

## Efficacy of Bite Opening in Begg's Technique

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**Abstract:** *Introduction:* With the introduction of Begg's, technique there is opening up of deep anterior overbite by depressing both upper and lower anterior teeth in their sockets. The aim of the study was to evaluate the efficacy of bite Opening by the Begg technique during the first stage of treatment cephalometrically. *Materials and Methods:* Materials for the study consisted of thirty pre-treatment and end of stage 1 cephalograms taken of patients treated with Begg mechanics. Tracing of the radiographs of Class I, Class II division 1 and Class II subdivision malocclusion cases were made and reference planes were drawn. The difference between the pre-treatment and stage-I measurements for all the sixteen parameters were analysed statistically. The student paired t-test was applied to determine the level of significance. *Results:* The estimation of apparent bite opening due to lower incisor proclination was derived using correlation coefficient and the regression equation was estimated. Overbite is reduced markedly with a mean of 4.66 +/- 1.637 mm, which is statistically highly significant. The result showed an apparent bite opening with a mean value of 1.97+2.44 mm which is statistically highly significant. *Conclusion:* Overbite was reduced markedly in all the cases with this technique used by Begg's and mandibular incisors showed a marked amount of intrusion, which accounts for 63.6% of bite opening which is found to be the primary factor contributing to correction of deep overbites.

**Keywords:** Begg's appliance, Overbite, Cephalograms, Class II subdivision, Apparent bite opening.

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## INTRODUCTION

Overbite has been defined by Neff, as a percentage of lower incisor covered by the corresponding upper incisors [1]. Further, he considered a 20% overbite as ideal. Evaluation of bite raising mechanics in the Begg technique has been continuing since Dr. Begg [2] first introduced his technique in the mid 1950's. According to Dr. Begg, opening up deep anterior overbite is done in this technique by depressing both upper and lower anterior teeth in their sockets; it is not done by elevating the mesial marginal ridges of the anchor molars [3]. Although a number of articles in the literature have reported and commented on the results of treatment with Begg mechanics, relatively

few articles contain quantitative information on tooth movements obtained cephalometrically. The aim of the present study is to evaluate the efficacy of bite Opening by the Begg technique during the first stage of treatment cephalometrically.

## MATERIALS AND METHODS

Materials for the study consist of thirty pre-treatment and end of stage 1 cephalograms taken of patients treated with Begg mechanics from the Department of Orthodontics, Yenepoya Dental College, Mangalore. All the cases had moderate to severe deep bite. All the cephalograms were taken using the same cephalometric machine (ROTOGRAPH PLUS - Villa, Italy) using standard x-

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ray tube to patient distance (5 ft.). The sample consisted of Class I, Class II division 1 and Class II subdivision malocclusion cases. Tracing of all radiographs were made on single matte acetate paper with sharp 2H pencil. For each cephalogram outline of anterior cranial fossa pterygomaxillary fissure, maxilla, mandible, porion, orbit, the maxillary central incisor and first molar, mandibular central incisor and first molar were traced (Fig 1). The following reference planes were drawn on pre-treatment and stage 1 cephalograms (Fig 2).

#### Horizontal Reference Planes:

- Palatal plane – line drawn from ANS to PNS.
- Mandibular plane - line drawn from gonion to menton.

#### Vertical Reference Planes:

- Palatal plane perpendicular- a line drawn through the anterosuperior portion of pterygoid fissure perpendicular to the palatal plane

In order to evaluate the changes in the position of maxillary and mandibular incisors brought about by orthodontic treatment the difference of pre-treatment and end of stage I findings were obtained. All linear and angular measurements were made 0.5 mm and 0.5° accuracy respectively. The difference between the pre-treatment and stage-I measurements for all the sixteen parameters were analysed statistically. The mean net changes and the standard deviation were registered.

## RESULTS

This study evaluated the efficacy of the bite opening by the Begg light wire technique during the first stage of treatment and also analysed apparent bite opening as a result of lower incisor proclination along with the percentage contribution by various teeth considered in the study. Samples consisted of pre-treatment and end of stage cephalograms of 30 cases treated with Begg light wire appliance analysed for results under 16 parameters considered in this study. The results thus obtained were analysed statistically, the mean value and standard deviation were registered for all 16 Parameters. Pared 't' test was applied to determine the level of significance. The estimation of apparent bite opening due to lower incisor proclination was derived using correlation coefficient and the regression equation was estimated. Results obtained are presented here under the headings of various parameters considered for the study. The observations are presented in Fig 4,5,6.

Overbite is reduced markedly with a mean of 4.66 +/- 1.637 mm, which is statistically very highly significant.

Upper incisor height from the incisal edge shows intrusion of incisal edge in 9 cases by 1.66mm, no changes in 9 cases and extrusion in 12 by 1.20mm cases. The mean value shows an intrusion of 0.1 +/- 1.8 mm, which was statistically not significant.

Upper incisor anteroposterior position shows a marked retraction in all the cases with a mean reduction of 8.75 + 3.35 mm, which is statistically very highly significant.

Lower incisor height from the incisal edge shows depression of incisal edge in 28 cases and 2 cases showed no changes. The mean value shows an intrusion of 2.93 +/- 2.20 mm, which is found to be statistically very highly significant.

Lower incisor anteroposterior position shows a retraction in 25 cases by 3.8mm and no change in 1 case and protraction in four cases by 2.75mm. The mean value shows a retraction of 2.73 +/- 3.33 mm, which is statistically significant.

The maxillary molar height from the mesial cusp tip shows an extrusion in 11 cases and no changes in 19 cases. The mean value shows an extrusion of 0.866 +/- 1.7 mm, which is statistically significant.

The maxillary molar height from the distal cusp tip shows an extrusion in 15 cases by 2mm, no change in 11 cases and intrusion in 4 cases by 1.25mm. The mean value shows an extrusion of 0.0167 +/- 4.4 mm, which is statistically not significant.

The maxillary molar anteroposterior position shows a mesial movement in 13 cases by 2.8mm, no change in 11 cases and distal movement in 6 cases by 2.08mm. The mean value shows a mesial movement of 0.65 +/- 2.5mm, which is statistically not significant

The mandibular molar height from the mesial cusp tip shows an extrusion in 26 cases and no change in 4 cases. The mean value shows an extrusion of 2.03+1.2 mm, which is statistically highly significant.

The mandibular molar height from the distal cusp tip shows an extrusion in 26 cases by 2.38mm, no change in 3 cases and intrusion in 1 case by Imm. The mean value shows an extrusion of 1.86 +/- 1.16 mm, which is statistically significant.

Mandibular molar anteroposterior position shows a mesial movement in 21 cases by 3.19mm, no change in 4 cases and distal movement in 5 cases by 1.6mm. The mean value shows a mesial movement of 2.13 +/- 2.62 mm, which is statistically highly significant.

Frankforts mandibular plane angle increased in 17 cases by 3.35° and no change in three cases and decreased in 10 cases by 2.9°. The mean value shows an increase in angulation of 1.27 +/- 3.34°, which is statistically significant.

The occlusal plane angle increased in 22 cases by 3° and no change in 2 cases and decrease in 6 cases by 2.5°. The mean value shows an increase of 1.84 +/- 3.14°, which is statistically highly significant

Upper central incisor angulation was decreased in 29 cases and 1 case showed no change. The mean value shows a decrease in angulation of 26.8 +/- 9.6°, which is statistically highly significant.

Lower central incisor angulation showed a decrease in 17 cases by 6° no change in 2 case and an increase in angulation in 11 cases by 5.3°. The mean value shows a decrease in angulation on 1.9 +/- 7.9°, which is statistically not significant.

Interincisal angle showed an increase in all the cases. The mean increase was 26.77 +/-15.19 degrees which is statistically very highly significant

**Percentage of bite opening (Fig 6)**

The percentage of bite opening analysed in the study was calculated as follows:

Initial overbite = 4.6 mm

- Upper Incisor Intrusion = 0.1 = 0.1 x 100/4.6 = 2%
- Lower incisor intrusion = 2.93 mm = 2.93 x 100/4.6 = 63.6%
- Upper and lower molar extrusion.
- L6to PP - 0.4 mm+ U6 to MP - 1.9mm

Total: 2.3 mm= 34.4%

Amount of bite opening by molar extrusion = 34.4 x 4.6/100=1.57 mm

Percentage bite opening by upper & lower molar individually.

Relative contribution of Upper molar extrusion = 2.3/0.4= 5.75

Therefore, Bite opening percentage = 34.4/5.75= 6%

Relative contribution of lower molar extrusion= 2.3/1.9=1.21

Bite opening percentage = 34.4/1.21= 28.4%

**Estimation of Apparent bite opening**

A sub sample was taken from the main sample, which exhibited proclination of lower incisors, for the estimation of apparent From the sub sample a formulae was derived to estimate the amount of apparent bite opening.

Correlation coefficient of amount of overbite and amount of proclination of lower incisors was r = - 0.4029

By using the correlation coefficient Regression equation was estimated

Regression equation

$$Y = a + bx$$

Where

Y = Apparent bite opening

X = Degree of proclination

a - constant

b - constant

The value for the constants derived are

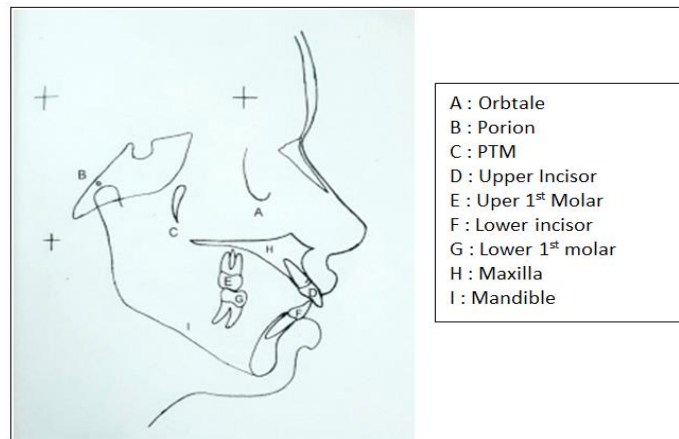
a= +1.96

b= -0.64

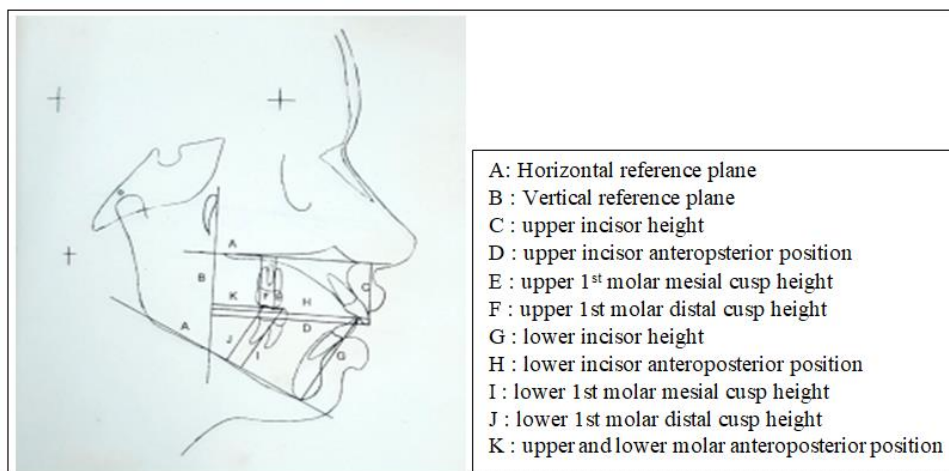
Therefore

$$Y = (1.96) + (-0.64 \times X)$$

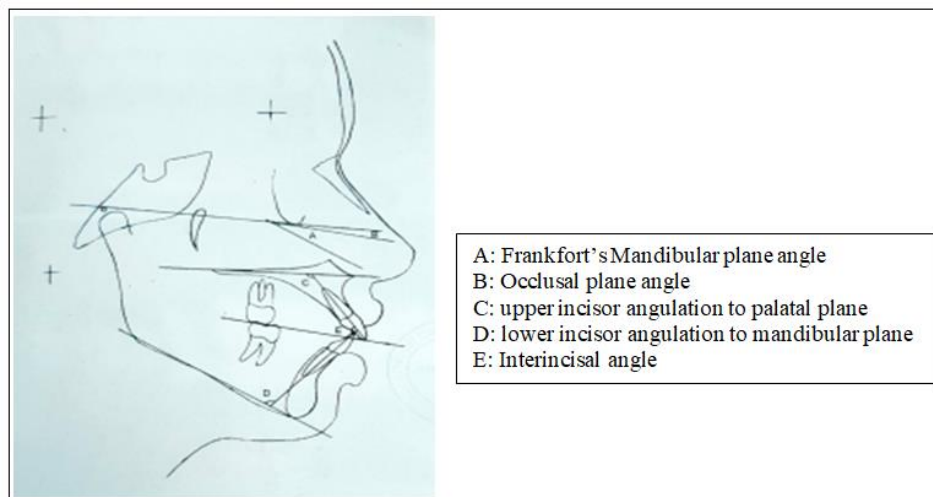
Using the formula the amount of apparent bite opening was estimated. The result thus obtained was statistically analysed, the mean value and standard deviation were registered. Student test was done to determine the level of significance. The result showed an apparent bite opening with a mean value of 1.97+2.44 mm which is statistically highly significant.



**Fig 1: Cephalometric Landmarks**



**Fig 2: Reference planes and linear measurements**



**Fig 3: Angular measurements**

## DISCUSSION

The orthodontic profession has assumed much of the responsibility for improvement of function of the teeth and jaws. Since function is closely associated with overbite, the correction of vertical overlap comprises the major part of clinical orthodontics. Successful treatment of deep overbite should establish the lost balance and stability and

thereby enhance function and overall esthetics. The correction of deep overbite is done in the first stage of Begg technique. According to Beggs, correction of deep overbite is done by depressing both upper and lower anterior teeth in their sockets; it is not done by elevating the mesial marginal ridges of the anchor molars. The objective of the present study is to evaluate the various tooth movements which

facilitates deep overbite correction in the Begg technique, cephalometrically. This study further investigated the apparent bite opening as a result of lower anterior proclination and analysed the percentage contribution of bite opening by various teeth considered in this study (Table 1). The present study observed a marked reduction of overbite. The mean reduction is 4.6mm, which is statistically very highly significant. This is in conformity with the findings of Levin [4] and Gcrano [5], who also observed significant reduction of deep overbite in Begg technique. Upper incisor height from the incisal edge shows a mean intrusion of 0.1mm, which is statistically not significant. This finding is substantiated by the findings of Kimmons [6] and James [7], who found that there is no significant amount of intrusion of maxillary incisors. J. R. E. Mills [8] is of the opinion that the upper incisor intruded by 0.5mm to 1.5mm and was the result of labial tilting rather than intrusion. Beggs is of the opinion that bite opening is due to the intrusion of upper and lower incisors. Beggs is of the opinion that bite opening is due to the intrusion of upper and lower incisors. The upper incisor antero-posterior position in this study showed a remarkable retraction of 8.7mm, which is statistically highly significant. This is the contributory factor in correction of overjet. Lower incisor height from the incisal edge shows a mean depression of incisal edge by 2.93 mm, which is statistically very highly significant. This suggests that intrusion of lower incisors is the main contributing factor in bite opening in Begg technique. This is substantiated by the findings of R. I. Levin [4], James [7] and Margolis *et al.*, [9] who concluded that there is a significant intrusion of lower incisors. Contrary to this R. J. Elder [10] is of the opinion that there is only a modest intrusion of lower labial segment. The lower incisor antero-posterior position shows a mean retraction of 2.73mm, which is statistically significant. This is contributed by lower incisor intrusion. The maxillary molar height from the mesial cusp tip shows an extrusion of 0.866 mm, which is statistically significant and distal cusp tip shows an extrusion of 0.016 mm, which is insignificant. This suggests that there is mild extrusion with distal tipping of maxillary molars, which contributes to bite opening. This is in agreement with the findings of Margolis *et al.*, [8] and Maria O Reilly [11] who observed an increase in upper molar tip to palatal plane. The present finding is contradicted by the report of P. R. Begg [2], which states that the bite opening in Begg technique is not done by extrusion of anchor molars. Upper molar antero-posterior position showed mesial movement with a mean value of 0.65 mm which was statistically nonsignificant. This indicates that maxillary molars remain in its same antero-posterior position. This is confirming the findings of Malcom

Meistrell [12], who observed a small forward change of 0.2mm in the maxillary first molar. Mandibular molar height from the mesial cusp tip showed a mean elevation of 2.03mm and the distal cusp tip showed a mean elevation of 1.86mm, which was statistically significant. This suggests that mandibular molars extrudes with a distal tipping and also plays a contributing role in bite opening. The distal tipping is due to the reciprocal action of the anchor bends. This substantiates the findings of Ricketts [13], Swain and Akerman [14], Maria O Rielly [11], who reports that lower molar extrusion is due to the intermaxillary elastics and anchor bends. James [7] states that correction of overbite at the first stage of Begg technique is accomplished by elevation of lower molars and depression of lower incisors. The present finding is contradicted by the report of P. R. Begg [2], which states that the bite opening in Begg technique is done by intrusion of incisors and not by extrusion of anchor molars. The study also showed that the mandibular molars moved mesially with a mean value of 2.13mm, which is statistically significant. The mesial movement also contributed to the reduction of the bite opening effect of molar extrusion. This is in agreement with the findings of Milton R. Sims [16], who states that mandibular anchor loss during initial stage of treatment is associated with distinctive elongation of lower molars. The Frankforts mandibular plane angle shows a mean increase in angulation by 1.2° which is statistically significant. This is contributed by elevation of upper and lower molars by 2.3 mm, which resulted in a clockwise rotation of mandible. In absolute value the FMA should have increased more than 1.2°. This does not occur because the molar also moved mesially reducing the FMA. Therefore, the net increase in FMA is only 1.2°. This is substantiated by the findings of James [7], Domnik J. Gcranzo [16] and Kenneth Barton [17], Hellen Knight [18] who states that mandibular plane angle increases with treatment the occlusal plane angle showed an increase in angulation with a mean value of 1.84 which is statistically significant. This may be due to extrusion of molars and intrusion of incisors. This is in accordance with Theodore Kottarabba [19], Kenneth A. Barton [20], R. I. Levin [7], Domnic J. Gcrano [16] and Maria O. Reilly [11] who observed that the occlusal plane angle increased with Begg technique.

Upper incisor angulation to palatal plane was decreased by 26.8° during stage I which is statistically significant. This is expected as the Class II mechanics needs to retract upper anteriors in order to achieve edge to edge bite at the end of stage I. Lower incisor angulation to mandibular plane showed a decrease by 1.9° which was statistically non-significant. The interincisal angle showed an increase by 26.7°, which is statistically highly



significant. This is due to the decrease in angulation of upper and lower incisors. Most of the earlier investigators reported the absolute value of incisor intrusion and molar extrusion. These values cannot be applied on all the cases, since the amount of deep bite varies from case to case. Hence a percentage distribution of these values could be applied on all cases. This study analyzed the percentage of bite opening contributed by different teeth under observation:

The upper incisor intrusion - 2%

Lower incisor intrusion - 63.6%

Upper molar extrusion - 6%

Lower molar extrusion - 28.4%

The amount of upper incisor intrusion is comparatively negligible as compared to lower incisors. This is due to the vertical component of class II mechanics which extrudes the upper incisors. Extrusion of lower molars is partly contributed by the anchor bends and vertical component of class II mechanics. In essence, class II elastics are extrusive in nature thereby helping to correct the deep bite and it is reverse in the case of upper incisors. In this study an increase in angulation of IMPA was observed in 11 out of 30 cases mostly with severe overjet. This creates an apparent bite opening which has to be evaluated. To estimate the amount of apparent bite opening a formula was derived using the regression equation.  $Y = (1.96) + (-0.64 \times X)$  amount of Where Y is the apparent bite opening, X proclination of lower incisors. Using this formula the amount of apparent bite opening was analysed, and was found to be 1.97mm which was statistically highly significant. This suggests that labial flaring of lower incisors during treatment played a correlative role with intrusion for overbite correction in 36% of cases. Since the duration of stage 1 in Begg technique is relatively short, most investigators judge the contribution of growth to be negligible. This study describes the various occlusogingival displacement contributing to the correction of deep overbite in stage 1 of Begg technique. In order to assess the permanency of the results achieved during stage 1, and to study the contribution of growth on a long term basis, preferably at least 10 years after retention, a further study is indicated during subsequent stages of Begg mechanotherapy.

## CONCLUSION

The results of this investigation led the following conclusions:

1. Overbite was reduced markedly in all the cases.
2. The mandibular incisors showed a marked amount of intrusion, which accounts for 63.6% of bite opening which is found to be the primary factor contributing to correction of deep overbites.

3. The maxillary incisor intrusion contributes to only 2% of bite opening
4. Maxillary molar extrusions contribute to 6% of bite opening
5. Mandibular molar extrusions contribute to 28.4% of bite opening.
6. The Cant of occlusal plane angle increased during treatment mainly due to molar extrusion and incisor intrusion.
7. Frankforts mandibular plane angle increased due to molar extrusion and clockwise rotation of mandibular.
8. The labial flaring of lower incisors during treatment played a correlative role with intrusion for overbite correction in 36% of the cases.

## Limitation of the study

Further investigation is recommended during the subsequent stages of Begg treatment in order to assess the permanency of results achieved during stage 1 of Begg therapy and to study the contribution of growth on a long term basis, preferably at least 10 years after retention.

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