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Evaluation of the Lip-Tooth Relation in Various Growth Patterns- A Cephalometric Study

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Abstract

Upper incisor crown exposure is directly influenced by hard and soft tissue structures that surround and support these teeth. The amount of upper incisor crown exposure has a direct impact on dentofacial esthetics. Lip-tooth relationship during speech and smiling are important aspects of facial esthetics. Hence, the aim of this study was to evaluate the lip-tooth relations in subjects with different types of growth patterns using lateral cephalograms. Methods-This was a retrospective study wherein case records of adult subjects aged 18-35 years were involved. A total of 30 case records of patients who had reported to a university hospital were identified and included in the study. The records of subjects were divided equally into three groups Group A - horizontal growth pattern; group B - average growth pattern and group C - vertical growth pattern. All lateral cephalograms were measured using FACAD software. A chi-square test was used to determine the association of lip-tooth relationships in various growth patterns. One-way ANOVA was used to compare the incisor exposure in different growth patterns. One-way ANOVA reported a statistically significant difference in lip-tooth exposure in various growth patterns ($p=0$, $p<0.05$). Similarly, chi-square test revealed a statistically significant association between lip-tooth relationships in various growth patterns ($p=.00$, $p<0.05$) Within the limitations of this study it can be concluded that there was an increased cervico-incisal exposure of incisors in vertical growth pattern as compared to average and horizontal growth patterns.

Keywords-*Upper incisor, Lip-tooth relationship, vertical growth pattern, average growth pattern, horizontal growth pattern*

Introduction

Upper incisor crown exposure is directly influenced by hard and soft tissue structures that surround and support these teeth. Among the factors that affect upper incisor crown exposure are upper lip length and maxillary incisor inclination.[1,2] The amount of upper incisor crown exposure has a direct impact on dentofacial esthetics.[3,4] In many malocclusions upper as well as lower incisors are proclined thus influencing the facial profile of the patient.[5] Excessive incisor exposure with proclination poses a high chance of fracture due to trauma which can cause non-vitality of the teeth.[6,7]

Peck and peck classified smiles as stage I and II; Ackermann et al designated the stage I smile as the posed smile and stage II as an unposed smile.[8,9] The unposed smile is involuntary and is induced by joy. An unposed smile is natural as it expresses authentic human emotion.

In orthodontics, smile analysis is done to evaluate the posed smile on the basis of 2 major characteristics: the amount of incisal and gingival display.

It is preferred that the elevation of the lip for the posed smile stops at the gingival margins of maxillary incisors. If there is an overexposure of the gingiva during

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smile it leads to gummy appearance called as a gummy smile, in these patients mini implants are preferably used to intrude incisors followed by gingivectomy to reduce the overexposure of gingiva. [10,11] Also, orthodontically, placement of the brackets during bonding can also cause intrusion and reduce the gingival exposure.[12,13,14] Males show less of maxillary incisors and more of mandibular incisors at rest and on smile than females.[15]

Lip-tooth relationship during speech and smiling are important aspects of facial esthetics.

Hence, the aim of this study was to evaluate the lip-tooth relations in subjects with different types of growth patterns using lateral cephalometric measurements.

Materials and Methods

This was a retrospective study where in 30 lateral cephalograms of adult subjects aged 18-35 years were selected and retrieved from the case record of patients visiting the department of orthodontics and dentofacial orthopaedics, Saveetha dental college and hospitals from the time period of January 2019 to March 2019.

Inclusion criteria-

1. Adults undergoing orthodontic treatment without any missing teeth.

Exclusion criteria-

Any obvious pathology like a cyst or tumour

Presence of anterior open bite leading to inaccurate measurement of incisor exposure

History of previous orthodontic treatment.

After selecting the cephalograms they were divided into three groups. Group A consisted of 10 cephalograms of vertical growers; group B consisted of 10 cephalograms of average growers and group C consisted of 10 cephalograms of horizontal growers.

Sampling method-

Sampling method carried out for this study was Randomized sampling. To minimize sampling bias, simple random sampling was performed. The investigator, A.T, did not subject-specific demographic information of the files until the study was completed.

2.4. Incisor exposure measurement method-

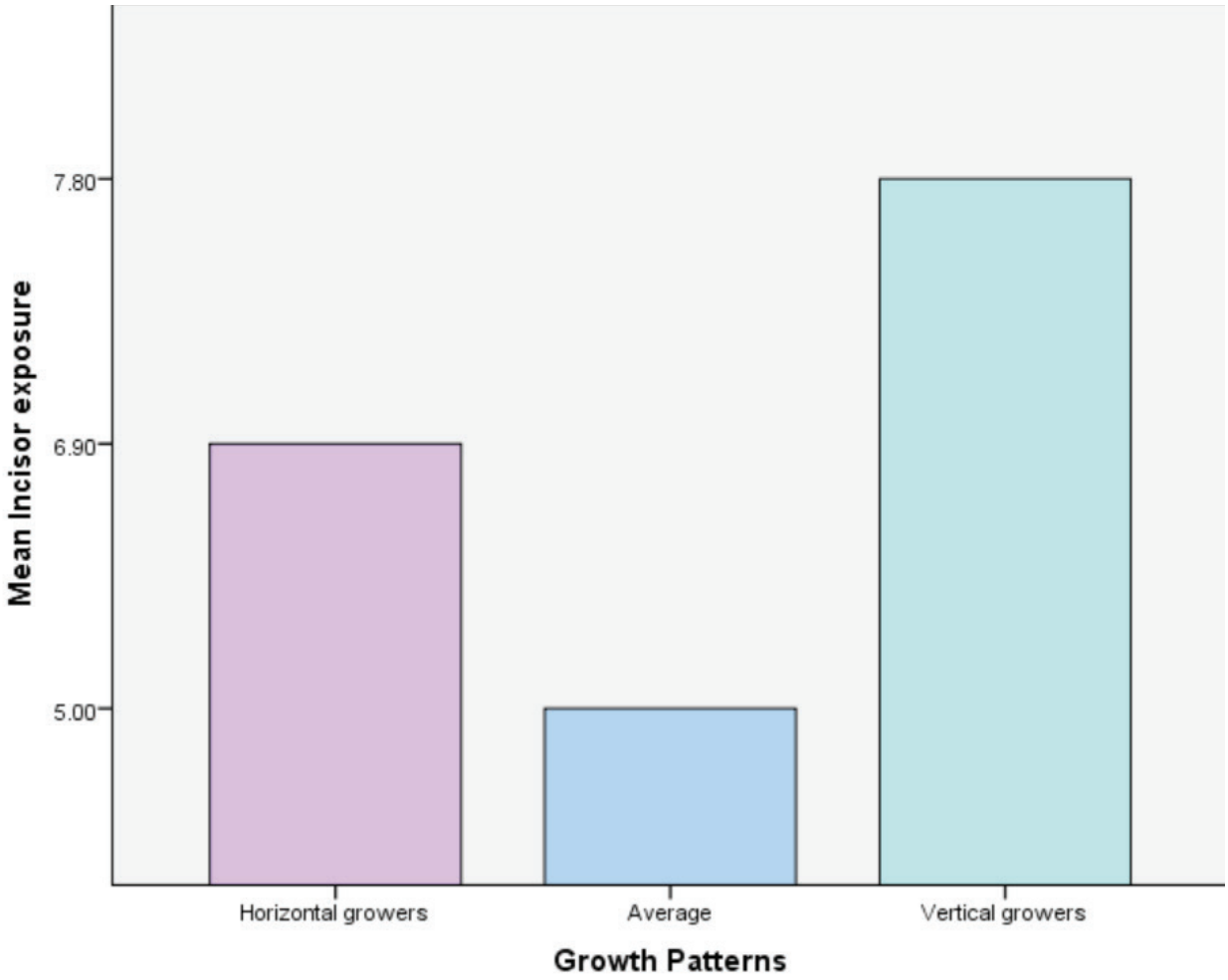
All lateral cephalograms were measured using FACAD software. The lateral cephalogram was calibrated at 10mm. To carry out the incisor exposure measurement, Burstone analysis was performed by measuring the distance from the tip of the upper central incisor to upper lip stomion.

2.5. Statistical analysis-

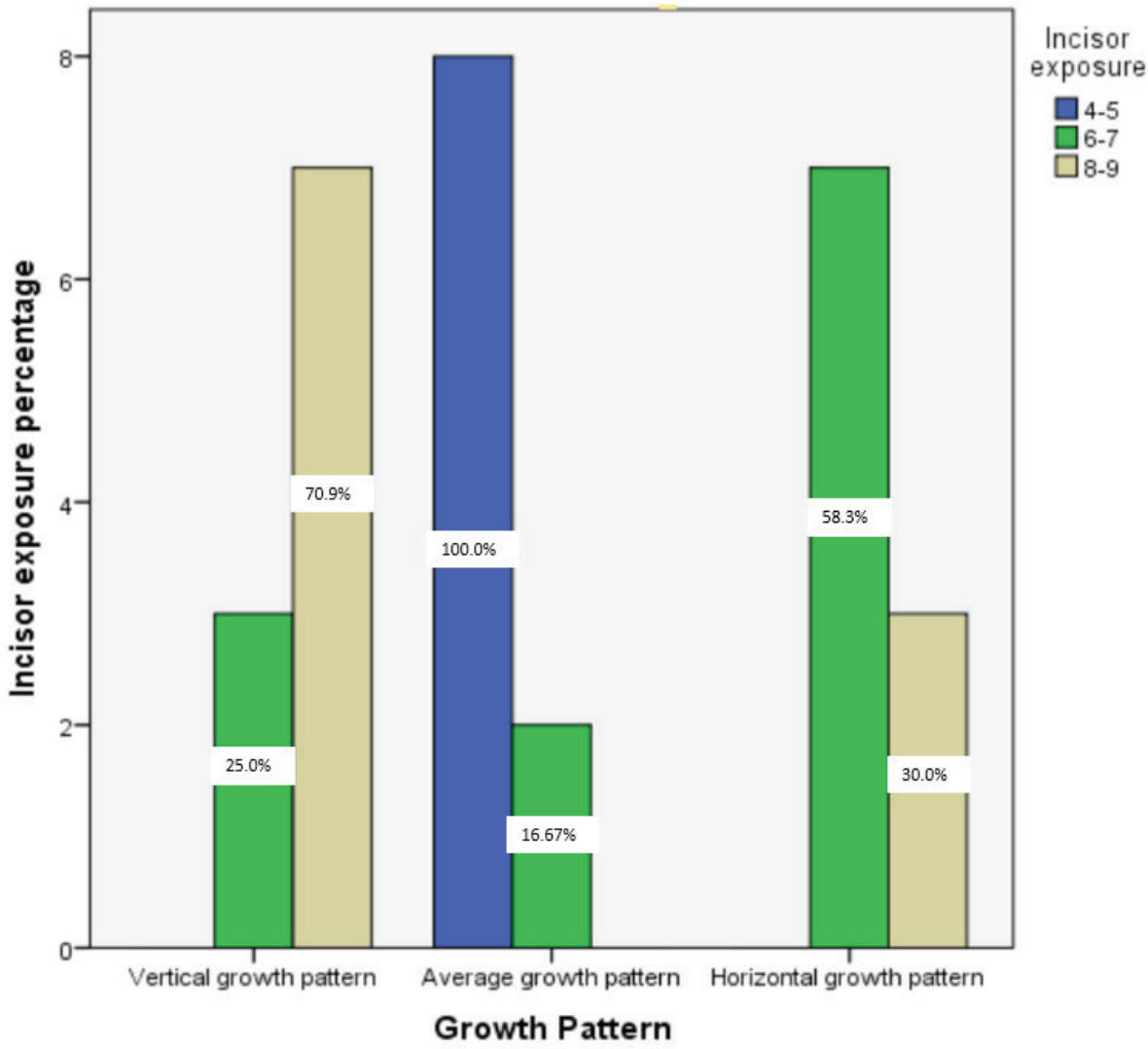
All statistical analysis was performed in SPSS. A chi-square test was used to determine the association of lip-tooth relationships in various growth patterns. One-way ANOVA was used to compare the incisor exposure in different growth patterns.

Results And Discussion

Graph 1 represents one-way ANOVA reporting a statistically significant difference in lip-tooth exposure in various growth patterns ($p=0$, $p<0.05$). Graph 2- Bar graph representing incisor exposure in different growth patterns. There was a statistically significant association between lip-tooth relationships in various growth patterns. (Chi-square value-26.9 p value=.00, $p<0.05$)



Graph 1. Bar chart representing incisor exposure in different growth patterns. X-axis represents the different growth patterns and Y-axis represents the mean of incisor exposure. Pink colour denotes horizontal growers, blue colour represents average and green colour represents vertical growers. Majority of the incisor exposure is found in vertical growth patterns(green) than the other growth patterns. Similarly, in One way ANOVA analysis, there was a statistically significant difference observed in the incisor exposure within the groups: and found that vertical growers(green) have a higher incisor exposure compared to other growers. (df=2,p=0, p<0.05)



Graph 2. Bar chart representing incisor exposure in different growth patterns. X axis represents different growth patterns and Y-axis represents the no. of patients in whom incisor exposure was measured. Blue colour denotes 4-5 mm of incisal exposure, Green colour denotes 6-7 mm of incisal exposure and brown colour denotes 8-9mm of incisal exposure. The majority of the 4-5 mm exposure(blue) is found in the average growth pattern than the other growth patterns and it is also significant statistically. (Chi-square value-26.9 p value=.00, p<0.05) proving that the incisor exposure is increased in vertical growth pattern.

Previously our team had conducted numerous studies such as an apparatus designed to measure orthodontic forces[16], quantification of intrusive forces[20], obstructive sleep apnea[22] and recycling methods[23] , comparison of intrusion on maxillary incisors[16,17] , stress distribution at mini-implant site[10] and an apparatus to measure Now we are focussing on epidemiological surveys, the idea for this study stemmed from the current interest in our community.

Incisor exposure and an attractive smile are the two major components of an attractive face, and most easily judged by a layman. Undoubtedly, patients undergoing orthodontic treatment are expected to have an attractive face with a pleasing smile and an adequate amount of incisor exposure after the treatment.[18]

In the present study, the chi-square test revealed a statistically significant association between lip-tooth relationships in various growth patterns. One-way

ANOVA reported that there was a statistically significant difference in lip-tooth exposure in various growth patterns. In subjects with vertical growth pattern, there was incisor exposure of 8-9mm whereas, in horizontal grower, incisor exposure of 6-7mm was most commonly found. Sufficient literature was not reported evaluating lip-tooth relation in various growth patterns.

Lip tooth relationships have been reported and studied extensively in various malocclusions in the past, but no studies are reported about lip tooth relationships in different growth patterns. This study was designed keeping in mind the lack of available literature in this area of interest. Some studies of lip tooth relationship in various malocclusions report that male subjects with class III malocclusion displayed slight exposure of incisors during smile than subjects with class I or class II malocclusion but did not evaluate the same in different growth patterns. [19,20,21] Factors such as age, ethnic variations affect the lip-tooth relationship in North American adolescents with class I skeletal pattern.[22,23]

Rashid et al reported there was a statistically insignificant difference in the incisor exposure in different malocclusions.[19,24]However, Arriola et al reported that there was a statistically significant difference in the upper incisor exposure in different malocclusions.[25]

The various limitations of this study are a small sample size, cephalogram based study (Lateral cephalograms are a 2-dimensional view of the 3-dimensional object).

Conclusion

Within the limitations of this study, it can be concluded that there was an increased cervico-incisal exposure of incisors in vertical growth pattern when compared to average and horizontal growth patterns. Therefore, the incisor exposure is different in various growth patterns henceforth, diagnosis and treatment planning should be carried out keeping it in mind.

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Ethical Clearance: It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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