Case Report

Collaborative treatment for a case of condylar hyperplastic facial asymmetry

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ABSTRACT

Facial asymmetry can be caused by unilateral condylar hyperplasia. In such cases, it may be difficult to achieve symmetry since there is dentoalveolar compensation on the affected side, and the occlusal cant does not correspond to the frontal mandibular deviation. In the case presented, surgical orthodontic treatment and orthognathic surgery planning was accomplished for a patient with facial asymmetry due to condylar hyperplasia. The surgical plan was devised with particular attention to the severe dentoalveolar compensation. In this case, prior to the two-jaw surgery, the occlusal cant and frontal mandibular plane inclination was corrected through impaction of the left molar region by segmental osteotomy. Facial asymmetry and severe dentoalveolar compensation were successfully corrected after a unilateral segmental osteotomy and two-jaw surgery, resulting in a stable occlusal relationship and facial symmetry as well as good jaw function. Collaboration between the orthodontists and maxillofacial surgeons was essential for the successful treatment of the patient. (*Angle Orthod.* 2018;88:503–517.)

KEY WORDS: Unilateral condylar hyperplasia; Dentoalveolar compensation; Orthognathic surgery; Orthodontics; Maxillofacial surgery

INTRODUCTION

Unilateral condylar hyperplasia causes facial asymmetry and malocclusion. Condylar hyperplasia usually develops in puberty, and a late onset after 20 years of age is uncommon.[1] It is characterized by elongation of the condyle while maintaining its normal form.[2] Especially in cases with a long-term course in adults, not only mandibular deviation is observed, but also severe vertical dentoalveolar compensation of the upper and lower alveolar bones on the affected side.[3,4] Although condylectomy has been recommended in several case reports as an alternative treatment,[5–7] the surgical procedure involves a high risk of postsurgical jaw dysfunction.[8] The establishment of facial symmetry is difficult, even with condylectomy and orthognathic surgery, because the occlusal cant and frontal mandibular deviation do not necessarily match. Therefore, such patients usually undergo so-called camouflage treatment, including overcorrection by reversed occlusal canting and genioplasty.[9] However, these are not fundamental solutions.

This report describes surgical orthodontic treatment and orthognathic surgery planning for a patient with facial asymmetry due to condylar hyperplasia. A

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Figure 1. Pretreatment facial and intraoral photographs.

treatment plan was devised, taking into account the large amount of dentoalveolar compensation. The facial asymmetry and severe dentoalveolar compensation were successfully corrected after unilateral segmental osteotomy and two-jaw surgery, resulting in a stable occlusal relationship and facial symmetry as well as good jaw function. Cooperation between orthodontists and maxillofacial surgeons was indispensable for this patient's treatment.

CASE REPORT

Diagnosis and Etiology

The patient was a 25-year-old woman with a chief complaint of facial asymmetry, crossbite, and difficulty biting on the left side. Pretreatment facial photographs showed a concave profile and severe facial asymmetry (Figure 1). Panoramic and lateral and anteroposterior cephalometric radiographs were obtained before treatment (Figure 2). The upper and lower third molars were impacted, and the root of the left lower second premolar was curved. Her mandible was deviated by 18.0 mm to the right with an overgrowth of the left condyle, and her lip and maxillary occlusal plane were tilted to the right. A large amount of dentoalveolar compensation was observed, and the occlusal plane was tilted 3° to the right, whereas the Go-Go' line was tilted 12° to the right. The maxillary midline was deviated toward the right by 3.0 mm, and the mandibular midline was 7.0 mm off the facial midline to the right. The left mandibular canal traversed through the lower part of the mandible near the border. A tracing of the lateral cephalometric radiograph confirmed asymmetric morphology at the inferior edge of the mandible.

The cephalometric tracing and analysis demonstrated a Class III skeletal relationship (ANB angle of −8.9°) with a flat mandibular plane angle (15.4°) (Table 1).

Table 1. Cephalometric Variables (Right Side)

Variables	Norm	Pretreatment	Post-treatment	Two Years in Retention
SNA	82.2	74.5	75.3	75.3
SNB	80.4	83.4	77.6	77.4
ANB	1.8	−8.9	−2.3	−2.1
FMA	26.8	15.4	21.4	21.5
U1 to SN	107.4	100.2	116.2	116.2
U1 to FH	114.3	114.6	130.6	130.6
L1 to Mand. P	91.8	76.6	83.9	83.9

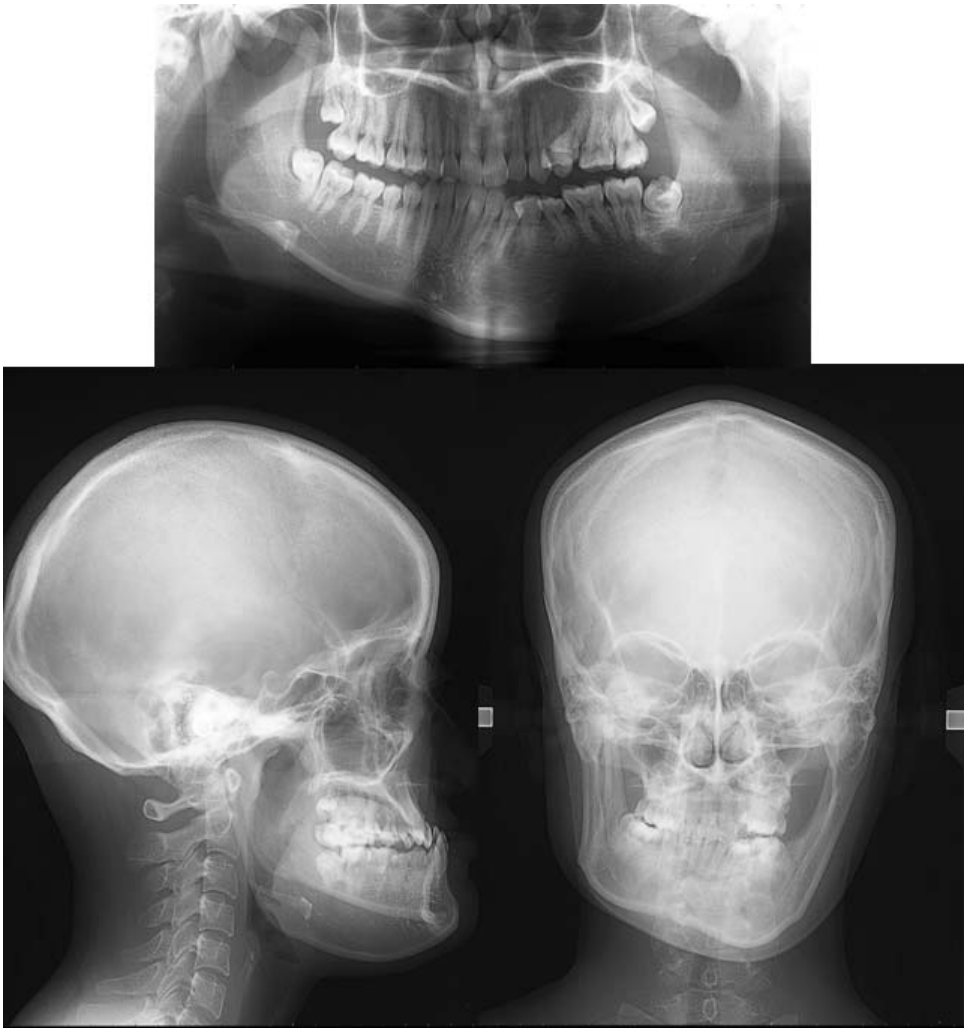

Figure 2. Pretreatment panoramic and cephalometric radiographs.

Figure 3. Pretreatment study models.

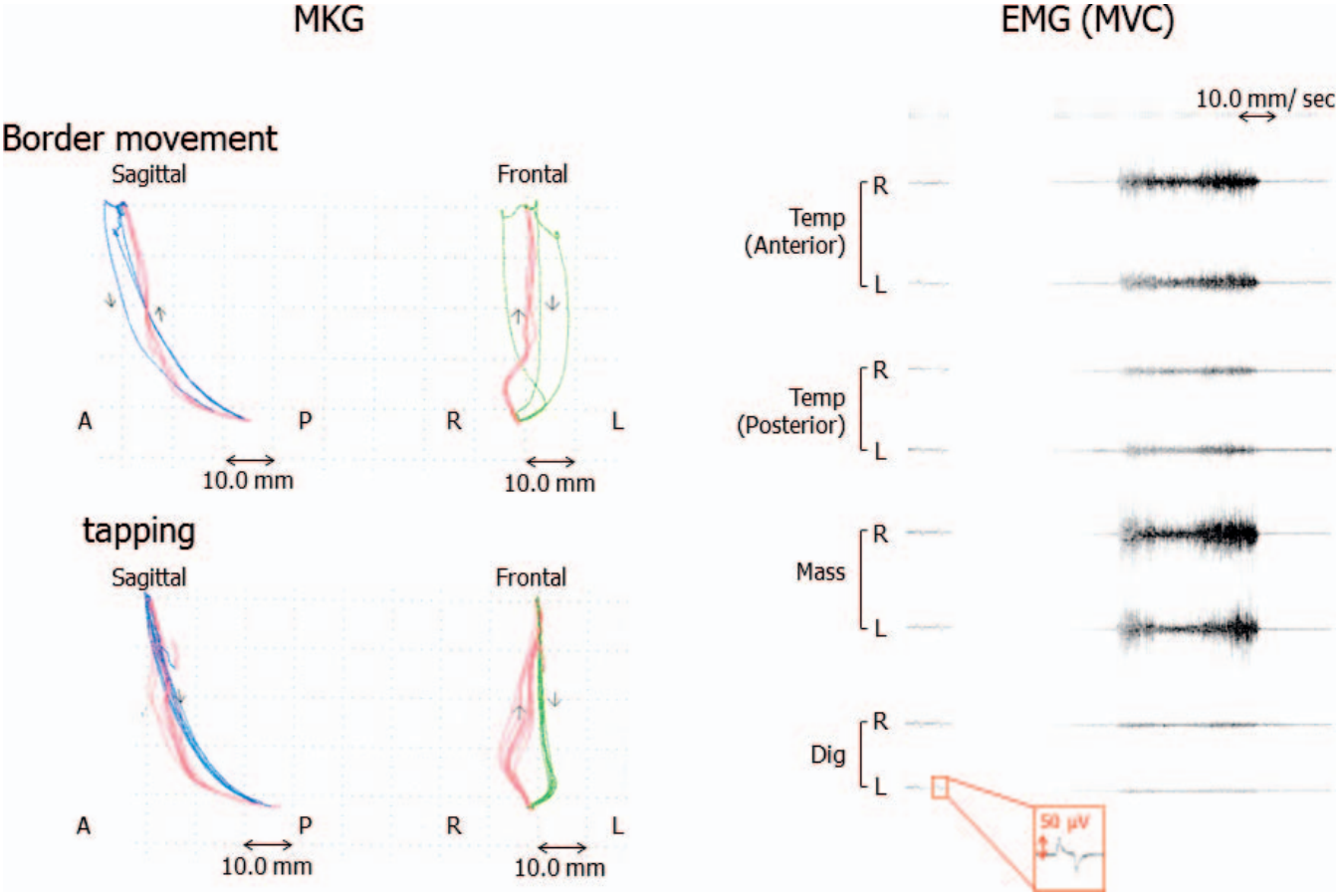

Figure 4. Pretreatment functional mandibular kinesiography (MKG) records obtained during lateral border movements and tapping and electromyography (EMG) of the jaw muscles during maximum voluntary clenching (MVC) are shown. The inset in the EMG records shows the calibration. Temp indicates temporal muscle; Mass, masseter muscle; Dig, digastric muscle; R, right; L, left; A, anterior; P, posterior.

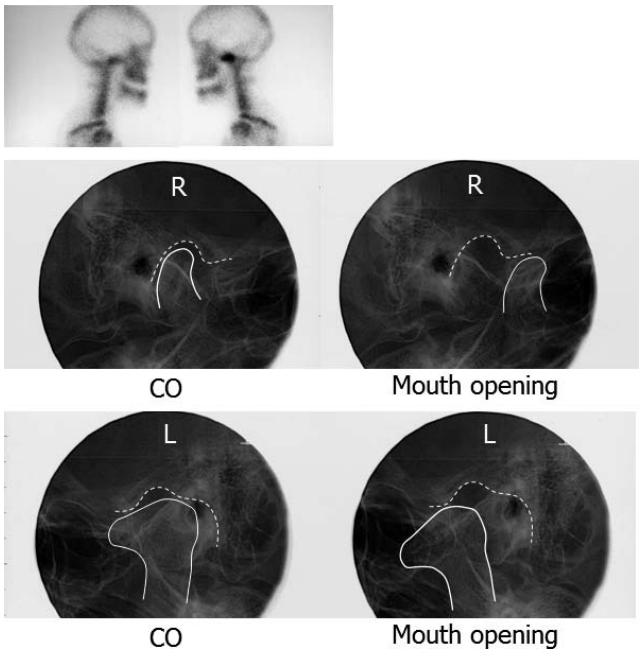

Figure 5. Pretreatment bone scintigraphy and temporomandibular joint radiographs obtained by the Schuller method.

The molar relationship on both sides was Angle Class III (Figure 3). The patient had an anterior crossbite; her overjet was −3.0 mm and her overbite was +5.0 mm. Because of the anterior crossbite and loss of canine guidance, there was a difference in the angle of inclination between the right and the left sides in a frontal view of the lateral border movements. However, no mandibular dysfunction or other abnormality was recognized (Figure 4). There was no trismus, both temporomandibular joints slid forward during jaw opening and closing, and the tapping locus was stable, which was confirmed by mandibular kinesiography (MKG) records. A whole-body bone scan using Tc-99m hydroxydiphosphonate demonstrated focal uptake in the left condyle (Figure 5). After 6 months of observation, the occlusion was compared with the initial records, and there was no change. Thus, the condylar hyperplasia was regarded as in an inactive state. Based on these findings, the patient was diagnosed with facial asymmetry, condylar hyperplasia, and skeletal Class III malocclusion with severe dentoalveolar compensation.

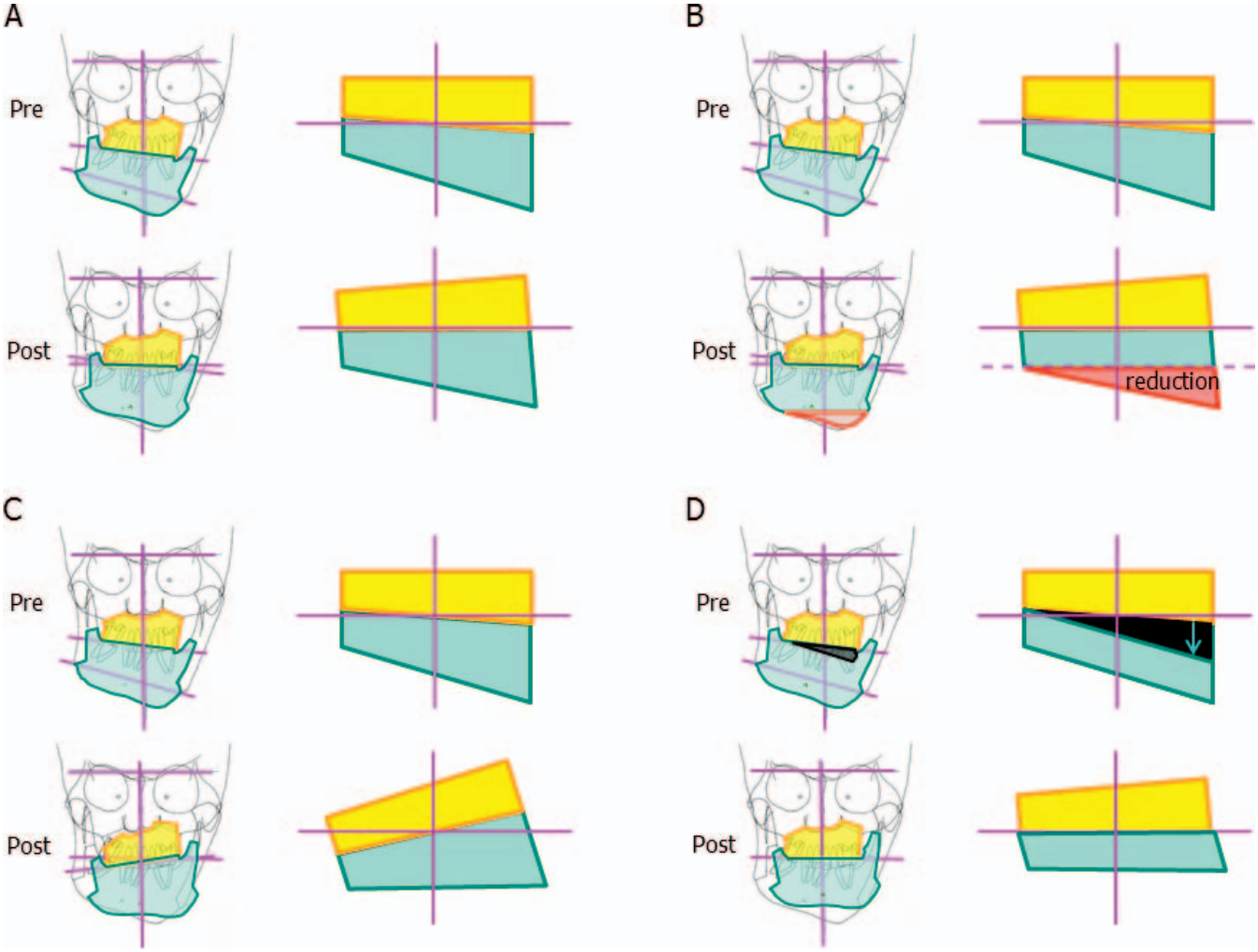

Figure 6. Treatment alternatives: (A) Correction of the occlusal cant only; (B) correction of the occlusal cant and genioplasty; (C) overcorrection; and (D) correction of the dentoalveolar compensation. For a further description, refer to the text. Pre indicates pre-surgery; Post, postsurgery.

Treatment Objectives

The treatment objectives for this patient were to (1) improve her facial asymmetry by correcting the severe dentoalveolar compensation, (2) create ideal overjet and overbite, (3) establish good occlusion, and (4) maintain or establish her jaw function.

Treatment Alternatives

Two-jaw surgery to improve skeletal Class III malocclusion was believed to be essential; condylectomy on the left side was also considered.[10] However, her jaw function was normal and the left condylar head did not exhibit progressive enlargement. Although a combination of genioplasty and mandibular limbic reduction was also considered, it was noted that there was a risk of damage to the mandibular canal because of its trajectory.[8] Trimming only the cortical bone protuberance at the inferior edge of the left mandible was considered. However, the patient's chief complaint of facial asymmetry would remain after conventional two-jaw surgery (Figures 6A,B) because of the inclination differences between the occlusal plane and Go-Go' plane. Therefore, overcorrection was also considered, but it was indicated that the left ascending mouth corners would be involved, and the surgical procedures were anticipated to be difficult with increasing upward movement of the left side of the maxilla (Figure 6C).

After extensive discussion between the patient, orthodontists, and maxillofacial surgeons, the plan selected included a left mandibular segmental osteotomy prior to the two-jaw surgery with extraction of all third molars and bilateral upper first premolars for correction of the maxillary discrepancy (Figure 6D).

Treatment Progress

The first step of the treatment plan included extraction of the upper first premolars on both sides

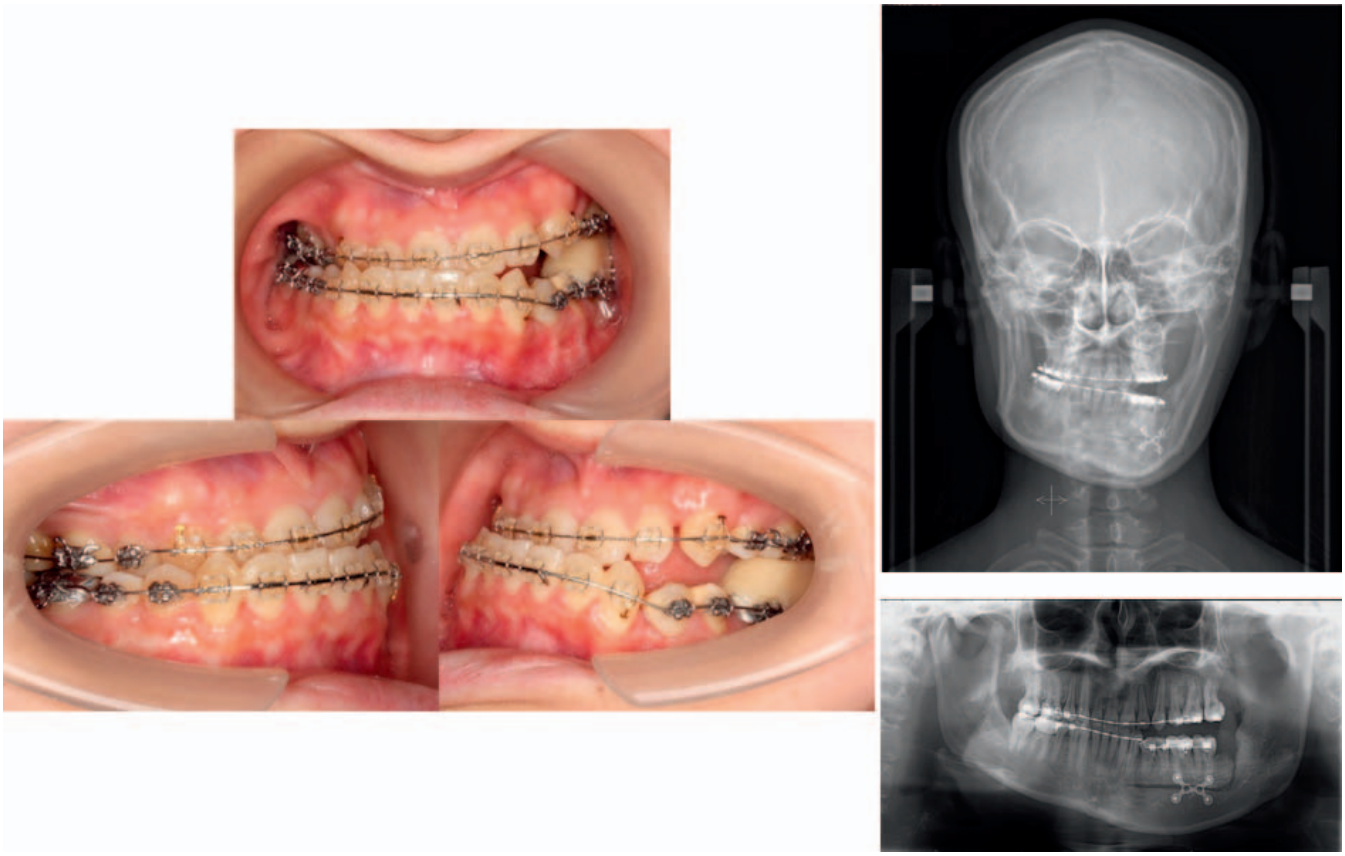

Figure 7. Intraoral photographs and panoramic and cephalometric radiographs obtained after segmental osteotomy are shown.

and all third molars to create the space needed for leveling. After the extractions, pre-adjusted edgewise appliances with 0.022 × 0.028-inch slots were bonded. An open coil was inserted between the lower left canine and the first premolar to make a small space to facilitate the segmental osteotomy. After 14 months, the left mandibular segmental osteotomy was performed. During surgery, the left posterior segment was impacted by 3.0 mm in the first premolar region and by 6.0 mm in the first molar region using an ultrasonic scalpel. The impacted posterior segment was fixed with a titanium plate and immediately adjusted with a 0.019 × 0.025 stainless steel wire. As a result, the mandibular occlusal plane and Go-Go' plane were parallel and the severe dentoalveolar compensation was corrected. Because a gap appeared between the upper and lower molars, a bite plate was bonded to retain the intermaxillary space and help chewing performance on the left side during the first operation (Figures 7 and 8). Her face showed almost no change at this point. Preparation for the two-jaw surgery was performed at 26 months after active treatment started. The bite plate was used until immediately before the two-jaw surgery: a Le Fort I osteotomy and sagittal split ramus osteotomy (SSRO) to correct the maxillary occlusal cant and mandibular deviation (Figures 9 and 10). The brackets were removed and fixed lingual retainers were bonded to the lower anterior teeth at 45 months after treatment started (Figure 11). In addition, a circumferential-type retainer was prescribed in the maxilla and a Hawley-type retainer in the mandible.

RESULTS

The posttreatment cephalometric and panoramic radiographs are shown in Figure 12. Facial asymmetry, which was the patient's chief complaint, was ameliorated. The dental midlines were aligned with the facial midline, and crowding in the upper and lower jaws was eliminated (Figure 13). The skeletal Class III relationship was improved compared to that at the initial visit (Figure 14). However, the U1 became proclined from dental compensation because of the remaining skeletal Class III relationship. The occlusal relationships were improved, Class I canine relationships were achieved on both sides, and ideal overbite and overjet relationships were established. At one year after the two-jaw surgery when the titanium plates for fixation of the bone segments were removed, 2.0 mm of the cortical bone protuberance was trimmed from her left mandibular edge. Then, the right and left inferior edges of her

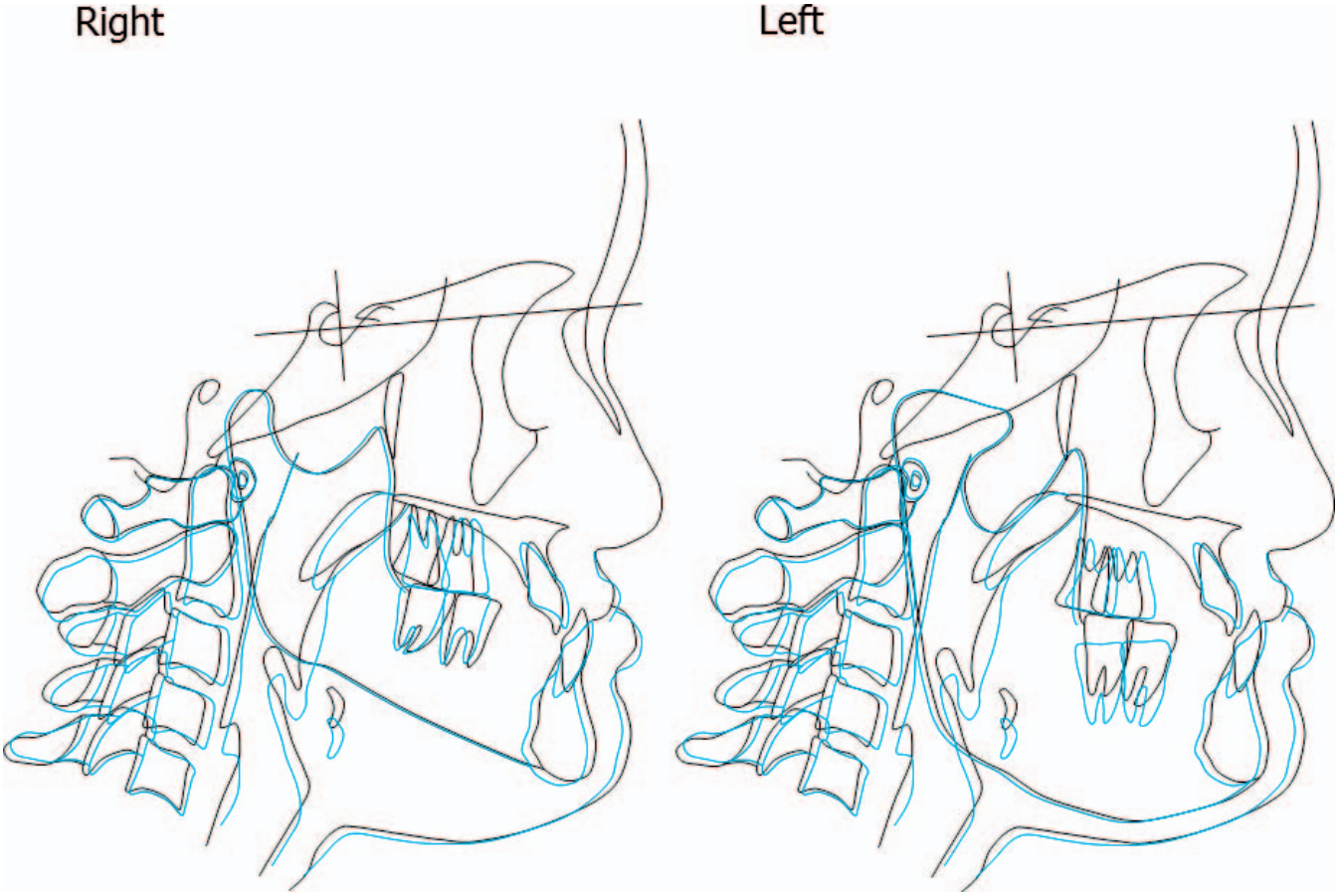

Figure 8. Unilateral superimpositions of cephalometric radiographs from before treatment (black lines) and after the segmental osteotomy (blue lines).

mandible exhibited symmetric morphology. The tapping locus was stable, canine guidance was achieved, and the orofacial muscle activity was well balanced (Figure 15). The Semmes–Weinstein monofilament score was 1 at six months after two-jaw surgery and the paralysis of her inferior alveolar nerve resolved.[11]

Superimposition of the cephalometric radiographs from posttreatment and retention (two years after treatment) showed almost no change (Figures 16–19). Moreover, superimposition of computed tomography images acquired before treatment and one year after the two-jaw surgery showed that symmetry of the

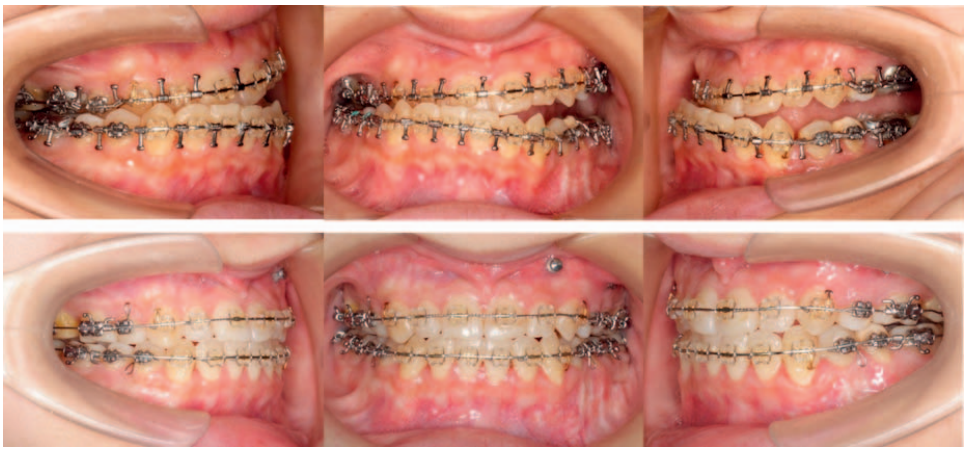

Figure 9. Intraoral photographs obtained before (upper row) and after (lower row) two-jaw surgery.

Figure 10. Cephalometric radiographs obtained after two-jaw surgery.

skeletal midline was achieved and the size of the left condyle was not changed (Figure 20). Posttreatment occlusal stability was observed for two years. Two years after treatment, the occlusion was acceptable (Figures 16 and 17). The changes in cephalometric variables during the treatment progress are shown in Table 1.

DISCUSSION

Since first described by Adams in 1836, condylar hyperplasia has been characterized by unilateral condylar enlargement and overgrowth during adolescence;[12] thus, onset at 20 years of age or later is rare. Wolford and coworkers classified condylar hyperplasia into four types: type I usually occurs during puberty,

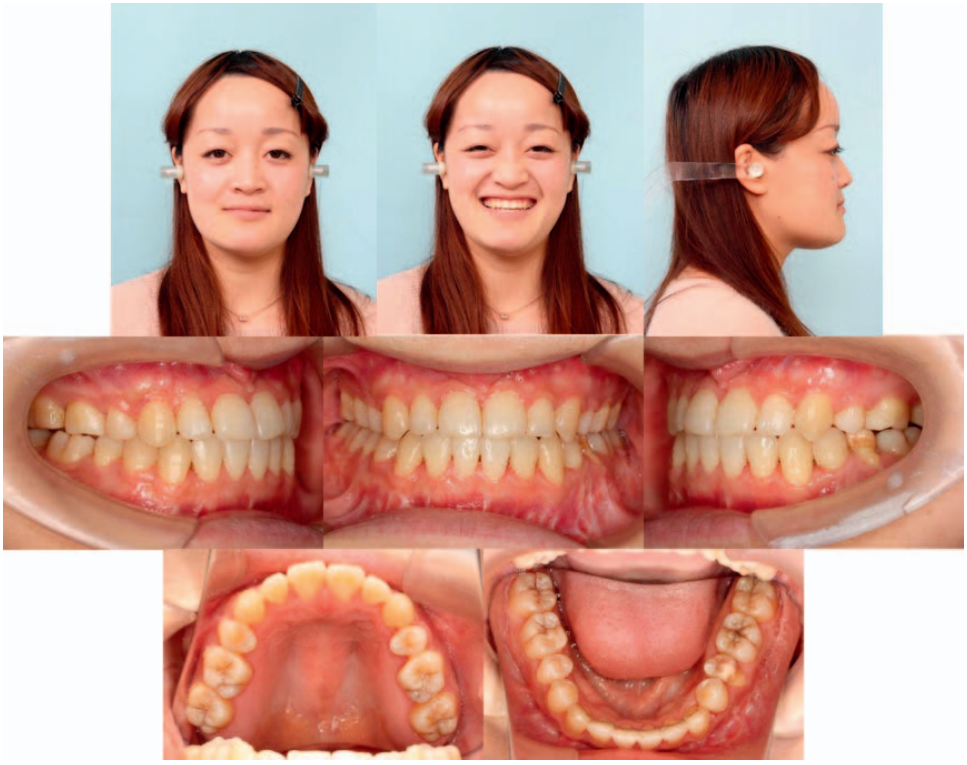

Figure 11. Posttreatment facial and intraoral photographs.

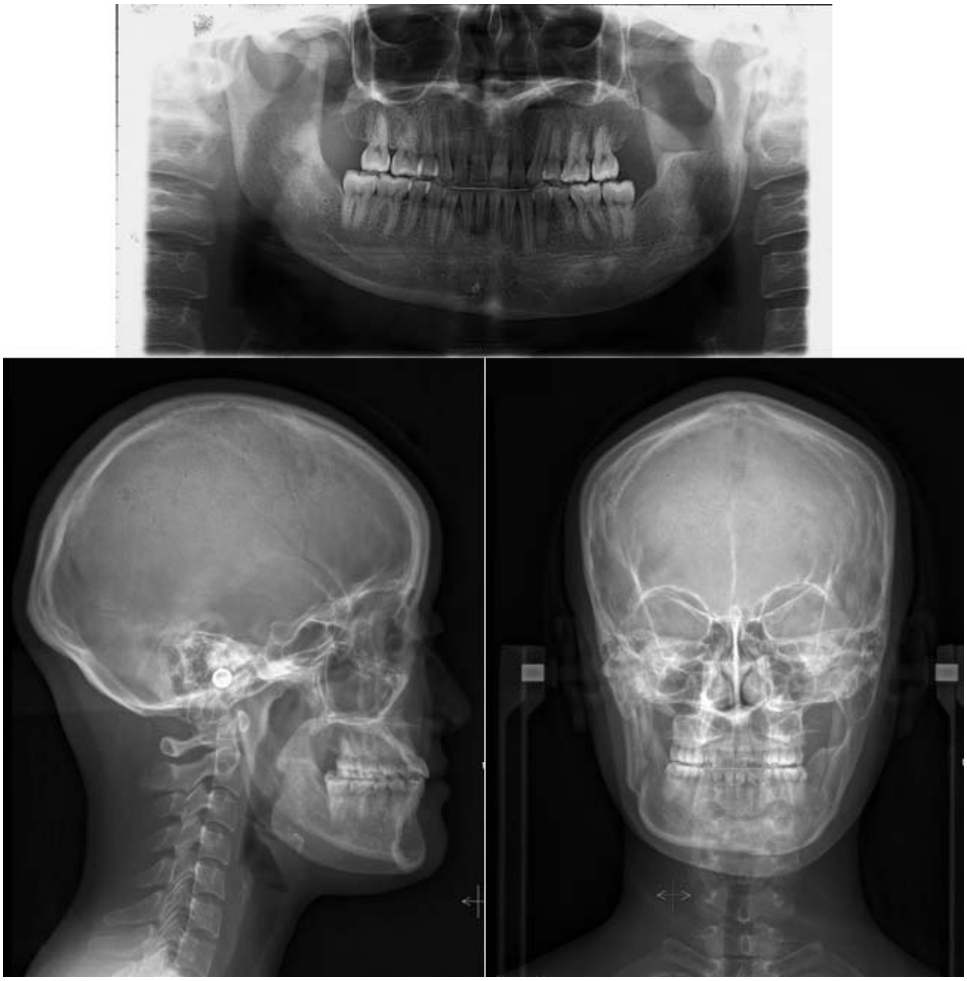

Figure 12. Posttreatment panoramic and cephalometric radiographs.

type II is osteochondroma, type III is a benign tumor, and type IV is a malignant tumor.[13] Since a reference classification has not been established, condylar hyperplasia has been often diagnosed clinically, morphologically, and histologically in a comprehensive manner. Thoma described condylar hyperplasia as a complication in which the shape and smooth surface of the condyle remain the same as in a normal condyle.[14]

Figure 13. Posttreatment study models.

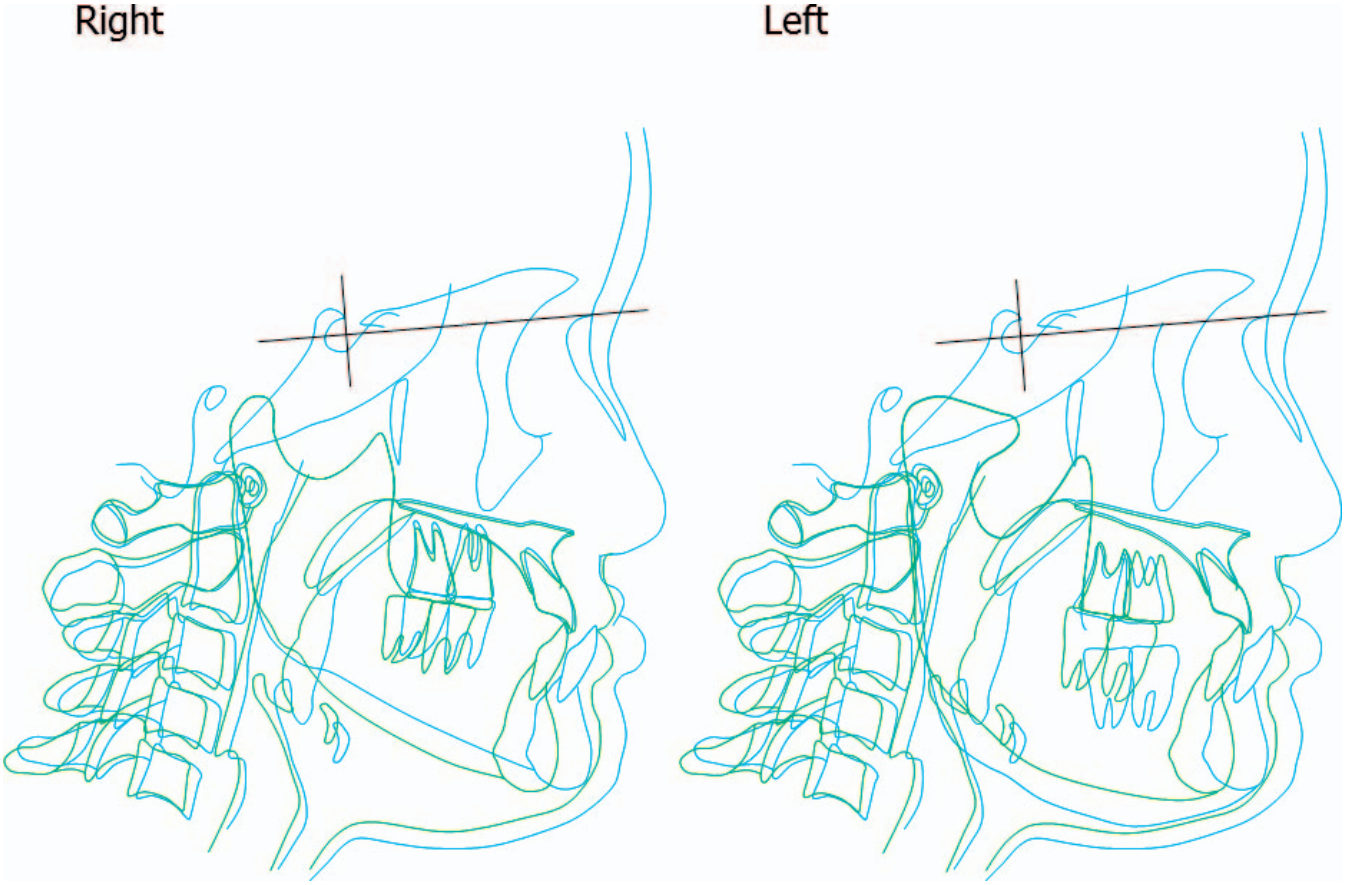

Figure 14. A unilateral superimposition of cephalometric radiographs obtained after segmental osteotomy (blue lines) and posttreatment (green lines).

Osteochondromas grow in spherical, lobulated, and pedunculated forms. Her left condyle was enlarged, but the surface appeared similar to that of her right condyle and the contour appeared uniform. Slootweg and Müller divided condylar hyperplasia into two types: true condylar hyperplasia and reactive condylar hyperplasia.[15] The former has an onset before adolescence and Tc-99m hydroxydiphosphonate demonstrates a focal uptake, while the latter has an onset after adolescence with pain and low-intensity uptake on bone scintigraphy.[4] Therefore, the current patient's left condyle was not considered to exhibit an osteochondroma.

For such a case, condylectomy has been proposed in several reports as a treatment. However, condylectomy is also known to involve a high risk of ankylosis of the temporomandibular joint and jaw dysfunction. Marchetti and colleagues described invasive surgical access to the temporomandibular joint; the function of the lateral pterygoid muscle, which is connected to the joint capsule, is suppressed; then, lateral movement of the mandible becomes limited.[16] Therefore, in this case, the condyle was preserved to maintain good jaw function.

To establish facial symmetry, four orthognathic surgical plans were considered. The first plan involved correcting only the occlusal cant with a typical two-jaw surgery (Le Fort I osteotomy and SSRO). In this plan, of course, the mandibular deviation would have remained.[8] Consequently, the second plan was to combine the first plan with an additional reduction[17] of her mandibular lower border; however, there was a high risk of damage to the mandibular canal because of its location. The third plan was to overcorrect the occlusal cant by two-jaw surgery. With this plan, there was the concern that the occlusal cant would be tilted to the opposite side along with her lip line. Bone segmental interference during the surgery was also considered.[18] In these three plans, successful results would not have been obtained in correcting the discrepancy between the occlusal cant and inclination of the Go-Go' plane. In the last plan, correcting the occlusal cant and frontal mandibular plane inclination by impacting her left molar region prior to two-jaw surgery was considered. Impaction by using temporary

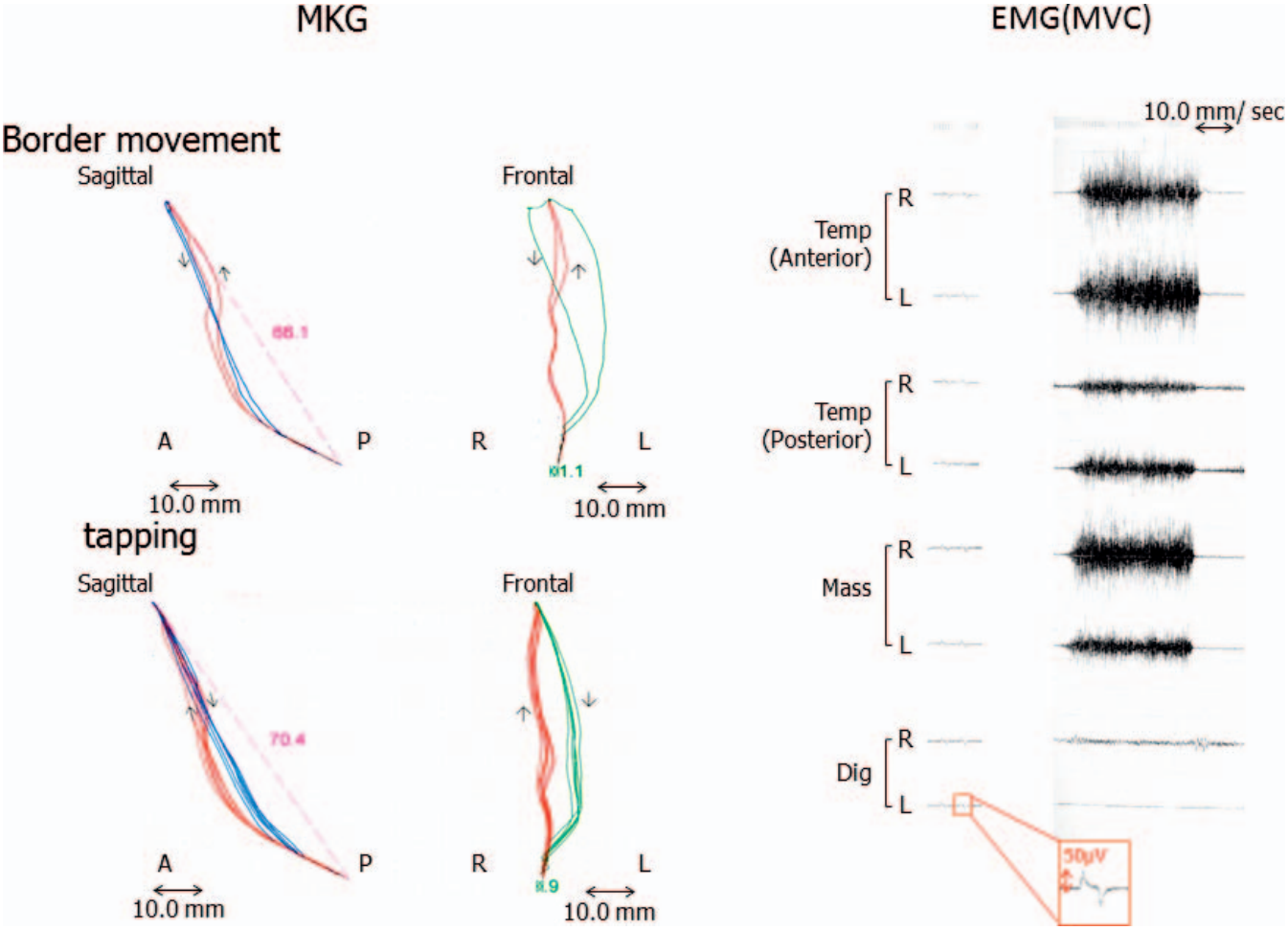

Figure 15. Posttreatment functional mandibular kinesiography (MKG) records during lateral border movements and tapping and electromyography (EMG) of the jaw muscles during maximum voluntary clenching (MVC). The inset in the EMG records shows the calibration. Temp indicates temporal muscle; Mass, masseter muscle; Dig, digastric muscle.

anchorage devices (TADs) was discussed but was thought to be difficult because of the large amount of impaction.[6] For that reason, a left mandibular segmental osteotomy was chosen. In addition, the timing of the segmental osteotomy procedures was discussed; it could have been performed as a single two-jaw surgery or as a two-jaw surgery after segmental osteotomy. The advantage of the former, simultaneous, method was that the physical burden on the patient would have been lower. However, if the amount of impaction was less than anticipated, the mandible would remain deviated. A drawback of the latter method was that general anesthesia needed to be performed twice. However, additional impaction can be performed with a fixed bone segment in a position that is not ideal for reasons of trimming a lesser amount, which is a difficult fixation because of the positions of the roots and mandibular canal. Therefore, to obtain more reliable symmetry, it must be explained to the patient that the operation will be divided into two procedures. Without collaboration between the orthodontists and maxillofacial surgeons, this treatment could not have been completed successfully.

By performing two-jaw surgery with segmental osteotomy for severe dentoalveolar compensation caused by residual asymmetry, a positive outcome was obtained for both functional occlusion and the profile.

CONCLUSIONS

- The deliberate selection of treatment alternatives with attention to the severe dentoalveolar compensation, which directly caused the facial asymmetry in association with unilateral condylar hyperplasia, resulted in a successful treatment outcome.
- Not only facial symmetry, but also esthetic and functional occlusion were achieved because of preservation of the left condylar hyperplasia.

Figure 16. Facial and intraoral photographs of retention two years after treatment.

- The treatment was performed successfully because of good collaboration between orthodontists and maxillofacial surgeons.

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Figure 17. Study models of retention two years after treatment.

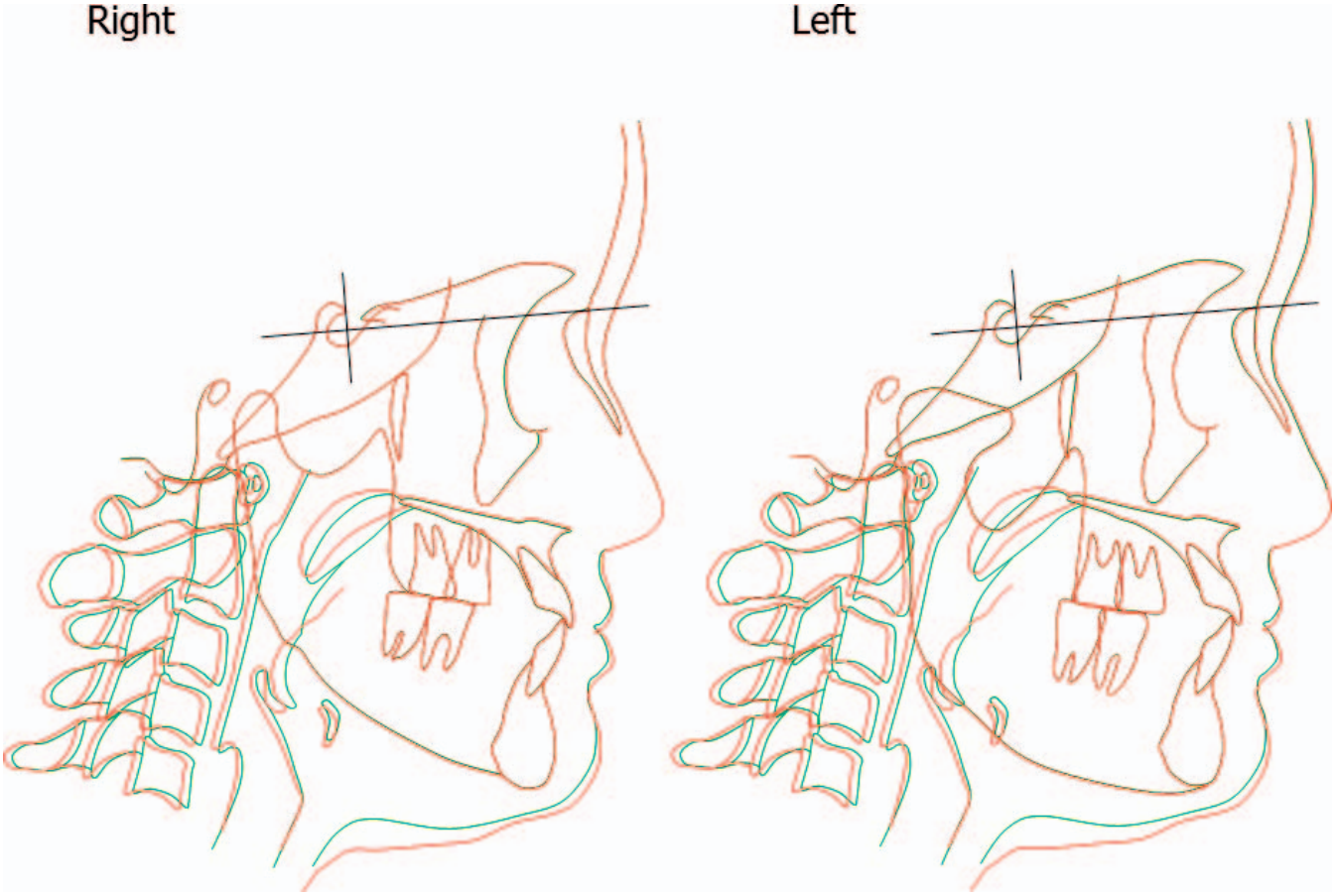

Figure 18. Unilateral superimpositions of cephalometric radiographs obtained posttreatment (green lines) and during retention (two years after treatment) (red lines).

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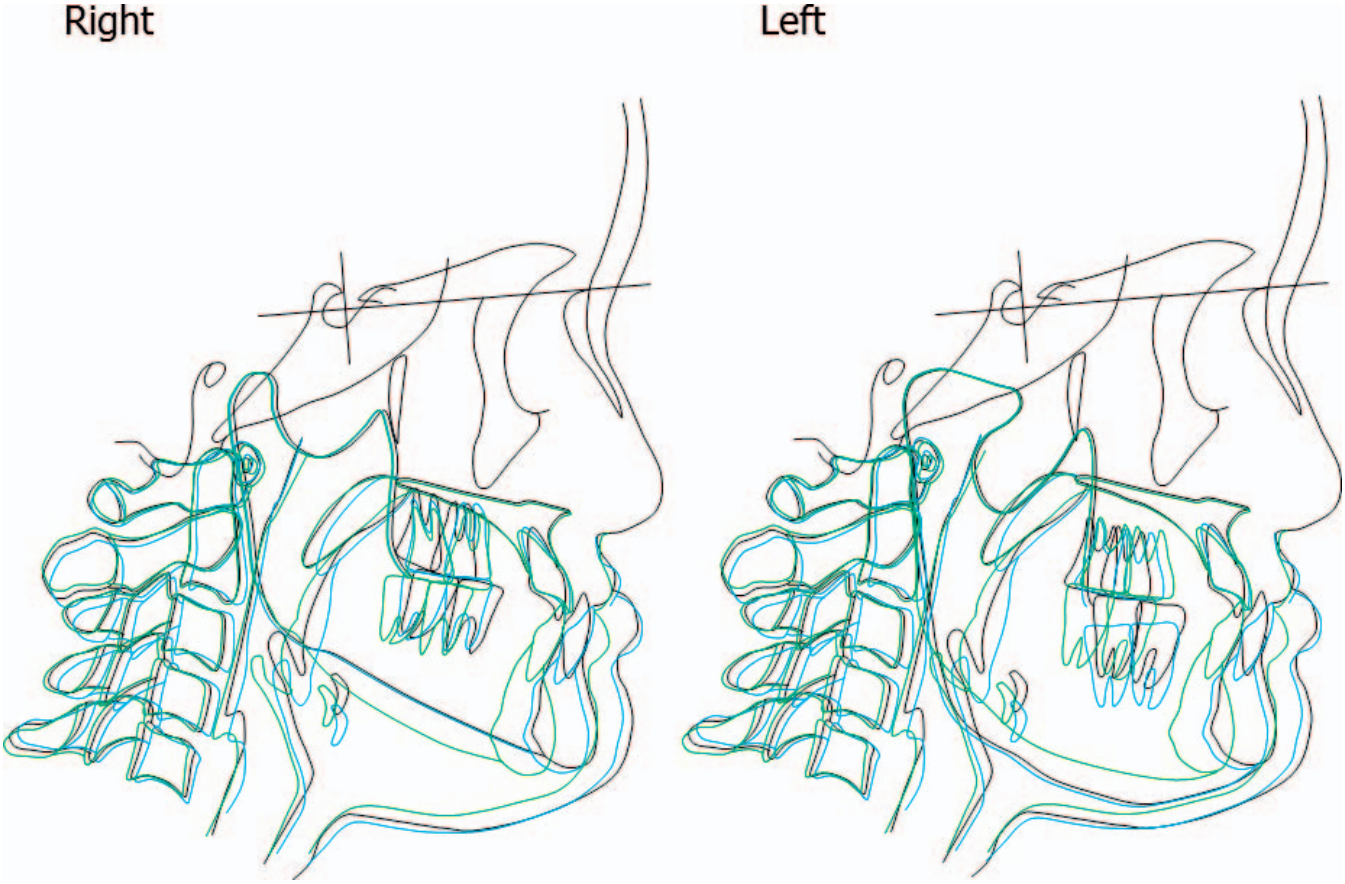

Figure 19. Unilateral superimpositions of cephalometric radiographs at several stages (black lines, pretreatment; blue lines, after segmental osteotomy; green lines, posttreatment).

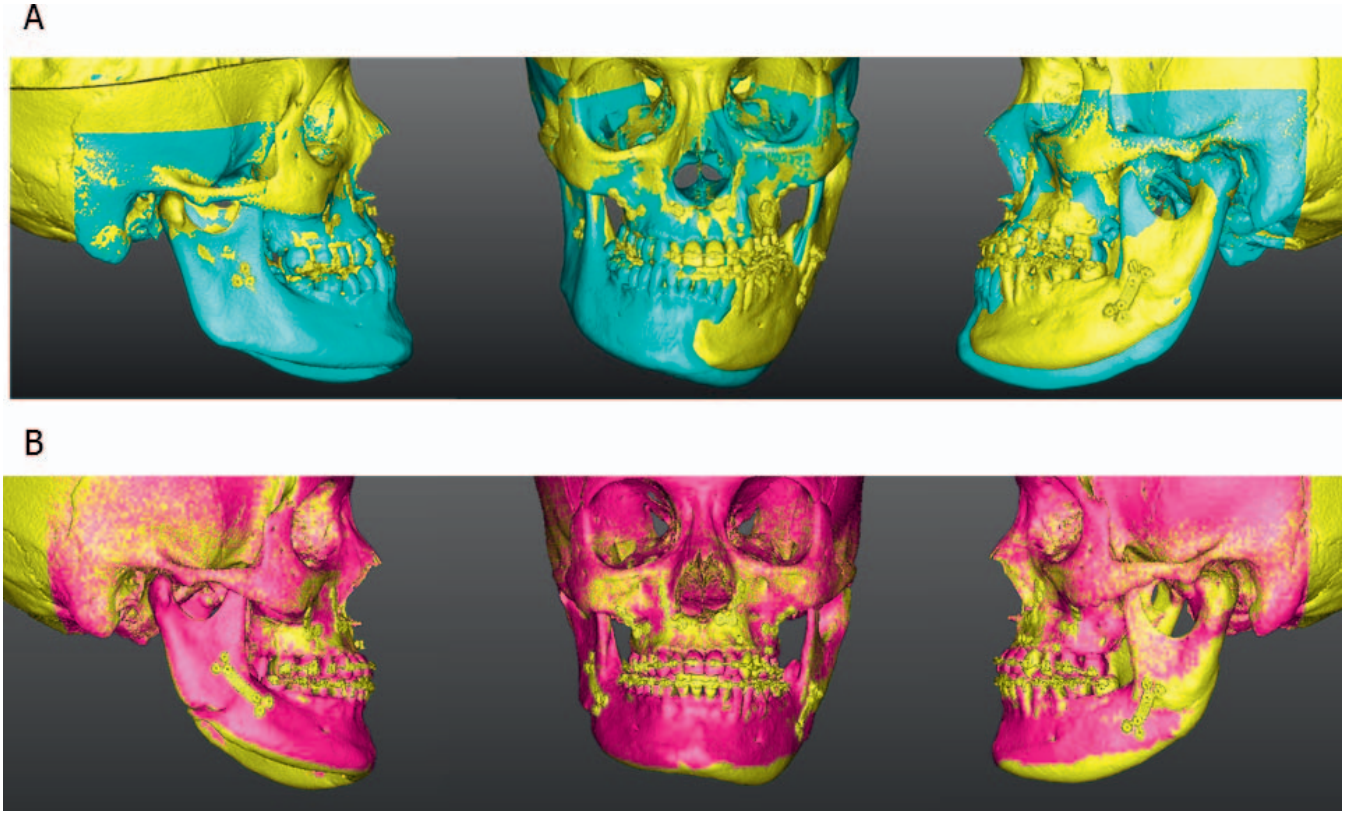

Figure 20. Superimposition of computed tomography images obtained before treatment and after two-jaw surgery (A) and images obtained after two-jaw surgery and during retention at one year (B).