Intraoral craniofacial manipulation by using MRI appliance

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This case illustrates the use of the Maxillary-Rotation-Impaction Appliance (MRI) to rotate and impact the maxilla. When this maneuver was completed the transverse expansion screw widened the maxillary arch. The case was completed using fixed orthodontic appliances. The result is that the facial bones appear in the correct position and the teeth are correctly positioned in the face with a class I occlusion.

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INTRODUCTION

When Williams. G. Sutherland developed manipulative procedures in early 1900s, there came the therapeutic potential to change the position and shape of the maxillae and the mandible. The methods used are quite gentle and rarely cause pain. As the occlusal position becomes more normal through such treatment, the unphysiologic patterns become more normal as well, and the pain and related problems diminish.[2,6,7]

From the sutures of the cranium and the temporomandibular joint to the joints of the pelvis and the feet, all articulations in the human body exhibit architectures that permit and support particular functions that contribute to the total economy of the body. The specific architecture of each articulation or joint will dictate the joint's type of motion and its maximal limits of motion. Any alteration of the joint that limits the normal range of motion will compromise function as well as related and dependent physiologic processes.[4,13,23]

The 22 bones of the cranium and face may exhibit variations from normal which result in asymmetry of anatomy and the dependent function. Dysfunction of any of these articulations between adjoining bones will compromise the function and physiology of related structures. To realize this is to understand the tremendous potential for clinical problems, and the wonderful opportunity to help relieve these problems by helping bring about more normal motion in these articulations.[2,4,5,8]

The folds of the cranial dura form the falx cerebri, the falx cerebella, and the tentorium cerebelli. Each bone of the cranium is enveloped by extensions of the periosteal dura, which is contiguous with the cranial dura. For this reason. the cranial dura is subject to strains when the bones function abnormally. Cranial bone dysfunction is most often the result of direct trauma or habit. However, it may also be due to an injury at an anatomically distant site. This injury is then mediated by the body's fasciae and may cause variations in muscle function, which in turn can also lead to cranial dysfunction.[10,12]

Asymmetries of the cranial bones, the maxillae rotate about nearly vertical axes that pass through the fronto-maxillary articulation. Anatomic variation may lead to a wider or narrower intemax- illary molar dimension with a correlated higher or lower hard palate. A distortion of position and function will cause asymmetries. For example, one side of a patient's mouth may have a narrow, straight dental ridge with a high palate, while the opposite side exhibits a relatively wide, more arcuate dental ridge, with a relatively low palate. As the maxillae rotate externally, the horizontal plates of the palate lower, and the alveolar ridge becomes more arcuate. The premaxillary portions of the maxillae that house the incisors provide an accessory articulation that allows these parts to operate with extra leniency. It is almost as though special architecture were provided to allow for thumb-sucking and youthful trauma.[1,7,12]

The temporal bones rotate about axes running from the jugular or quadralateral surface of the petrous portion of the temporal bone up to the apex. When there is asymmetric rotation the mandible (symphysis menti) shifts to the side toward which the petrous ridge of the temporal bone has rotated anteriorly. Bilateral anterior

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rotation of the temporals produces a retrusive mandible, and, conversely, bilateral posterior rotation produces a protrusive mandible. The fossae positons vary in the coronal and sagittal planes as well, which further accounts for variation in occlusal position.[7,9,11]

This clinical case shows how intraoral cranial manipulation can alter the facial appearance and dental occlusion by using Maxillary Impaction Rotation appliance (MIR).

CASE REPORT

DS is a healthy twelve-year old girl, reported to the Department of Pediatric Dentistry at Tufts University School of Dental Medicine with a request for an "orthodontic consultation", as stated by the mother. The patient was allergic to dust and pollen and her past medical history was otherwise non contributory.

Extra oral examination

The patient had a convex profile. The lips were potentially competent. Facial asymmetry was noted with the left ear, and eye higher than right, left ear more forward than the right, chin shifted to left, right side fuller than left, and the left shoulder higher than right shoulder.

Intraoral examination

Intraoral examination revealed mixed dentition and localized gingivitis, due to poor oral hygiene. Carious lesions were detected in teeth numbers # 3,14,18,19,30. Permanent canine relationship was Class II on right and N/A on left. Permanent molar relationship was Class I on right and class II on left.

Upper midline was shifted 1mm to left, lower shifted 2mm to right. Overbite was 1mm and overjet was 3mm. Upper and lower arch form was V shaped.

Radiographic examination

Panoramic view: showed the presence of all permanent teeth and cloudy maxillary sinuses. Left condyle is higher than right. Upper midline is shifted to left. Short symmetrical rami.

Lateral cephalogram: revealed skeletal class I malocclusion. Normal mandibular angle. Anterior facial height 40:60 ratio.

Transcranial Radiographs: Revealed the condyles were at the center of the fossa.

Bitewing Radiographs: No interproximal caries were detected, and the interproximal bone level was adequate.

Examination of Mounted Casts: The casts were mounted on the Denar-Witzig articulator.

Treatment

Prior to initiating orthodontic treatment, diet counseling and preventive measures were instituted. Fissure sealants were placed on permanent bicuspids and molars. Teeth numbers # 3,14,18,19,30 were restored with Tetric Ceram.

Orthopedic treatment was achieved by using MRI appliance, which was designed as an upper transverse appliance with occlusal coverage on the right side only and lower lingual arch with clasps, to attach elastics.

Figure 1. Pretreatment frontal view of the patient.

Figure 2. Pretreatment profile view of the patient.

In order to achieve rotation to the right side, impaction of the right side and transverse expansion, for 4 months. Evaluation of maxillary rotation and impaction by comparing her recent face-bow record fixed on an articulator and her study model before treatment.

This was followed by straight wire appliance to level and align the teeth for eight months. Debracketing and delivered occlusal guide as retainer.

Figure 3. Pretreatment smile view of the patient showing right eye and ear lower, while plane of occlusion on right side is lower and maxillary midline is shifted to left.

Figure 4. Pretreatment frontal view of the patient with face bow showing right eye is lower.

Figure 5. Pretreatment view of the maxillary teeth.

Figure 6. Pretreatment view of the mandibular teeth.

Figure 7. Pretreatment frontal view of the occlusion.

Figure 8. Pretreatment right occlusal view of the patient.

Figure 9. Pretreatment left occlusal view of the patient.

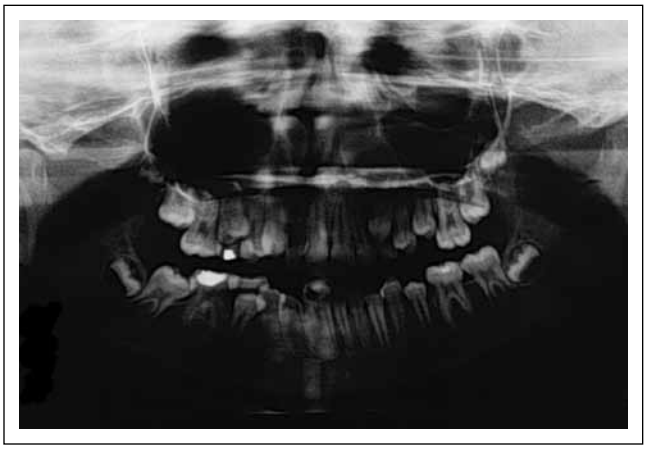

Figure 10. Pretreatment panograph view of the patient.

Figure 11. Pretreatment cephalometric view of the patient.

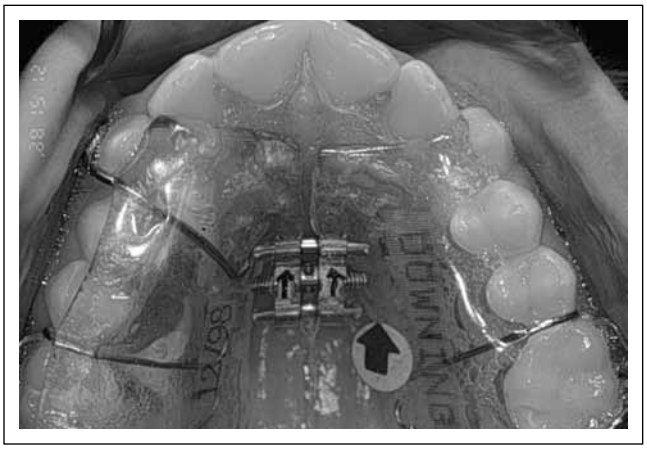

Figure 12. View of MRI (Maxillary-Rotation-Impaction Appliance) with transverse expansion screw.

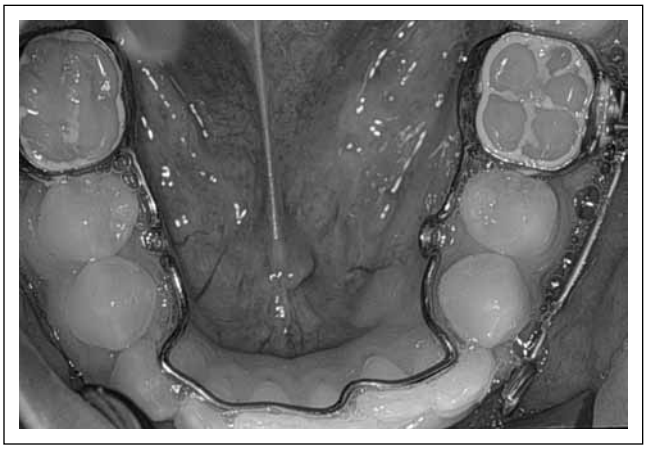

Figure 13. Lingual arch with left buccal arm for elastics is noted.

Figure 14. Frontal view showing how elastics are placed to rotate maxilla to right. The left side has class III elastic forces, while the right side has class II elastic forces. There is only right side occlusal contact so as to impact maxilla with occlusal forces.

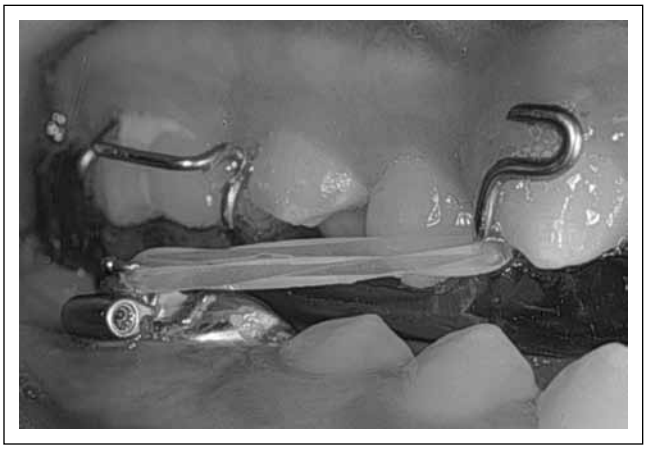

Figure 15. Right view of both appliances showing heavy elastics to rotate maxilla to the right.

Figure 16. Left view showing both appliances. Lower buccal arm is for heavy elastic to connect to clasp distal to upper first permanent molar.

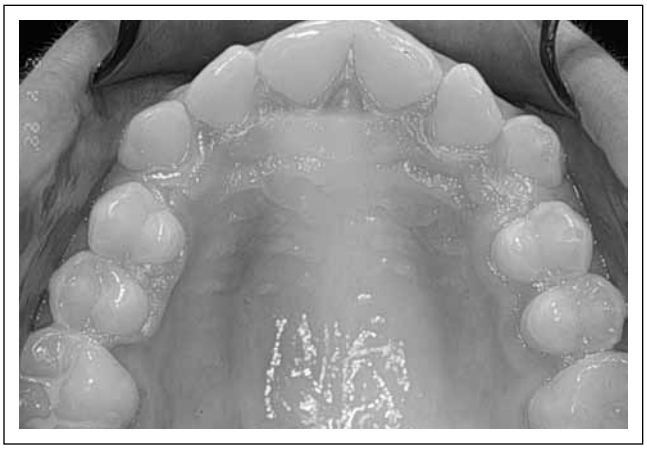

Figure 17. Upper arch after rotation, impaction and transverse expansion.

Figure 18. Lingual arch with left buccal arm removed for patient comfort and the maxillary rotation is completed.

Figure 19. Occlusal view after rotation, impaction and transverse expansion.

Figure 20. Right side view after rotation, impaction and transverse expansion.

Figure 21. Left side view after rotation, impaction and transverse expansion.

Figure 22. Upper arch with fixed orthodontic appliance showing well developed arch.

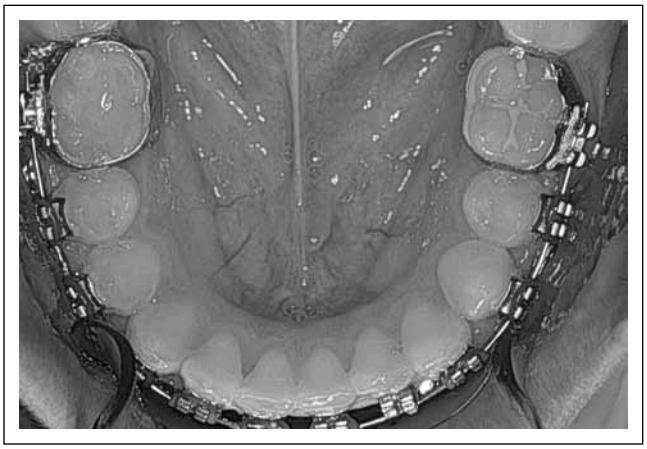

Figure 23. Lower arch with fixed orthodontic appliance showing well developed arch.

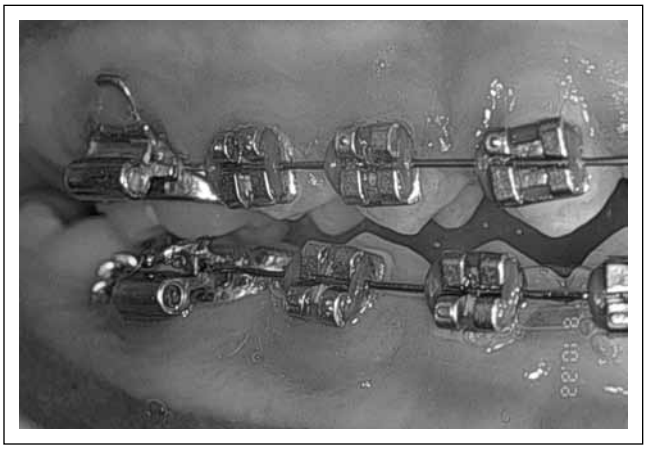

Figure 24. Frontal view with fixed orthodontic appliance showing well developed arches.

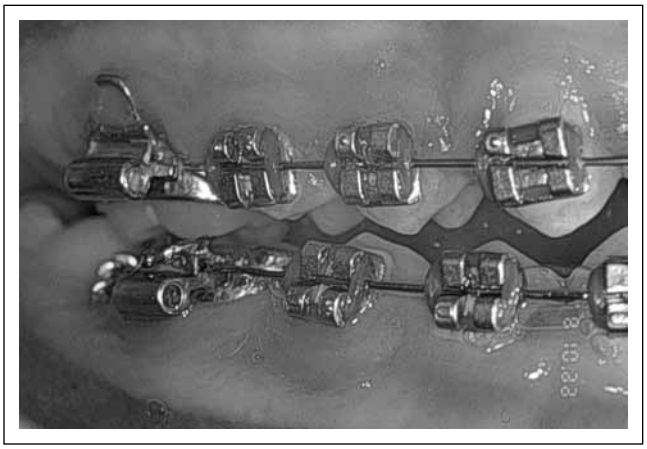

Figure 25. Right side view showing fixed orthodontic appliances.

Figure 26. Left side view showing fixed orthodontic appliances.

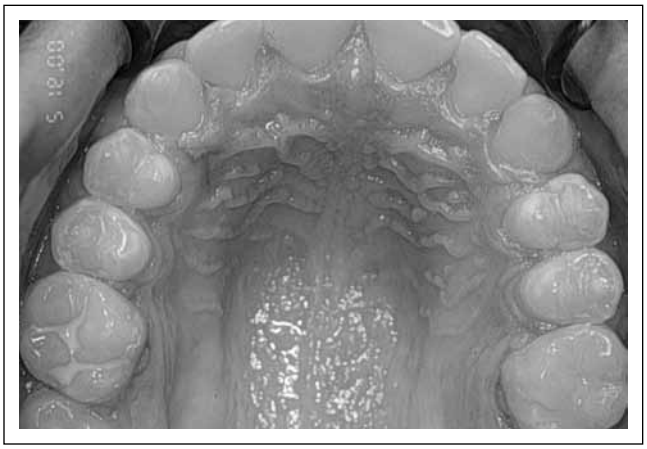

Figure 27. View showing well developed maxillary arch.

Figure 28. View showing well developed mandibular arch.

Figure 29. Frontal view showing excellent occlusion.

Figure 30. Right side view of class I occlusion.

Figure 31. Left side view of class I occlusion.

Figure 32. Frontal view showing eyes are level.

Figure 33. Profile view showing normal contours of face.

Figure 34. Smile showing midlines of dentition are coincident with facial midlines and eyes are parallel.

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