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Non-surgical Treatment for a Patient with Condyle Head Resorption and Unstable Occlusion

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Abstract
This case report presents multiple TADs application technique on managing difficult dental and skeletal malocclusion. This 36-year-old female who was diagnosed as rheumatoid arthritis and had been under medication control for 6 years. In addition, she was diagnosed as condyle erosion with bilateral crepitus sound during jaw movement. The characters of occlusion including Class II malocclusion with increased overjet (6 mm), multiple posterior teeth missing and super-erupted teeth 17 and 26, and unstable occlusion. During phase I, patient was referred for occlusal splint treatment, and we followed the progression of condylar condition. At phase II, surgical intervention was suggested but it was refused by the patient. Therefore, a non-surgical orthodontic treatment plan to achieve intrusion of super-erupted teeth and to stabilize the occlusion with the aid of mini-screws anchorage. After 42 months of treatment, the patient was satisfied with the treatment outcomes. Also, the patient's physical health, TMJ status and occlusion were all in stable condition.

Keywords
condyle resorption; non-surgical treatment; rheumatoid arthritis

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INTRODUCTION

Rheumatoid arthritis (RA) is a chronic systemic auto-immune disease that correlated with persistent inflammatory synovitis. The peripheral joints are usually involved in symmetric pattern. The prevalence of RA ranged from 0.5% to 1% of the population. Women has higher risk than men in 3:1 ratio. The affecting age ranged from 35 to 45 years. Studies indicate that more than 50% of RA patients exhibit TMJ involvement clinically, the clinical findings are pain, swelling, movement impairment and crepitation.2

Unstable occlusion with condyle head resorption is a tough challenge for orthodontists. If patients had obvious condyle head resorption, the differential diagnosis of possible etiology and timing for orthodontic interceptive treatment is crucial. Also, the orthodontic mechanics applied on these cases should avoid the force burden on TMJ.

NON-SURGICAL TREATMENT FOR A PATIENT WITH CONDYLE HEAD RESORPTION AND UNSTABLE OCCLUSION

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During phase I, patient was referred for occlusal splint treatment, and we followed the progression of condylar condition. At phase II, surgical intervention was suggested but it was refused by the patient. Therefore, a non-surgical orthodontic treatment plan to achieve intrusion of super-erupted teeth and to stabilize the occlusion with the aid of mini-screws anchorage.

After 42 months of treatment, the patient was satisfied with the treatment outcomes. Also, the patient’s physical health, TMJ status and occlusion were all in stable condition. (Taiwanese Journal of Orthodontics. 32(2): 104-112, 2020)

Keywords: condyle resorption; non-surgical treatment; rheumatoid arthritis
CASE REPORT

A 36-year-old female was referred from TMJ doctor due to unstable occlusion. Before coming to the Orthodontic Department, the patient had already suffered from wrist joint stiffness and swelling since 2007. Her hand wrist radiograph revealed joint space narrowing and mild erosion of interphalangeal area on her index and middle fingers (Figure 1). She was diagnosed as rheumatoid arthritis (RA). Since then, she was prescribed with NSAIDs, steroid and anti-rheumatoid medication by AIR (allergy, immunology, rheumatology) doctor. The inflammation index from routine serum investigations went toward normal gradually (Table 1). However, she started to suffer from pain over bilateral TMJ and temporalis muscle, so she was referred to Stomatology department for occlusal splint treatment. Due to bilateral crepitus sound during jaw movement, she was diagnosed as condyle head erosion (Figure 1). After 3 years of occlusal splint treatment, her condylar condition was stabilized. Therefore, she was transferred to the Orthodontic Department for establishing a stable occlusion which was better for balanced condyle loading.

Table 1. Serum level before orthodontic treatment.

<table>
<thead>
<tr>
<th></th>
<th>2010.04</th>
<th>2011.05</th>
<th>2012.05</th>
<th>2013.01</th>
<th>Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>13000</td>
<td>9700</td>
<td>8500</td>
<td>9400</td>
<td>4500-11000/CUMM</td>
</tr>
<tr>
<td>ESR</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>20 mm/hr, &lt;50 y/o</td>
</tr>
<tr>
<td>RF</td>
<td>20.4</td>
<td>&lt;20</td>
<td>25.8</td>
<td>25</td>
<td>0-30 IU/ML</td>
</tr>
<tr>
<td>CRP</td>
<td>0.158</td>
<td>0.11</td>
<td>0.11</td>
<td></td>
<td>0-0.5 MG/DL</td>
</tr>
</tbody>
</table>

WBC = white blood cell, ESR = erythrocyte sedimentation rate, RF = rheumatoid factor, CRP = C-reactive protein

Figure 1. a Joint space narrowing and mild erosion over interphalangeal area on her index and middle fingers; b bilateral condyle head erosion.
Clinical findings

The patient presented to our department with a convex profile and 6 mm inter-labial gap (Figure 2a). The dental characteristics showed that the mandibular dental midline shifted toward her left side by 1 mm, overjet was 5 to 6 mm and vertical overlapping of anterior teeth was 0.5 mm but only one-point contact bilaterally (15/45 and 28/38) (Figure 3a). Multiple missing teeth (18, 16, 27, 36, 37, 46, 47, 48) and malformed tooth 28, mesial-tilted tooth 38 were noted. Super-erupted tooth 17 was 4.5 mm below the occlusal plane with mesial tilting. There was 4 mm space left between the tooth 15 and 17.

The lateral cephalometric radiographic analysis revealed that the patient was Class II skeletal relationship.
due to mandibular retrognathic, high mandibular plane angle with increased lower anterior facial height (Figure 4a, Table 2). The panoramic radiographic examination revealed that there were mild erosion of bilateral condyle head and the descending maxillary sinus floor at upper right was more obvious than the upper left (Figure 5a).
Figure 3. a Initial intraoral photographs; b X-ray and progress intraoral photographs of tooth 17 intrusion; c progress intraoral photographs and X-ray of tooth 38 uprighting; d debond.

Figure 4. The lateral cephalometric radiographic film a initial; b debond; c overall and regional superimposition of cephalometric tracing.
Table 2. Cephalometric analysis before and after treatment.

<table>
<thead>
<tr>
<th>MEASUREMENTS</th>
<th>Initial</th>
<th>Debond</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA°</td>
<td>84.0°</td>
<td>83.5°</td>
</tr>
<tr>
<td>SNB°</td>
<td>76.0°</td>
<td>77.5°</td>
</tr>
<tr>
<td>ANB°</td>
<td>8.0°</td>
<td>6.0°</td>
</tr>
<tr>
<td>SN-MP° (Me-Go)</td>
<td>39°</td>
<td>37°</td>
</tr>
<tr>
<td>LAFH</td>
<td>75.5 mm</td>
<td>72 mm</td>
</tr>
<tr>
<td>DENTAL ANALYSIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper 1 TO NA</td>
<td>3 mm</td>
<td>2 mm</td>
</tr>
<tr>
<td>Upper 1 TO SN</td>
<td>95°</td>
<td>105.5°</td>
</tr>
<tr>
<td>Lower 1 TO NB</td>
<td>9 mm</td>
<td>8.5 mm</td>
</tr>
<tr>
<td>Lower 1 TO MP</td>
<td>95.0°</td>
<td>96.5°</td>
</tr>
<tr>
<td>E-LINE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper lip</td>
<td>3 mm</td>
<td>-1 mm</td>
</tr>
<tr>
<td>Lower lip</td>
<td>3 mm</td>
<td>0.5 mm</td>
</tr>
</tbody>
</table>
Diagnosis
(1) Rheumatoid arthritis under good medication control.
(2) Previous disc displacement with reduction s/p occlusal splint treatment; mild erosion of bilateral condyle head.
(3) Class II skeletal relationship with high mandibular plane angle, retroclined maxillary incisors.
(4) Angle’s Class II dental relationship with unstable occlusion.

Treatment objectives
The preliminary treatment objectives were setup based on patient’s chief complaints (protrusive upper lip and incisors, excessive overjet and unstable occlusion) and the clinical findings, include:
(1) Create proper overjet and overbite
(2) Achieve solid inter-digitation and better occlusion
(3) Redistribute dental spaces for prosthesis fabrication
(4) Improve facial profile within non-surgical treatment limitation

Treatment plan
The non-surgical treatment was applied with periodic periodontal control and prosthodontic treatment. The pure orthodontic treatment plan was as follows:
(1) Full mouth treatment with fixed orthodontic appliance (0.022x0.028 slot pre-adjusted bracket)
(2) Tooth extraction: 28
(3) Temporary anchorage devices (TADs) to facilitate tooth 17 intrusion and whole maxilla intrusion and anterior teeth retraction
(4) Tooth uprighting: 38
(5) Space re-distribution for future prosthesis construction
(6) Retention: occlusal splint on the upper jaw and Hawley retainer on the lower jaw

Treatment alternatives
The alternative treatment plan was orthodontic combined with surgical intervention. The overall treatment plan included:
(1) Tooth extraction: 28
(2) Intrusion: tooth 17; uprighting: tooth 38
(3) One-jaw orthognathic surgery: maxillary LeFort I impaction for 3 mm, setback for 2 mm, let mandible counter-clockwise autorotation.
(4) Space: close tooth 16 space by tooth 17 segmental osteotomy
(5) Future prosthesis construction
(6) Retention: occlusal splint on the upper jaw and Hawley retainer on the lower jaw

Treatment progress
After discuss the pros and cons of possible treatment options, the patient hesitated to receive orthognathic surgery, so she chose the non-surgical orthodontic treatment plan.

At the beginning, three TADs (A1 2x10 mm) were placed on upper right IZC and posterior palatal region for intrusion of tooth 17 (Figure 3b). Upper dentition was bonded with 0.022x0.028 slot pre-adjusted edgewise brackets and initial leveling and alignment was carried out sequentially by 0.016 and 0.016x0.022-inch NiTi wire. Upper anterior (A1 1.4x7 mm) and upper left IZC TADs (A1 2x10 mm) were also placed for whole maxilla intrusion in the first year (Figure 5b). Whole maxillary dentition distalization (working wire 0.018x0.022-inch) was done by bilateral TADs as anchorage.

In the lower arch, initial leveling and alignment which include tooth 38 was started by 0.016 and 0.016x0.022-inch NiTi wires. Tooth 38 was uprighted by pushing force from coil-spring for the first 3 months, afterward, it was intruded and uprighted with the aid of TADs in the retromolar area. After tooth 38 had been uprighted, two TADs (MIA 1413x10 mm) in front of it on edentulous region were placed and build-up for bracketing to provide better 3-dimensional control of tooth movement (Figure 3c).

From cephalometric superimposition and intra-oral photos, intrusion of maxillary dentition and tooth 38 was successfully achieved which might help counter-clockwise autorotation of mandible. And a relative stable occlusion was established after 16 months of treatment.
During the treatment, TADs placed at upper left interdental (MIA 141x10 mm) and lower right edentulous region (A1 2x8 mm) helped on intrusion mechanics, since occlusal plane canting was noted.

After consolidating the occlusion and coordinating the upper and lower arch, we had patient passively maintained and followed up for 6 months. The occlusion and temporomandibular joint condition remained stable. With patient’s confirmations of acceptable occlusion for proper daily functions, all fixed appliance was removed. The total treatment duration was 42 months. The patient was satisfied with the treatment outcomes including facial profile.

RESULTS

After orthodontic treatment, facial profile and lip incompetence were improved with better chin projection (Figure 2b). From intra-oral photos, good interdigitation and stable occlusion was achieved (Figure 3b). Since large amount of intrusion on tooth 17 was achieved, special observation and periodontal maintain were highly focused. The bone level of these region which was evaluated by periapical film showed relatively even (Figure 3b). The probing depth of these region were all within normal range. No angular bony defect was detected and caused by the treatment.

At the end of treatment, the patient had occlusal splint on upper jaw and Hawley retainer on lower jaw for retention. Implants were placed in the molars of lower right region for occlusal support at 7 months after orthodontic treatment (Figure 4b,5c). The treatment outcomes were stable during periodic recall examination.

DISCUSSION

In this report, we presented a Class II case with unstable occlusion. Her condyle head erosion was an unpredictable bomb which required careful diagnosis and informed consent. RA is one of the etiologies for female with condyle resorption. The patient in our report was diagnosed with RA since 2007. After medication control, the laboratory examination including serum level was within normal range. Orthodontic treatment should be hold until systemic autoimmune condition was under balanced control, also occlusal splint wearing till the occlusion could maintain stable was necessary. Orthodontic intervention afterward, could help to resolve problems of uneven condyle loading by establishing a stable occlusion. Therefore, to remove occlusal interference, extraction of tooth 28 and uprighting, intruding the extruded tooth 38 were the first move in this case.

For these Class II high angle cases, LeFort I surgery for whole maxilla impaction combined with mandibular advanced surgery, or pure orthodontic treatment by intrusion of maxillary dentition to create mandible counterclockwise rotation were published. However, some Class II cases have short lower face originally, which may not be indicated for further reduction of lower anterior facial height by pure intrusion of maxilla in surgery or non-surgery way. Proper diagnosis is crucial. This patient is a Class II open bite and high MPA case, therefore intrusion of maxillary dentition could help on lower facial height reduction, lip incompetence improvement, and proper occlusion establishment. If patient asked further profile improvement, a rhinoplasty or genioplasty might be recommended.

Sugawara et al. stated that during intrusion of the molars with TADs, the lower anterior facial height, mandibular plane angle and ANB difference were reduced significantly, whereas the overbite and Wits appraisal increased significantly. In this case, we finally intruded the upper anterior teeth by 3.5 mm and the posterior teeth by 2.5 to 4.5 mm. While upward and forward mandibular rotation was achieved, ANB difference was reduced from 8 to 6 degrees (Table 2) and the lower anterior facial height was reduced by 3.5 mm with better chin projection (Figure 4c).

In regard to the posttreatment stability, upper molar intrusion was proved to have a relapse rate from 10% to...
Strategies to improve stability include light force with slow intrusive movement to allow for neuromuscular adaptation, overcorrection and longer retention periods. In our case, post treatment occlusal splint at night time, provide a posterior bite block effect and benefit for relief of condyle loading. In the meantime, establishment of solid posterior occlusion through prosthesis was also crucial for post treatment stability.

CONCLUSION

For patients with temporomandibular joint disorders (TMD) combined condyle head resorption, the timing to start orthodontic treatment should be decided after careful examination and differential diagnosis. Occlusal splint wearing for a period of time without occlusion changes was a timing to start the orthodontic treatment. Due to unstable occlusion caused by TMD and condyle head resorption, establish a stable occlusion may be one of the most important treatment goals to avoid more force burden on TMJ.

Additionally, to deal with Class II open bite with high mandibular plane angle, LeFort I impaction was an ideal option for correcting severe skeletal discrepancy. However, intrusion of whole maxillary dentition with the help of TADs may achieve similar dental result which is an alternative option.

REFERENCES


