

IOF International Orthodontics Foundation Clinical Showcase  
**LEARNING & REFLECTION**



IOF International Orthodontics Foundation

International Orthodontics Foundation  
**Clinical Showcase**

📍 Peking University School and Hospital of Stomatology

**TEMPOROMANDIBULAR DISORDERS AND ORTHODONTICS**

### Case 1

## orthodontic treatment of a skeletal class II, arch width discrepancy with TMD-OA and chronic pain patient

### 01. Case summary

A 31-year-old male from Fujian Province came to the clinic with a chief concern of chewing difficulties that had gradually worsened in the past year.

The patient has suffered from bilateral temporomandibular joint chronic pain for 10 years, and in the past year, he developed chewing difficulties, masticatory pain, tinnitus, and sleep disorder. He was once treated in the Center for Temporomandibular joint disease and oral-maxillofacial pain of Peking University School of Stomatology. After taking temporomandibular joint radiographs, he was diagnosed as temporomandibular joint osteoarthritis. Orthodontic improvement of occlusal is recommended.



Facial examination showed that the patient's head position was tilted, the face was asymmetrical, bilateral pupils were highly inconsistent, both eyes were congested for a long time, the lip was slightly strained when

mouth closed, and the upper teeth were exposed and the lower lip was covered while smiling. Lateral examination, the patient showed convex profile with mandibular retrusion.

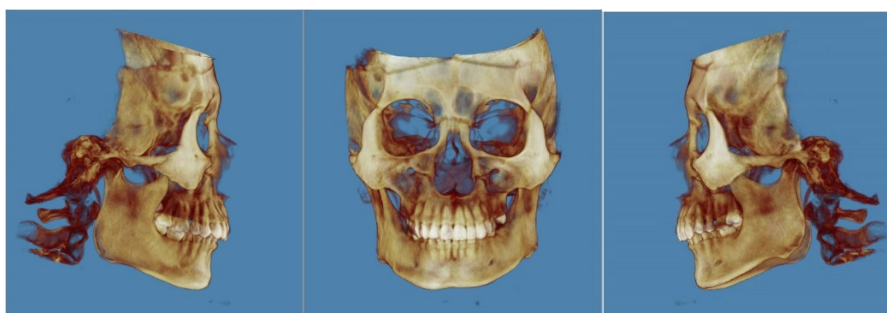


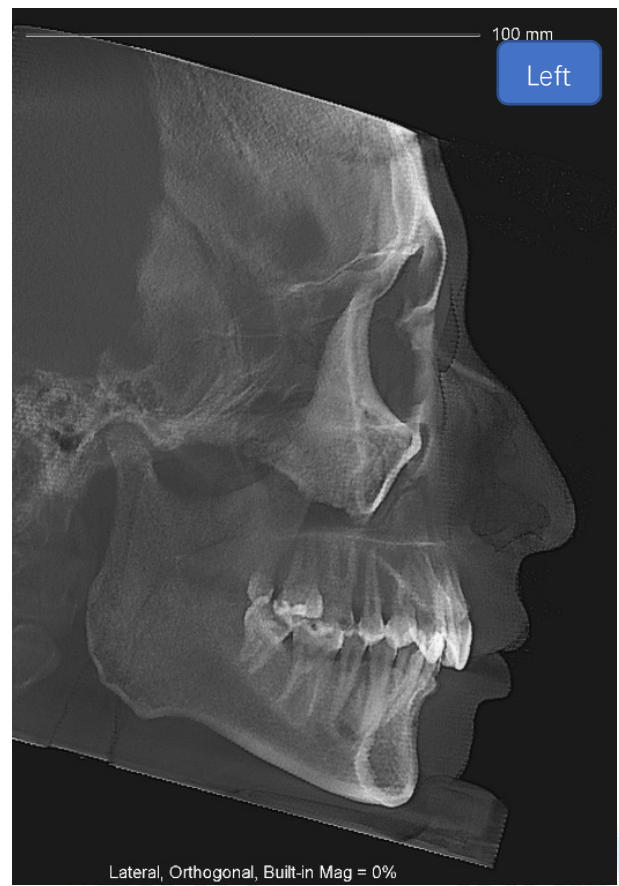
Temporomandibular joint (TMJ) palpation showed the patient's facial muscle strength was basically normal, but bilateral masseter muscle tenderness, especially on the right side. The amount of maximum active opening is 2 fingers, passive opening is 3 fingers. Crepitus was palpable in bilateral joints without TMJ lock or click.

Intra-oral examination showed bilateral class II molar relationship, left heavier than right. The lower midline was off to the right 1.5mm. The anterior teeth were III degree deep overbite with anterior teeth lingually inclined. The width of the upper and lower teeth arches was discrepancy, the upper arch was wider than the lower, with the bilateral first and second bicuspid teeth and the left second molar were scissors bite. No crowding existed. The left upper third molar has emerged.

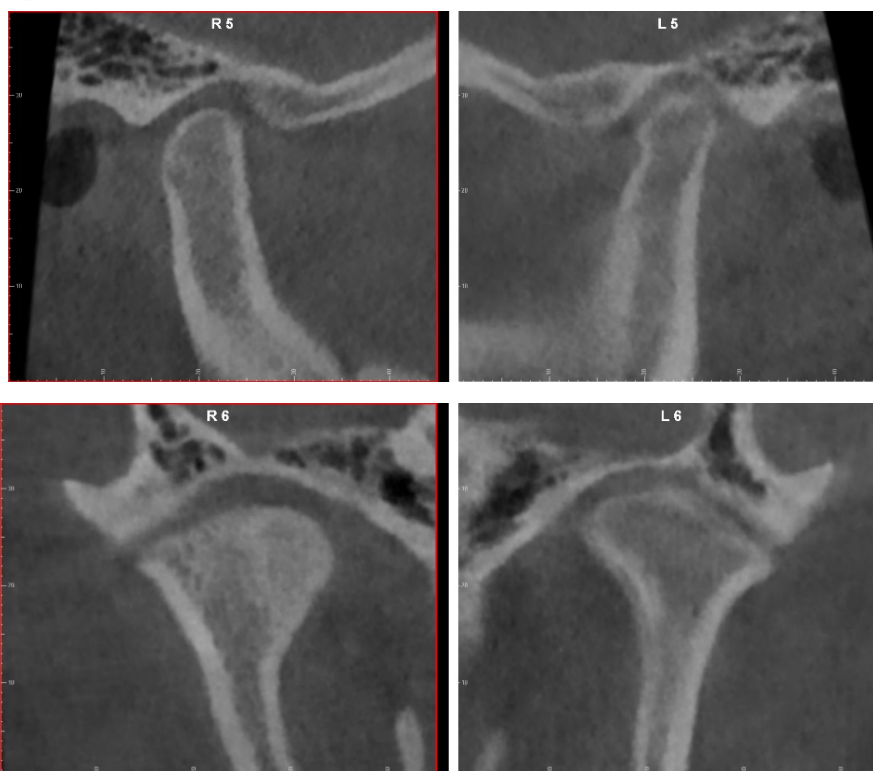


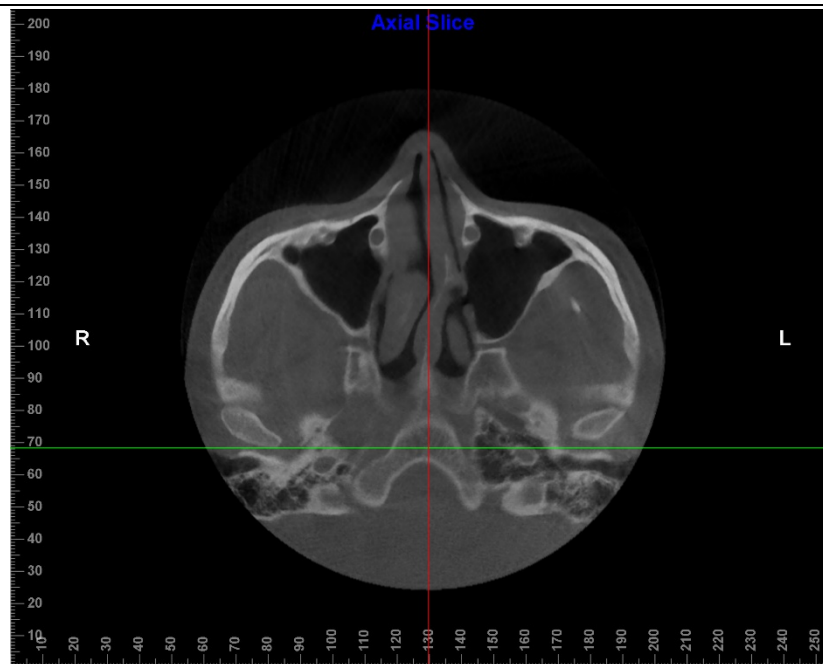
Cone-beam computed tomography (CBCT) analysis: skeletal class II low angle, mandibular retrusion and maxillary protrusion, short face type. The width of basal bone was coordinating. The height of bilateral articular fossa, condyle morphology, mandibular rami, masseter tuberosity, antegonial angle, tuberculum mentale, mandibular plane and occlusal plane were asymmetrical. The inclination degree of mandibular molars on the right side was greater than the left, and the lower left second molar was excessively overerupted. The upper incisors were lingually inclined and the lower incisors were vertical.





In the region of TMJ, from sagittal view, we can see the right condyle was bigger than the left, which was absorbed, while both of them were short. Smaller joint space on the left side was also found. Coronal view showed blurry cortical bone on the lateral slope of bilateral condyles, and there was double line sign on the left. In the axial view, the bilateral condyle axes were asymmetrical, and the left condyle was significantly more anterior than right.





## 02. Diagnosis & Objectives of Treatment

The patient was diagnosed with skeletal class II, euryprosopic, class II molar relationship, skeletal asymmetry, arch width discrepancy with multiple posterior teeth scissors bite, temporomandibular joint disorder/ osteoarthritis.

The patient's treatment plan was as follows:

1. Relieve TMD symptoms
2. Coordinate arch width, reconstruct functional occlusion
3. Improve skeletal class II relationship

## 03. Treatment plan

Option 1: Orthognathic surgery, TMD management, control the symptom.

Option 2: Orthodontic treatment, extraction of upper bicuspid, compensate the lower narrow arch and class II molar relationship, TMD management, control the symptom.

Option 3: occlusal splint to increase the vertical dimension and joint space of TMJ. Reposition of the mandible downward and forward, reconstruct occlusion. Coordinate the upper and lower arch width, extraction is optional.

The patient finally chose option 3.

## 04. Case summary

The patient's two maxillary third molar teeth were extracted and treated with fixed straight wire appliance. Three months after the treatment, splint was inserted. Six months after the treatment, an implant was placed in the right mandibular molar area to realize the right lower second molar intrusion. After 13 months of treatment, the splint was removed and started occlusion reconstruction. After 20 months of treatment, we conferred with the patient on the maxillary premolars extraction to better coordinate the width of the upper and lower dental arches. Patient refused, and expressed willingness to try another way. Thus, the left mandibular implant was placed to intrude the left mandibular canine and premolar, as well as facilitate dental arch expansion. Class II elastic moved lower dental arch forward. The overall treatment time for the patient was 30 months.

After treatment, the width of the mandibular arch was significantly improved, and the width of the upper and lower arches was basically coordinated. Scissors bite were relieved, normal overjet and overbite were

constructed, and stable occlusion was obtained. The improvement of skeletal class II was very obvious with molars upright, intruded, occlusal plane counterclockwise rotated, and mandible advanced. Both condyles moved forward, left side moved more. We also see increasement of TMJ space, fossa modification and improvement of bone morphology. Cervical vertebra curvature was improved, atlantoaxial joint space and airway were enlarged as well. Ultimately, this patient eliminated TMD symptom, sleep disorder and red eyes, obtained better chewing function and improved facial appearance. After 3 years retention, the patient's condition was even better.



Pre-operation

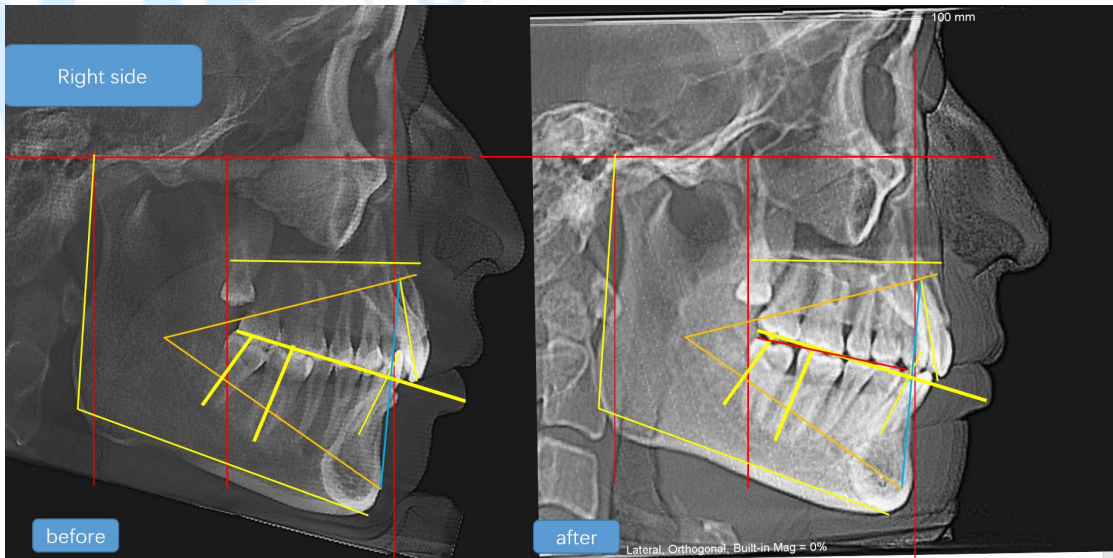
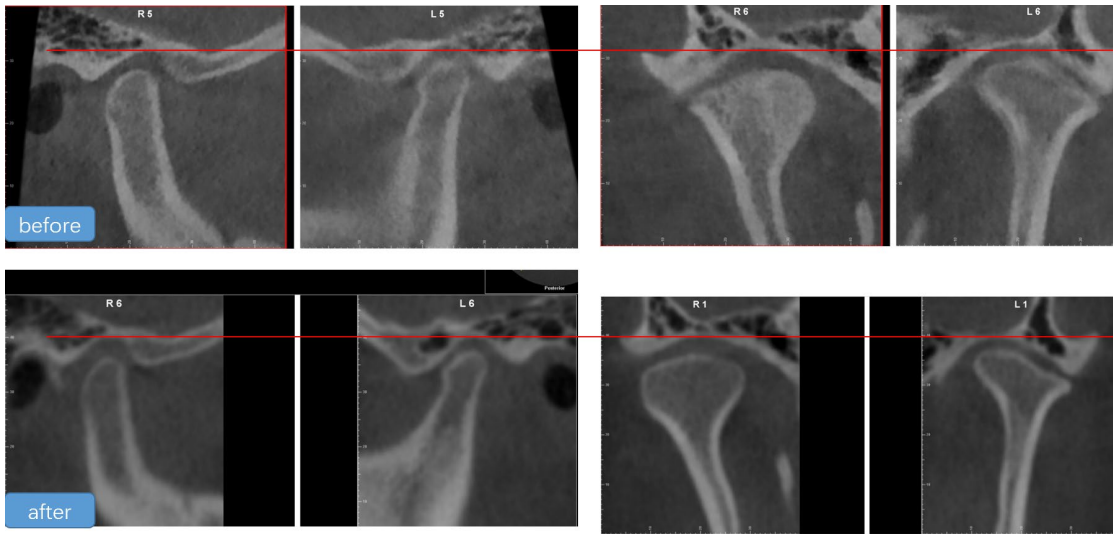


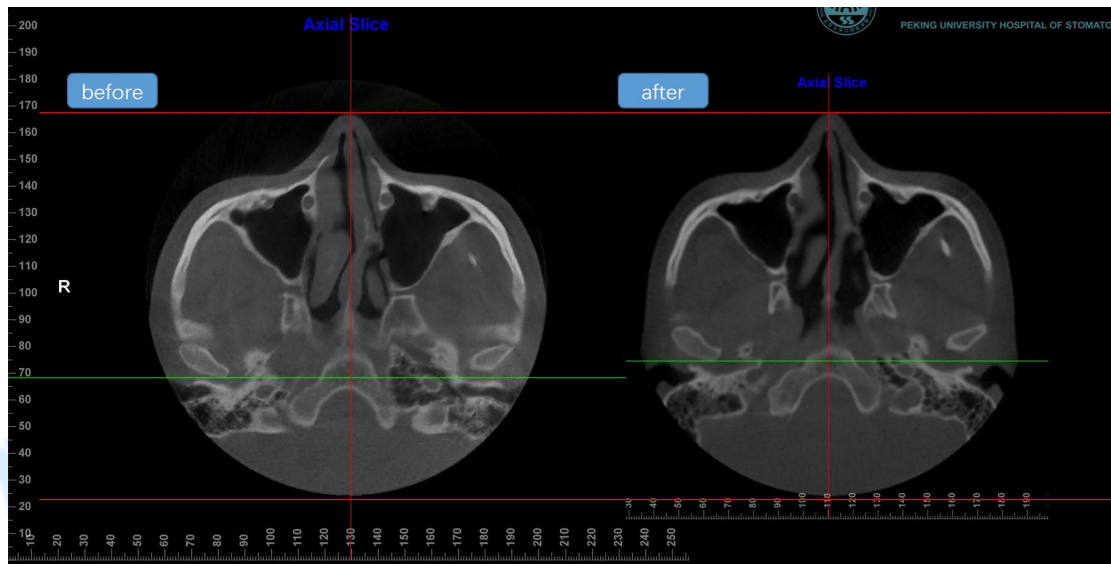
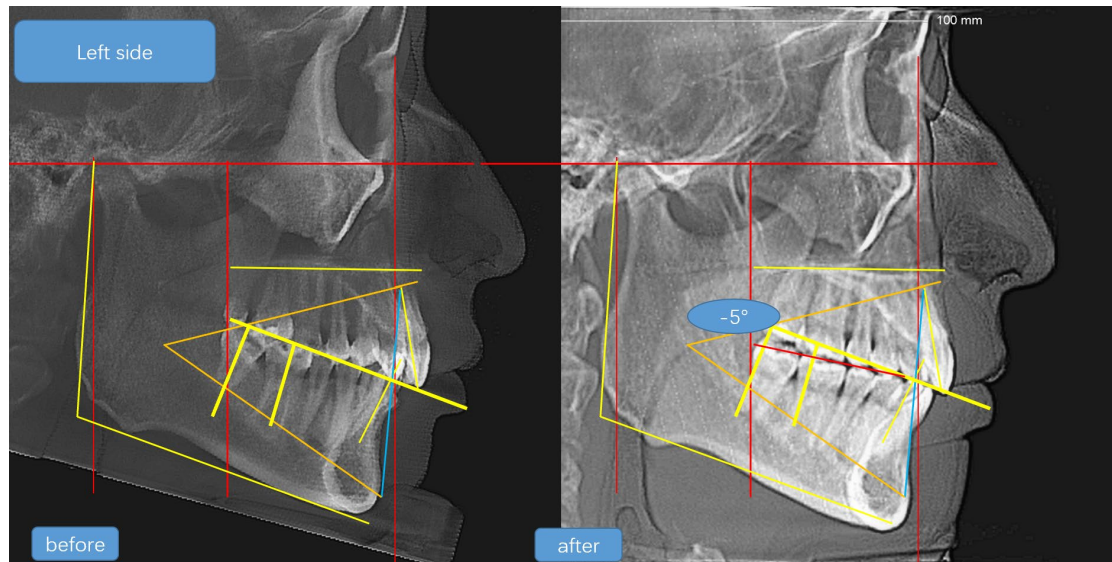


After treatment



3 years in retention





## 05. Discussion & Learning

Orthodontic treatment for patients with temporomandibular joint disease (TMD), which exists in a significant proportion of orthodontic patients, is currently a hot topic. This case presented with dental discrepancy, skeletal discrepancy, and TMD. The discussion focuses on the above three aspects of the patient's diagnosis and treatment.

### [1] Diagnosis and treatment of upper and lower arch width discrepancy

As an orthodontic issue, most of the time when we refer to a width discrepancy, an expansion of the upper jaw is performed. There are many ways to expand the maxillary arch, but it is more difficult for patients with constricted lower arch: The cortical bone of the mandible is more rigid, and there is no suture to use and lack of comfortable mandibular expansion device. The expansion of the mandibular arch depends more on dental inclination than on bony expansion [1,2]. In this patient, the lower arch was narrowed while the teeth were tilted lingually, so there is hope for his mandibular arch to be expanded successfully. Using a fixed appliance, Professor Liu Yi planned to combine implant anchorage and maxillary extraction to compensate and coordinate the width of the upper and lower dental arches. Although the patient ultimately refused extraction treatment, the pre-treatment width discrepancy was well solved by the extension of the mandibular arch and upright the mandibular teeth.



## **[2] Diagnosis and treatment of patients with skeletal Class II short facial type**

In this patient, the condyle was significantly worn shorter, therefore, the patient's vertical height was insufficient, which can be regained by combined orthodontic-orthognathic treatment, or by occlusal splint to reconstruct occlusion and restore part of the height by moving the mandible forward [3,4]. Professor Liu Yi thinks whether patients with skeletal deformities should undergo orthodontic camouflage treatment or orthognathic surgery is still a blurred issue. In his opinion, because there are skeletal problems, even though an obvious therapeutic effect has been achieved through non-surgical treatment on this patient, he will still recommend orthognathic surgery at first if he faces a similar patient again, which is more favorable for the improvement of skeletal deformity and joint space in his view. At the same time, Professor Liu Yi stressed that clinical decision should be made with full respect for the wishes of the patient. In patients who do not wish to undergo surgery, extraction is always an option. However, it is need to be cautious to carry out extraction treatment for patients with insufficient vertical height, because it is not conducive to regain the lost vertical height. In the choice of treatment plan, Professor Jiang Lingyong has the same opinion with Professor Liu Yi. Professor Jia Qilin holds a conservative attitude towards surgical treatment, and believes that surgery may not be able to better improve TMJ symptoms. For patients who do not have facial aesthetics requirements, he prefers non-surgical treatment.

## **[3] Etiology, symptoms, diagnosis, and evaluation of corresponding treatment of TMD.**

TMD is a syndrome with complex and diverse etiologies. TMJ is a part of the balance of the stomatognathic system. Various exogenous stresses, including physiological and psychological stress, are factors that can break the balance. TMD is one of the many manifestations that may occur when the balance is broken [5,6]. It is still controversial whether the occurrence of TMD is related to the dental occlusion system.

The symptoms of chronic pain may come from muscle and TMJ, the reason could be the bone changes of the joint, or the degeneration of cartilage, joint disc and ligament, or may be related to the displacement and deformation of joint disc. Professor Fu Kaiyuan thought that this patient had obvious disorders of the stomatognathic system, multiple teeth were malocclusion, and there was obvious deviation of the bones, cervical vertebrae, head position and muscles of the face. Therefore, although the patient showed a lot of discomfort, the manifestations related to acute joint inflammation, including limited mouth opening and obvious TMJ area pain, were absent or very mild. The patient's cortical bone was also seen to be continuous on the CBCT imaging. Thus, the patient's discomfort symptoms were more related to the muscle problems caused by oral and jaw dysfunction and deviation.

The diagnosis of TMD can be made combining with radiological imaging and functional examination. This patient's symptoms were more relevant to the occlusal dysfunction. We can find patient's articular bone had signs of destruction and resorption on CBCT imaging. However, due to the lack of MRI examination, we cannot make very accurate judgments about soft tissue in the TMJ region, such as cartilage, discs, ligaments, muscles, etc. From the perspective of joint space changes, it can be speculated that he had disc deformation and displacement. MRI is supplementary for diagnosis improvement of soft tissue issues in TMJ region. Professor Fu Kaiyuan considered that the right condyle was significantly flattened and shortened in this case, and the diagnosis of osteoarthritis was clear, which is always caused by anterior disc displacement without reduction (ADDWoR). Therefore, if MRI is not available, the diagnosis of an anterior disc displacement without reduction can be added when osteoarthritis can be seen on other images.

In terms of treatment, joint symptoms can be relieved by corresponding joint health education, physical therapy, medication, vertical height restoration of occlusal splint, and surgery in the department of

arthropathy. Different experts have different attitudes on the diagnosis and treatment of patients with ADDWoR. Some experts believe that it is necessary to perform surgery to relocate the articular disc, otherwise it may cause condylar resorption. While others hold the attitude of conservative treatment with non-surgical methods as far as possible. Occlusal splint is one of the conservative treatment methods. As a feasible means for orthodontists, occlusal splint treatment can be used for patients with TMJ internal derangement and degenerative diseases. The use of occlusal splints is thought to alleviate or prevent degenerative forces placed on the TMJ, articular disk, and dentition. There are various methods for making occlusal splint, different methods produce different effects. Systematic reviews have shown conflicting results on the preferred occlusal device for relieving TMD symptoms [7-10]. Many orthodontists are confused about whether TMD patients can start orthodontic treatment or not. Professor Fu Kaiyuan's answer to this question is yes if the TMJ symptoms are mild or disappeared, the bone remodeling is completed, and the cortical bone is continuous and smooth.

As for the treatment of this case, Professor Liu Yi used occlusal splint to increase the patient's occlusion vertical dimension and enlarge the joint space, which was beneficial to the improvement of the patient's intra-articular pressure. At the same time, the occlusal function was reconstructed by correcting scissors bite. Balanced occlusion relieved patient's symptoms significantly.

Professor Fu Kaiyuan also makes some suggestions for treatment of patients with TMD: In the clinical evaluation, some quantitative indicators are needed, such as using mandibular function index and quality of life score of TMD to quantify the symptoms and subjective feelings, mouth opening recorded accurately to the centimeter to quantify patient's signs, as well as evaluating the patient's psychological state. In this way, the value of the treatment can be more intuitive through the comparison of these quantitative indicators, and more theoretical supports can be provided for scientific research.

Professor Jiang Lingyong and Professor Jia Qilin propose that it is also very important to add more effective means to overlap pictures, radiographs or models before and after treatment in this case, so as to evaluate the changes in joint area and mandibular position more intuitively.

#### **[4] Feasibility of mandibular position adjustment in patients with TMD**

This case was not treated with extraction, but the molar relationship changed from distal before treatment to near neutral after treatment. In addition, the patient's facial pattern was more harmonious and the joint space was also changed. Except the expansion of mandibular arch width and the erection of mandibular teeth, there should be a mandibular position change. There is no doubt that the discs in this patient had been anteriorly displaced. Lacking in MRI, it is difficult to determine the true state of the articular disc. Professor Jiang Lingyong believes that if the patient's anterior displaced articular disc is already in a contracture and deformation state, this method of repositioning the mandible position forward and downward is helpful to relieve joint symptoms. If the disc is only anterior displaced to the 8 or 9 o'clock position of the condylar head without contracture, the same operation may compress and irritate the articular disc and cause contracture and deformation. Therefore, whether mandibular position can be redetermined is individualized. Professor Fu Kaiyuan agrees with Professor Jiang Lingyong, and he think this patient already had a absorption of the condyle, indicating that the ADDWoR had existed for a long time. In this situation, it is safe to move the patient's mandible forward and downward, the possibility of irritating the disc is very small, and this operation contribute to the increase of joint space, which helps to improve the intra-articular pressure and relieve symptoms.

Mandibular position adjustment is also a hot topic in orthodontic treatment. Professor Jia Qilin believes that, in general, minor patients are more likely to undergo mandibular position adjustment than adult patients, and whether mandibular position adjustment can be performed and whether it can be successfully

performed varies from person to person. In the treatment process of this case, Professor Liu Yi completed the reconstruction of the occlusion with the help of the occlusal splint, and this patient could stabilize in a new mandibular position, which brings us a lot of inspiration: What's the real relation between occlusion and mandibular position? Is the Stavicek school right, which claim that the occlusion determines the final mandibular position, or is the Roth school right, which claim that the mandibular position determines the occlusion? Professor Liu Yi believes that in the process of mandibular position adjustment, there will be an adaptation process. In this process, there will be a difference between the retruded contact position and the intercuspal position, but this difference will become less and less obvious with the patient's adaptation and the reconstruction of the TMJ area, and eventually stabilize with minimal difference. In the absence of MRI, we can combine CT and functional examination to obtain a general assessment of the disc status and the mandibular position of the patient. The functional status of the TMJ should be closely observed after the occlusal splint was inserted. During the first 3 weeks, the patient's symptoms should be gradually relieved. If they are worsen, the occlusal splint should be removed as soon as possible because it's not in an appropriate position. Of course, if MRI can assist us to judge and quantify the distance of condylar movement, the position of occlusal splint will be more accurate.

From Professor Liu Yi's case, we can see that during orthodontic treatment, even in adults, the patient can adapt and stabilize in the reconstructed mandibular position, and the TMJ will also have adaptive remodeling when the occlusal function is well established. This case inspires orthodontists to seek the safe range of TMJ adaptive remodeling. The amazing outcome also encourages orthodontists: not only can Oral and Maxillofacial surgeons escort TMD patients during orthodontic treatment, but also the improvement of occlusal function by orthodontists ultimately contributes to the normal function of TMJ.

## Reference

1. Quinzi, V., et al., Comparison of Mandibular Arch Expansion by the Schwartz Appliance Using Two Activation Protocols: A Preliminary Retrospective Clinical Study. *J Funct Morphol Kinesiol*, 2020. 5(3).
2. Houle, J.P., et al., The predictability of transverse changes with Invisalign. *Angle Orthod*, 2017. 87(1): p. 19-24.
3. Raposo, R., et al., Orthodontic camouflage versus orthodontic-orthognathic surgical treatment in class II malocclusion: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg*, 2018. 47(4): p. 445-455.
4. Knösel, M., et al., Angle class II correction: stepwise mandibular advancement or bite jumping? : A systematic review and meta-analysis of skeletal, dental and condylar effects. *J Orofac Orthop*, 2020. 81(4): p. 286-300.
5. Greven, M., Allostasis and dentistry. *Journal of Craniomandibular Function*, 2009. 1: p. 283-294.
6. Slavicek, R., Relationship between occlusion and temporomandibular disorders: implications for the gnathologist. *Am J Orthod Dentofacial Orthop*, 2011. 139(1): p. 10, 12, 14 passim.
7. Greene, C.S., Relationship between occlusion and temporomandibular disorders: Implications for the orthodontist. *Am J Orthod Dentofacial Orthop*, 2011. 139(1): p. 11, 13, 15.
8. Gauer, R.L. and M.J. Semidey, Diagnosis and treatment of temporomandibular disorders. *Am Fam Physician*, 2015. 91(6): p. 378-86.
9. Ohrbach, R. and S.F. Dworkin, The Evolution of TMD Diagnosis: Past, Present, Future. *J Dent Res*, 2016. 95(10): p. 1093-101.
10. Piehlinger, E., et al., Orthopedic jaw movement observations. Part I: Determination and analysis of the length of protrusion. *Cranio*, 1993. 11(2): p. 113-7.

## Writer Information



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## Case 2

### Vertical control improves camouflage orthodontic treatment outcomes for skeletal class II patients with temporomandibular joint osteoarthritis

#### 01. Case information

- General information

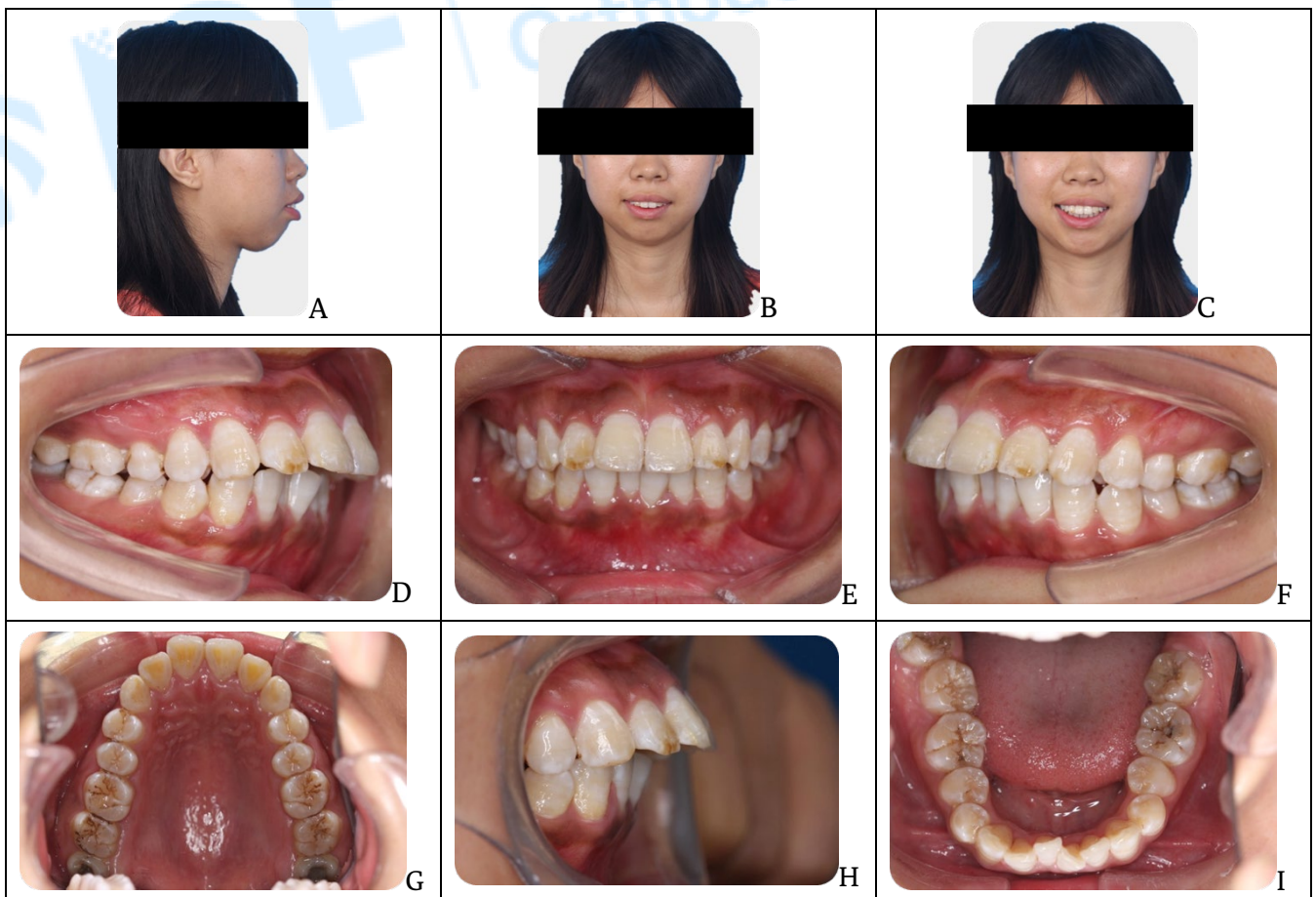
A 25-year-old female patient complained of poor occlusion and a convex profile. She felt that her facial profile was good when she was in junior high school, and her mentum gradually become retrognathic years later. She denied bad oral habits and nasopharyngeal diseases. She had bilateral TMJ clicking. She denied dental trauma and family history.

- Clinical examination

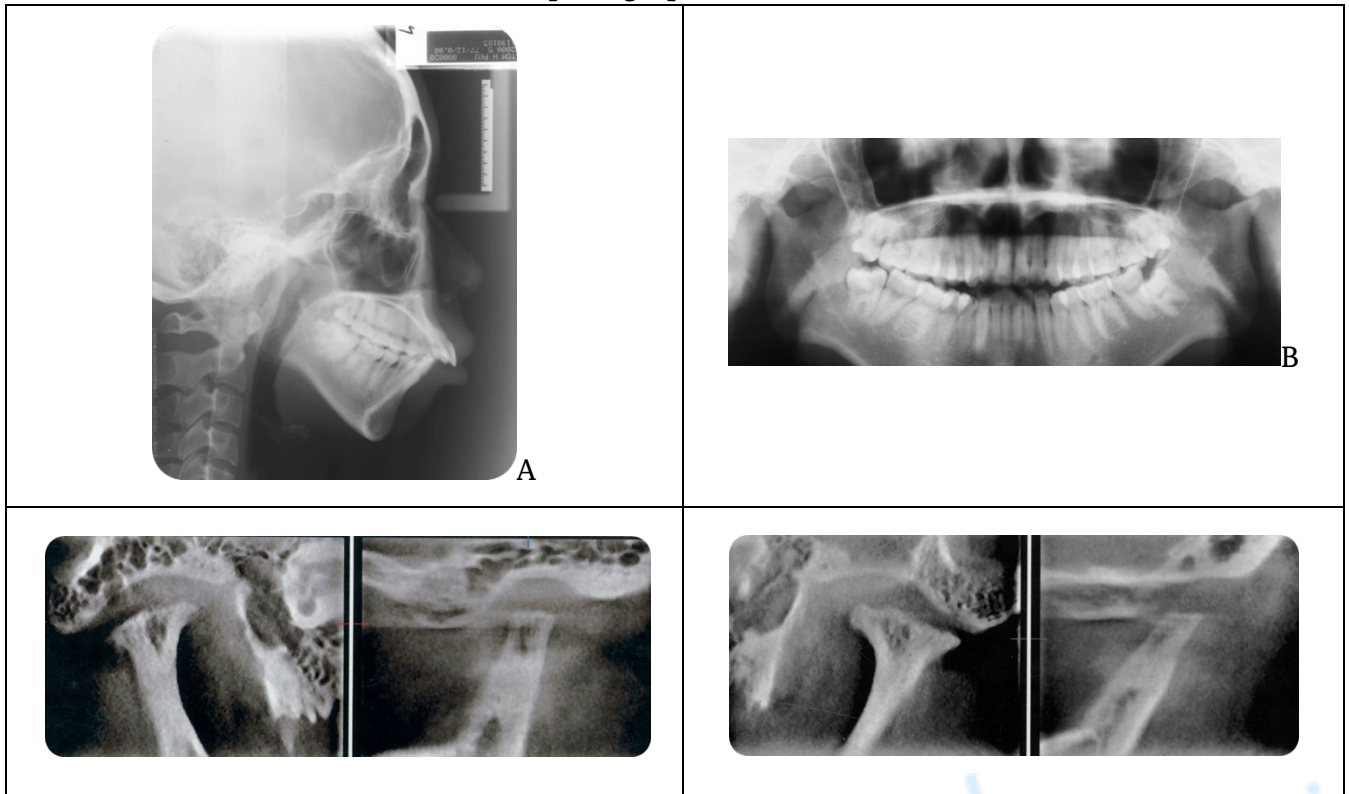
facial examination: frontal view: the face is basically symmetrical on the left and right, the lower 1/3 of the face is slightly longer, the gingiva are exposed when smiling, and the mentum is tense. Lateral view: convex facial profile, prognathic maxilla, retrognathic mandible, and underdeveloped mentum.

intraoral examination: permanent dentition, no crowding of the upper dental arch; The lower dental arch had 6mm crowding. The molar and canine presented distal relationship. The anterior teeth presented a 9 mm overjet. The upper anterior teeth were proclined, resulting in normal overbite; The lower middle line is slightly shifted to the right.

temporomandibular joint: bilateral joints clicking without obvious pain and limited opening.



Intraoral photograph before treatment



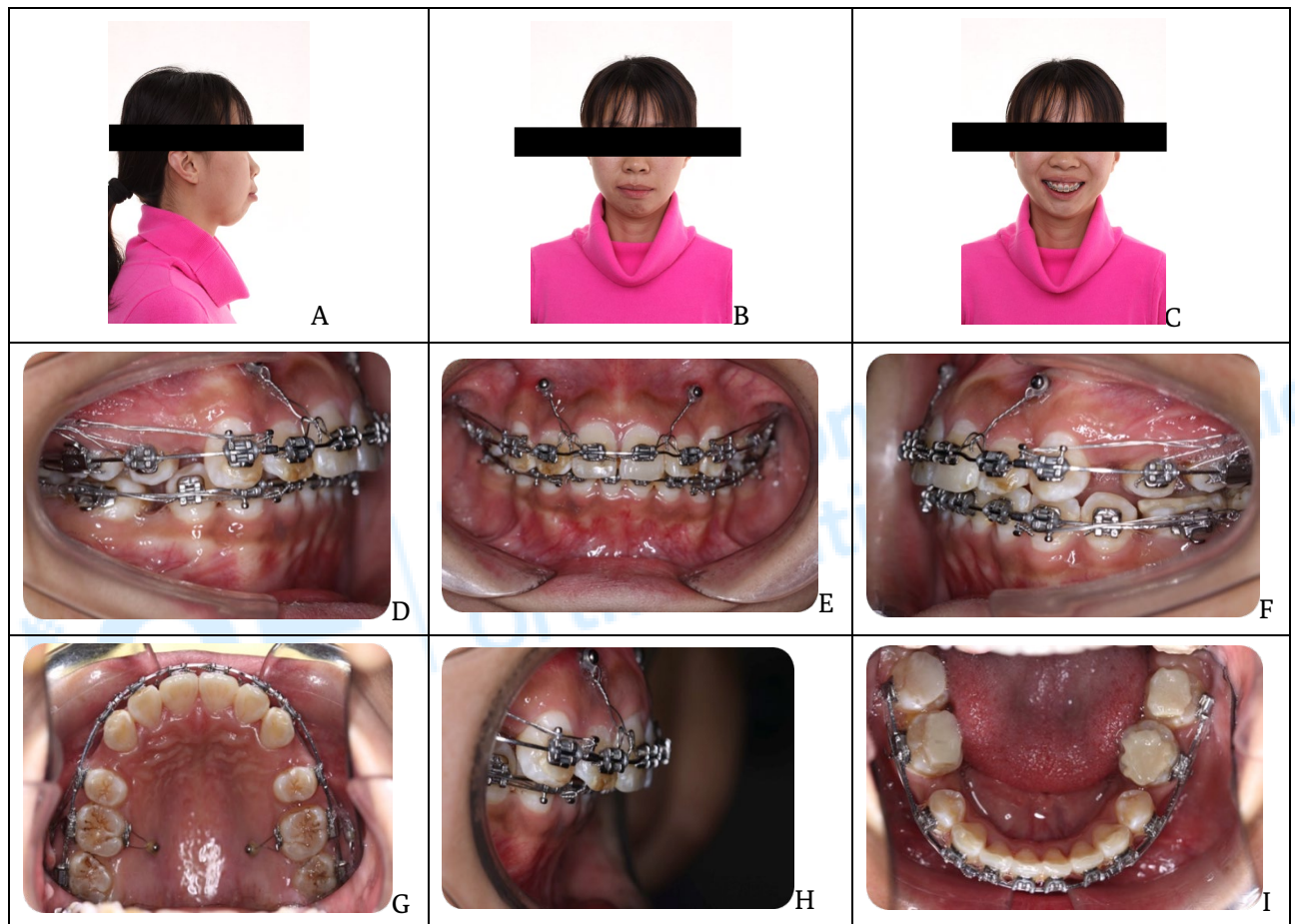
Intraoral radiograph before treatment

- X-ray examination and analysis  
the results of measurement show skeletal Class II high angle.  
Panoramic radiograph : 38, 48 vertical impaction; erosion of bilateral condyles  
CBCT showed that bilateral condyles were flattened and shortened, and the surface bone was basically continuous.
- Diagnosis  
Angle: II<sup>1</sup>; Skeletal: Class II high angle; TMJ Osteoarthritis
- Treatment goal  
Improve profile; Align the dentition and establish a good occlusal relationship
- Treatment planning  
Plan 1: combined orthodontic and orthognathic treatment, Or orthodontic treatment + genioplasty.  
The patient refused and asked for orthodontic treatment alone.  
Plan 2: camouflage orthodontic treatment.
  - straight wire technique, subtraction 14,24,35,45,18,28,38,48, strong maxillary anchorage, weak mandibular anchorage.
  - align the dentition, close the extraction space, retract the anterior teeth, establish the normal overbite and overjet of the anterior teeth, establish the neutral relationship between the canines and the molars, coordinate the maxillary and mandibular midlines, and improve the profile.
  - use implant anchorage as vertical control to improve gingival smile.
- Treatment process

1-9 months: apply the full mouth straight wire appliance, align the upper and lower dentition, and use 0.019 inch \*0.025 inch stainless steel wire.

10-28 months: miniscrews were implanted in the buccal and palatal sides between the maxillary first and second molars, and in the labial side between the maxillary lateral incisors and canines. The maxillary posterior and anterior teeth were continuously intruded. At the same time, the maxillary posterior miniscrews were used as strong anchorage to close the extraction space and retract the maxillary anterior teeth. The lower archwire with the reverse curve of Spee was used to control the overbite.

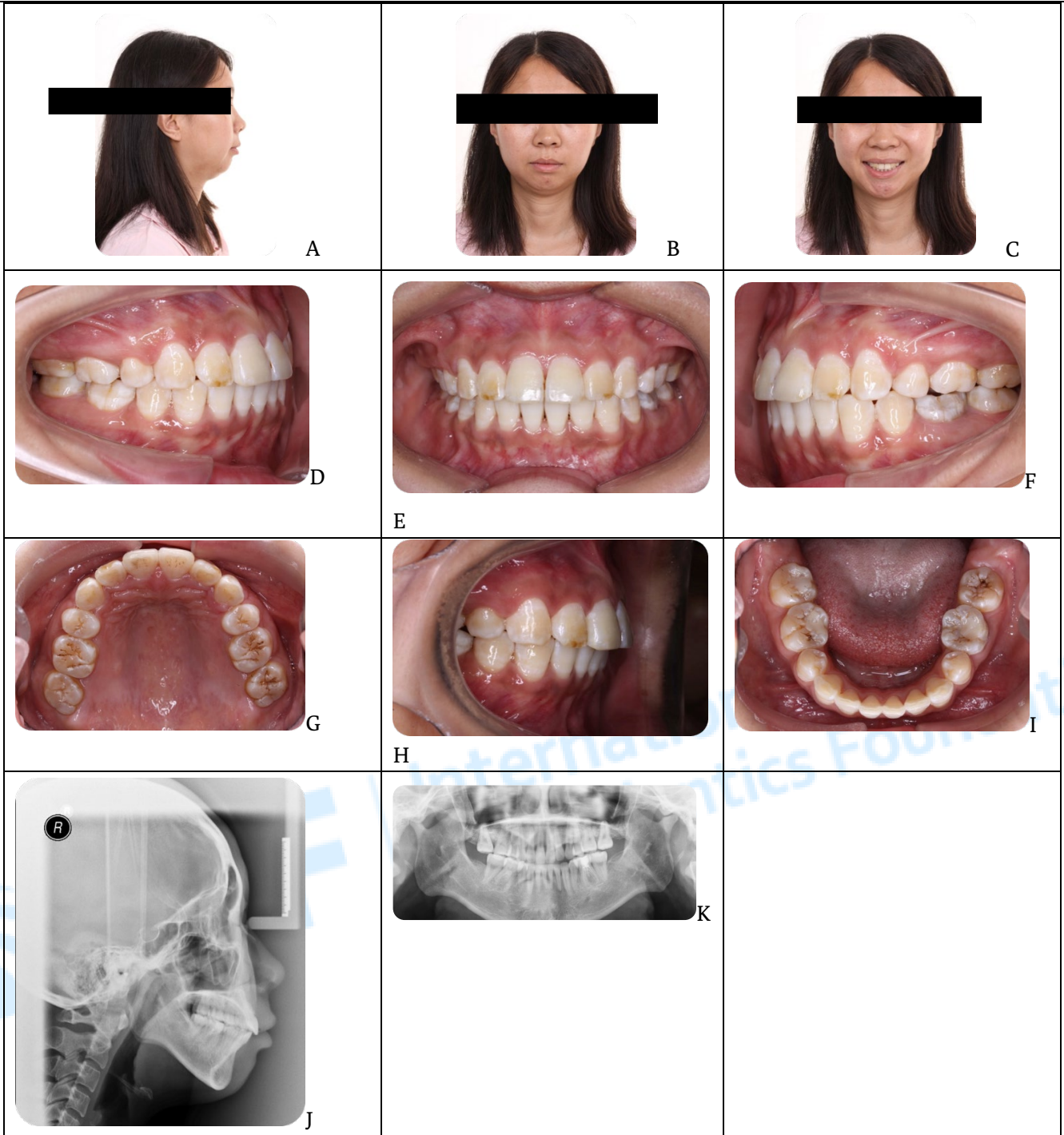
29-32 months: fine adjustment, removal of fixed appliance and retainer wearing.



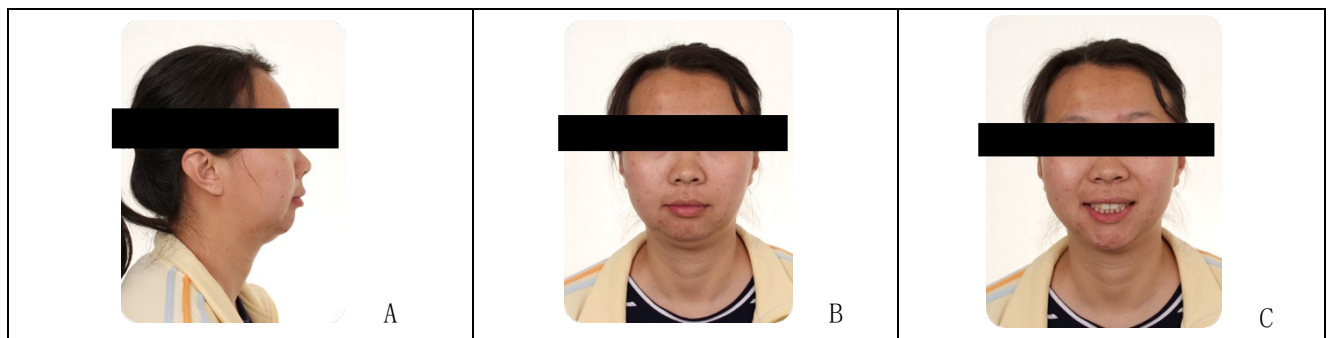
Intraoral photograph during space closure

- Treatment outcome

After orthodontic treatment, the occlusal relationship was good, the overbite and overjet were normal. The neutral molar and canine relationship was established, and the upper and lower midlines were corrected. The profile has been greatly improved, the nasal-labial angle is normal, and the lip closure is normal under natural conditions. When smiling, the gingival smile was significantly improved, and the lip tooth relationship was normal. The panoramic radiograph of the whole mouth showed that the tooth roots were arranged in parallel, and no obvious abnormality was found in the tooth roots and alveolar bone. Measurement and analysis of lateral cephalogram: the upper anterior teeth were retracted as a whole, the dental axis was well controlled, and the ANB and mandibular plane angle tended to decrease. See table 1 for the measurement results. After 3 years of treatment, the teeth were aligned and the occlusion was stable.



Intraoral photograph and radiograph after treatment



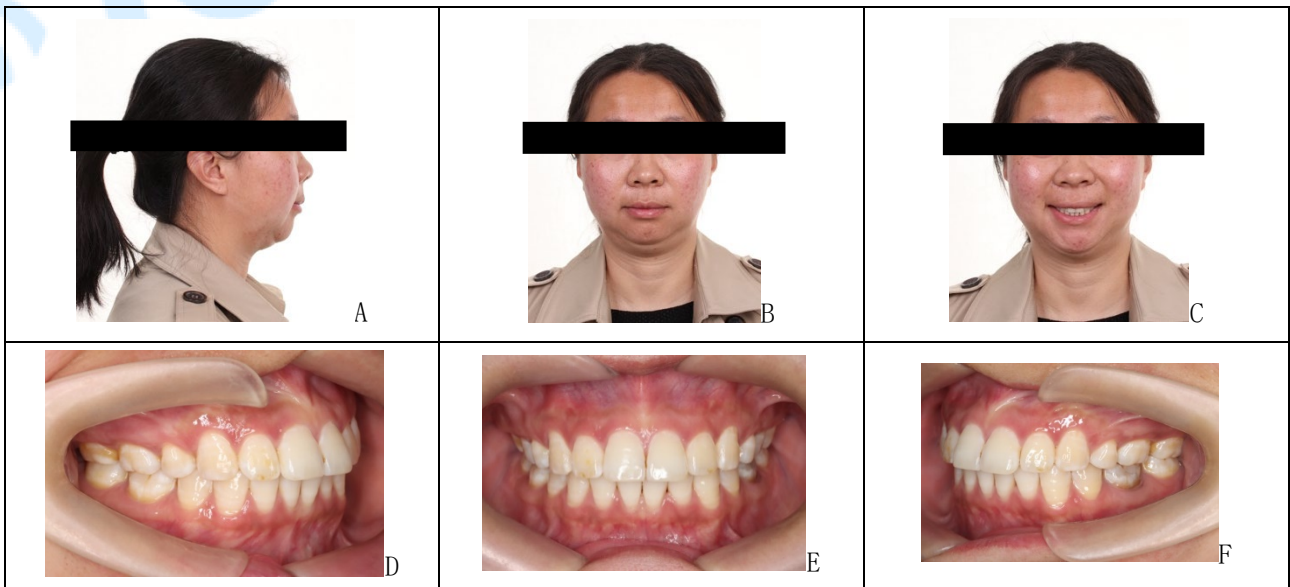


Intraoral photograph and CBCT after 3 years retention



Table 1 cephalometric results before and after treatment

Measurement	Normal value	Measured value	
	Mean $\pm$ standard deviation	Before treatment	After treatment
SNA	82.8 $\pm$ 4.0 $^{\circ}$	81.89 $^{\circ}$	80.49 $^{\circ}$
SNB	80.1 $\pm$ 3.9 $^{\circ}$	73.46 $^{\circ}$	75.37 $^{\circ}$
Anb	2.7 $\pm$ 2.0 $^{\circ}$	8.23 $^{\circ}$	5.12 $^{\circ}$
U1/NA	22.8 $\pm$ 5.7 $^{\circ}$	27.5 $^{\circ}$	20.3 $^{\circ}$
L1/NB	30.3 $\pm$ 5.8 $^{\circ}$	44.50 $^{\circ}$	42.20 $^{\circ}$
U1/L1	125.4 $\pm$ 7.9 $^{\circ}$	102.94 $^{\circ}$	110.74 $^{\circ}$
U1/SN	105.7 $\pm$ 6.3 $^{\circ}$	112.02 $^{\circ}$	102.02 $^{\circ}$
MP/SN	32.5 $\pm$ 5.2 $^{\circ}$	50.94 $^{\circ}$	48.73 $^{\circ}$
MP/FH	31.1 $\pm$ 5.6 $^{\circ}$	50.01 $^{\circ}$	48.4 $^{\circ}$
L1/MP	92.6 $\pm$ 7.0 $^{\circ}$	100.09 $^{\circ}$	100.6 $^{\circ}$





Intraoral photograph and CBCT after 9 years retention

- Discussion

the following difficulties exist in orthodontic treatment

- Severe skeletal Class II high angle, significant retrognathic mandible and gingival smile are all indications for orthognathic surgery. However, the patients refused the combined orthodontic and orthognathic treatment, and it was more difficult to adopt camouflage orthodontic treatment.
- It is difficult to establish a neutral molar relationship and normal overbite.
- The patient has osteoarthritis and obvious condylar erosion. Before orthodontic treatment, it is necessary to check and confirm that the condyle is in stable stage before starting treatment. Whether the vertical control will affect the force of TMJ still lack relevant clinical research, which should be used with caution. In addition, orthodontic treatment should establish good intercusp relationship and create good occlusal conditions for the reconstruction of the TMJ. Long term stability after orthodontic treatment is also one of the difficulties for patients with malocclusion who have osteoarthritis

- tooth movement control in orthodontics

- Anchorage control, paying equal attention to sagittal and vertical directions: before treatment, the molar of the patient was distally positioned, the anterior teeth overjet was deep, the lateral profile was protruding, and the anchorage of the upper and posterior teeth was strengthened by miniscrews to ensure that the maxillary molar did not move forward. The maxillary molar area was gently intruded by buccal and palatal miniscrew to achieve vertical control, avoiding buccal inclination of posterior teeth and increasing arch wire sliding resistance in the process of intrusion. The alveolar bone in the maxillary anterior region of the patient was overdeveloped, and the patient presented gingival smile. The miniscrew in the maxillary anterior region gently intruded the upper anterior teeth, promoted local periodontal remodeling, improved the gingival smile, and avoided the lingual inclination of the upper anterior teeth and the deepening of overbite during the gap closing process. Due to the distal relationship of the molars, the mandibular anchorage was weak. The traction force should be added to the mandibular first molar when the applying the sliding method to close the extraction space to promote the proximal movement of the molars, which was helpful to establish the neutral molar relationship. During treatment, class II intermaxillary traction should be avoided for a long time, and mandibular molar elongation and aggravation of high angle should be avoided to the greatest extent.
- Vertical control in patients with osteoarthritis: this case used miniscrew to assist in applying continuous light force to the anterior and posterior maxillary teeth intrusion, trying to reverse the rotation of the jaw to improve the high angle, controlling the anterior and posterior tooth torque, establishing a good relationship, creating a stable occlusion, and improving the gingival smile at the same time. After orthodontic treatment, the condylar bone did not further erode but also underwent compliance remodeling. It was found that the occlusion was stable after 3 years of routine maintenance. CBCT of the TMJ showed that a small amount of TMJ remodeling occurred in the condyle compared with that before treatment. The condyle morphology was fuller, and the TMJ stability was good.

Through the successful treatment of this case, we found that vertical control is beneficial to improve camouflage orthodontics in patients with osteoarthritis. However, in clinical practice, we must pay attention to the following: severe osteoarthritis is a difficult case in the field of Orthodontics and TMJ. Before orthodontic treatment, the department of arthritis needs to make sure that the condylar bone is in a stable stage, and if necessary, follow-up should be more than one year; During orthodontic treatment, we should also pay close attention to whether patients have TMJ clicking, pain, limited opening and other symptoms, avoid long-term intermaxillary traction, and recommend that patients regularly go to the department of arthritis for review. Although this case shows that vertical control combined with fixed orthodontics is helpful to improve the effect of traditional camouflage orthodontics and does not lead to further absorption of the condyle, the protective effect on the condyle, and the three-dimensional changes of the condyle after counterclockwise rotation of the mandible, still need a large sample of clinical research.

(Case completed by: Dr. Wang Xuedong)

## 02 Expert discussion

### Professor Fu Kaiyuan, Peking University School and Hospital of Stomatology

Professor Fu believes that this is a typical case of orthodontic treatment of juvenile osteoarthritis. Professor Fu believes that this is not idiopathic condylar resorption. Idiopathic condylar resorption refers to condylar resorption for which no etiology can be found. This case is juvenile osteoarthritis, and the cause of the disease is irreducible anterior disc displacement in adolescence. Such patients often have a history of limited opening, TMJ clicking, and TMJ pain, but because the duration may be very short, many patients do not remember that they have a similar history when asking for the history. And this kind of disease is self-limiting. Some patients' condyles can repair themselves, and the condyles will be stable and asymptomatic when the patients go to the orthodontics department. Temporomandibular joint osteoarthritis is different from TMJ degenerative diseases in other parts of the body. The peak age of occurrence is 20-30, and the second peak is under 20 years old. The early age of occurrence is closely related to the irreducible anterior disc displacement. If this kind of patient does not have high requirements for their own profile, the vertical control of non-surgical therapy is very worthy of promotion.

Professor Fu believes that the joints of such patients have remained stable before orthodontic treatment. There were no symptoms, and the shape of the condyle was well reconstructed. Therefore, orthodontic treatment in this scenario is relatively safe. Whether it is low angle patients treated with occlusal splint or the high angle patients applying vertical control, the condyle could remain stable.

### Professor Jiang Lingyong, Shanghai Ninth People's Hospital

Professor Jiang believes that this is a very beautiful orthodontic camouflage treatment for a patient with osteoarthritis. Professor Jiang believes that after orthodontic treatment, a good intercuspal relationship between and a functional occlusion will create good conditions for the long-term healthy reconstruction of our TMJ. For vertical control, Professor Jiang believes that for patients with poor control, even if the reduction achieves the expected effect, due to its vertical elevation, the clockwise rotation will counteract the expected change. If the vertical direction is well controlled, the effect of reduction can be strengthened to the greatest extent. Professor Jiang put forward some opinions on the relationship between occlusion and TMJ: he believes that the therapeutic effect of occlusion on joints lacks research evidence. Whether the joint can withstand the changes brought by treatment is related to its intrinsic characteristics. Professor Jiang also had some questions about some treatment details. For example, the case shown in the figure used 6 miniscrews. Professor Jiang believes that if the transverse palatal bar is used on the palatal side, the miniscrew on the palatal side may not be needed. For the control of overbite in the anterior tooth area, Professor Jiang believes that the long traction hook can be used to replace the short traction hook, which has a better effect on anterior tooth intrusion, and may not need to implant miniscrew in the anterior tooth area.

### Professor Jia Qilin, Peking University School and Hospital of Stomatology

Professor Jia mentioned that the first person to put forward the concept of vertical control should be Dr. Tweed. To treat Class II high angle patients, the existing orthodontic technology generally uses straight wire orthodontic system and miniscrew to achieve vertical control under the concept from Dr. Tweed. Professor Jia therefore raised two questions: first, how much does vertical control contribute to the improvement of profile? Doctors usually treat TMD patient with occlusal splint. It will be helpful to reduce the pressure of TMJ and release the symptoms of TMJ and muscle. The benign reconstruction of the joint was achieved while the posterior teeth were intruded for this TMD OA patient.. The second question is what the mechanism for the improvement. Dr. Wang answered Professor Jia's question. Dr. Wang mentioned that in his existing research, the change of Z angle in the vertical control group is the greater compared to patients without vertical control. In view of the latter problem, Dr. Wang mentioned that these cases had no discomfort in the TMJ area before orthodontic treatment. In addition, the process of intrusion was relatively slow, the strength was relatively light, and the stress of the TMJ had no obvious change, which was in line with its physiological compliance.

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