Orthopedic approach in the treatment of a skeletal class II division 1 malocclusion with an anterior open bite

N. Al-Sulaiti* / G.E. White**

The patient presented with a skeletal class II malocclusion characterized by an anterior open bite and maxillary midline deviation. This mixed dentition case was treated orthopedically with MRI appliance to rotate and impact the maxilla. A Bionator was used advance the mandible. The case was completed using Occlus-O-Guide. The result showed that the facial bones and teeth appear in the correct position.

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INTRODUCTION

Anterior open bite is defined as the absence of contact between the maxillary and mandibular incisors at centric relation. In younger children, it can be caused by one factor or a combination of factors; including finger and lip sucking habits, enlarged tonsils or adenoids that interfere with proper tongue position, creating mouth breathing, a constricted maxilla, and a skeletal open bite growth pattern, mouth breathing associated with allergies and inadequate nasal breathing, abnormal tongue habits with tongue thrust and cheek biting, macroglossia or abnormal tongue position.[1-3,10]

All class II malocclusions present a challenge to the orthodontics. Each requires a treatment regimen specifically designed for the individual patient. The degree of difficulty with class II treatment varies with accompanying disorders, which may include medical, dental, and skeletal structure, hereditary factors, growth trends, the influence of environmental factors or any combination of the above. Attempting to treat all patients with class II malocclusions with 'cookbook' treatment criteria often leads to a compromised result, or perhaps totals failure. Careful diagnosis helps reveal subtle discrepancies that may require alterations in the treatment plan.[1-3]

Williams G. Sutherland developed manipulative procedures in early 1900s, from which came the therapeutic potential to change the position and shape of the maxilla and the mandible.[4-6] Asymmetries of cranial bones are noted as to how the maxilla rotates about a nearly vertical axis that passes through the fronto-maxillary articulation. Anatomical variation may lead to a wider or narrower intermaxillary molar dimension with a correlated higher or lower hard palate. A distortion of position and function will cause asymmetries.[4-6]

The temporal bones rotate about axis running from the quadrilateral surface of the petrous portion of the temporal bone up to the apex. When there is asymmetrical rotation, the mandible (symphysis menti) shifts to the side toward which the petrous ridge of the temporal bone has rotated anteriorly. Bilateral anterior rotation of the temporal produces a retrusive mandible, and conversely, bilateral posterior rotation produces a protrusive mandible.[4-6]

One approach to the treatment of skeletal open bite is to control all subsequent growth so that the mandible will rotate in a counterclockwise direction, upward and forward. Successful early treatment of these problems in the mixed dentition can prevent the worsening of the facial profile.[2,3]

The advantage of functional appliances is that it allows orthopedic effects on the bone for the correction of skeletal malocclusions. The disadvantages of the functional appliance are: the lack of ability to align the teeth, the need of cooperation by the patient,[2] and the complex and expensive construction of the appliance.

The Bionator is an arch-aligning appliance, for correcting a skeletal class II malocclusion to a class I molar relationship, increasing the vertical dimension of occlusion, bringing the mandible down and forward and moderately widen the maxillary and mandibular dental

* Noor Al-Sulaiti, BDS, MS, Diplomate of ABPD, is a consultant in the Department of Pediatric Dentistry, Hamad Medical Corporation, P.O. Box 3050, Doha, Qatar

** George E. White, chairman and professor of pediatric dentistry, Department of Pediatric Dentistry, Tufts University School of Dental Medicine, 1 Kneeland Street, Boston, MA 02111, USA.

arches when needed, thus developing the entire lower face.[14,15]

By bringing the mandible down and forward and developing the lower face, it gives the male patient a masculine, square jaw and rugged appearance. It gives the female patient a full facial profile and a pleasing and attractive lower face. It eliminates the weak and unassuming chin associated with class II malocclusion exhibiting concomitant deep overbite and excessive overjet. Thus the Bionator is a "facemaker" as well as a "mouthmaker". It also gives great stability in the final treatment position by virtue of stimulating condylar growth.[11,14,15]

CASE REPORT

A female patient, 8 years old came with her mother for orthodontic evaluation. The chief complaints were (1) misalignment of teeth and (2) active thumb sucking habit. The patient was aware of the worsening of her dental problem with the thumb sucking habit and showed a desire to quit. Patient medical history was noncontributory.

Figure 1. Frontal view prior to treatment.

Figure 2. Smile showing facial asymmetry with right eye lower than the left, suggesting that the maxilla is not level and properly developed vertically.

Clinical examination revealed that the patient had an ovoid asymmetrical facial form, the left eye and ear are higher than right, the right side is fuller than left; the occlusal plane is tilted down towards the right. The lower facial height appeared long in relation to the total facial height. The profile was convex characterized by an acute nasolabial angle, and a retrognathic chin with incompetence lips. A skeletal class II, division 1 malocclusion was characterized by an overjet of 7mm with an anterior open bite in the mixed dentition. The upper midline was deviated 2mm to the right. Her oral hygiene was good, the texture and color of the oral soft tissue were normal. Her dentition showed reasonable dental care.

The initial model analysis showed class II on left/right primary canine relationship, and mesial step on left/right primary molars relationship. According to the Moyers mixed dentition analysis, the upper and lower arch length were adequate. The maxilla and mandible had a "U" shape arch form.

The temporomandibular joints functioned without limitations and no complaint of pain or clicking. Maximum opening was 46mm with no deviation on opening or closing.

Bitwing radiographs: no interproximal caries were detected, and the interproximal bone level was adequate.

The panoramic radiograph revealed the presence of all her teeth for her age (mixed dentition), cloudy maxillary sinuses and swollen turbinate. Right condyle is higher than left. Upper midline is shifted to right. Short symmetrical rami were noted.

The lateral cephalometric revealed skeletal class II malocclusion with retruted mandible, normal mandible angle.

Problems list are skeletal class II division 1 malocclusion, facial convexity with lip incompetence, an anterior open bite, Protruded maxillary incisors, and maxillary midline shift.

Figure 3. Showing retruded lower jaw.

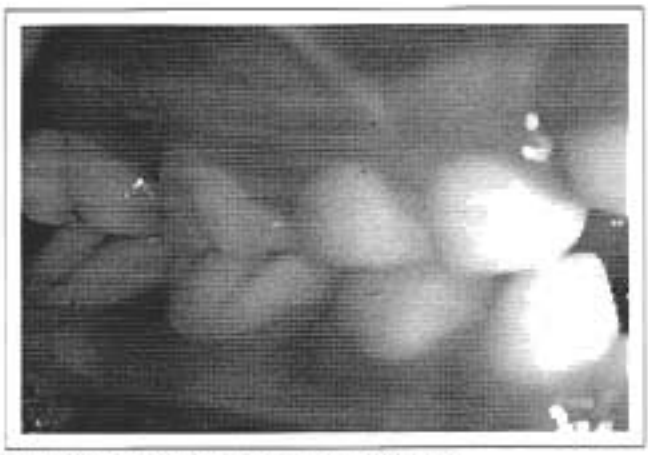

Figure 4. Right side intraoral prior to treatment.

Figure 5. Left side intraoral prior to treatment.

The initial objective in the treatment of this malocclusion was to apply orthopedic force to correct the anteroposterior, transverse and vertical conditions: correct the position of maxilla by rotation toward the left, impact the right side to level the occlusal plane, and widen the maxillary arch. Then correct the class II skeletal malocclusion by advancing the mandible and correct the proclination of upper incisors to achieve proper overjet and overbite, close the anterior open bite. Finally, retention and guidance of the case was done using an Occusal-O-Guide appliance.

Figure 6. Maxilla prior to treatment

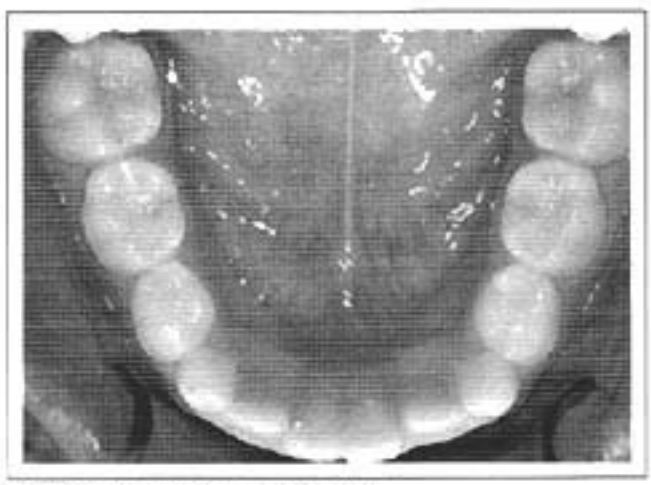

Figure 7. Mandible prior to treatment.

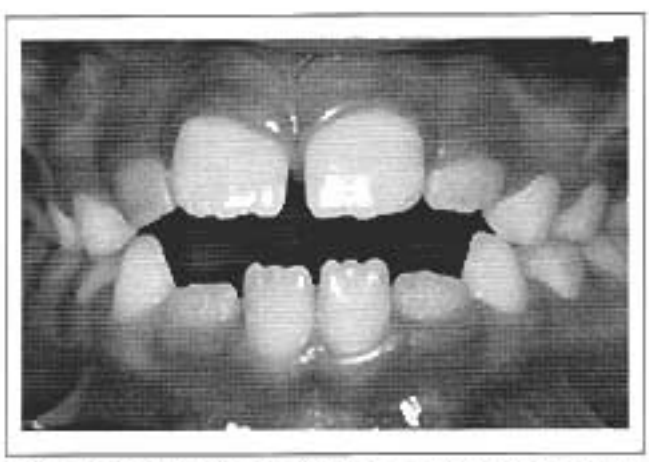

Figure 8. Anterior open bite with midline not coincident is noted.

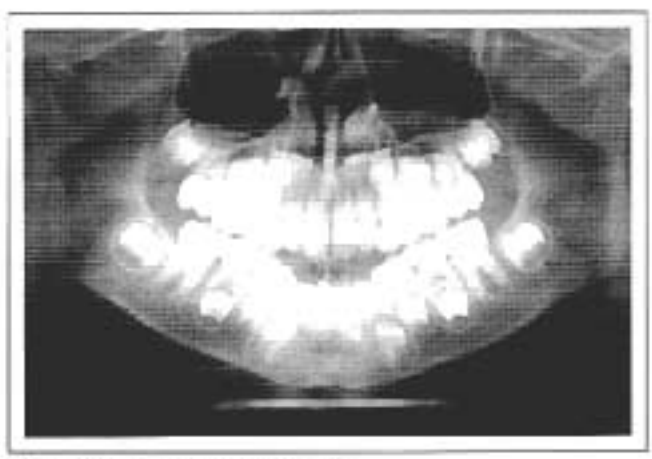

Figure 9. Pretreatment panograph.

Figure 10. Pretreatment cephalogram.

TREATMENT

Prior to initiating orthodontic treatment, diet counseling and prevention measures were instituted. First permanent molars were restored occlusally with Tetric Ceram.

Orthopedic treatment was achieved by using Maxillary-Rotation - Impaction Appliance (MRI), which was designed as an upper transverse appliance with hooks and occlusal coverage on the right side only, and lower lingual arch with clasps to attach elastics for rotation. She used the MRI appliance for 3 months and evaluation of maxillary rotation and impaction of right side by comparing her recent face-bow record fixed on an articulator with her study model before treatment.

Bionator was used to close the anterior open bite, correct the proclination of upper incisors, and advance the mandible, followed for 6 months. Finally the Occlus-O-Guide was used for retention and guidance of the newly erupted permanent teeth. It was worn 4 hours a day and at night for 3 months. After 3 months, it was worn only at night until eruption of all her permanent teeth. Also the Occlus-O-Guide will be used as retainer to prevent any relapse.

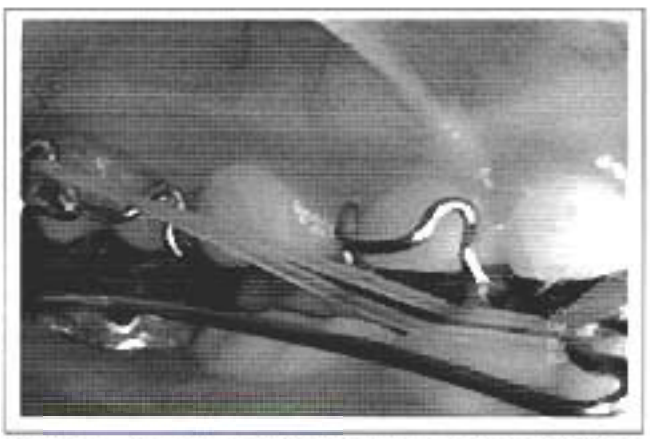

Figure 11. Right side showing class III mechanics of Maxillary Rotation Intrusion Appliance (MRI) with occlusal contact so that maxilla will intrude on the right side.

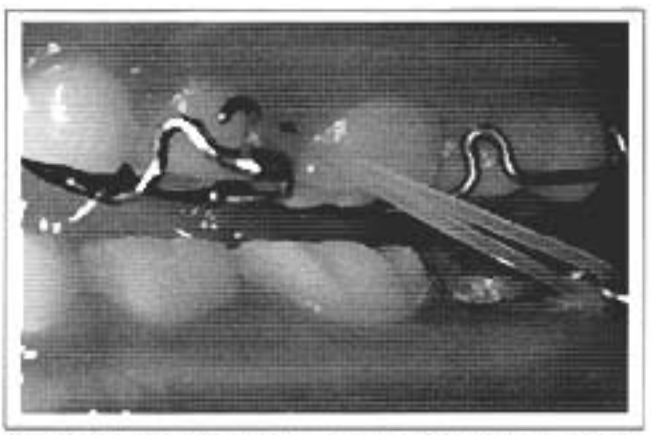

Figure 12. Left side showing class II mechanics of Maxillary Rotation Intrusion Appliance (MRI) and no occlusal contact.

Figure 13. Intra oral view of MRI appliance with class III mechanics on the right side and class II mechanics on the left side, with the purpose to rotate the maxilla to the right.

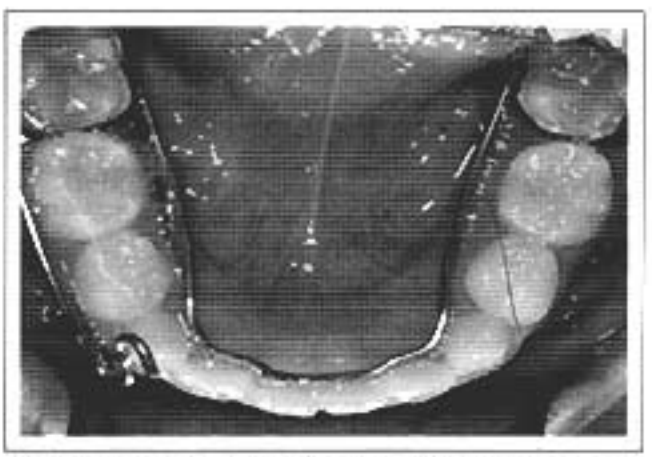

Figure 14. The lingual arch with an arm for class III mechanics is noted.

RESULTS

The response of the treatment was excellent and cooperation was good. The maxillary midline was corrected to coincide with the midline of the face, and dental midline was corrected as well. The anterior open bite was closed, the class I occlusion was achieved, as well as a positive overbite and proper overjet relationship. The facial photographs showed improvement of the soft tissue profile and proper upper / lower anterior facial height.

Figure 15. Right side of Bionator in the mouth.

Figure 16. Post treatment smile.

Figure 17. Post treatment profile.

Figure 18. Post treatment upper arch.

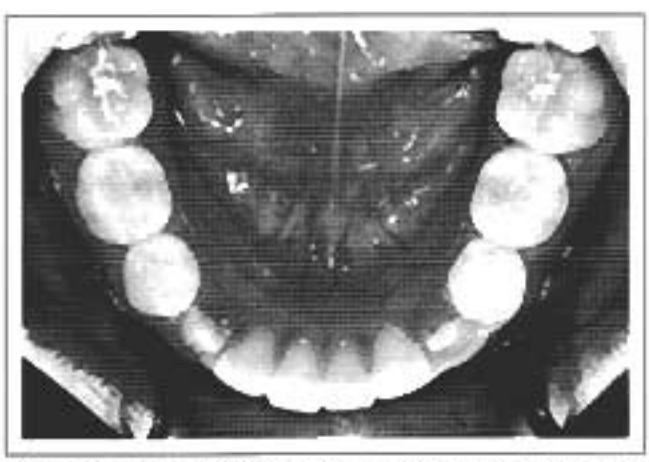

Figure 19. Post treatment lower arch with permanent cuspids erupting into the mouth

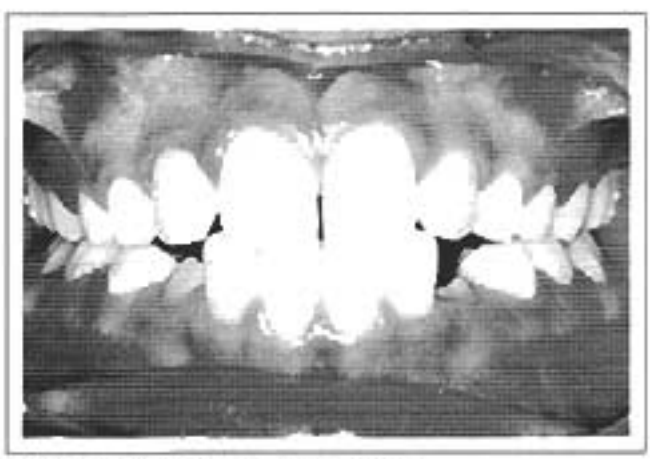

Figure 20. Post treatment mixed dentition.

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