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Facial Attractiveness Appraisal By Comparing Sagittal Maxillary Central Incisors Position to Forehead Morphology in Profile View For Young Kashmiri Adults

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Abstract

Objectives: To determine the role of sagittal position of the maxillary central incisors relative to the forehead as a diagnostic tool in assessment of facial attractiveness in young Kashmiri adults.

Materials and Method: Smiling profile photographs of 134 young Kashmiri adults were rated into pleasant and unpleasant face groups by three evaluators viz orthodontist, general dentist and non-medico. The images were captured in NHP. Reference lines were constructed to assess the sagittal position of maxillary central incisor and forehead inclination angle.

Statistical Analysis: Obtained data was subjected to descriptive and comparative statistical analysis using software SPSS version 20 to test the significance of findings. Unpaired t-test was used to compare pleasant and unpleasant group. Systematic error was measured by using interclass correlation coefficient of reliability (R) which revealed statistically insignificant differences between two readings, showing consistency of measurements.

Results: In the pleasant face group, the maxillary central incisors were positioned between the forehead facial axis (FFA) point and glabella in 72% of subjects, posterior to the FFA point in 20.5% and anterior to glabella in 7.5%.

The position of maxillary central incisor and forehead inclination were poorly correlated (r^2 =0.014). In unpleasant face group, the maxillary central incisors were positioned, posterior to the FFA point in 54.5% of subjects, anterior to glabella in 25.9% of subjects and between the forehead facial axis (FFA) point and glabella in 19.6% of subjects. The maxillary central incisor position and forehead inclination were moderately positively correlated (r^2 =0.363). The anteroposterior position of maxillary central incisor relative to forehead between the pleasant and unpleasant groups showed statistically significant difference (P =0.03). The forehead inclination between these two groups was statistically highly significant (P = 0.002).

Conclusions: In subjects with Maxillary central incisor lying anterior to forehead's FFA point i.e., between FFA point and glabella presents with pleasant looking faces. Increased forehead inclination i.e., forwardly inclined forehead was associated positively with pleasantness of face.

Keywords: Sagittal position, Maxillary central incisor, forehead, smiling profile photograph, pleasant and unpleasant faces.

Introduction

With the shift in orthodontic treatment focus from simply correcting misaligned teeth to enhancing facial aesthetics, patients are increasingly seeking treatment to improve their facial appearance. In today's scenario, physical attractiveness is highly valued. Dion et al. (2002) found that attractive individuals are perceived as more likely to secure better jobs, have more successful marriages, and lead happier, more fulfilling lives[1]. Overall physical appearance, particularly facial balance and symmetry influences the way individuals perceive themselves and by others[2,3].

For assessment of a patient's facial appearance or aesthetics, an orthodontist needs to evaluate the face in profile also as part of comprehensive orthodontic diagnosis. Various methods exist for evaluating facial profiles, including traditional cephalometrics, repose soft tissue analyses, and Andrews' Six Elements of Orofacial Harmony (1999). Traditional cephalometrics relies on internal osseous landmarks to define points and planes for quantifying anteroposterior jaw and incisor positions. However, these landmarks can be less reliable due to identification errors and soft tissue compensations[4,5]. Orthodontists who relied strictly on cephalometric measurements have often found that facial aesthetics were compromised[6]. Hence, diagnosing and treating for facial beauty using cephalometric norms is questionable because hard tissue structures are not consistently related to the soft tissues of the face[7].

Repose soft tissue analysis uses external soft tissue landmarks to define points and lines, from which measurements are taken and compared to established norms. Andrews' Six Elements of Orofacial Harmony uses the forehead as a landmark to assess the sagittal position of maxillary central incisors in profile[8].

Andrews (2008) defined forehead landmarks and observed a correlation between the prominence and inclination of the forehead and the position of the maxillary central incisors in individuals with aesthetically pleasing smiling profiles[9]. Schlosser et al. (2008) found that Andrews' method of profile assessment was a useful tool for evaluating attractiveness relative to the position of the maxillary incisors[8].

Materials & Method

This cross-sectional analytic study was conducted on 134 young Kashmiri adults within the age range of 17-26 years. Kashmiri origin was selected to minimize the

variability from racial or geographical differences. An informed written consent was taken from each subject at the start of the study. Subjects with fully erupted permanent dentition up to second molars, no previous history of orthodontic treatment, absence of any supernumerary teeth, and any pathological condition, without history of trauma in maxillofacial region, medically fit, absence of severe craniofacial abnormalities e.g. cleft lip or palate, no history of artificial crowns or laminates on upper anterior teeth and high-quality facial photographs were included in the present study.

Standardization of Photographs was done with a photographic setup. A DSLR photographic camera was placed on the tripod stand at a predetermined center i.e. 6 feet. Subject was positioned in natural head position (NHP) in lateral profile view. A scale was place in front of the subject through his/her mid sagittal plane and mirror was installed at the distance of 4 feet in front of the subject. Then the photograph was clicked of each subject smiling with maxillary incisors visible and looking straight into his own eyes in the mirror. Each image was digitally scanned and imported into Adobe Photoshop (Adobe Systems). The images were resized to approximate life size and converted to black and white format. Then printed on standard 8½" x 11" white paper.

Grouping of the Samples

The selected images were then examined & rated by a panel of 3 judges [one orthodontist, one general dentist and one non medico/lay person] into either pleasant or unpleasant faces. Two of the three evaluators have to agree on the profile judgment of a subject for grouping them into either of the two groups. Based on the collective answers, the sample subjects were divided into two groups.

Group A: Pleasant faces

Group B: Unpleasant faces

Photographic Landmarks: (Figure 1)

There are three different shapes of forehead defined by Andrews[10]

1. Straight
2. Rounded
3. Angular

All measurements were made on the printed paper. Following landmark points (Table 1, figure 1, 2) for the forehead and maxillary central incisor were identified in facial smiling profile photograph and marked as described by Andrews[11]. The linear and angular parameters were measured and scaled to the nearest 0.5mm and angle nearest 0.5^0 were used.

Assessment of Sagittal Maxillary Central Incisor Position (Table 2, figure 2)

Forehead inclination angle was measured as the superior angle between line 4 and line 1 using a protractor.

Results

Data was subjected to descriptive and comparative statistical analysis using software SPSS version 20 to test the significance of findings. Unpaired t-test was used to compare pleasant and unpleasant group. Systematic error was measured by using interclass correlation coefficient of reliability (R) revealed statistically insignificant differences between two readings, showing consistency of measurements.

Division into Pleasant & Unpleasant face group

The facial profile photographs were judged by three evaluators into the pleasant and unpleasant faces.

a) Pleasant face group – 68 subjects (51%)

b) Unpleasant face group – 66 subjects (49%)

Comparison of sagittal maxillary central incisor position between pleasant and unpleasant faces (Table 3, Graph 1A)

For pleasant faces, the sagittal position of the maxillary incisors relative to the forehead ranged from -13mm to 17mm. For the unpleasant faces, sagittal position of the maxillary central incisors relative to the forehead ranged from -11.5mm to 16mm. The maxillary central incisor were positioned more anteriorly relative to the forehead in the pleasant group with the mean value of 4.11 mm as compared to unpleasant group with mean value of 1.84mm. Statistically significant difference was shown between the two groups (p=0.003)*.

Comparison of forehead inclination between pleasant and unpleasant faces (Table 4, Graph 1B)

For the pleasant faces forehead's inclination ranged from 6˚ to 33˚, with a mean of 20.40˚. For the unpleasant faces the forehead's inclination ranged from 1˚ to 33˚, with the mean of 17.38˚. Forehead was found to be more inclined in pleasant faces than in unpleasant faces and was statistically highly significant (p=0.002)**.

Regression analysis for Sagittal maxillary central incisor position relative to forehead inclination in both groups. (Graph 2)

Graphs 4 showed that in pleasant faces the Sagittal positions of the maxillary central incisors were poorly correlated with the inclinations of the forehead (r^2=0.014)

In the unpleasant faces group, they were moderately positively correlated (r^2=0.363). It was found that for the pleasant faces (17.80) and unpleasant faces (18.70) were the predicted value of the inclination of forehead when FFA point and FA point coincides.

Comparison of distribution of the sagittal maxillary central incisor position relative to the forehead between pleasant and unpleasant groups (Graph 3)

In the pleasant face group, 49 subjects **(72 %)** had maxillary central incisors positioned somewhere at or between the FFA point and glabella,14 subjects (20.5 %) had maxillary central incisors positioned posterior to the forehead's FFA point, and 5 subjects (7.5 %) had maxillary central incisors positioned anterior to glabella.

In the unpleasant face group, 36 subjects **(54.5 %)** had maxillary central incisors positioned posterior to the forehead's FFA point. 17 subjects (25.9 %) had maxillary central incisors positioned anterior to glabella. 13 subjects (19.6 %) had maxillary central incisors positioned somewhere at or between the FFA point and glabella.

Discussion

Facial aesthetics, including profile aesthetics, is a primary reason of concern for many patients, seeking dental care. The perception of an attractive smile is subjective, influenced by various factors such as media, socioeconomic status, and cultural and ethnic backgrounds[12]. Many studies have suggested that the sagittal position of the maxillary incisors significantly affects facial profile aesthetics[13,14].

Comparison of sagittal maxillary central incisor position relative to forehead between pleasant and unpleasant faces

On analysing the study subjects, it was observed that in the pleasant group, the maxillary central incisors were positioned more anteriorly, mean 4.11 mm ahead of the forehead's FFA point. In contrast, in the unpleasant group, they were 1.84 mm ahead of the forehead's FFA point. This difference was statistically significant and supports the findings of Peck and Peck[15], who noted that attractive faces tend to exhibit incisor protrusion and procumbency, which are not typically reflected in standard cephalometric norms.

This suggests that individuals perceived as "good looking" had their maxillary central incisors positioned more anteriorly and significantly ahead of the FFA point when compared to the unpleasant faces. These findings

support with the results reported by Andrews[10]. Additionally, this supports Li Cao's[16] study, which found that the anterior positioning of the maxillary central incisors relative to the forehead is a characteristic of an aesthetically pleasing smiling profile.

This supports with Adams'[17] study which found a highly significant difference in sagittal maxillary central incisor positions between the pleasant and unpleasant faces. Czarnecki's[18] study, demonstrated that greater lip protrusion is generally acceptable, particularly when accompanied by a large nose or chin.

Thus, a retrusive maxillary incisor position is generally less favoured and highly noticeable, negatively impacting profile aesthetics[19]. A protrusive or fuller profile may be preferred due to its subconscious association with youth[20,21]. The lack of acceptance for retrusion favours Czarnecki et al.'s[18] findings, where 62% of participants rated retrusive profiles as the least attractive, also noting it as a common sign of aging. Torsello's[22] study suggested that treatment goals regarding lip protrusion or retrusion should be individualized to achieve the best possible relationships with surrounding structures. Danqing He[23] found that the distance between the maxillary incisors and the forehead anterior limit line (FALL), as well as the angulation of the maxillary incisors to the A-Po line, can be used to evaluate facial attractiveness.

Comparison of forehead inclination angle between pleasant and unpleasant faces

The comparison of forehead inclination angles between pleasant and unpleasant faces revealed highly significant results. The inclination was greater in pleasant faces, with a mean angle of 20.40°, compared to a mean angle of 17.38° in unpleasant faces. Thus, the forehead was more inclined in pleasant faces. This supports Adams'[17] study on adult white adults[17].

Change in sagittal maxillary central incisor position versus change in forehead inclination

In this study, the sagittal position of the maxillary central incisor showed a poor correlation with forehead inclination in pleasant faces but a moderate positive correlation in unpleasant faces. This contrasts with Adams'[17] study on adult white males, where the position of the maxillary central incisor was moderately correlated with forehead inclination in the pleasant faces and strongly correlated in the unpleasant faces.

Distribution of the sagittal position of maxillary central incisor relative to forehead

According to Andrews' study on white adults, the treatment goals should aim for the maxillary central incisors to be positioned somewhere between the forehead's FA point and the glabella. This study confirms that this guideline also applies to the young Kashmiri population, as 72% of subjects in the pleasant faces had their maxillary central incisors located between the FFA point and the glabella. In contrast, only 19.6% of subjects with unpleasant faces had their maxillary central incisors positioned between these points, with the majority (54.5%) being posterior to the FFA point. This finding is supported by He Danqing's[24] study, which evaluated aesthetics by measuring the antero-posterior position of the maxillary central incisors in patients after extraction treatment. This is consistent with studies by Adams[17] and Andrews[10] on white adults. Webb[25] also found that for a pleasing profile, the upper incisors should be positioned between the forehead facial plane and the forehead midpoint plane.

Conclusions

1. Sagittal maxillary central incisors position relative to forehead’s FFA point is more anterior in pleasant faces.
2. Fuller profiles were associated with attractive faces.

3. Maxillary incisor protrusion is preferable to retruded incisors.
4. Increased forehead inclination is accepted as associated with pleasant faces.
5. For the face to appear pleasant, maxillary central incisor should lie between forehead's FFA point and Glabella neither be posterior to forehead's FFA point nor anterior to the Glabella.

Hence, it can be concluded that the forehead morphology can be used as a landmark for assessing the facial profile as it relates to sagittal maxillary central incisor position. So that treatment goals can include harmonious sagittal relationship between maxillary central incisor and forehead morphology.

Limitations

1. The perception of the attractiveness may be influenced by the protrusion of the nose and chin.
2. Many factors in addition to sagittal position of maxillary central incisor including jaw position, labiolingual inclination of the maxillary anterior teeth and soft tissue changes should be considered in order to obtain a balanced smiling profile.
3. As it is a panel-based study, the composition of the judging panel might be a limitation of this study.
4. Rater's judgement can be affected by his ethnic and educational background.
5. More research with raters from more diverse ethnic background need to be included.

References

1. Dion. K, Berscheid. E, & Walster. E. What is beautiful is good. Journal of Personality and Social Psychology 1972; 24(3): 285–290.
2. Giddon DB. Orthodontic applications of psychological and perceptual studies of facial esthetics. Semin Orthod.1995; 1: 82-93.
3. Arnett GW & Bergman RT. Facial keys to orthodontic diagnosis and treatment planning Part I. Am J Orthod Dentofacial Orthop.1993; 103: 299-312.
4. Michiels L.Y.F & Tourne. LP. Nasion true vertical: a proposed method for testing the clinical validity of cephalometric measurements applied to a new cephalometric reference line. Int J Adult Orthod Orthog Surg.1990; 5: 43-52.
5. Burstone, C. J. The integumental profile. American Journal of Orthodontics 1958; 44(1):1–2.
6. Phillips C, Bennett ME & Broder HL. Dentofacial disharmony: psychological status of patients seeking treatment consultation. J Appl Psychol.1998; 68: 556.
7. Mantzikos T. Esthetic soft tissue profile preferences among the Japanese population. Am J Orthod Dentofacial Orthop.1998; 114: 1-7.
8. Polk MS. Soft tissue profile: a survey of African-American preferences. Am J Orthod Dentofacial Orthop.1995; 108: 90-101.
9. Herz-Fischler R. A mathematical history of the golden number. Dover Publications, NewYork (1998).
10. Andrews, W. AP relationship of the maxillary central incisors to the forehead in adult white females. Angle Orthod.2008; 78: 662-669.
11. Brugger W. Philosophisches Worterbuch, 9th ed. Freiburg: Herder; 2009:29f.
12. C. Flores- Mir, E. Silva, M.L. Barriga, M.O. Lagravere, and P.W. Major. Lay person's perception of smile aesthetics in dental and facial views. Journal of orthodontics 2004; 31(3):204-209.
13. Cao Li, Z hang k, Bai d, Tain Y, Guo Y. Effect of maxillary incisor labioloingual inclination and AP

position on smiling profile esthetics. Angle Orthod 2011; 81:121-129.

14. Sarver DM and Ackerman MB. Dynamic smile visualization and quantification: part 1. Evolution of concept and dynamic records for smile capture. Am J Orthod Dentofacial Orthop. 2003; 124:4-12.
15. Peck H, Peck S. A concept of facial esthetics. Angle Orthod 1970; 40:284-318.
16. Cao Li, Z hang k, Bai d, Tain Y, Guo Y. Effect of maxillary incisor labioloingual inclination and AP position on smiling profile esthetics. Angle Orthod 2011; 81:121-129.
17. Adams M Andrews, W Tremont, T Martin, C Razmus, T Gunnel, E and Nganp. Anteroposterior relationship of maxillary central incisor to the forehead in adult white males. Orthodontics the art and practice of dentofacial enhancement 2013; 14(1) e2-e9.
18. Czarnecki, S. T., Nanda, R. S., & Currier, G. F. Perceptions of a balanced facial profile. American Journal of Orthodontics and Dentofacial Orthopedics 1993; 104(2): 180–187.
19. Schlosser JB, Preston CB & Lampasso J. The effects of computer-aided anteroposterior maxillary incisor movement on rating of facial attractiveness. Am J Orthod Dentofacial Orthop.2005; 127:17-24.
20. Ricketts RM. Esthetics, environment and the law of lip relation. Am. J. Orthod. 1968; 54:272-289.
21. Foster EJ. Profile preferences among diversified groups. Angle Orthod. 1973; 43:34-40.
22. Torsello, F., Graci, M., Grande, N. M., & Deli, R. Relationships between facial features in the perception of profile attractiveness. Progress in Orthodontics 2010; 11(2): 92–97.
23. Danqing He, Yan Gu & Yannan Sun. Correlations between objective measurements and subjective evaluations of facial profile after orthodontic treatment. Journal of International Medical Research 2020; 48(7): 1-13.
24. Danqing He, Yan Gu & Yannan Sun. Evaluation of aesthetic anteroposterior position of maxillary incisors in patients with extraction treatment using facial reference lines. Journal of International Medical Research 2019; 47(7):2951-2960.
25. Webb Ma, Cordayfe, Rossouw. Upper incisor position as a determinant of ideal soft Tissue profile. J Clin Orthod .2016; 50 (11):651-662.

Legend Figures & Tables

Figure 1: Photographic landmarks

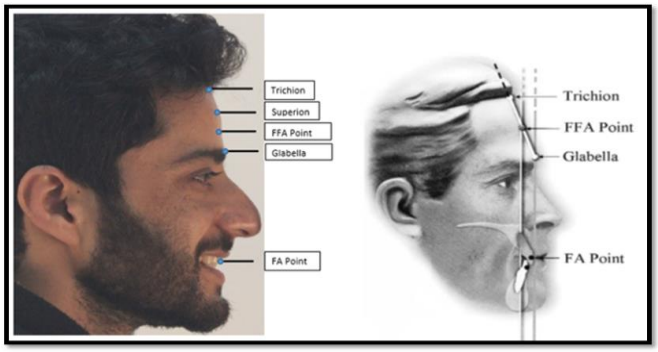
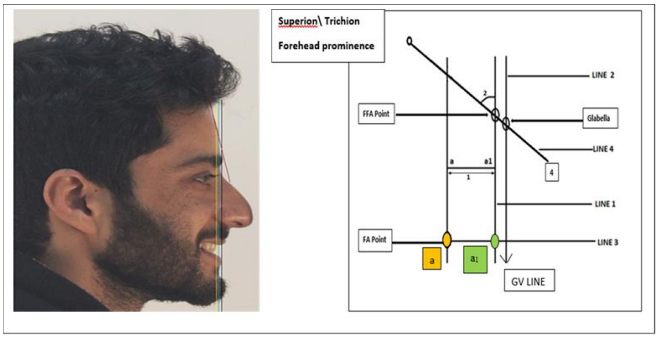
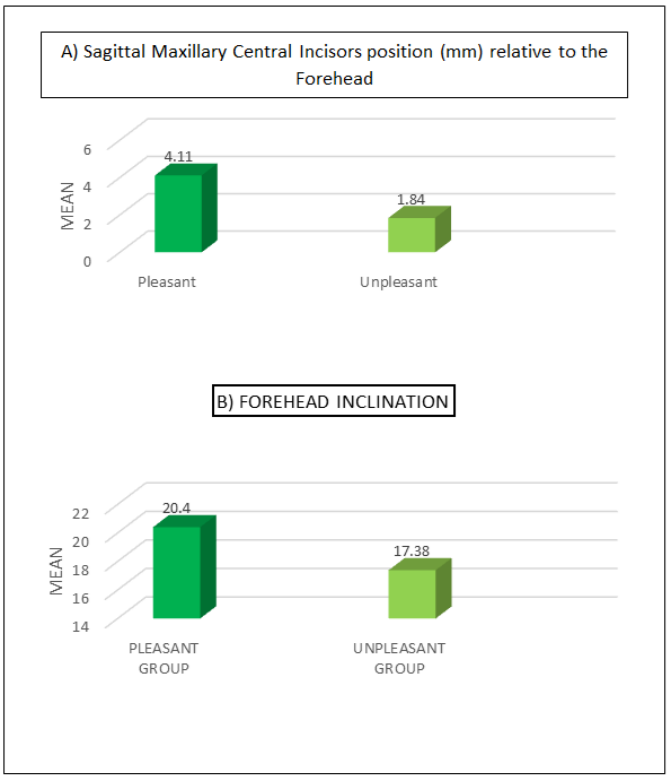


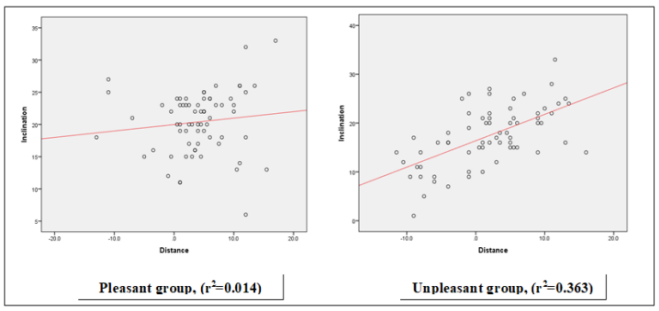
Figure 2: Linear and angular measurements



Graph 1: Comparison of parameters between two groups



Graph 2: Change in sagittal maxillary central incisor position vs. change in forehead inclination



Graph 3: Distribution of the sagittal maxillary central incisor positions relative to the forehead in both groups

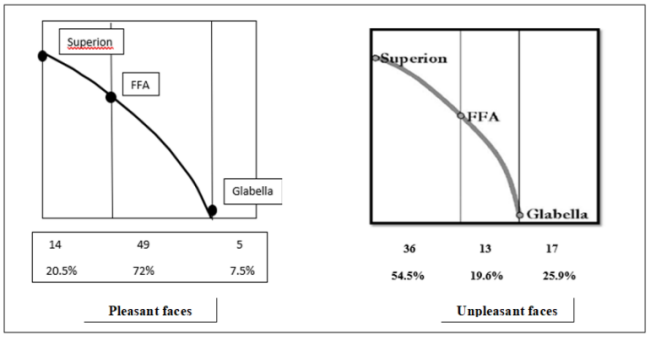


Table 1: Landmarks and parameters used in the study

1. TRICHION is defined as the hairline, and is the most superior aspect of the forehead when the forehead is relatively of flat contour.
2. GLABELLA is the most inferior aspect of the forehead
3. SUPERION is the most superior aspect of the forehead and is either rounded or angular in contour.
4. FFA (Forehead front area) point is the midpoint between Trichion and Glabella for foreheads with flat contour or the midpoint between Superion and Glabella for foreheads with rounded or angular contour.
5. Central incisor FA point – Facial axis (FA) point of the maxillary central incisor.
6. Line 2: Glabella vertical (GV): It is a true vertical line through point glabella.
7. Line 1: Vertical line parallel to GV passing through FFA point.
8. Line 3: Vertical line through maxillary central incisor's FA point.
9. Line 4: Forehead inclination – The line connecting the glabella with the uppermost point of the clinical forehead (superion or trichion) depending on forehead shape.

Table 2: Assessment of sagittal maxillary central incisor position

(1) **The anteroposterior relationship** of the maxillary central incisor to the forehead was measured as the distance between line 1 and line 3 using a metric ruler.
(i) **a (+)** positive value was assigned to maxillary central incisor (line 3) if it lies anterior to (line 1) FFA point.
(ii) **a (-)** negative value was assigned when maxillary central incisor (line 3) lies posterior to (line 1) FFA point.
(iii) **a-a_1** is the anteroposterior maxillary central incisor distance from forehead prominence.
(iv) Point a - Midpoint on line 3 on facial surface of maxillary CI.
(v) Point a^* - Midpoint on line 1 parallel to point a.

Table 3: Sagittal Maxillary Central Incisors position (mm) relative to the Forehead in two groups

	Mean (mm)	SD	Minimum	Maximum	difference	t value	p value
Pleasant Group (n=68)	4.11	5.7	-13	17	2.27	2.084	0.03*
Unpleasant Group (n=66)	1.84	6.8	-11.5	16			

*= Statistically significant

Table 4: Forehead inclination in two groups

	Mean (Degree)	SD	Minimum	Maximum	difference	t value	p value
Pleasant Group (n=68)	20.40	4.8	6	33	3.02	3.166	0.002**
Unpleasant Group (n=66)	17.38	6.1	1	33			

*= Statistically significant