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Original Article

Comparative evaluation of anchorage reinforcement between orthodontic implants and conventional anchorage in orthodontic management of bimaxillary dentoalveolar protrusion

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ABSTRACT

Background: Increased upper lip procumbency is commonly associated with maxillary dentoalveolar protrusion with the major goal of reducing maxillary dentoalveolar protrusion. The treatment plan usually includes extraction of the maxillary first premolars, followed by retraction of anterior teeth with maximum anchorage. Dental implants have been widely accepted as successful adjuncts for obtaining maximum anchorage in orthodontic treatment.

Methods: 50 subjects between the ages of 13 and 17 years having bimaxillary dentoalveolar protrusion were included in the study. The patients were divided into two groups. Both groups received treatment with 0.022″ MBT prescription preadjusted edgewise appliance system. In addition, subjects of Group 'I' received the Nance button and lingual arch as anchorage reinforcement in the upper and lower arches, respectively. Subjects of Group 'II' received self-drilling titanium OI for anchorage reinforcement.

Results: Significant retraction was achieved in all cases with good vertical control. Anchor loss was observed in both groups. Anchor loss was much higher in Group I compared to Group II, and an intergroup comparison for anchor loss was highly significant.

Conclusion: Implants as anchorage, for en masse retraction, can be incorporated into orthodontic practice. The use of orthodontic implants for anchorage is a viable alternative to conventional molar anchorage.

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Introduction

Over the past two decades, dentistry has seen a dramatic increase in the use of dental implants. The vast majority of dental implant research is centered on the use of endosseous implants for replacement of missing teeth. Previously, the use of dental implants within the specialty of orthodontics was limited to integration of implants into treatment plans strictly to facilitate tooth replacement.

Integration of dental implants into contemporary orthodontic practice has advantages of serving as a method of increasing orthodontic anchorage, virtually eliminating patient compliance issues and occasionally permitting orthodontic treatments previously thought to be impossible without surgery.

The practice of clinical orthodontics is largely dependent on the availability of anchorage. According to Proffit,[1] in treatment planning of orthodontics, it is simply not possible to consider only the teeth whose movement is desired. Reciprocal effects throughout the dental arches must be carefully analyzed, evaluated, and controlled. An important aspect of treatment is maximizing the tooth movement that is desired, while minimizing undesirable side effects.

Increased upper lip procumbency is commonly associated with maxillary dentoalveolar protrusion.[2] Patients with this feature often seek orthodontic treatment to improve their facial esthetics. With the major goal of reducing maxillary dentoalveolar protrusion, the treatment plan usually includes extraction of the maxillary first premolars, followed by retraction of anterior teeth with maximum anchorage.[3]

There are numerous ways in which orthodontics has tried to augment anchorage, including auxiliary devices, such as headgear, transpalatal arches, Nance button, and other appliances. Many of these appliances like headgears are extraoral and are awkward or uncomfortable for patients, often leading to less than desired levels of compliance. Thus, treatment outcomes may become compromised.

In recent years, the concept of using dental implants has been widely accepted as successful adjuncts for obtaining maximum anchorage in orthodontic treatment.

The present study was carried out with the aim of evaluating the efficacy of orthodontic implant (OI) as anchorage reinforcement method when compared with conventional intraoral methods for anchorage reinforcement.

The objectives of this study were:

(i) To quantify the amount of anchor loss if any by using intraoral anchorage enhancement.
(ii) To compare the amount of anchor loss if any in patients treated with conventional intraoral methods with OIs.
(iii) To compare the time taken for space closure in both the methods of anchorage reinforcement.

Materials and methods

This research was carried out after a formal approval from the ethical committee of the institution. This study included all bimaxillary protrusion cases reporting to this orthodontic center between April 2009 and September 2009.

The original sample consisted of 57 subjects between the ages of 13 and 17 years seeking orthodontic treatment and clinically and radiographically diagnosed as having bimaxillary dentoalveolar protrusion. All patients had lip incompetence ≥4 mm. From this group, 50 subjects with the following additional inclusion criteria were selected:

(a) Bimaxillary proclination with Angles Class I molar relation. ANB angle from 1° to 3°.
(b) No indication for orthognathic surgical intervention for correction of the malocclusion.
(c) Need for extraction of all four first bicuspids to be carried out as confirmed by clinical examination, cephalometric analysis, and model analysis in order to achieve the desired facial changes.
(d) Need for maximum anchorage. Presence of permanent dentition.
(e) No congenitally missing permanent teeth (except for the third molars).
(f) No history of deleterious oral habits or previous orthodontic treatment.
(g) Absence/unrestorable teeth due to caries/periodontal disease. Absence of any systemic illness.

Standard orthodontic diagnostic records comprising of study models, lateral cephalograms, orthopantomogram, and intra- and extraoral photographs were taken for all patients.

All patients and/or their parents were informed about the purpose of this study and a written consent was obtained. Maximum anchorage was predicted on the need to restrict mesial movement of posterior teeth to have a Class I molar relation and an optimal overjet and overbite at the end of orthodontic treatment. Two patients did not agree to participate in this study and therefore were not included. In addition, one patient moved out to another city and hence was excluded from the study.

Those who fulfilled the inclusion criteria and agreed to take part were allocated alternately to Group I – the conventional anchorage group, or Group II – the OI group.

Both groups received treatment with 0.022″ MBT prescription preadjusted edgewise appliance system; molar tubes were welded to preformed first molar bands and therapeutic extraction of all first premolar teeth.

In addition, subjects of Group 'I' received Nance button and lingual arch as anchorage reinforcement in upper and lower arches, respectively (Fig. 1a and b). Subjects of Group 'II' received self-drilling titanium OI for anchorage reinforcement (Fig. 1c). The OIs were placed in the buccal alveolar bone in the region of the attached gingiva, between the second premolars and first molars in all the four quadrants.

All OIs were inserted by a single operator. Prior to insertion, an intraoral periapical radiograph was taken of the interdental space between the maxillary second premolar and maxillary first molar using a paralleling technique to assess root angulations and the amount of interradicular bone present between the roots of the adjacent teeth.

Stability and mobility of the inserted mini-screw implants was checked with the help of cotton tweezers by holding the

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