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DEEP BITE CORRECTION BY INCISORS INTRUSION WITH CONNECTICUT INTRUSION ARCH – CASE REPORT

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Abstract

Deep overbite as one of the most common malocclusion that can occur along with other associated malocclusions can be treated with several mechanisms.

One such mechanics is true intrusion of anterior teeth. Deep overbite correction by intrusion of anterior teeth affords a number of advantages and is the desired treatment option for gummy smile correction, esthetics improvement as well as correction of mandible rotation in order to improve vertical dimension and to correct Class II malocclusion.

This case report describes the orthodontic treatment of a 17-year-old patient diagnosed as severe Angle's Class II malocclusion with maxillary prognathism and skeletal deep bite, dental Class II division 1 malocclusion associated with 4 mm overbite, an increased overjet and excessive gingival display on smiling.

After the analyses and due to the fact that the patient avoided surgical method for her malocclusion correction, our treatment plan in this case was alternative (camouflage) with upper premolars extraction.

In the first phase we did 9 mm canine retraction with preserved vertical dimensions of upper incisors. In the second phase of our treatment we did incisor intrusion and en masse retraction of the incisors. Intrusion of upper incisors was done using a 0.017 × 0.025 Connecticut intrusion arch and 0.019 x 0.025 stainless steel as base archwire was used. Outstanding results were achieved with an improved facial profile, smile harmony and stable occlusal relationships.

Through this case report we highlight the efficiency of Connecticut intrusion arch as a clinically manageable biomechanical system to optimize the orthodontic treatment. The use of good biomechanical principles helped us to achieve all treatment goals and objectives with minimal side effects.

***Keywords*:** deep bite, maxillary incisors intrusion, Connecticut intrusion arch

Introduction

Deep overbite is a multifactorial vertical malocclusion that has been considered as one of the most common malocclusion that can occur along with other associated malocclusions and are difficult to be treated and retained. Prevalence of deep overbite was found to be 21% to 26% in the normal population, and about 75% in orthodontic patients [1, 2].

A deep overbite requires a careful diagnosis and can be treated with various treatment protocols. The choice of treatment depends on patient's age, etiology of the deep bite, skeletal and dental morphology, the vertical dimension, the relationship of the teeth to the surrounding soft tissue structures, length of lip and occlusal plane [3, 4].

A deep overbite can be corrected either by extrusion of posterior teeth or by intrusion of anterior teeth, or by a combination of the two [5, 6].

Maxillary incisor intrusion should be the desired treatment option for non-growing patients with anterior deepbite which is caused by overeruption of the maxillary incisors. There are a lot of advantages of intrusion of anterior teeth, such as correction of gummy smile, correction of mandible rotation in order to improve vertical dimension and correction of Class II malocclusion and esthetics improvement. Not all patients with deep overbite should be treated with the same mechanics. Alignment and leveling achieved by means of straight wires may cause deep bite. Furthermore, in

case of extraction of first bicuspids, partial retraction of canines with straight wires also increases deep bite.

There are so many treatment techniques for deep bite correction that have an important role in oral function and facial appearance [6].

Intrusion arches are commonly used to treat deep overbite.

In the present case report, the arch of intrusion and simultaneous retraction was used for intrusion of incisors with greater control of axial inclination without necessarily promoting real tipping.

At the end of treatment, the aims were achieved with optimal esthetic balance as well as excellent occlusal relationships, which provided outstanding long-term stability. By presenting this case report we wanted to highlight the use of good biomechanical principles to achieve predictable results with minimal side effects.

Diagnosis and treatment objectives

A 16-year-female patient presented with a chief complaint of irregularly placed upper and lower front teeth. The patient was diagnosed as severe Angle's Class II malocclusion with maxillary prognathism and skeletal deep bite. She had dental Class II division 1 malocclusion associated with an increased overjet, 14 mm, and excessive gingival display on smiling, 4 mm overbite and super-eruption of maxillary incisors, with occlusal cant, presence of bad oral habits and infantile swallowing. Both arches exhibited minor crowding (Fig. 1 and Fig. 2).

Figure 1. Pretreatment facial photographs

Figure 2. Pretreatment intraoral view of the patient

The primary objective was to correct the deep bite because of its potentially detrimental effects on periodontal health, temporomandibular joint function, as well as esthetics. Extrusion of the patient's posterior teeth would result in increasing the lower anterior facial height which may not always be stable.

Due to the patient's vertical maxillary excess, the large interlabial gap and the long lower facial height the treatment objectives were to correct the increased overbite with incisor intrusion, to correct the increased overjet and to reduce the maxillary incisor proclination with retraction of the incisors and canines in the space of extracted first premolars.

Treatment objectives for the occlusion were to correct molar and canine relation and to achieve canine guidance with anterior disclusion. For the soft tissue the treatment objective was to achieve lip competency and ideal facial profile.

Treatment plan and progress

Due to the fact that the patient avoided surgical method for her malocclusion correction, our treatment plan in this case was alternative (camouflage) with upper premolars extraction. The upper first premolars were extracted to reduce the overjet and to align canines properly in the arch form. 0.022 × 0.028 MBT prescription was used. Alignment was done by 0.014 and 0.016 Ni-Ti and active

tiebacks. Most of the extraction space was utilized for alignment of canines. In the first phase we did 9 mm canine retraction with preserved vertical dimensions of upper incisors (Fig. 3).

Canine retraction incorporated new forces and moments into the system so good anchorage control to overcome the side effects of the mechanics was crucial.

Figure 3. Canine retraction in the extraction space

In the second phase of our treatment we established Class I canine and Class II molar relationship; we achieved ideal overjet and overbite by correcting the incisor inclination along by en masse retraction of the incisors. Intrusion of upper incisors was done using a 0.017 × 0.025 Connecticut intrusion arch. This arch incorporates the characteristics of the utility arch as well as those of conventional intrusion arch and has unique properties.

Due to the forces and moments created by the system of incisor intrusion and canine retraction, the largest number of posterior teeth was incorporated into posterior segments and good anchorage control was achieved. For incisor intrusion and canine retraction with elastomeric chains in order to prevent incisor bite deepening we used 0.019 x 0.025 stainless steel as base archwire [7].

Although having the intrusion arch cinched back is a determining factor for stress generation in the molar region, we cinched the arch distal to the molar tube, so that when sliding forward through the molar tube it will not procline the incisors [8, 9].

We minimized the moment for lingual root torque that would flare incisors even more due to the full engagement in the incisors brackets [7, 10].

We ligated and tied the intrusion arch at the lateral incisors and between the central incisors to prevent the loss of distal anchorage and to prevent the extrusive force generated on the incisors when the canine retraction was done [11].

Molar relation was corrected by light Class II elastics. Finishing was accomplished with coordinated upper and lower 019×.025 stainless steel wire (Fig. 4).

Figure 4. Intrusion of upper incisors with 0.017 × 0.025 Connecticut intrusion arch

Treatment Results

The change in our patient's smile was the most impressive part of the treatment. Outstanding results were achieved with an improved facial profile and smile harmony (Fig. 5).

With extraction of the first upper premolars, 9 mm retraction of upper canines was achieved. The Class II molar relation was fixed and Class I canine relationship was corrected and occlusal contacts were obtained between all of the other teeth, especially the canines.

A mutually protected occlusion was obtained with stable contacts in centric relation and efficient protrusive movements, as well as right and left laterality movements (Fig. 6).

Figure 5. Facial and smile photographs at the end of the treatment

Figure 6. Intraoral view at the end of the treatment.

Discussion

Deep bite is a complex orthodontic problem that needs to be corrected and is very difficult to be treated successfully with a minimal tendency for relapse. Deep bite due to supraocclusion of anterior teeth can be corrected by intrusion of incisors that must be carefully planned.

Maxillary incisor intrusion is recommended in non-growing patients with deep overbites, especially in those with a gummy smile. The position of maxillary incisors, especially about the upper lip is a key factor in determining the type of treatment since overbite correction with maxillary incisor intrusion in patients with insufficient incisor display leads to flattening of the smile arch and reduces smile attractiveness [12, 13].

A literature review indicated different opinions regarding the amount of force for intrusion of incisors and usually light, continuous forces were stated to be more suitable [14-16].

It is suggested that low load-deflection mechanisms should be used [17].

Different force range from 40 to 100 g has been used in recent literature. Senisik used a range from 90 to 100 g [18]. CIA intrusion arch produces light continuous force according to Burstone and Nanda [17, 20].

CIA intrusion arch exerts a force of 35–45 gm bringing about 1mm of intrusion in 6 weeks [19]. Nanda recommends an optimal force of 10 gm for each mandibular incisor with a total of 40 gm for four incisors [20].

The history of orthodontics reveals the wide variety of methods developed to correct deep bite. Conventional intrusion-arch mechanics frequently cause labial tipping of the incisors, which does not always give favorable treatment outcomes. To intrude the incisors with maintenance of their axial inclination without producing any labial or lingual rotation, the forces should be applied through the centre of resistance (CR) and near the distal surface of lateral incisors.

The centre of resistance can be estimated to be located near the geometric centre of their root by controlling the system of forces [21, 22].

Among all orthodontic tooth movement, intrusion is probably the most detrimental in orthodontics. These forces generates stress that can cause changes on the tooth structure and periodontal ligament [21, 23]

In this case report the maxillary incisors were intruded 0.49 mm/month and the total rate of intrusion was 2.4 ± 0.8, which makes CIN very efficient and successful in treatment of deep bite [24, 25].

Conclusion

The importance of accurate diagnosis, which entails detailed identification of the etiological factors, cannot be overstressed because effective and efficient treatment of deep bite and long-term retention depend on it.

Although intrusion of anterior teeth is difficult and requires use of an appropriate biomechanical system, it offers a number of advantages which includes Class II correction by allowing forward rotation of mandible and correction of high gingival smile line. Applying sound biomechanical principles such as Connecticut intrusion arch which is versatile and simple in design is successful in reducing overbite by intruding upper incisors to certain limit but more without altering their axial inclination.

Advantage of this technique is anchorage control. As seen in the present case report the intrusion arch was tied over the stainless steel base wire that creates a distal crown tipback moment on the molars. These mechanics is ideal for cases where anchorage is critical. Low forces also help in minimizing root resorption. We can conclude that application of sound biomechanical strategies can help us overcome these challenges without compromising treatment time.

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