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ABOUT COVER

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Hybrid treatment of varied orthodontic appliances for a patient with skeletal class II and temporomandibular joint disorders: A case report and review of literature

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Abstract

BACKGROUND

The relation between orthodontic treatment and temporomandibular disorders (TMDs) is under debate; the management of TMD during orthodontic treatment has always been a challenge. If TMD symptoms occur during orthodontic treatment, an immediate pause of orthodontic adjustments is recommended; the treatment can resume when the symptoms are managed and stabilized.

CASE SUMMARY

This case report presents a patient (26-year-old, female) with angle class I, skeletal class II and TMDs. The treatment was a hybrid of clear aligners, fixed appliances and temporary anchorage devices (TADs). After 3 mo resting and treatment on her TMD, the patient's TMD symptom alleviated, but her anterior occlusion displayed deep overbite. Therefore, the fixed appliances with TAD were used to correct the anterior deep-bite and level maxillary and mandibular deep curves. After the levelling, the patient showed dual bite with centric relation and maximum intercuspation discrepancy on her occlusion. After careful examination of temporomandibular joints (TMJ) position, the stable bite splint and Invisible Mandibular Advancement appliance were used to reconstruct her occlusion. Eventually, the improved facial appearance and relatively stable occlusion were achieved. The 1-year follow-up records showed there was no obvious change in TMJ morphology, and her occlusion was stable.

CONCLUSION

TMD screening and monitoring is of great clinical importance in the TMD susceptible patients. Hybrid treatment with clear aligners and fixed appliances

and TADs is an effective treatment modality for the complex cases.

Key Words: Temporomandibular disorder; Skeletal class II; Deep overbite; Dual bite; Invisible mandibular advancement appliance; Case report

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Core Tip: This article is about the treatment of an adult female patient with skeletal class II and temporomandibular disorders (TMDs). The treatment was a hybrid of clear aligners, fixed appliances and temporary aids devices (TADs). This case report suggested that TMD screening and monitoring is of great clinical importance in the TMD susceptible patients. For these cases, hybrid treatment with clear aligners and fixed appliances and TADs is an effective treatment modality for the complex cases.

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INTRODUCTION

Temporomandibular disorders (TMDs) encompass clinical issues involving the temporomandibular joints (TMJ), associated muscles, and related structures[1]. They manifest as limited jaw movement, muscle and joint pain, joint noise during use, myofascial pain, and constraints in jaw opening[2]. Approximately 6% to 12% of the global population experiences TMD symptoms[3], which are more common between ages 20 and 40, with a higher prevalence among women[4,5].

The relation between orthodontic treatment and TMD is under debate; the management of TMD during orthodontic treatment has always been a challenge[6-8]. A recent study has reported that TMD is prevalent (66.67%) during orthodontic treatment and pain-related symptoms are most frequent[9]. If TMD symptoms occur during orthodontic treatment, an immediate pause of orthodontic adjustments is recommended; the treatment can resume when the symptoms are managed and stabilized[10,11].

This study presented a 26-year-old skeletal class II female patient, who experienced TMD (disc displacement of the right joint) after 8-mo clear aligners treatment. After 3-mo resting and TMD treatment, the joint symptoms were relieved but deep bite increased. Fixed appliances with temporary anchorage devices (TADs) were used to open the deep bite. At the late stage of the treatment, a dual-bite was observed; a stable bite splint and an invisible mandibular advancement appliance were used for occlusal reconstruction. After the treatment, the TMD symptoms disappeared, and balanced occlusion and facial appearance were achieved. The 1-year follow-up showed good stability of the treatment result in TMJ and occlusion.

CASE PRESENTATION

Chief complaints

A 26-year-old woman complained of maxillary anterior teeth protrusion and increased overbite.

History of present illness

The patient had no history of TMJ clicking and pain.

History of past illness

The patient denied any history of previous disease.

Personal and family history

The patient denied any family history of present illness.

Physical examination

Facial analysis showed a convex profile with a high angle, a protrusive maxilla, and a retrusive mandible (Figure 1A). Intraoral analysis demonstrated that she had maxillary anterior teeth protrusion, class I molar and canine relationships, increased overjet (5 mm), increased overbite (5 mm), and mild crowding in the maxillary arch (2.4 mm) and mandibular arch (2.2 mm) (Figure 2A).



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Figure 1 Pretreatment facial, intraoral and progress photographs. A: Pretreatment facial and intraoral photographs; B: Progress photographs in the 8th month; C: Progress photographs in the 11th month of the treatment (after 3 mo rest); D: Progress photographs in the 18th month; E: Progress photographs in the 19th month; F: Progress photographs in the 26th month; G: Photographs after fixed treatment; H: Wearing mandibular advancement to forward the mandibular positioning in the 44th month of treatment; I: Final photographs; J: Photographs after 1 years of follow-up.

Imaging examinations

Cephalometric analysis demonstrated a retrognathic mandible and slightly protrusive maxilla, with a skeletal class II relationship (ANB, 6.1°). Her maxillary anterior incisors were slightly proclined (U1-NA, 25.4°), with a hyperdivergent growth pattern (SN-MP, 40.7°); her mandibular incisors were slightly proclined (IMPA, 94.6°) (Figure 3 and Table 1). The panoramic radiograph indicated that there were no third molars and other disorders. In addition, the imaging of bilateral condyles showed no obvious abnormalities (Figure 3C-E). No sign of TMD was observed before the treatment.

FINAL DIAGNOSIS

This patient was diagnosed with a skeletal class II profile, a high mandibular plane angle, angle class I malocclusion and increased overbite.

TREATMENT

Treatment objectives

To improve the convex profile and retrognathic mandible, correct the deep bite and increased overjet, and establish a balanced and stable facial appearance and occlusion.

Treatment alternatives

The patient requested clear aligners for dental aesthetics. Two options were discussed with the patient and parents. They chose option 2 and refused orthognathic surgery in the consideration of surgical risk and cost.

Option 1. Orthognathic surgery and orthodontic treatment with extraction of two mandibular first premolars. Retraction of the mandibular anterior teeth, followed by bilateral sagittal split ramus osteotomy mandibular advancement. Genioplasty can be considered, depending on the patient's request.

Option 2. Camouflage treatment with clear aligners and extraction of the four first premolars. Use the extraction spaces to retract the anterior teeth to camouflage the skeletal class II. Genioplasty can be considered, depending on the patient's request. The extraction of upper first premolars and lower second premolars were also discussed with the patient, but considering the biomechanics of clear aligners and anchorage management, extraction of four first premolars were finally chosen.

Treatment progress

After the extraction of four first premolars, clear aligners (Align Technology, Santa Clara, California) were delivered to the patient. Each aligner was worn at least 22 h per day for 15 d.

In the 8th month of treatment (Invisalign, #16 of 42), the patient reported pain around the right TMJ (Figure 1B). Orthodontic treatment was immediately paused. Magnetic resonance imaging (MRI) and cone-beam computed tomography (CBCT) were taken to evaluate the TMJ. MRI showed anterior disc displacement without reduction (addwoR) in the bilateral TMJ (Figure 4A-D). TMJ radiograph showed the superior surface of the bilateral condyle had a unconservative cortex and the spaces of the bilateral TMJ were significantly narrowed (Figure 4E-H). Intraoral examination showed 6 mm overbite and 4 mm overjet in the anterior teeth. The maxillary and mandibular remaining extraction spaces were about 10 mm and 8 mm respectively (Figure 4I-K).

Due to the TMD symptoms, the orthodontic treatment was temporarily paused; physiotherapy and anti-inflammatory therapy were used to improve the TMD. After 3 mo, the TMD symptoms were significantly alleviated, the clear aligners treatment was resumed for 7 month (from Invisalign #16 to #30) (Figure 1C). But the intraoral examination showed a severe anterior deep bite at the 18th months of treatment (Figure 1D).

To correct the deep overbite more efficiently, fixed appliances (Clarity SL, 3M, 0.022 × 0.028-in slot) were used at the 19th month of treatment (Figure 1E). A series of archwires were used, including superelastic nickel-titanium archwires (from 0.014 × 0.025 to 0.018 × 0.025) and 0.018 × 0.025-in stainless steel arch wire with reverse curve of Spee. At the 26th month of treatment, two 8.0 × 1.4 mm mini-screws (Ormco, Orange, Calif) were inserted between the central and lateral incisors to intrude anterior teeth (Figure 1F). The treatment combined with mini-screws intruded the anterior incisor for 6 mo, and the deep overbite was basically resolved (Figure 5).

At the 31st month of treatment, the patient developed a dual bite [centric relation (CR)–maximum intercuspation (MI) discrepancy] after the deep bite correction (Figure 6). CBCT images showed when the bilateral condyle was in CR, the bilateral TMJ space was significantly narrowed and the molars were in a severe class II relationship with deep over jet (7 mm). When the bilateral condyle was in MI, the superior and posterior space of the bilateral TMJ were widened and the molars were located in a class I relationship with normal overjet (2 mm). The cephalometric analysis of CR showed that the mandible was retruded and rotated clockwise, resulting in a more severe skeletal class II (ANB, 8.4°) but demonstrated the relative normal ANB angle (3.6°) in MI (Figure 7).

To correct the dual bite, both surgical and conservative options were discussed with the patient. She was against surgery and chose the conservative option with a stable bite splint to stabilize the mandibular position and reduced the load on bilateral TMJ.

Table 1 Cephalometric summary

Measurement	Norm	Standard deviations	Pre-treatment	Post-treatment
SNA (°)	83.1	3.6	85.8	83.6
SNB (°)	79.7	3.2	80.1	80.1
ANB (°)	3.5	1.7	6.1	3.5
MP-SN (°)	32.8	4.2	40.7	39.7
Y-axis (°)	65.3	3.2	71.4	71.2
U1-L1 (°)	127	8.5	113.9	119.9
U1-SN (°)	104.6	6	111.2	106.2
U1-NA (mm)	4.1	2.3	7.4	6.5
U1-NA (°)	21.5	5.9	25.4	22.5
L1-NB (mm)	5.7	2	9.5	7.9
L1-NB (°)	28.1	5.6	35	31.7
FMIA (°)	57	6.8	52.8	53.3
IMPA (°)	93.9	6.2	94.6	90.7
FMA (°)	31.3	5	34.7	32.6
UL-EP (mm)	1.8	1.9	-0.7	1.3
LL-EP (mm)	2.7	2.2	3.3	2.9
Z angle (°)	71.2	4.8	61.7	61.4

ANB: Subspinale-nasion-supramental; ANS: Anterior nasal spine; EP: E plane; LL: Lower lip; L6: Lower first molar; Me: Menton; MP: Mandibular plane; Go: Gonion; S: Sella; FMIA: The angle between lower central incisor long axis and Frankfort horizontal plane; IMPA: The angle between lower central incisor long axis and mandibular plane; PP: Palatal plane; N: Nasion; A: Subspinale; B: Supramental; SNA: Sella-nasion-subspinale; SNB: Sella-nasion-supramental; SN-MP: The angle between sella-nasion and mandibular plane; U1: Upper central incisor long axis; L1: Lower central incisor long axis; FMA: The angle between frankfort horizontal plane and mandibular plane.

At the 38th months of treatment, the fixed appliances were debonded. Due to her tongue thrusting habit, the patient developed anterior open-bite at this stage (Figures 1G and 2B). A stable bite splint was used to identify the appropriate MI position for TMJ, and the patient was educated to cease the tongue thrusting habit (Figure 8). Then the patient reported no discomfort in the bilateral TMJ.

At the 44th month of treatment, the Invisible mandibular advancement appliance (MA) was used to guide the mandible forward to improve the overjet and occlusal reconstruction (Figure 1H).

At the 50th month of treatment, the patient reported no discomfort on TMJ and the overjet was improved. The extraction spaces were closed and the molar relationship became class I (Figure 1I).

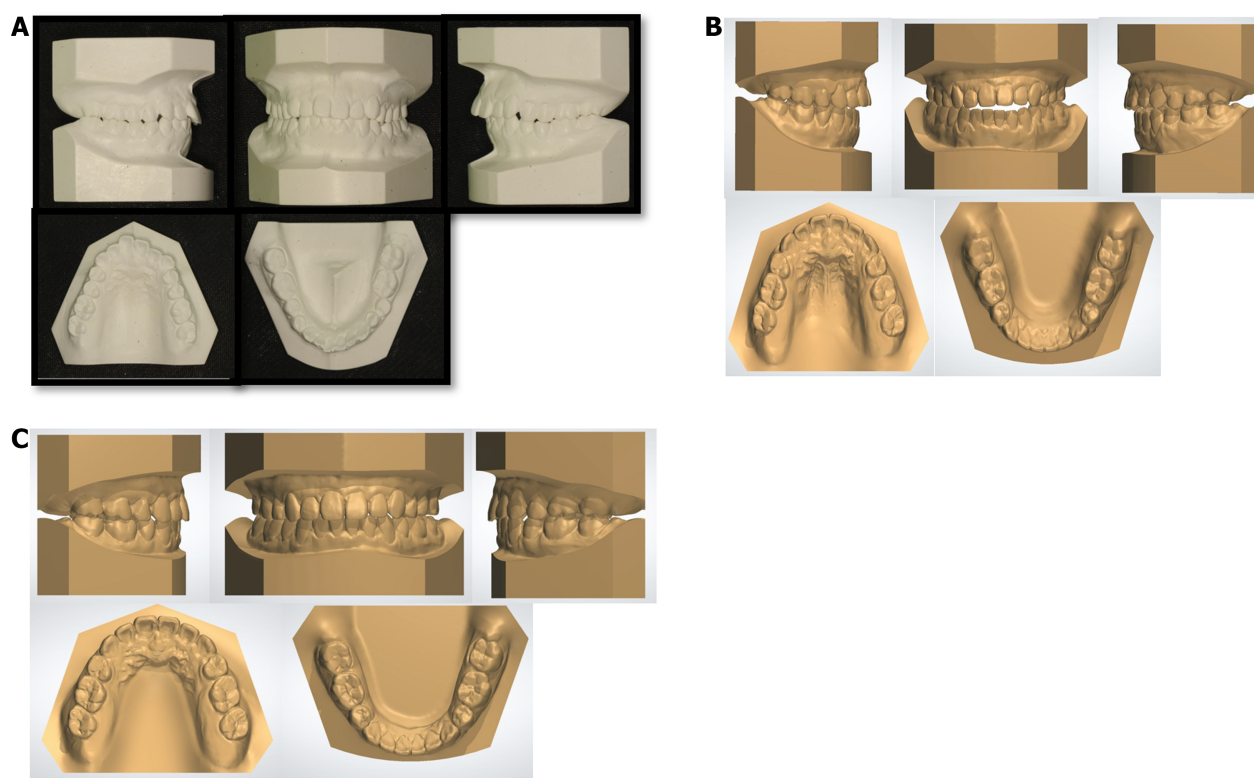
The total treatment time was 50 mo, including 38 mo of hybrid treatment of clear aligners and fixed appliances, 6 mo of stable bite splint, and 6 months of MA. Vacuum formed retainers were used for retention.

OUTCOME AND FOLLOW-UP

Post-treatment examination showed favorable improvement in the patient's profile, occlusion, and smiling aesthetics. Intraorally, normal overjet and overbite and a class I molar relationship were achieved (Figures 1I and 2C).

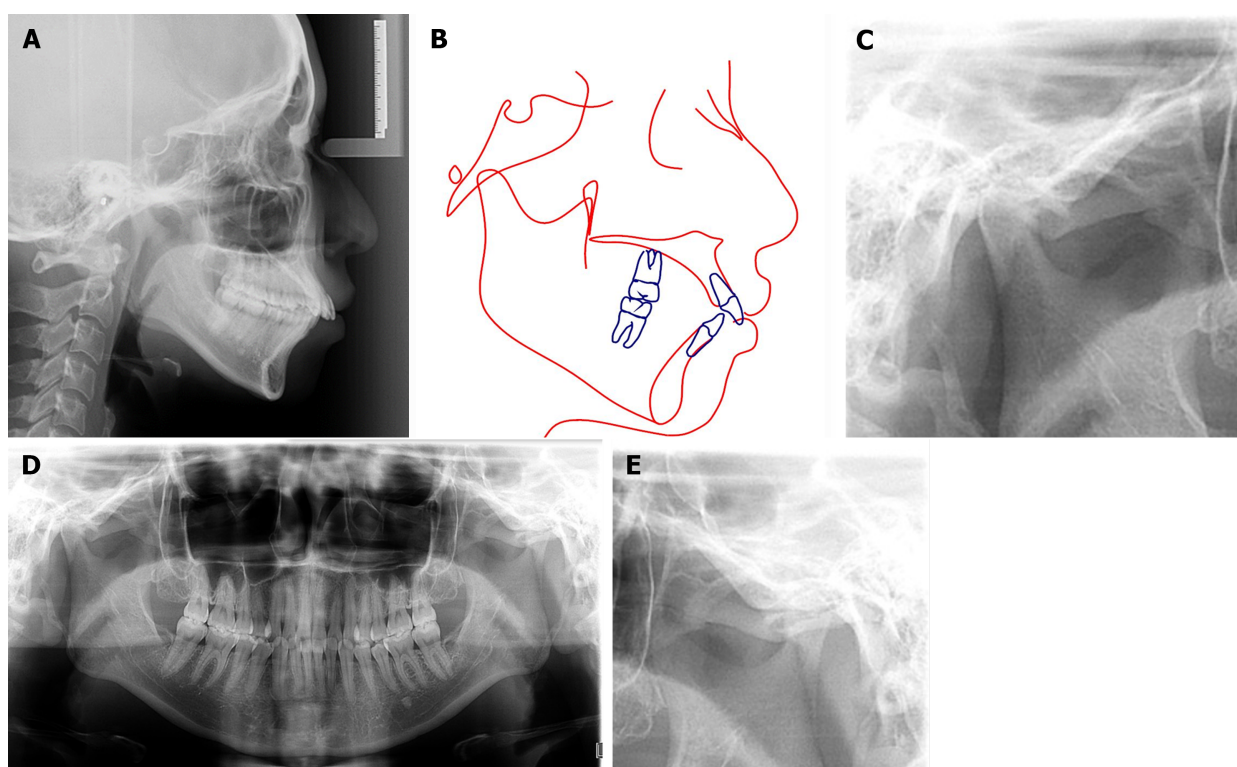
The post-treatment cephalometric analysis showed that the patient's maxillary anterior teeth (U1-NA) were retracted from 25.4° to 22.5°, and the mandibular anterior teeth (IMPA) were uprighed from 94.6° to 90.7°. The ANB angle was reduced from 6.1° to 3.5°. The lower lip to E-line distance were decreased from 3.3 mm to 2.9 mm (Table 1 and Figure 9). The patient treatment process is shown in Figure 10.

Follow-up records after 1 year showed a stable occlusion without relapse (Figure 1J); patient had no TMD symptoms; and the CBCT images showed that the bilateral temporomandibular joint space was significantly improved, and the condyle morphology had no obvious change (Figure 11).



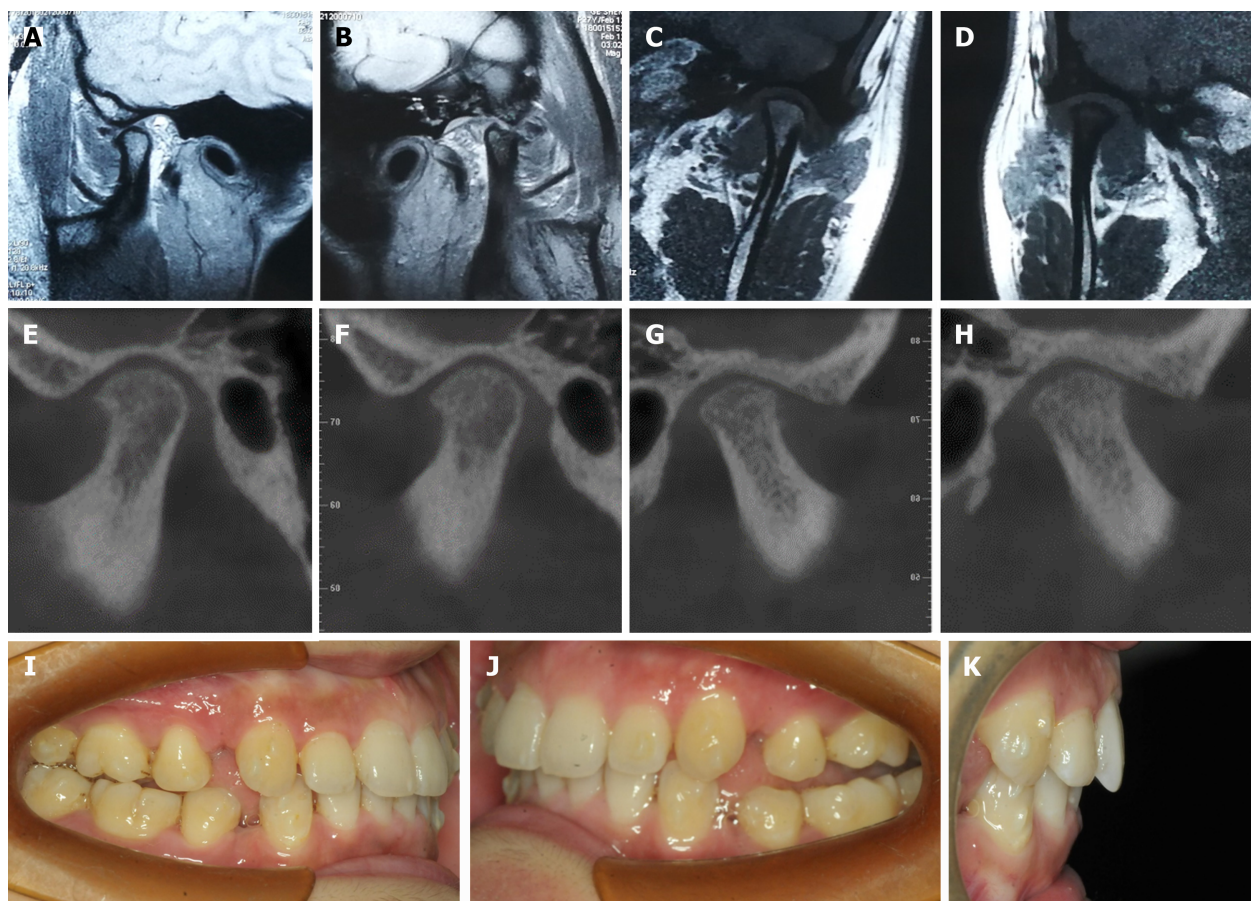
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Figure 2 Dental models. A: Pretreatment dental models; B: Dental models after fixed treatment; C: Final intraoral dental models.



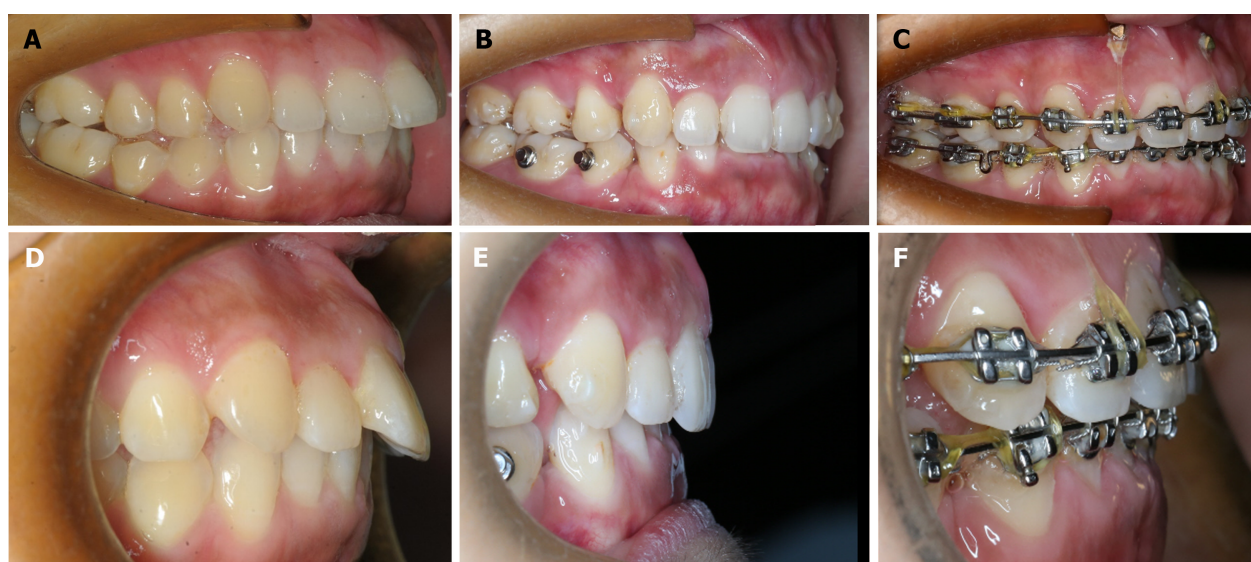
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Figure 3 Pretreatment lateral cephalometric and panoramic radiographs. A: Initial cephalometric radiograph; B: Cephalometric tracing; C-E: Panoramic radiograph.



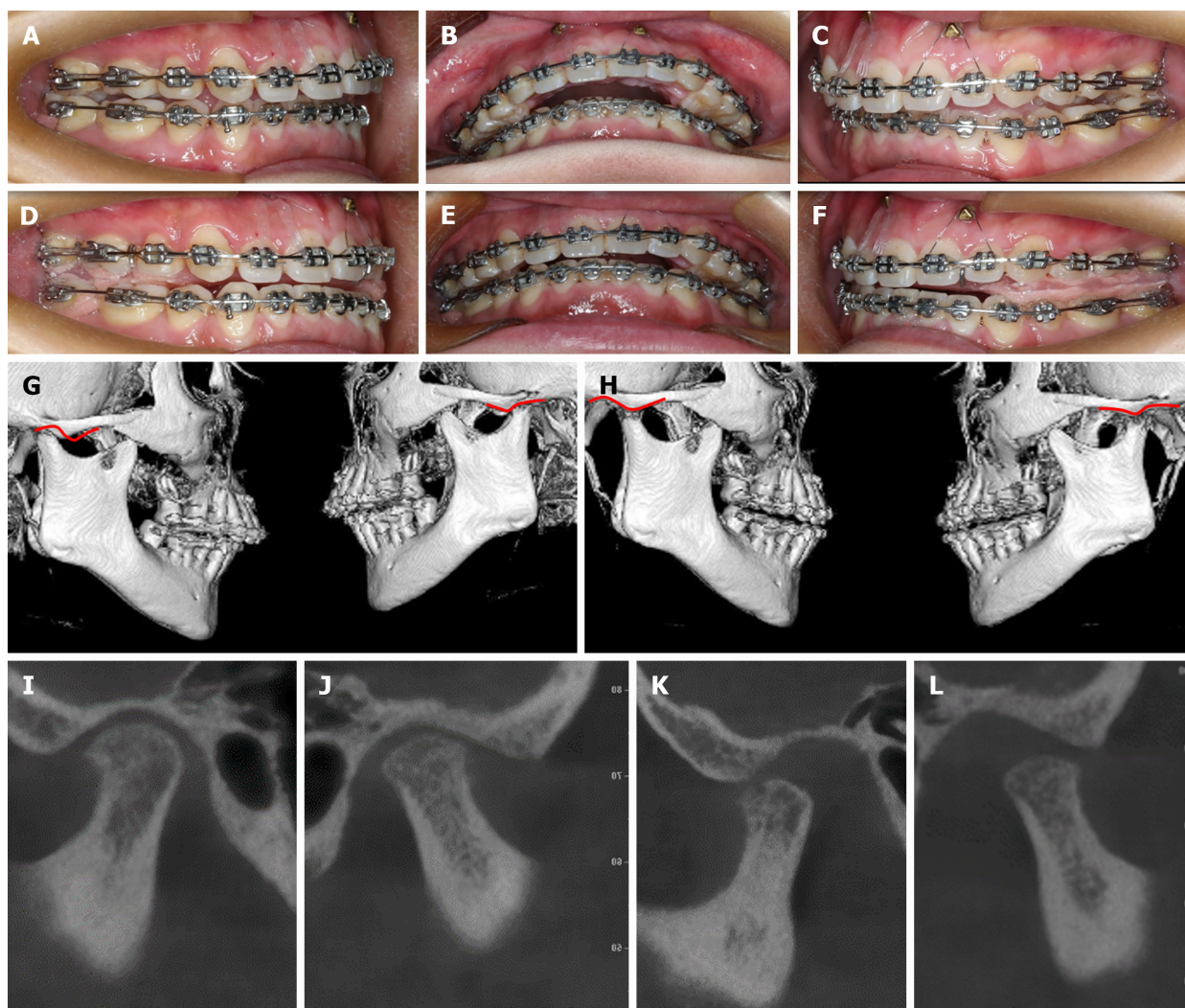
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Figure 4 Magnetic resonance imaging images, cone-beam computed tomography images and intraoral photos: 8th month of the treatment. A and B: Magnetic resonance imaging (MRI) images of right and left temporomandibular joints (TMJ) in opening position; C and D: MRI images of right and left TMJ in closed position; E-H: Cone-beam computed tomography images of right and left TMJ in closed position; I-K: Intraoral photos.



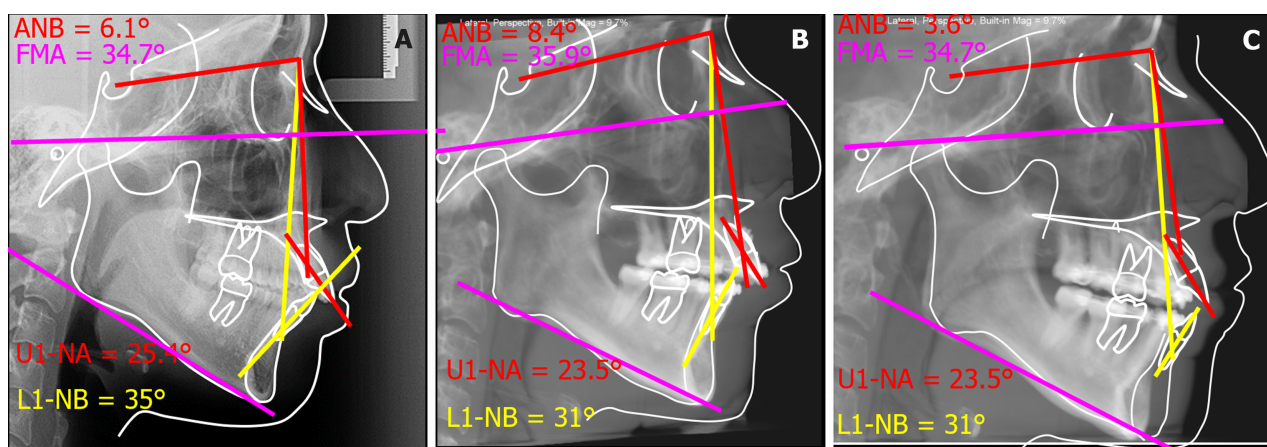
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Figure 5 Intraoral overbite photographs. A and D: First visit; B and E: 19th month; C and F: 29th month.



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Figure 6 Dual bite at the 31st month of treatment. A-C: Intraoral photos in centric relation (CR) position; D-F: Intraoral photos in maximum intercuspation (MI) position; G-H: 3D images of temporomandibular joints (TMJ) in CR and MI positions; I-L: Computed tomography images of TMJ in CR and MI positions.

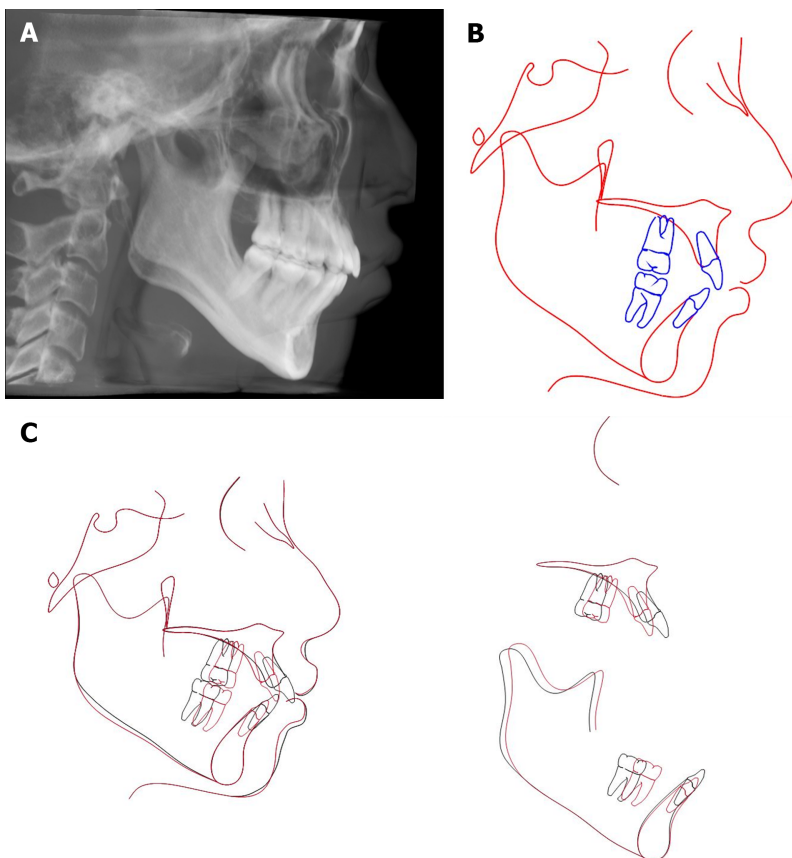


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Figure 7 Cephalometric tracing and cephalometric measurements. A: First visit; B: In centric relation position; C: In maximum intercuspation position.



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Figure 8 Wearing stable occlusal splint to improve open-bite: 43rd month of treatment. Intraoral photographs.

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Figure 9 Cephalometric radiograph and superimpositions. A: Final cephalometric radiograph; B: Cephalometric tracing; C: Superimposition of lateral cephalograms (pretreatment: black, post treatment: red)

DISCUSSION

The relationship between orthodontic treatment and TMD has been widely debated. To date, most of the clinical evidence seems to indicate that orthodontic treatment is not directly related to TMDs, and the role of malocclusion in the occurrence and development of TMDs should not be exaggerated[11,12]. For instance, a ten-year longitudinal study showed that joint symptoms during orthodontic treatment should be attributed to differences in age and not to the procedure of orthodontic treatment[13]. Furthermore, patients who experienced orthodontic treatment did not have a higher risk of developing TMD later in life, compared with untreated orthodontic patients[14,15].

In this case, the patient didn't have TMJ discomfort at the initial diagnosis, but experienced joint pain on the right hand side at the 8th month of treatment when the anterior teeth retraction was only about 1 mm. At the 18th month of treatment,

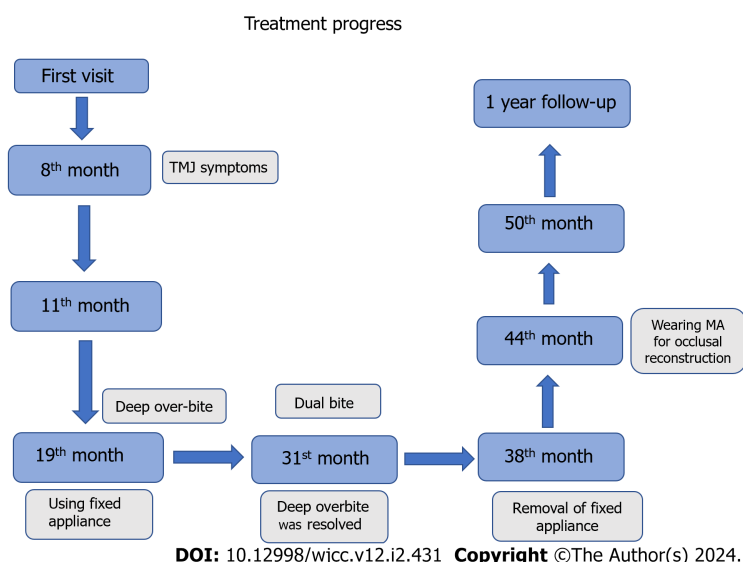
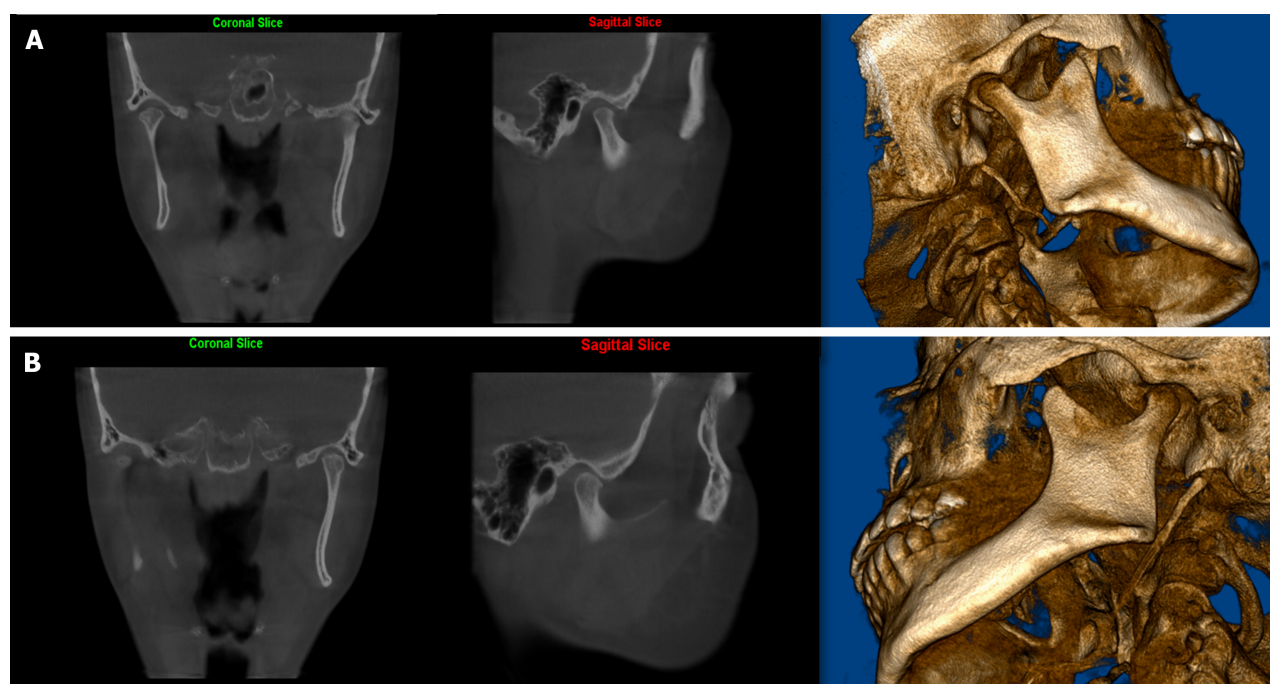


Figure 10 Orthodontic treatment flowchart.



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Figure 11 Computed tomography images of temporomandibular joints after 1 years of follow-up. A: Right temporomandibular joint (TMJ) images; B: Left TMJ images.

patient's TMD symptoms were basically alleviated, but unexpected deep bite was found. This can hardly attribute to the possible resorption of bilateral condyles caused by TMD and the decrease in posterior height, which in turn led to mandibular counter clockwise rotation and deeper anterior teeth overbite.

It has been found that there are deficiencies in the correction efficiency with clear aligner therapy compared with traditional fixed appliances, especially for the vertical and torque management[16-18]. The inefficient performance in the torque control during anterior teeth retraction and the Spee's curve leveling may result in the anterior teeth deep overbite in this case[19,20]. Therefore, for deep bite correction, fixed appliances were also used in this case. In addition, TADs were also used in this case to assist the correction of the deep bite and anterior teeth intrusion[21-23].

After the deep overbite correction, the mandibular deviation and dual bite were observed in this case. The underlining mechanism may be due to some possible condylar resorption and clockwise rotation of the mandible[24,25]. Clinical treatment of condylar resorption has been difficult due to unstable condylar position and persistent changes in the bite [26]. The unstable condylar position can cause confusion during orthodontic evaluation, usually TMJ should be stabilized with occlusal splint prior to orthodontic treatment, which was defined as mandibular reconstruction.

Mandibular reconstruction for dual bite is challenging, especially in adult patients. It could restore deviated mandible and TMJ to their normal position by orthodontic means[27,28]. The basic mechanism of cell biology of occlusal reconstruction is adaptive modification of condyles under exogenous stimulation[29]. At this time, the balance between occlusion, mandibular position and the TMJs needs to be re-established. Under the stimulation of exogenous factors such as stable occlusal splint and invisible MA treatment, the condylar cartilage makes a cell biological response to initiate endochondral osteogenesis, which could be concluded as adaptive modification of the condyle[30]. The treatment of dual bite is often to stabilize and forward mandible to the normal position to promote the modification of condyle adaptation.

Surgery has also been reported to be a good option for the patients who had TMD with occlusal problems[31,32]. The current patient refused any type of surgery, therefore the Invisalign mandibular advancement devices were used to advance the mandible and promote the adaptive modification of the patient's condyles. After the treatment, CBCT images showed that the bilateral TMJ space was significantly improved, and the condyle morphology had no pathological change.

There are limitations in this case. Ideally the patient should be screened for TMD using CBCT and MRI. Since there is uncertainty in the success of occlusal reconstruction, regular imaging could be performed to monitor the morphological change of condyles. If the orthodontic occlusal reconstruction failed, surgical reconstruction could be considered.

CONCLUSION

TMD screening and monitoring is of great clinical importance in the TMD susceptible patients. Hybrid treatment with clear aligners and fixed appliances and TADs is an effective treatment modality for the complex cases.

FOOTNOTES

Author contributions: Lu T performed the orthodontic treatments under the supervision of Li H, and made contributions to collecting data and drafting the paper; Mei L made contributions to collecting data and drafting the paper; Li BC made contributions to lateral cephalometric radiographs and cone-beam computed tomography 3D superimposition; Huang ZW contributed to revising and editing the manuscript; Li H contributed to the conception and design of the paper, and clinical supervision of the treatments. All authors gave final approval and agree to be accountable for all aspects of the work.

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REFERENCES

- 1 Ohrbach R, Bair E, Fillingim RB, Gonzalez Y, Gordon SM, Lim PF, Ribeiro-Dasilva M, Diatchenko L, Dubner R, Greenspan JD, Knott C, Maixner W, Smith SB, Slade GD. Clinical orofacial characteristics associated with risk of first-onset TMD: the OPPERA prospective cohort study. *J Pain* 2013; **14**: T33-T50 [PMID: 24275222 DOI: 10.1016/j.jpain.2013.07.018]
- 2 Wadhwa S, Kapila S. TMJ disorders: future innovations in diagnostics and therapeutics. *J Dent Educ* 2008; **72**: 930-947 [PMID: 18676802]
- 3 Lipton JA, Ship JA, Larach-Robinson D. Estimated prevalence and distribution of reported orofacial pain in the United States. *J Am Dent Assoc* 1993; **124**: 115-121 [PMID: 8409001 DOI: 10.14219/jada.archive.1993.0200]
- 4 Manfredini D, Guarda-Nardini L, Winocur E, Piccotti F, Ahlberg J, Lobbezoo F. Research diagnostic criteria for temporomandibular

- disorders: a systematic review of axis I epidemiologic findings. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2011; **112**: 453-462 [PMID: 21835653 DOI: 10.1016/j.tripleo.2011.04.021]
- 5 **Dworkin SF**, LeResche L, DeRouen T, Von Korff M. Assessing clinical signs of temporomandibular disorders: reliability of clinical examiners. *J Prosthet Dent* 1990; **63**: 574-579 [PMID: 2338670 DOI: 10.1016/0022-3913(90)90079-r]
 - 6 **Gauer RL**, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. *Am Fam Physician* 2015; **91**: 378-386 [PMID: 25822556]
 - 7 **Murphy MK**, MacBarb RF, Wong ME, Athanasiou KA. Temporomandibular disorders: a review of etiology, clinical management, and tissue engineering strategies. *Int J Oral Maxillofac Implants* 2013; **28**: e393-e414 [PMID: 24278954 DOI: 10.11607/jomi.te20]
 - 8 **Christidis N**, Lindström Ndanshau E, Sandberg A, Tsilingaridis G. Prevalence and treatment strategies regarding temporomandibular disorders in children and adolescents-A systematic review. *J Oral Rehabil* 2019; **46**: 291-301 [PMID: 30586192 DOI: 10.1111/joor.12759]
 - 9 **Yap AU**, Chen C, Wong HC, Yow M, Tan E. Temporomandibular disorders in prospective orthodontic patients. *Angle Orthod* 2021; **91**: 377-383 [PMID: 33534890 DOI: 10.2319/010720-863.1]
 - 10 **Shen YH**, Chen YK, Chuang SY. Condylar resorption during active orthodontic treatment and subsequent therapy: report of a special case dealing with iatrogenic TMD possibly related to orthodontic treatment. *J Oral Rehabil* 2005; **32**: 332-336 [PMID: 15842240 DOI: 10.1111/j.1365-2842.2005.00989.x]
 - 11 **Michelotti A**, Rongo R, D'Antò V, Bucci R. Occlusion, orthodontics, and temporomandibular disorders: Cutting edge of the current evidence. *J World Fed Orthod* 2020; **9**: S15-S18 [PMID: 33023726 DOI: 10.1016/j.ejwf.2020.08.003]
 - 12 **Mohlin B**, Axelsson S, Paulin G, Pietilä T, Bondemark L, Brattström V, Hansen K, Holm AK. TMD in relation to malocclusion and orthodontic treatment. *Angle Orthod* 2007; **77**: 542-548 [PMID: 17465668 DOI: 10.2319/0003-3219(2007)077
 - 13 **Dibbets JM**, van der Weele LT. Orthodontic treatment in relation to symptoms attributed to dysfunction of the temporomandibular joint. A 10-year report of the University of Groningen study. *Am J Orthod Dentofacial Orthop* 1987; **91**: 193-199 [PMID: 3469905 DOI: 10.1016/0889-5406(87)90446-x]
 - 14 **Egermark I**, Magnusson T, Carlsson GE. A 20-year follow-up of signs and symptoms of temporomandibular disorders and malocclusions in subjects with and without orthodontic treatment in childhood. *Angle Orthod* 2003; **73**: 109-115 [PMID: 12725365 DOI: 10.1043/0003-3219(2003)73<109:AYFOSA>2.0.CO;2]
 - 15 **Henrikson T**, Nilner M, Kurol J. Signs of temporomandibular disorders in girls receiving orthodontic treatment. A prospective and longitudinal comparison with untreated Class II malocclusions and normal occlusion subjects. *Eur J Orthod* 2000; **22**: 271-281 [PMID: 10920559 DOI: 10.1093/ejo/22.3.271]
 - 16 **Buschang PH**, Shaw SG, Ross M, Crosby D, Campbell PM. Comparative time efficiency of aligner therapy and conventional edgewise braces. *Angle Orthod* 2014; **84**: 391-396 [PMID: 24749702 DOI: 10.2319/062113-466]
 - 17 **Weir T**. Clear aligners in orthodontic treatment. *Aust Dent J* 2017; **62** Suppl 1: 58-62 [PMID: 28297094 DOI: 10.1111/adj.12480]
 - 18 **Dai FF**, Xu TM, Shu G. Comparison of achieved and predicted tooth movement of maxillary first molars and central incisors: First premolar extraction treatment with Invisalign. *Angle Orthod* 2019; **89**: 679-687 [PMID: 30920875 DOI: 10.2319/090418-646.1]
 - 19 **Jaber ST**, Hajeer MY, Sultan K. Treatment Effectiveness of Clear Aligners in Correcting Complicated and Severe Malocclusion Cases Compared to Fixed Orthodontic Appliances: A Systematic Review. *Cureus* 2023; **15**: e38311 [PMID: 37128600 DOI: 10.7759/cureus.38311]
 - 20 **Ke Y**, Zhu Y, Zhu M. A comparison of treatment effectiveness between clear aligner and fixed appliance therapies. *BMC Oral Health* 2019; **19**: 24 [PMID: 30674307 DOI: 10.1186/s12903-018-0695-z]
 - 21 **Alshammery D**, Alqhtani N, Alajmi A, Dagriri L, Alrukban N, Alshahrani R, Alghamdi S. Non-surgical correction of gummy smile using temporary skeletal mini-screw anchorage devices: A systematic review. *J Clin Exp Dent* 2021; **13**: e717-e723 [PMID: 34306536 DOI: 10.4317/jced.58242]
 - 22 **Atalla AI**, AboulFotouh MH, Fahim FH, Foda MY. Effectiveness of Orthodontic Mini-Screw Implants in Adult Deep Bite Patients during Incisor Intrusion: A Systematic Review. *Contemp Clin Dent* 2019; **10**: 372-381 [PMID: 32308304 DOI: 10.4103/ccd.ccd_618_18]
 - 23 **Bardideh E**, Tamizi G, Shafaei H, Rangrazi A, Ghorbani M, Kerayechian N. The Effects of Intrusion of Anterior Teeth by Skeletal Anchorage in Deep Bite Patients: A Systematic Review and Meta-Analysis. *Biomimetics (Basel)* 2023; **8** [PMID: 36975331 DOI: 10.3390/biomimetics8010101]
 - 24 **Burstone CJ**. Diagnosis and treatment planning of patients with asymmetries. *Semin Orthod* 1998; **4**: 153-164 [PMID: 9807152 DOI: 10.1016/s1073-8746(98)80017-0]
 - 25 **Owtad P**, Potres Z, Shen G, Petocz P, Darendeliler MA. A histochemical study on condylar cartilage and glenoid fossa during mandibular advancement. *Angle Orthod* 2011; **81**: 270-276 [PMID: 21208079 DOI: 10.2319/021710-99.1]
 - 26 **Lee GH**, Park JH, Lee SM, Moon DN. Orthodontic Treatment Protocols for Patients with Idiopathic Condylar Resorption. *J Clin Pediatr Dent* 2019; **43**: 292-303 [PMID: 31094632 DOI: 10.17796/1053-4625-43.4.12]
 - 27 **Tingey EM**, Buschang PH, Throckmorton GS. Mandibular rest position: a reliable position influenced by head support and body posture. *Am J Orthod Dentofacial Orthop* 2001; **120**: 614-622 [PMID: 11742306 DOI: 10.1067/mod.2001.119802]
 - 28 **De Stefano AA**, Guercio-Monaco E, Hernández-Andara A, Galluccio G. Association between temporomandibular joint disc position evaluated by magnetic resonance imaging and mandibular condyle inclination evaluated by computed tomography. *J Oral Rehabil* 2020; **47**: 743-749 [PMID: 32181898 DOI: 10.1111/joor.12962]
 - 29 **Owtad P**, Park JH, Shen G, Potres Z, Darendeliler MA. The biology of TMJ growth modification: a review. *J Dent Res* 2013; **92**: 315-321 [PMID: 23358678 DOI: 10.1177/0022034513476302]
 - 30 **Shen G**, Darendeliler MA. The adaptive remodeling of condylar cartilage---a transition from chondrogenesis to osteogenesis. *J Dent Res* 2005; **84**: 691-699 [PMID: 16040724 DOI: 10.1177/154405910508400802]
 - 31 **Wang H**, Xue C, Luo E, Dai W, Shu R. Three-dimensional surgical guide approach to correcting skeletal Class II malocclusion with idiopathic condylar resorption. *Angle Orthod* 2021; **91**: 399-415 [PMID: 33373430 DOI: 10.2319/050320-383.1]
 - 32 **Chigurupati R**, Mehra P. Surgical Management of Idiopathic Condylar Resorption: Orthognathic Surgery Versus Temporomandibular Total Joint Replacement. *Oral Maxillofac Surg Clin North Am* 2018; **30**: 355-367 [PMID: 30008344 DOI: 10.1016/j.coms.2018.05.004]



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