and found that normal profile or bimaxillaryretrusion in females were the most attractive profile. Although, these studies were performed with the picture of models in lip at rest, the results were in agreement with our results in that, normal and retrusion had significantly higher attractiveness score than protusion.

For changing in inclination of incisors, the results from this study showed that Thai people liked the normal inclination, followed by proclination and retroclination respectively. This result is consistent with the results from the study of Ghaleb et al. (2011) that was conducted in Lebanon, in which initial photo and +5 degree proclination was the most attractive inclination perceived by lay people.

When considering the inclination together with position, the results suggested that, if the position of incisors has to be changed into more retrusive or protrusive position, it is better to keep the inclination normal or proclined rather than proclined or retroclined because proclining or retroclining of upper incisors either in protrusive or retrusive position caused significant reduction in facial attractiveness when compared to normal inclination. Therefore when changing position of incisors, either in protrusive or retrusive direction, torqing control should be applied in order to keep the inclination as close to normal position as possible.

The results from this study provided the information about the preference of Thai people for smiling profile view in the model who has skeletal features within standard value. However, there are many factors that determine the most proper incisor position and inclination in each person. Therefore the actual orthodontic treatment planning must be adjusted for each individual with the basic information for average Thai preferences gathered from this study.

CONCLUSION

In Thai people with normal skeletal, dental and soft tissue appearance, moving incisors forward can cause significant reduction in facial attractiveness in smile profile view. Normal inclination and proclination of incisor were more attractive compared to retroclination. In 3 mm protrusive or 3 mm retrusive positions of incisors, normal inclination received highest attractiveness score when compared to proclination or retroclination

ACKNOWLEDGMENTS

This research was funded by Research institute of Rangsit University.

REFERENCES

Andrews WA. 2008. AP relationship of the maxillary central incisors to the forehead in adult white females. *Angle Orthod.* 78(4): 662-669.

Faure JC, Rieffe C, & Maltha JC. 2002. The influence of different facial components on facial aesthetics. *Eur J Orthod.* 24(1): 1-7.

Fernandez-Riveiro P, Smyth-Chamosa E, Suarez-Quintanilla D. & Suarez-Cunqueiro M. 2003. Angular photogrammetric analysis of the soft tissue facial profile. *Eur J Orthod.* 25(4): 393-399.

Ghaleb N, Bouserhal J, & Bassil-Nassif N. 2011. Aesthetic evaluation of profile incisor inclination. *Eur J Orthod, 33*(3): 228-235.

Holdaway RA. 1983. A soft-tissue cephalometric analysis and its use in orthodontic treatment planning. Part I. *Am J Orthod.* 84(1): 1-28.

Howells DJ, & Shaw WC. 1985. The validity and reliability of ratings of dental and facial attractiveness for epidemiologic use. *Am J Orthod.* 88(5): 402-408.

Johnston C, Hunt O, Burden D, Stevenson M, & Hepper P. 2005. The influence of mandibular prominence on facial attractiveness. *Eur J Orthod.* 27(2): 129-133.

Johnston C, Hunt O, Burden D, Stevenson M, & Hepper P. 2010. Self-perception of dentofacial attractiveness among patients requiring orthognathic surgery. *Angle Orthod.* 80(2): 361-366.

Kiekens RM, Maltha JC, van 't Hof MA, & Kuijpers-Jagtman AM. 2005. A measuring system for facial aesthetics in Caucasian adolescents: reproducibility and validity. *Eur J Orthod.* 27(6): 579-584.

McNamara JA Jr. 1984. A method of cephalometric evaluation. *Am J Orthod.* 86(6): 449-469.

Mejia-Maidl M, Evans CA, Viana G, Anderson NK, & Giddon DB. 2005. Preferences for facial profiles between Mexican Americans and Caucasians. *Angle Orthod.* 75(6): 953-958.

Polk MS, Jr, Farman AG, Yancey JA, Gholston LR, Johnson BE, & Regennitter FJ. 1995. Soft tissue profile: a survey of African-American preference. *Am J Orthod Dentofacial Orthop.* 108(1): 90-101.

Proffit WR, Fields HW, & Saver DM. 2013. *Contemporary Orthodontics.* 5th ed. St.Louis: Elsevier.

Schlosser JB, Preston CB, & Lampasso J. 2005. The effects of computer-aided anteroposterior maxillary incisor movement on ratings of facial attractiveness. *Am J Orthod Dentofacial Orthop.* 127(1): 17-24.

Sharma JN. 2011. Steiner's cephalometric norms for the Nepalese population. *J Orthod.* 38(1): 21-31.

Soh J, Chew MT, & Wong HB. 2005a. A comparative assessment of the perception of Chinese facial profile esthetics. *Am J Orthod Dentofacial Orthop.* 127(6): 692-699.

Soh J, Chew MT, & Wong HB. 2005b. Professional assessment of facial profile attractiveness. *Am J Orthod Dentofacial Orthop.* 128(2): 201-205.

Soh J, Chew MT, & Wong HB. 2007. An Asian community's perspective on facial profile attractiveness. *Community Dent Oral Epidemiol.* 35(1): 18-24.

Sorathesn K. 1988. Craniofacial Norm for Thai in Combined Orthodontic Surgical Procedure. *J Dent Assoc Thai.* 38: 190-201.

Steiner CC. 1953. Cephalometrics for you and me. *Angle Orthodontist.* 39(10): 729-755.

Steiner CC. 1959. Ceohalometric for clinical prctice. *Angle Orthodontist.* 29(1): 8-29.

Suchato W, & Chaiwat J 1984. Cephalometric evaluation of the dentofacial complex of Thai adults. *J Dent Assoc Thai.* 34(5): 233-243.

Tweed CH. 1962. Was the development of the diagnostic facial triangle as an accurate analysis based on fact or fancy? *Am J Orthod.* 48: 823-840.

Xiao-Ting L, Tang Y, Huang XL, Wan H, & Chen YX. 2010. Factors influencing subjective orthodontic treatment need and culture-related differences among Chinese natives and foreign inhabitants. *Int J Oral Sci.* 2(3). 149-157.

หน้านี้ไม่เอา