Long-term stability of anterior open-bite treatment by intrusion of maxillary posterior teeth

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Introduction: Anterior open bite results from the combined influences of skeletal, dental, functional, and habitual factors. The long-term stability of anterior open bite corrected with absolute anchorage has not been thoroughly investigated. The purpose of this study was to examine the long-term stability of anterior open-bite correction with intrusion of the maxillary posterior teeth.

Methods: Nine adults with anterior open bite were treated by intrusion of the maxillary posterior teeth. Lateral cephalograms were taken immediately before and after treatment, 1 year posttreatment, and 3 years posttreatment to evaluate the postintrusion stability of the maxillary posterior teeth.

Results: On average, the maxillary first molars were intruded by 2.39 mm ($P < 0.01$) during treatment and erupted by 0.45 mm ($P < 0.05$) at the 3-year follow-up, for a relapse rate of 22.88%. Eighty percent of the total relapse of the intruded maxillary first molars occurred during the first year of retention. Incisal overbite increased by a mean of 5.56 mm ($P < 0.001$) during treatment and decreased by a mean of 1.20 mm ($P < 0.05$) by the end of the 3-year follow-up period, for a relapse rate of 17.00%. Incisal overbite significantly relapsed during the first year of retention ($P < 0.05$) but did not exhibit significant recurrence between the 1-year and 3-year follow-ups.

Conclusions: Most relapse occurred during the first year of retention. Thus, it is reasonable to conclude that the application of an appropriate retention method during this period clearly enhances the long-term stability of the treatment.

Read the full text online at: www.ajodo.org, pages 396.e1-396.e9.

EDITOR’S COMMENT

We can expect to achieve long-term success in the closure of anterior open bites 75% of the time by treating this malocclusion with fixed appliances, with either a nonsurgical or surgical approach, depending on the overall skeletal and esthetic demands of the case. But for some patients, neither option is ideal. A nonsurgical approach often requires full-time use of elastics to close the open bite by extruding the anterior teeth. This type of tooth movement demands excellent cooperation, might not enhance facial esthetics, and could also be unstable. When considering the other choice, to many people, “surgery” is still “surgery” and might be rejected for any number of reasons. With good studies to support what can and cannot be achieved in the treatment of malocclusions characterized by anterior open bite, there is still room for a third option—treatment with miniscrew implants to intrude the maxillary posterior teeth. Several questions then come to mind. How far can the maxillary posterior teeth be safely intruded? Will this approach lead to increased stability? If immediate stability is not 100%, what can be done to prevent the return of bite opening in both the short and long terms?

In this clinical study, 9 patients treated with miniscrew implants to intrude the maxillary posterior teeth were followed for at least 3 years posttreatment. The subjects were selected according to the following criteria: (1) diagnosed with incisal open bite (incisor overbite, $<-1.0$ mm), (2) high SN-MP angle ($>40^\circ$), and (3) skeletal Class I or Class II discrepancy (anteroposteriorly). Two methods were used for intrusion of the maxillary molars. The first method called for placement of the miniscrew implants on the buccal and palatal sides between the roots of the maxillary second premolar and first molar, and between the roots of the maxillary first and second molars. After 1 to 2 weeks, an intrusive force was directly applied to the molars with elastomeric chains (Fig 1, A and B). The second method called for the placement of miniscrew implants on the buccal side only between the roots of the maxillary second premolar and first molar, and between the roots of
the maxillary first and second molars. Rigid transpalatal arches were placed before applying an intrusive force to prevent buccal tipping of the teeth (Fig 1, C and D).

After the authors evaluated all data, they found no significant difference between the 2 methods in the amounts of intrusion achieved. They concluded that the overall pattern of relapse was similar to that of surgical treatment. Downward displacement of the posterior nasal spine, eruption of the maxillary molars, and downward and backward rotation of the mandible resembled the relapse after orthognathic surgery. Such events after surgery are allegedly induced by physiologic adaptations of adjacent muscles and soft tissues to the altered skeletal structures and thus the function. A tooth displaced intrusively is much less stable than one displaced either mesiodistally or rotationally; 1 reason is that there is no effective way to retain an intruded tooth. More than 80% of relapse of the intruded maxillary first molars occurred during the first year of retention. A significant amount of overbite relapse also occurred at the end of the first year but not between the end of the first year and the third year. After completing this study documenting relapse, the authors devised a more effective way of preventing molar extrusion or relapse by fabricating a clear retention device with buttons on the buccal side for wearing elastics directly to the mini-screw implants for additional anchorage. Although not part of this study, it is expected that this method of retention might prove effective in the future.

Q & A

Turpin: Were you surprised with the relapse tendency for the intruded posterior teeth?

Young Chel Park: The relapse tendency documented in this study was very much expected from our experience treating similar cases and as reported in other articles. The purpose of this study was not to report a peculiarity of the relapse pattern but to specify the exact period where the greatest amount of relapse takes place, and the amount of relapse that occurs during different time periods.

Turpin: Do you routinely use the newly designed ‘active retainers’ with elastics to miniscrews?

Young Chel Park: In applicable cases, yes, we highly recommend that patients use the device for a minimum of 6 months after intrusion of posterior teeth. In order to further support the efficiency of active retainers, however, we plan to conduct prospective studies to examine the retentive effects of wearing an active retainer for different periods of time, and comparing it to those of other types of retainers, i.e., posterior bite block, tooth positioner, and Begg-type retainer.
Turpin: When planning future studies of open bite treatment, have you considered a prospective study design to allow for greater control of all treatment mechanics throughout the study period?

Young Chel Park: Great point. I am also aware that there are increasing demands nowadays for studies to apply more scientific methods to assess clinical outcomes. As a matter of fact, we are planning our future studies as prospective randomized controlled clinical trials (RCTs) to meet these demands. Our studies from the past and currently in process, in the mean time, will continue to be collected as retrospective data and will serve as substantial historical data to assist in identifying the sources of variation, and thus contribute to the scientific designing of future prospective studies.

Sources of the variations seen in our current study include patient attributes (sex, age, risk factors, demographics), inconsistency in treatment techniques, inconsistency in persons practicing the techniques, and being a non-blinded study. These are factors that could be controlled in future studies.

Most important of all, however, would be to legitimately determine a sample size that is both scientifically justifiable in terms of its method of calculation, and capable of generating statistically significant results to credit the study. Sample size determination prior to the start of study will also make the documentation of data exclusion, whether it be in the process of treatment or in final data assessment, more meaningful.

Fig 4. The active retainer: a clear plate with buttons attached on the buccal side to hook to the miniscrew implants with elastic.