

Original Research

Comparison of anchor loss and anterior retraction in bimaxillary protrusion treated by conventional and Skeletal Anchorage System

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ABSTRACT:

Introduction: Bimaxillary protrusion is a deformity characterised by protrusive and proclined maxillary and mandibular incisors. Successful treatment of this condition in adult patient is one of difficult biomechanical case in orthodontics. Orthodontic anchorage system is better explained by Newton's law of motion. The objective of this study was to compare the amounts of anchorage loss and retraction of anterior tooth using conventional tooth anchorage and skeletal anchorage in individual with bimaxillary protrusion. **Materials and methods:** The study consists of two groups of 25 patients in group A (conventional anchorage) and 25 patients in group B (skeletal anchorage system). This study was used to compare the anchorage loss and amount of anterior retraction in bimaxillary deformity treated by conventional tooth anchorage versus skeletal anchorage system (SAS). **Results:** The result showed that skeletal anchorage group had greater anterior tooth retraction and less maxillary molar mesialization than the conventional group. **Conclusion:** Although difference in anchorage system could not reduce the duration of treatment, in case of bimaxillary cases the skeletal anchorage system can produce more successful outcome. The success rate and stability of skeletal anchorage group was more than traditional anchorage group

Keywords: Anchorage loss, Skeletal anchorage, bimaxillary protrusion

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INTRODUCTION

Bimaxillary protrusion in non-growing individuals is a condition which is considered very difficult to manage. The ultimate goal of treatment is retraction of both maxillary and mandibular anterior teeth with appropriate anchorage system. Anchorage may be

defined as a resistance to reaction forces. When an action is applied to retract the anterior teeth and reactive force is acted upon the posterior teeth moving it forward. Anchorage is a resistance to unwanted tooth movement [1]. Whereas, an absolute anchorage means no movement of the anchorage unit as a

consequence to the inevitable reactionary forces applied to move teeth which are impossible if the force applied is from the anchorage unit and this foundation principle of biomechanics defies Newton's Third law of Motion i.e. Every action has an equal and opposite reaction[2]. The correction bimaxillary protrusion cases with class I or II malocclusion often includes extraction of premolar tooth and retraction of maxillary and mandibular anterior teeth with different approaches of anchorage. Maximum anchorage is obtained by preventing the forward movement of posterior tooth. Generally this means less than 25 per cent of space closure in the extraction space via posterior anchorage loss[3]. There are several studies which compares the different anchorage system for en-masse retraction of anterior teeth[4-5].For the successful outcome in treatment of bimaxillary protrusion clinician must predict the anchorage loss. This study was used to compare the anchorage loss and amount of anterior retraction in bimaxillary deformity treated by conventional tooth anchorage versus skeletal anchorage system (SAS).

MATERIALS AND METHODS

The study sample consist of 50 patients with bimaxillary protrusion with class I or II malocclusion. Out of 50 subjects 30 were female(mean age 18-30) and 20 were male(mean age 20-30).Final sample were decided by excluding patient with craniofacial deformities and syndromes. All patient were treated by retracting the maxillary dentoalveolar process by extraction of all first bicuspid, fixed pre-adjusted Edgewise appliances .After leveling and alignment using 0.016- and 0.018-inch stainless steel (SS) wires and anchorage systems were applied .The sample were divided into two groups A (Conventional tooth anchorage- maxillary molar anchorage) and B(skeletal anchorage- mini-implant). In this study we used titanium mini – implant of size 1.3mm diameter attached to buccal alveolar bone . Lateral cephalograms of each patient were taken before and after treatment .Anchor loss was assessed by calculating the distance between pterygoid vertical to maxillary molar(PTV-6 CEJ) in pre- and post lateral cephalogram. The measures obtained were evaluated and compared the parameters anterior retraction and anchorage loss. The results were calculated using Student t- test using statistical software SPSS.

RESULTS

Table 1 shows analysis of both groups based on anchorage loss measures based on cephalograms (PTV-6 CEJ).

Comparison of Anchor Loss(mm) in CONVENTIONAL and SKELTAL ANCHORAGE Group		
	Mean	Standard deviation
GROUP A	1.58	0.43
GROUP B	0.00	0.00

Table 2 show mean difference incisor position(UI-E) (LI-E) of two groups

Comparison of ANTERIOR RETRACTION in CONVENTIONAL and SKELTAL ANCHORAGE Group			
	Mean	Standard deviation	Duration(days)
GROUP A(MAXILLA)	0.1000	0.42164	178
GROUP B	1.5000	0.21075	
GROUP A(MANDIBLE)	1.0032	0.37204	176
GROUP B	1.0543	0.16754	

Student t -test were used to analyze the treatment changes in 2 groups. There were no significant difference between the skeletal variables like N-A, SNB,ANB, and N- A- Pog and 2 linear measurements (A-Nv,Pog-Nv) defined as the distance from Point A and Pog to N-vertical line in cephalograms before the orthodontic treatment. For each cephalometric measurements values analysed before and after treatment, we found statistically significant difference between both groups in terms of anchorage loss. In conventional group as values obtained from cephalogram posterior anchorage loss is more than skeletal anchorage group. Mean anchorage lose in conventional group is 1.58 mm. The inclination of the occlusal plane relative to the anterior cranial base is increased in both groups. The skeletal group showed less mesial movement of molars than the other group. No significant difference found in the vertical movement of maxillary molar in both groups. When analysed the retraction movement of maxillary and mandibular anterior teeth, the amount of retraction of upper incisor is more in group B (skeletal).The controlled tipping movement was more common in maxillary teeth in both groups. Controlled tipping was assigned if the maxillary central incisor crown had moved posteriorly with the center of rotation at the root apex. The retraction of mandibular incisor proclination was not statistically significant between both groups. The degree of vertical and sagittal movements of both maxillary and mandibular anterior horizontal movement have certain degree of co-relation with retroclination.

DISCUSSION

The main goal of orthodontic treatment is to achieve acceptable facial aesthetics with proper evaluation and assessment. Bimaxillary protrusion is characterised by protrusion of anterior dentoalveolar segment of both maxillary and mandibular arch with convexity of lower facial third. Anchorage is one of the vital component of the orthodontic biomechanics. As anchorage loss can lead greatest problems, Orthodontists pay special attention to maintain anchorage to obtain successful treatment outcomes[6]. This anchorage is essential to retraction of the anterior teeth effectively. The aim of this study was to compare the anchorage loss and retraction of anterior teeth caused by two different anchorage systems conventional and skeletal. Based on the type of malocclusion and anchorage requirements all the cases selected for our study were undergone extraction of first bicuspid. We observed statistically significant increased anchorage loss of maxillary first molar in patients treated with conventional tooth anchorage system. It is also seen that skeletal anchorage group showed adequate control of the vertical movement of maxillary molars that facilitate correction of class II malocclusion. This vertical movement also resulted in backward rotation of mandible. In a study by Kanomi et al. successful outcome of skeletal anchorage has been described with the findings supporting our results[7]. In our study we found a mean anchorage loss of 1.58mm in conventional group independent of age and sex differences. The success rate and stability of skeletal anchorage group was more than traditional anchorage group. Skeletal anchorage using dental implants, miniplates, miniscrews, and microscrews, provide an absolute anchorage for tooth movements[8-9]. In our study En-masse retraction of skeletal anchorage group was more than conventional group which shows its better posterior anchorage preservation. This also facilitated increased retraction of anterior to the available extraction space. The advantage of newly invented skeletal anchorage systems has been described in many literatures that makes the treatment plan efficient and with reduced time[10-11]. In contrast our study there was no statistically significant difference in the treatment duration between both groups. As duration of treatment primarily depends upon the parameters such as mechanics, patient cooperation and patient motivation. These variables which were not controlled in our study.

CONCLUSION

The skeletal anchorage group has achieved better anchorage and increased retraction of anterior teeth than did the conventional anchorage system during the treatment of bimaxillary dentoalveolar protrusion. In cases requiring maximum anterior retraction with absolute anchorage, skeletal anchorage system can be used preventing complications of conventional mechanics.

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