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**Case Report**

**Orthodontic Treatment of Adult Skeletal Class II with Idiopathic Condylar Resorption History and Severe Anterior Open Bite Without Using Temporary Anchorage Device – A Case Report**

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The aim was to present the treatment of an adult patient with idiopathic condylar resorption (ICR) who exhibited good adaptation of condyles after orthodontic treatment and to discuss management of anterior open bite when it is related with TMJ problems.

A case of 47 y/o female with skeletal Class II, anterior open bite and ICR history under bite-plate therapy and regular follow up. Intraoral examination noted premature contact and occlusal interference over bilateral posterior teeth. Our treatment plan is orthodontic camouflage treatment to correct anterior open bite and remove all 3rd molars and hopeless UL 2nd molar. An implant was placed after treatment completion.

As ICR with condylar head resorption was noted in this patient, thus no TAD and only light force was applied. By using cutting edge (TP plus) bracket, thermoelastic NiTi, light force elastic combining modified MEAW technique, a normal overbite and overjet was achieved within 1 year and 7 months. Her profile became more harmony after correction of anterior open bite. Although the occlusal stability relies on the health of TMJ, the current occlusal and facial results provide a better quality of life for her. Orthodontic treatment in ICR patient should be very careful. Proper diagnosis and etiology, good selection of bracket and wire should be confirmed before treatment. In addition, the operator must monitor the TMJ condition from time to time. It is suggested to use light force and minimal invasive treatment to prevent unpredictable complications.


Keywords: anterior open bite; Idiopathic condylar resorption; transmission effect

**INTRODUCTION**

Anterior open bite is considered as one of the most complicated problems in orthodontic treatment. Management of anterior open bite varies from observation, myofunctional therapy, conventional orthodontic treatment to complex surgical treatment.
It is important to diagnose the true origin of anterior open bite especially when it is related with TMJ problems. Idiopathic condylar resorption (ICR) is defined as in the condition of unknown origin, while the condyles of the mandible partially resorbed, causing a loss of condylar height and alteration of the maxillofacial morphology and occlusion. While progressive condylar resorption (PCR) is a more general term describing conditions resulting in loss of condylar height, including those of known etiology (eg. juvenile rheumatoid arthritis, lupus erythematosus, trauma, steroid use).  

A number of local and systemic factors or diseases can cause mandibular condylar resorption. Local factors include ICR, osteoarthritis, reactive arthritis, avascular necrosis, infection, and traumatic injuries. Systemic connective tissue and autoimmune diseases that can create condylar resorption including rheumatoid arthritis, psoriatic arthritis, scleroderma, systemic lupus erythematosis, Sjögren’s syndrome, ankylosing spondylitis, and others. ICR has a different cause and pathogenesis with other condylar resorption conditions and therefore a specific method of treatment is indicated for each patient.  

Until today, no method of management has yet been described for ICR that will provide predictable stable outcomes of the TMJ, which has optimal functional and esthetic results, and pain free. The purpose of this article is to present the treatment of an adult patient with ICR who received orthodontic treatment for correction of her anterior open bite malocclusion by using light force and without the aid of temporary anchorage device. Adaptive remodeling of the condyles after orthodontic treatment was demonstrated. We will discuss the management of anterior open bite when it related with TMJ problems.

**CASE REPORT**

This is a case of a 47 y/o female who complained that she could not bite with her anterior teeth for more than 10 years. She had severe anterior open bite with a

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*Figure 1. Pre-treatment facial and intraoral photographs. Note that the occlusion of this patient is Angle Class III for molar classification and anterior open bite around 6 mm.*
Class III molar relationship. Overjet and overbite were +3 mm and -6.0 mm, respectively (Figure 1). She complained limited mouth opening, right TMJ pain and she has been diagnosed as ICR at other hospital by the following lateral tomograms record. She received bite plate therapy and under regular follow up for more than 1 year.

Cephalometric analysis (Figure 2, Table 1) indicated that her facial pattern was skeletal Class II malocclusion (ANB angle approximate 9.8 degree) with retruded mandible, as the pogonion to N-vertical is significantly smaller than the norms. She had high mandibular plane angle as shown the extension of her mandibular plane locates inside the occipital bone. The SN-MP angle is 38.5 degree. Labio-lingual inclinations of the maxillary incisors were almost normal, but the inclinations of the mandibular incisors were proclined as compared to norms.

Lateral tomograms (Figure 3) revealed an irregular shape of right condylar head due to loss of continuity of cortical bone. This is the evidence that proved the condyles of this patient was once under resorption.

![Figure 2. Lateral cephalometric films before (left) and after (right) treatment.](image)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skeletal analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNA (°)</td>
<td>86.5</td>
<td>86.5</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>76.7</td>
<td>78.5</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>9.8</td>
<td>7.4</td>
</tr>
<tr>
<td>SN-MP (°)</td>
<td>38.5</td>
<td>35.3</td>
</tr>
<tr>
<td><strong>Dental analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1-SN (°)</td>
<td>102.0</td>
<td>101.2</td>
</tr>
<tr>
<td>L1-MP (°)</td>
<td>107.1</td>
<td>106.8</td>
</tr>
<tr>
<td>Upper 1-PP (mm)</td>
<td>27.8</td>
<td>29.5</td>
</tr>
<tr>
<td>Upper6-PP (mm)</td>
<td>23.2</td>
<td>21.2</td>
</tr>
<tr>
<td>Lower 1-MP (mm)</td>
<td>41.3</td>
<td>42.0</td>
</tr>
<tr>
<td>Lower 6-MP (mm)</td>
<td>33.9</td>
<td>34.2</td>
</tr>
<tr>
<td><strong>Esthetic line analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper lip (mm)</td>
<td>3.0</td>
<td>2.1</td>
</tr>
<tr>
<td>Lower lip (mm)</td>
<td>3.3</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Based on clinical diagnosis, the patient has no tongue swallowing or tongue thrusting habits. According to the ICR protocol that defined by Larry Wolford, patient with following specific facial morphologic characteristics appear to be most susceptible to ICR. The pre-treatment panoramic radiograph indicated tooth 27 is hopeless due to severe periodontal destruction and a cone shape root of tooth 28 (Figure 4).

![Figure 4. Pre-treatment panoramic radiograph. Teeth 27 is hopeless due to severe periodontal destruction and a cone shape root of tooth 28 was noted.](image)

<table>
<thead>
<tr>
<th>Facial morphologic characteristics</th>
<th>Our patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 females (approximately 9:1 female to male ratio)</td>
<td>Match (female)</td>
</tr>
<tr>
<td>2 age range from 10 to 40 years old with a strong predominance for teenagers in their pubertal growth phase</td>
<td>Current age: 47 y/o</td>
</tr>
<tr>
<td>3 high occlusal plane angle and mandibular plane angle</td>
<td>Match (SN-MP around 38.5 degree)</td>
</tr>
<tr>
<td>4 predominance of Class II skeletal and occlusal relationship with or without open bite</td>
<td>Match (Skeletal Class II with open bite)</td>
</tr>
</tbody>
</table>
From the above findings, this case was diagnosed as idiopathic condylar resorption (ICR) with condylar resorption (Table 2). The recovery of condylar resorption was considered very difficult and was not included in our treatment plan. Our treatment goal is to produce a stable occlusion for the patient without deterioration of her TMJ problems.

The final treatment plan for this patient as following:
1. Extraction of upper and lower right 3rd molar, hopeless upper left 2nd molar and 3rd molar.
2. Full mouth Tip-edge plus bracket system in combination of LH wire and modified MEAW technique for anterior open bite correction.
3. Implant placement of upper left 2nd molar after orthodontic treatment complete.
4. Regular monitor and follow up of TMJ condition to prevent unwanted side-effect or joint loading.

After 3 months of observation after her first visit, all TMD symptoms such as pain and crepitus almost disappeared. Thus, full mouth orthodontic treatment using Tip-edge plus bracket was begin.

After leveling of both dentitions completed, a stabilizing arch wire of 0.016 X 0.022 inch LH wire in combination of mild curve of Spee for upper arch and stronger reverse curve of Spee for lower arch were applied for dentition tip backs. In addition, bilateral short Class III elastics of 2oz were used for overbite correction and to prevent anterior intrusion (Figure 5).

In order to reduce the effect of tongue movement for occlusion, tongue training exercise was advised during this period. We taught patient chewing gum on molars teeth then place the gum at the tip of the tongue and push the gum on the palatal vault of the upper jaw, training the standard tongue position when swallowing. With superior cooperation from patient, a good vertical control of posterior teeth was achieved even without insertion of temporary anchorage device.

The anterior open bite was reduced in 5 months after treatment (Figure 6). Edge to edge overbite was achieved after 7 months of treatment. As the molar relationship is remained in Class III condition, thus a square Australian wire of 0.016 X 0.016 inch was applied to upper arch and a round Australian wire of 0.016 inch was used for lower arch. Bilateral light Class III elastic around 2oz was used to distalize lower arch and to achieve Class I molar relationship (Figure 7).

After 2 years of treatment, an acceptable occlusion was achieved without any TMD symptoms. Overjet and overbite were both improved to +1.5 mm, respectively. The patient obtained a well aligned dentition with good interdigitation and ideal root parallelism as shown in final panoramic radiograph (Figure 8). Bilateral Class I canine and molar relationships were attained. Upper Hawley retainer and lower anterior lingual fixed retainer were provided to maintain teeth alignment. The positioner part of retainer helps to interrupt the error tongue movement.

In addition, her facial profile became harmonized after correction of anterior open bite. The upper and lower dental midlines coincided with the facial midline. Although the occlusal stability relies on the health of TMJ, the current occlusal and facial results provide a better quality of life for her (Figure 9).

The final cephalometric values are shown in Table 1. The superimposition of cephalometric radiographs was based on sella-nasion line indicated a counter-clockwise rotation of the mandible due to intrusion of upper molar. The anterior open bite was corrected from -6 mm open bite changed to +1.5 mm overbite. The correction came from intrusion of upper molar about 2 mm and extrusion of both upper and lower incisors about 1.7 mm. The dental changes between the initial and final tracings of the regional superimposition of maxilla and mandible was shown in Figure 10.

Lateral tomograms of the TMJ demonstrated bony deformation of right condyle observed before treatment.
Anterior Open Bite with ICR History

Figure 5. A soft and light stabilizing arch wire of 0.016 X 0.022 inch LH wire in combination of COS & RCOS and anterior short class III were applied to mimic MEAW technique for correction of anterior open bite.

Figure 6. In 5 months of treatment, anterior open bite was reduced to 2 mm. Asymmetry elastic were applied for midline correction and prevent anterior intrusion.

Figure 7. Bilateral light Class III intermaxillary elastic were applied for distalization of lower dentition to create Class I canine and molar relationship. Bilateral lower premolar was not ligated to the main wire in order to mimic MEAW technique and create individual tooth movement. In combination with Tip-edge plus bracket with cutting edge, this point contact design with light force is effective in molar tip back and completely arch distalization.

Figure 8. Post-treatment panoramic radiograph. All teeth were good align and showed ideal root parallelism.
Figure 9. Post-treatment facial and intraoral photographs. Good interdigitation with normal overjet and overbite was achieved. This case finished at bilateral Class I canine and molar relationship.

Figure 10. Superimposition of cephalometric radiograph showed counter-clockwise rotation of mandible, intrusion of upper molar, lower molar tip back and extrusion of both upper and lower incisors.
had disappeared and adaptive remodeling was induced on the surface of right condyle. There was no deterioration of TMJ and no signs and symptoms complained after orthodontic treatment completed (Figure 3).

After 1-year retention, acceptable occlusion was maintained without recurrence of any TMD symptoms, indicating a long term stability of occlusion and TMJ components.

**DISCUSSION**

According to Wolford et al., the following specific facial morphologic characteristics appear to be most susceptible to ICR: (1) females (approximately 9:1 female to male ratio); (2) age range from 10 to 40 years old with a strong predominance for teenagers in their pubertal growth phase; (3) high occlusal plane angle and mandibular plane angle; and (4) predominance of Class II skeletal and occlusal relationship with or without open bite. ICR rarely occurs in low occlusal and mandibular plane angle facial types or in Class III skeletal relationships.

As most ICR patients predisposed to ICR are usually high occlusal plane angle facial types with skeletal Class II relationships, they are often candidates for orthognathic surgery before the onset of the disease. In most cases, ICR would develop regardless of orthodontic or orthognathic procedures. Moreover, if any of these procedures increase loading or stress to the TMJs, they may initiate or accelerate the rate of resorption and causing deterioration of TMJs. Thus, it is important to understand if ICR does go into remission, as it can easily have reactivated by orthodontics, orthognathic surgery, or other factors that load or stress on the joint.

Due to the above reasons, we tend to use light orthodontic force to correct her anterior open bite and monitor the TMJ condition closely during the whole treatment period. Tip-edge plus bracket with cutting edge was selected due to this reason. Tip-edge bracket that original invented by Kesling et al., is a combination of Begg and standard edgewise appliance. The Tip-edge plus bracket with deep tunnel, which first introduced in 2003, is a combination of Begg and straight wire bracket system. The deep tunnel design use superelastic Ni-Ti archwire in stage III for correction of tip and torque rather than conventional side-winder springs. Tip-edge bracket introduced differential tooth movement within a modified straight-wire bracket system. The unique bracket

![Figure 11. Retraction of a canine with conventional brackets has vertical consequences which may extrude the incisor segment and might cause loss of molar anchorage. While with Tip-edge plus bracket, as cutting edge exists in canine bracket, it will lead the tooth to differential tooth movement that leaves the apex behind and allowed retraction of crown without carrying vertical consequences. (From Am J Orthod Dentofac Orthop 99:387-401, 1991)](image-url)
architecture with cutting edge design, allows controlled tipping in one direction without binding effect that frequently shown in standard edgewise appliance (Figure 11). After reviewing several articles, we decided to use “transmission method” which is a method based on light force but efficiency in uprighting and distalization of arch. This method was first introduced by Dr. Lin Jiu Xiang for correction lower anterior crossbite by distalizing lower arch in early skeletal Class III patient. A method which use round wire in bracket with cutting edge and light Class III elastics (2oz) that allows the distal tipping of lower dentition. When elastic was applied, the premolars was not ligated to the main wire. The mechanics of this method work when forces applied to central and lateral incisors, that lead to the lingual tipping movement of the dentition. As canine was placed in the corner of the dentition, it is move toward the distal direction.

As the inclination of the canine is the steepest among the whole dentition and it has the longest root length thus the bodily movement of canine has the highest resistance among all teeth. However, this characteristic will lead to distal tipping of canine especially in crown portion. This effect was also seen on traditional edgewise bracket but it is limited due to bracket binding effect, and thus inefficiency. As the tip-edge plus bracket is origin improved from the Begg bracket, it allows a wide range distal movement and is more efficiency in distalization of arch due to crown tipping even under light force condition.

The forces of elastic transmitted through the incisal edge and buccal surface of central incisor and create a force that move central incisor to the lingual and distal direction. This forces that passed through the point contact of the bracket will transmitted the force for each other until the end of the dentition. These phenomena will produce a distal tipping of the dentition. This is similar with theory of arch bridge, which Dr. Lin Jiu Xiang named it as “transmission method” (Figure 12). This method merely uses simple and effective intra-oral anchorage and could effectively distalize the dentition by causing

*Figure 12. “Transmission method” is similar with arch bridge theory. It uses only light force around 50 to 60 gm which can minimized the loading of the temporomandibular joint but is effectively in distal tipping of the whole dentition without binding effect. (Form Clin J Orthod 18:61-67, 2011)*
distal tipping of crown. In addition, it uses only light force around 50 to 60 gm. which can minimized the loading of the temporomandibular joint and avoid deterioration of joint resorption.

**CONCLUSION**

Orthodontic treatment in ICR patient should be very careful. Proper diagnosis and etiology, good selection of bracket and wire should be confirmed before treatment. In addition, the operator must monitor TMJ condition from time to time. It is suggested to use light force and minimal invasive treatment to prevent unpredictable complications.

In our case, we have treated our patient by the following protocol and received a good treatment outcome. Our suggestion for patient with open bite and ICR as following:

1. Postpone definitive occlusal treatment until condylar resorption has been “burnt out” for at least 1 year.
2. Follow up TMJ condition every 6 months in case of further resorption noted.
3. Use light and continuous forces, bracket with cutting edge and light elastic and round working wire.
4. Splint usage if necessary before or during treatment.

During treatment for occlusal reconstruction in patients with ICR, it is prudent for orthodontists to obtain stable occlusion without producing the recurrences of condylar dislocation and TMD symptoms. The present case report would provide an insight into a new therapeutic approach to ICR patients.

**REFERENCES**