# Hemimandibular hyperplasia treated with orthognathic surgery and mandibular body osteotomy

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Surgical treatment of facial asymmetry usually involves 2-jaw orthognathic surgery. But when the size of the mandible differs a great deal between the right and left sides, as in hemimandibular hyperplasia, additional contouring surgery is required. A 20-year-old woman presented with facial asymmetry, showing marked mandibular hyperplasia of the right side. She was treated with the use of 2-jaw surgery with mandibular body osteotomy in conjunction with orthodontic intrusion. Good esthetic outcome and functional occlusion were achieved. (Am J Orthod Dentofacial Orthop 2019;155:714-24)

Patients with severe facial asymmetry require a combination of orthodontic treatment and orthognathic surgery for esthetic and functional improvement.[1-3] Asymmetry usually presents as deviation of mandibular menton or changes in cant and yaw of one or both jaws. However, asymmetry that is caused by differences in bone volume may require additional contouring surgical procedures, such as bone grinding, corticotomy, or ostectomy.[4-10] Hemimandibular hyperplasia presents changes in mandibular height, which usually benefits from inferior border ostectomy.[7] In some cases, inferior alveolar nerve repositioning may also be required,[7,11] although this procedure carries a risk of nerve damage. Another option is to intrude the dentition in the affected area, followed by body osteotomy. Using this approach, nerve repositioning is not required and the amount of inferior border ostectomy is minimized.

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The present case report describes the treatment of a patient with hemimandibular hyperplasia through intrusion of the affected teeth, followed by mandibular body osteotomy and orthognathic surgery.

## DIAGNOSIS AND ETIOLOGY

A 20-year-old woman presented with a chief complaint of facial asymmetry. She had first noticed the asymmetry at 12 years of age, and felt it progress for the next 5-6 years. She had no relevant medical or dental history. Pretreatment facial photographs show severe hyperplasia of the right mandibular body, with deviation of chin point to the left. Incisal exposure at rest was 1 mm, and the right and left mouth corners were at different levels. Intraoral evaluation showed Angle Class I molar relationships on both sides. Overjet and overbite were 4.5 mm and 4.0 mm, respectively. The upper and lower arches were V shaped. Maxillary dental midline was deviated to the right by 1 mm. Mandibular dental midline showed a 2.5-mm deviation to the right. The mandibular right first premolar was buccally placed and in crossbite. On lateral cephalometric analysis, skeletal Class III characteristics were observed, with an ANB angle of 0.1°. She had hypodivergent facial characteristics with an FMA angle of 15.4°. The upper incisors were labially inclined (U1 to FH 128.2°).

Posteroranterior cephalometric analysis showed the right maxillary molars extruded by 7 mm compared with the left. The tip of the chin was deviated 9.4 mm to the left. On the panoramic radiograph, the right mandibular body showed severe hyperplasia. When comparing the height of the mandibular body, the

**Fig 1.** Pretreatment facial and intraoral photographs.

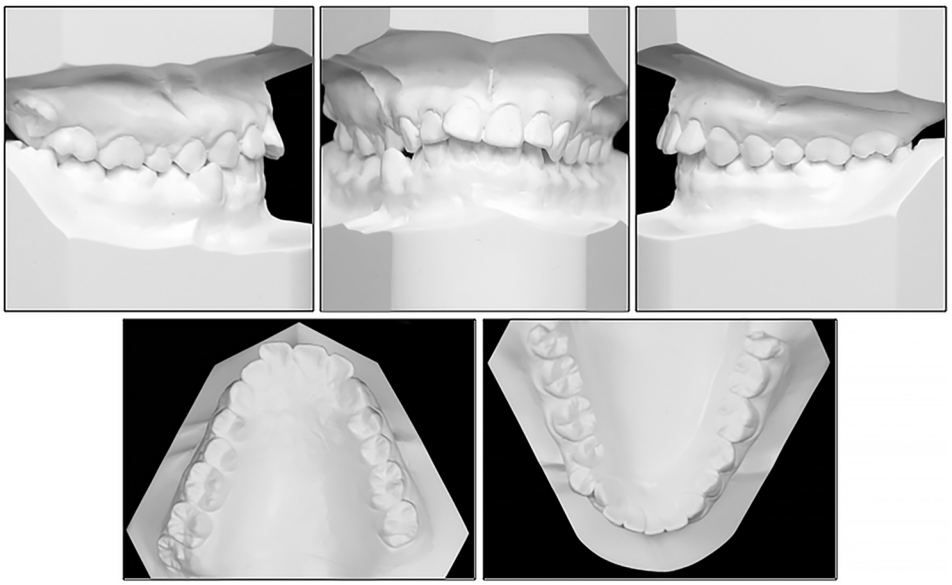

**Fig 2.** Pretreatment dental casts.

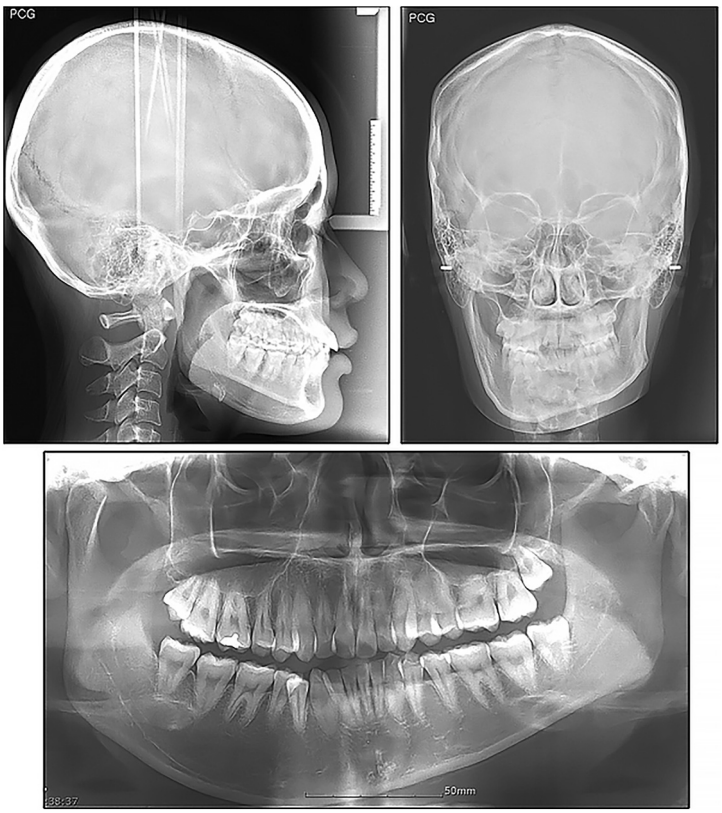


**Fig 3.** Pretreatment radiographs. Lateral and posteroanterior cephalograms and panoramic radiographs are shown.

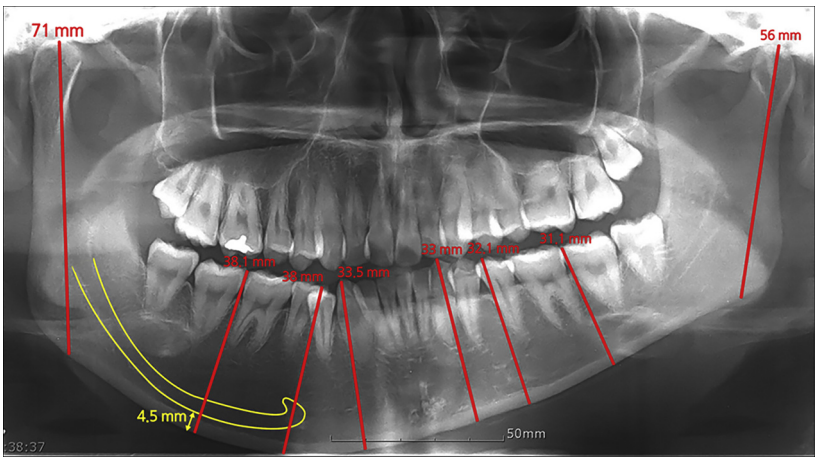


**Fig 4.** Panoramic radiograph showing measurements of ramus, body, symphyseal region and vertical depth of bone between the nerve and lower border of the mandible.

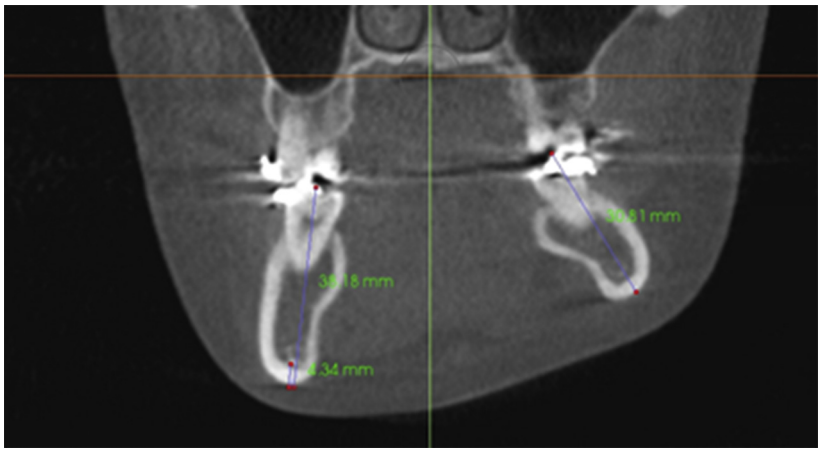


**Fig 5.** On CBCT, the vertical distance from the inferior alveolar nerve to the lower border of the mandible at the right first molar level is 4.5 mm. The distance from the right first molar to the lower border of the mandible is around 7 mm longer than the same position on the left side.

distance between the left and right first molar crown tips to the lower border of the mandible showed the right side to be 7 mm longer than the left. The right mandibular ramus was also 15 mm longer than the left side. The inferior alveolar nerve was placed close to the lower border of the mandible. On cone-beam computed tomographic (CBCT) imaging, the distance between the inferior alveolar nerve and mandibular inferior border at the lower part of the right first molar was 4.5 mm (Figs 1-5; Table).

On the panoramic radiograph, the right condyle was enlarged and elongated, and the right ramal height was increased. The patient was referred to a temporomandibular joint (TMJ) specialist for TMJ evaluation. TMJ clinical examination, TMJ radiographs, and CBCT were performed. TMJ CBCT provides an accurate, cost-effective, and dose-effective diagnostic tool for the evaluation of osseous abnormalities of the TMJ.[12,13] It was concluded that both condyles were stable enough to continue with orthodontic and surgical treatment. The patient was seen again by the TMJ specialist immediately before surgery to rule out possible activity in the condyles.

## TREATMENT OBJECTIVES

Based on the cephalometric findings, the patient was diagnosed as having a skeletal Class III malocclusion and hypodivergent facial pattern, facial asymmetry to the left, and right mandibular body hyperplasia.

The treatment objectives for the patient were to: (1) coordinate the maxilla and mandible to achieve symmetry and align the facial, upper, and lower midlines; (2) correct the skeletal Class III anteroposterior relationship; (3) achieve mandibular symmetry through right-side mandible body inferior border ostectomy and angle reduction; (4) improve occlusal canting; (5) level and align upper and lower arches; and (6) achieve ideal overjet and overbite relationships.

**Table.** Lateral cephalometric measurements

| *Measurement* | *Normal* | *Before treatment* | *Final* |
|---|---|---|---|
| SNA (°) | 81.6 ± 3.1 | 82.4 | 81.8 |
| SNB (°) | 79.1 ± 3.0 | 82.3 | 79.9 |
| ANB (°) | 2.4 ± 1.8 | 0.1 | 1.9 |
| SN-GoMe (°) | 36 ± 4.0 | 25.8 | 32.2 |
| Gonial angle (°) | 118.6 ± 5.8 | 114.9 | 120.2 |
| FMA (°) | 24.2 ± 4.6 | 15.4 | 22.1 |
| IMPA (°) | 95.9 ± 6.3 | 91.1 | 96.1 |
| U1-FH (°) | 116 ± 5.7 | 128.2 | 122.3 |

## TREATMENT ALTERNATIVES

Two treatment objectives were considered: (1) conventional presurgical orthodontics to level and align the arches, followed by orthognathic surgery which would include right-side mandibular body inferior body ostectomy and inferior alveolar nerve repositioning; (2) intruding the lower right premolar and molars during presurgical orthodontics, followed by orthognathic surgery with right-side mandibular body osteotomy and inferior border ostectomy.

The first option involves treatment of the asymmetry through mandible inferior border ostectomy only. The Le Fort I procedure would involve a 7-mm canting correction of the maxilla and bilateral sagittal-split ramus osteotomy of the mandible. Mandibular surgery would also require inferior border ostectomy of ~7 mm

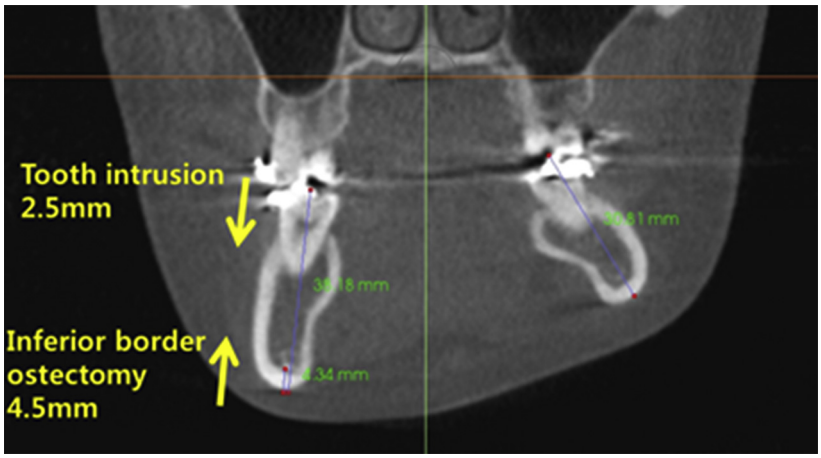


**Fig 6.** Intrusion of the right posterior teeth (~2.5 mm) allows the vertical dimension to be decreased through body osteotomy, and the amount of inferior border ostectomy (~4.5 mm) can be kept to a minimum.

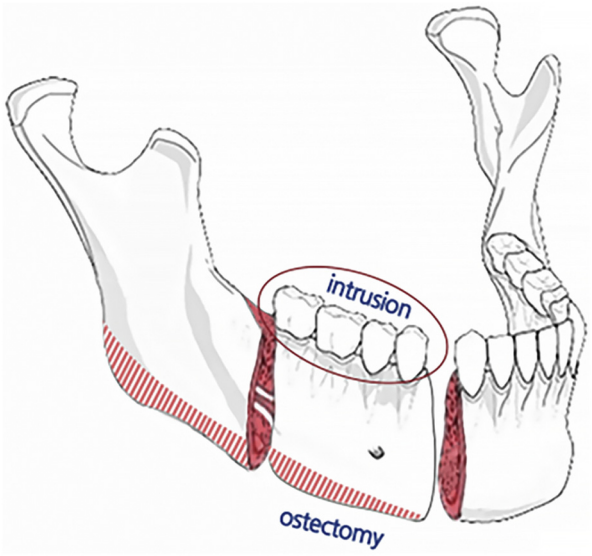


**Fig 7.** Illustration of molar intrusion + sagittal-split ramus osteotomy + inferior border ostectomy + mandibular body osteotomy.

at the right premolar and molar area. Because the distance from the mandibular inferior border to the inferior alveolar nerve is only 4.5 mm, a nerve repositioning procedure is required to sufficiently correct the asymmetry.

The second option requires the same Le Fort I osteotomy with bilateral sagittal-split ramus osteotomy. But in addition, a total body osteotomy of the lower right segment is planned. The lower right premolar and molars would be intruded by 2.5 mm during presurgical orthodontics. This would allow intermaxillary clearance to vertically move the distal segment up after body osteotomy between the lower right canine and first premolar. An additional 4.5-mm inferior body ostectomy would correct the asymmetry, without the need for inferior alveolar nerve repositioning (Figs 6 and 7).

Both options would require right-side mandibular angle reduction (~15 mm) and third molar extractions.

The main advantage of the first option is shortened presurgical orthodontic treatment duration, because molar intrusion is not required. However, nerve repositioning carries the risk of nerve damage. This was the main reason for the patient choosing the second option.

## TREATMENT PROGRESS

All third molars were extracted before the start of orthodontic treatment. Preadjusted 0.022-inch slot Clippy C (Tomy, Futaba, Fukushima, Japan) brackets were bonded. After leveling and alignment, the upper arch was expanded to help relieve the mandibular right first premolar crossbite. A miniscrew (1.6 × 6 mm, G2, Dual Top Anchor System; Jeil Medical, Seoul, Korea) was also inserted between the lower right first and second premolars. The initial plan was to intrude the lower right quadrant as a segment after leveling and alignment, but because the patient wanted surgery as soon as possible, lower right molar intrusion was commenced during leveling with the use of 0.016 × 0.022-inch nickel-titanium wire. After 2 months, intrusion allowed a 2.5-mm interocclusal distance (Figs 8 and 9).

Orthognathic surgery included maxillary Le Fort I osteotomy (5 mm posterior impaction, 2 mm setback, 1 mm midline shift to the left, and 7 mm canting correction), and mandible bilateral sagittal-split ramus osteotomy (with 15 mm angle reduction of the right side). Body osteotomy of the right mandible was performed

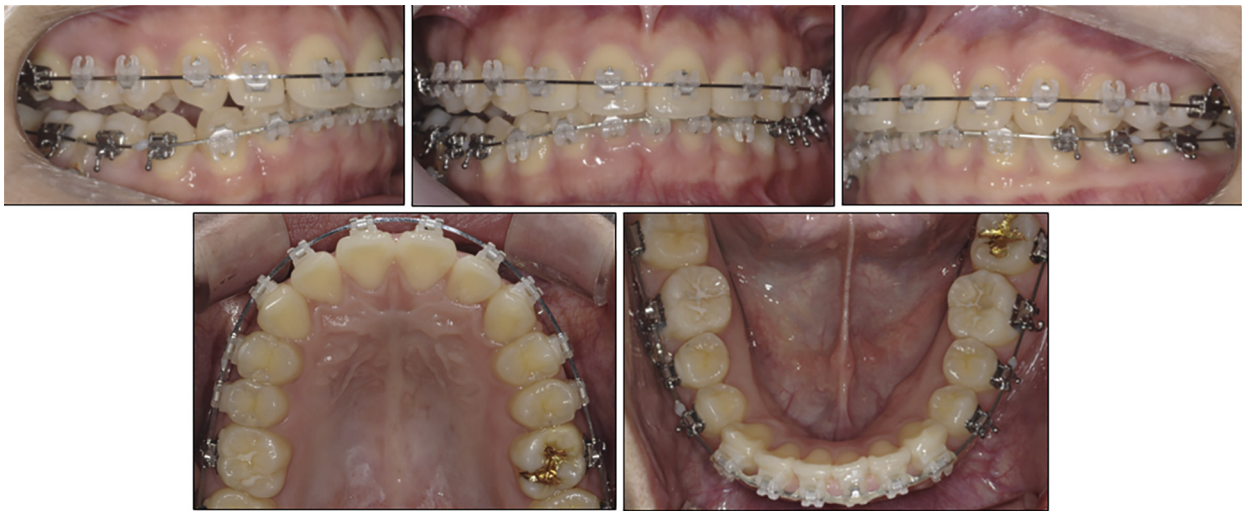

**Fig 8.** Presurgical intraoral photographs. Interocclusal clearance can be seen at the right molar area.

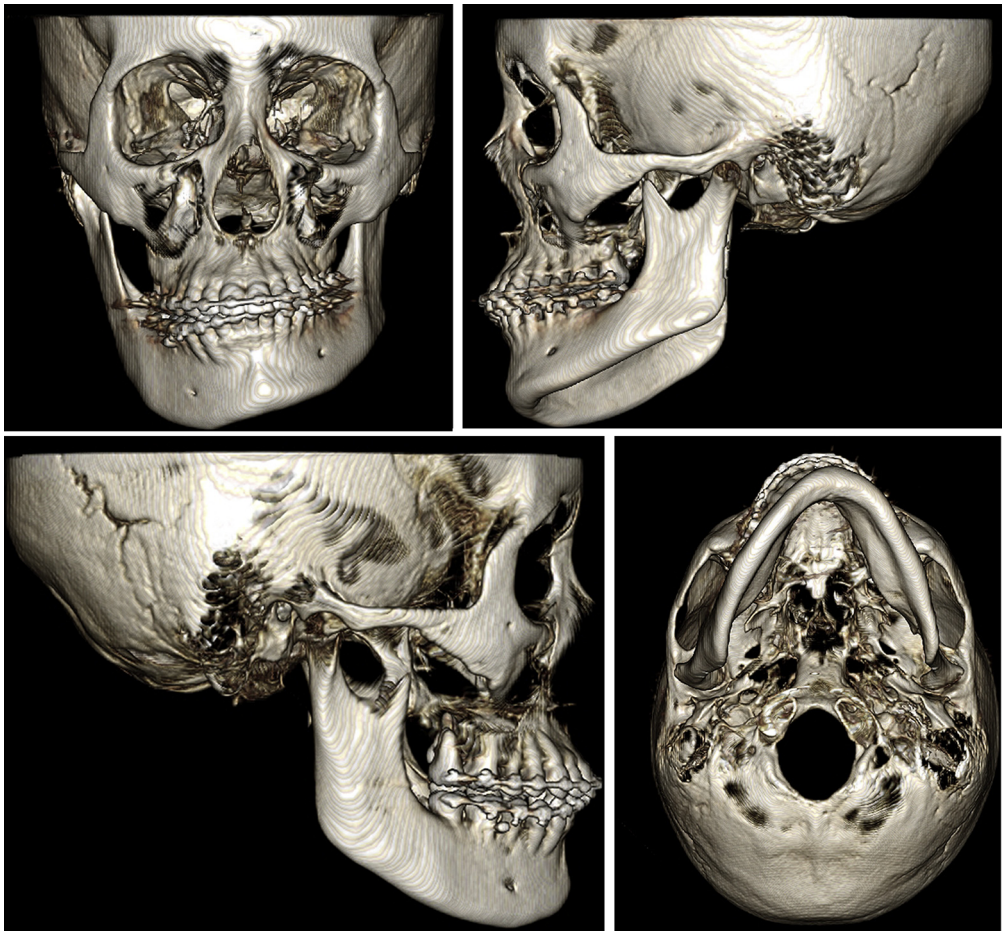

**Fig 9.** Presurgical 3-dimensional images.

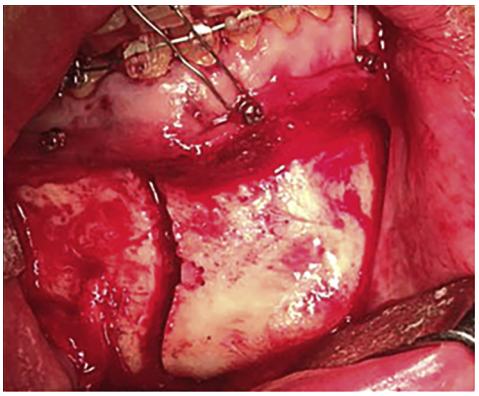

**Fig 10.** Body osteotomy between the mandibular right canine and first premolar was performed.

**Fig 11.** Posttreatment facial and intraoral photographs.

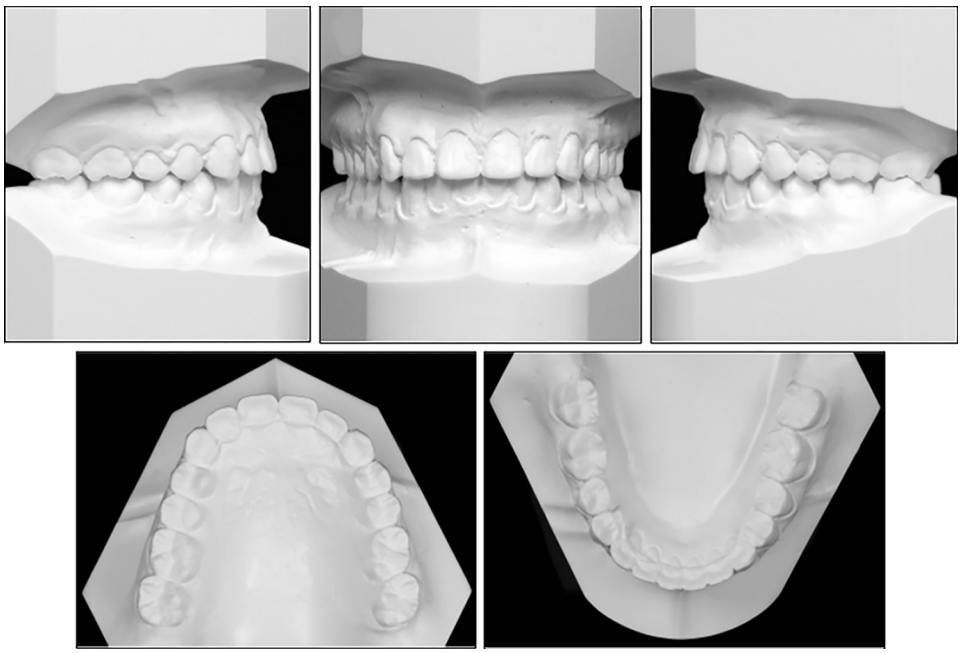

**Fig 12.** Posttreatment dental casts.

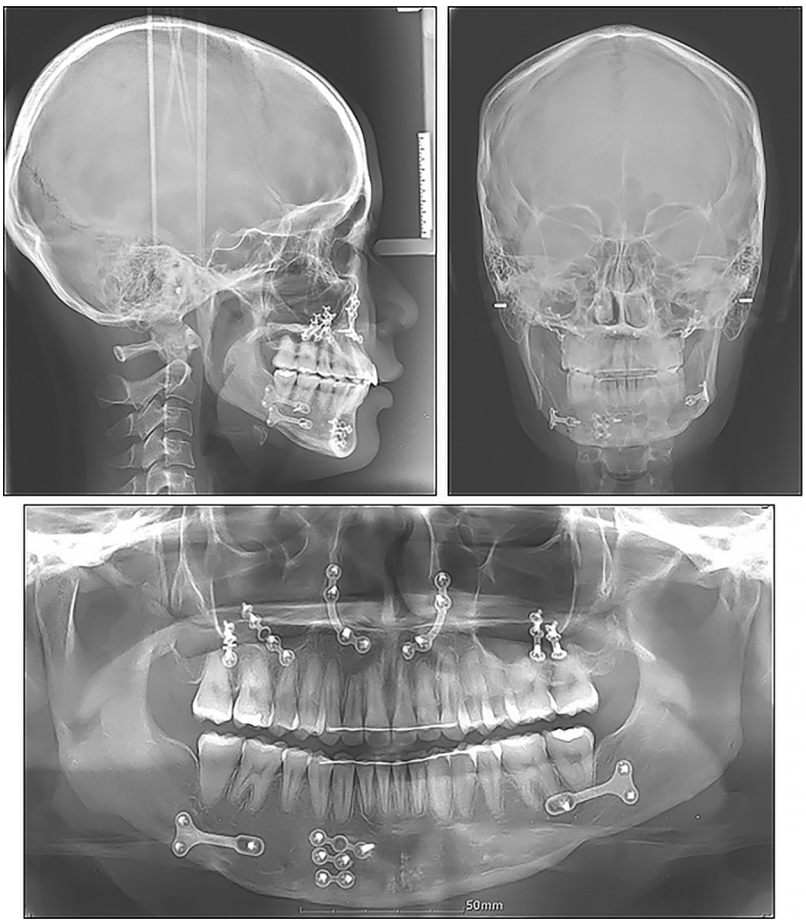


**Fig 13.** Posttreatment radiographs. Lateral and posteroanterior cephalograms and panoramic radiographs are shown.

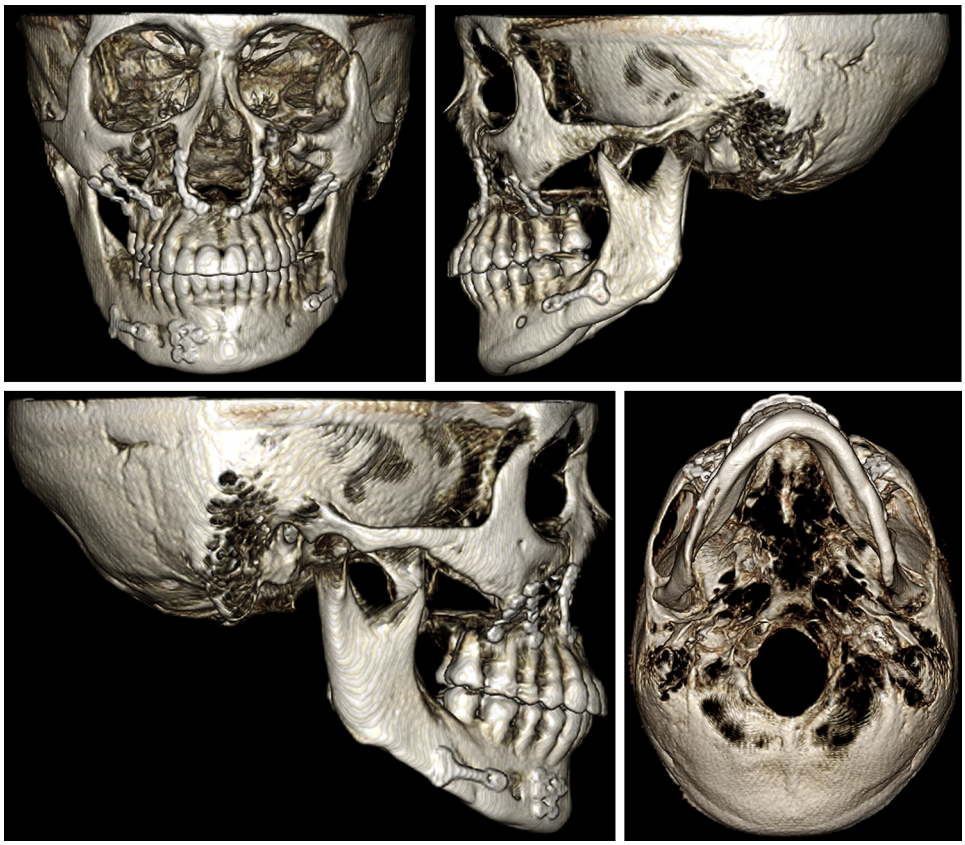

**Fig 14.** Posttreatment 3-dimensional images.

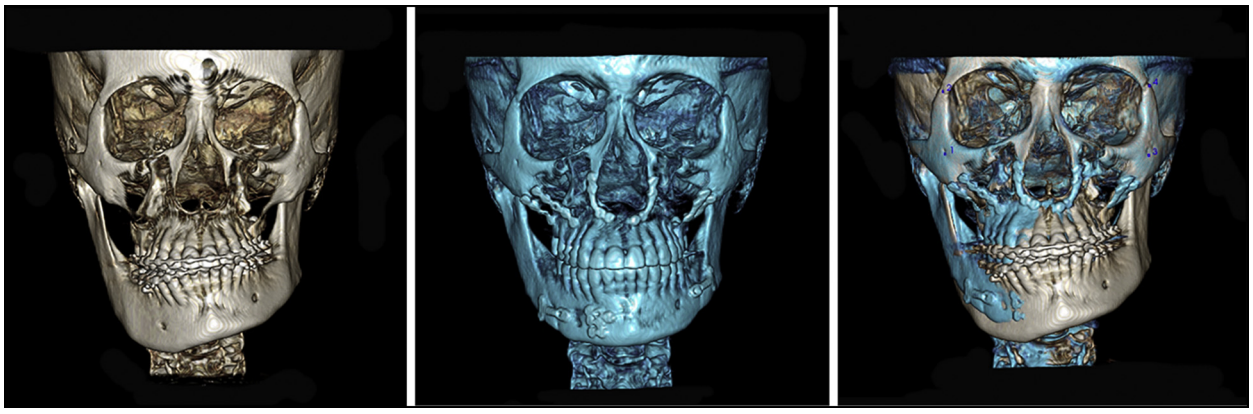

**Fig 15.** Pre- and postsurgery 3-dimensional volume-rendering images.

between the lower right canine and first premolar. The segment containing premolars and molars was positioned superiorly 2.5 mm with the use of a prefabricated surgical splint (Fig 10). After intermaxillary fixation, plates and screws were used to fix the osteotomy segment in place.

A 4.5-mm inferior border ostectomy was then performed on this distal segment, taking care to keep below the inferior dental nerve. Grinding genioplasty was then carried out to position the chin symmetrically. Intermaxillary fixation was in place for 2 weeks after surgery. The surgical splint was wired onto the mandibular arch for

6 weeks. Postsurgical orthodontics was commenced 8 weeks after surgery. Postsurgical orthodontics lasted 1 year. Upper and lower fixed lingual retainers and circumferential retainers were delivered.

## TREATMENT RESULTS

Posttreatment photographs show that the facial asymmetry improved and normal occlusal relationship was achieved. Class I canine and molar relationships and normal overjet and overbite were attained. The upper and lower dental midlines were coincident with the facial midline. The patient's chief complaint of facial asymmetry showed a marked improvement. ANB improved from 0.04° to 1.86°. FMA improved from 15.4° to 19°. On posteroanterior radiograph, maxilla cant was corrected and the chin point was coincident with the facial midline. On CBCT the hyperplastic right mandible was now similar in appearance to the normal left mandibular body. The distance from the condylar head to the gonion was now similar on both sides, and the height of the mandibular body at the premolar and molar levels were similar on both sides (Figs 11-15).

## DISCUSSION

Hemimandibular hyperplasia is a developmental asymmetry caused by a 3-dimensional enlargement of one side of the mandible, and involves the condyle, condylar neck, ramus, and body, usually terminating at the symphysis.[7,14-16] The chin deviates to the unaffected side, the lower mandibular border is asymmetric, and the occlusal plane is tilted.[17] In advanced forms of hemimandibular hyperplasia there is overgrowth of the maxillary and mandibular alveolar bone and compensatory canting, with a significant functional malocclusion. This usually requires a bimaxillary surgical correction.[7,18,19]

Various methods of treating hemimandibular hyperplasia have been reported.[19-24] Lippold et al[17] performed mandibular condylectomy of the affected side in 6 patients, gaining acceptable results. During the 2-year follow-up, they reported stable symmetric mandibles with remodeling of the joint and concluded that condylectomy can successfully correct hemimandibular hyperplasia even in patients with active condylar growth. Ferguson[11] reported 3 cases where the inferior dental neurovascular bundle was dissected completely free of the mandible up to the mental foramen, the proximal mandible fragment rotated cranially, then followed by bone reduction at the superior border.

Brasileiro et al[7] modified the sagittal-split ramus osteotomy by extending the vertical cut down to the mental foramen. Inferior alveolar nerve repositioning with inferior border ostectomy of the affected side followed. Current research has applied computer-assisted 3-dimensional surgical planning for treatment of hemimandibular hyperplasia.[8]

Successful treatment of hemimandibular hyperplasia requires that the right and left mandible have symmetric shape and size. In most cases, a large amount of inferior border ostectomy is required, which in turn makes inferior alveolar nerve repositioning a requirement. Nerve dissection usually carries a high risk of damage to the nerve and increases surgical time. As a way of avoiding this risky procedure, we planned for our patient to undergo mandibular body osteotomy after intrusion of the teeth on the affected side. This procedure allowed the amount of inferior body ostectomy to be kept to a minimum and avoiding inferior alveolar nerve repositioning. This surgical plan requires thorough examination and treatment planning. Presurgical orthodontics need to be carefully planned, and a diagnostic set-up to simulate the surgical procedure is a prerequisite.

## CONCLUSION

We have introduced an effective method of treating facial asymmetry caused by hemimandibular hyperplasia. The teeth of the affected side of the mandible were intruded presurgically, followed by body osteotomy to move the segment up. In combination with maxilla canting correction and bilateral sagittal-split ramus osteotomy, we achieved excellent symmetric results. This surgical and orthodontic treatment plan means that the amount of inferior border ostectomy can be kept to a minimum and avoids the risky nerve repositioning procedure. This is a viable and successful alternate treatment option for treating hemimandibular hyperplasia.

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