There is often a disharmony of maxillary and mandibular widths when preoperative orthodontic treatment is completed before surgery. If the mandibular width is larger than the maxillary width, then maxillary width expansion or mandibular width constriction is necessary; however, in general, the majority of cases opt for orthodontic maxillary arch width expansion.

Cases involving the maxillary expansion include the expansion of the dental alveolus and the expansion of the maxillary bones. The expansion of the dental alveolus is difficult to perform once the growth period is complete, and only a limited amount of expansion can be achieved. Furthermore, because the dental alveolus is expanded by the tipping movement of the teeth orthodontically, there are risks such as relapse after surgery, root exposure, and retraction of the buccal gingiva.1,2 In the expansion of the maxillary bones, however, the surgical stress and patient burden is obviously greater than

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**Background:** The aim of the present study was to evaluate the treatment of patients developing a transverse jaw width discrepancy who exhibited class III malocclusion and/or facial asymmetry by a combination of mandibular constriction (MC) and intraoral vertical ramus osteotomies (IVROs).

**Subjects and methods:** In a retrospective study, functional results, postoperative complications, and skeletal stability were analyzed for all the patients who had undergone MC and IVRO, with more than 2 years of follow-up. A mandibular midline osteotomy for constriction with lag screw technique and IVROs was used for MC and setback.

**Results:** Sixteen patients were included in the present study. The average degree of MC was 6.34mm. Both the occlusal relationship and facial appearance in all patients were significantly improved by the surgical orthodontic treatment, with no harmful clinical symptoms. In addition, our original MC using lag screw technique provided the most reliable results in terms of skeletal stability.

**Conclusions:** This study showed that MC using lag screw technique gives a very stable mandibular width constriction, and the combination of MC and IVROs offers a promising treatment alternative for patients with mandibular prognathism developing a transverse jaw width discrepancy. (Plast Reconstr Surg Glob Open 2015;3:e521; doi: 10.1097/GOX.0000000000000505; Published online 22 September 2015.)
in simple 1-jaw surgery when a combination of procedures, such as segmental Le Fort I osteotomy and mandibular surgery, is performed.4,5

However, there are no previously reported ways to appropriately narrow the diameter of the mandible by means of either surgical assisted orthodontic or orthodontic treatment; thus, surgeons must expand the maxillary width when the mandibular width is too large, as determined by a model analysis and a cephalometric analysis.

The first known discussion of the mandibular midline osteotomy, as presently used, was published in 1976.6 The method was described in more detail by Brusati et al.7

The mandibular midline osteotomy for constriction, which we call mandibular constriction (MC), was modified by Alexander et al8 in 1993 to reduce the disharmony of the mandibular width using a single plate. They were the first to describe stabilization of the mandibular width with rigid internal fixation.9 Since 1994, we have performed MC as an additional routine operation in cases with mandibular setback when the mandibular width was larger than the maxillary width. A setback of the distal segment after osteotomy in IVROs with transverse width discrepancy often causes an overlap between the proximal and distal segments, and the lower edge of the proximal segment sometimes far-ends up outside of the distal segment. Performing this procedure in combination with MC helps to avoid this condylar rotation caused by lateral displacement of the proximal segment.

The purpose of the present study was to discuss the utility of this method and to describe the combined procedures of MC and IVROs using lag screw technique. We conducted a prospective clinical study evaluating the clinical results in terms of the safety, efficacy, morbidity, and skeletal stability associated with the surgical treatment of patients developing a transverse jaw width discrepancy who exhibited class III malocclusion and/or facial asymmetry by combination of MC and IVROs using lag screw technique.

MATERIALS AND METHODS

Patients
To address the research purpose, we designed and implemented a prospective clinical study. The study population included all patients suffering from class III malocclusion and/or facial asymmetry with a transverse jaw width discrepancy who had undergone MC using lag screw technique at the Department of Oral and Maxillofacial Surgery at Kochi Health Sciences Center between August 1, 2008 and August 31, 2011. To be included in the study sample, the patients need to have undergone MC and IVROs. The patients were excluded as study subjects if they had undergone sagittal split ramus osteotomy (SSRO). The choice of surgery was always left to the patient after close consultations based on our clinical assessment. All the patients were also provided with treatment options that involved alternative orthognathic surgery. Every patient underwent a standard surgical assessment, dental model surgery, 3-dimensional (3D) computed tomography (CT)-based virtual surgical simulation using SimPlant OMS (Materialise, Leuven, Belgium), and prediction tracing. This study was approved by the Kochi Health Sciences Center Institutional Review Board and all participants signed an informed consent agreement.

Surgical Method
A vertical osteotomy was performed at the midline of the mandible, and the width of the mandible was then reduced (Fig. 1A) and fixed using 2 lag screws (Figs. 1B, C). During the preparation for the operation, a model of the mandible was divided and narrowed to the designed width by jaw model surgery or personal computer virtual surgery. A firm surgical splint (mandible functional orthopedics appliance (FKO) type) with an extended long flange on the lingual side was made (Fig. 2A).

The mandibular midline osteotomy was performed simultaneously with IVROs under general anesthesia, first installing a surgical splint ligated tightly in the lower dental arch and then performing intermaxillary fixation. After that, the middle of the mandible was fixed with 2 lag screws.10,11 When the first 3 points of bone cutting (an MC and 2 IVROs) were held just before the perfect split of a bone, the osteotomized bone segments were repositioned to the desired position safely and easily. The incision line of the oral mucosa for the MC was the same as that used for genioplasty: vertically below the root apex between the lower incisor teeth, so that genioplasty could also be simultaneously performed as when the need arose. A flowchart showing the procedure is given below.

IVROs were performed incompletely (one side split completely, the other side incompletely). Only the osteotomy line of the IVRO was drawn vertically using the oscillating saw blade without splitting. Then, a 0.4-mm wire was threaded not tightly through the surgical splint (mandibular FKO type) and teeth.

A mandibular midline osteotomy (Fig. 2B) was performed completely.

Another IVRO (the side split incompletely) was completely split (the other side was also completely split). The ramus was then completely split vertically into 2 segments using a mobilizer and hammer.
Wiring fixed a surgical splint with 2 separated mandibular distal segments (right and left) (Fig. 2B).

Firm intermaxillary fixation with up/down elastics and wires was also performed. We placed the mandibular distal segment in the desired position fitted to the surgical splint.

The 2 mandibular distal segments (right and left) were fixed completely using the lag screw technique with 2 screws (one for lag screw, another for positioning screw) (Fig. 2B).

A special long sleeve to protect the lips was used.

When there was intervention on the lingual side of the 2 mandibular distal segments (right and left) at the midline, the intervening part of the bone was eliminated using a bone saw.

Bending the center of mandibular arch wire (between the mandibular center intercisor teeth) into the shape of V was modified to prevent the postoperative buccal tipping of the mandibular teeth by means of the relapse force of the arch wire (Fig. 2B).

Next, the proximal segment was cut at a downward angle with the filing saw blade after confirming the location of the proximal segment. Thereafter, the proximal segment was moved to the front using absorption thread to prevent medial trapping (malpositioning) of the proximal segment and condylar luxation (Fig. 2C).

**Postoperative Examination**

Patients were seen at 1 and 2 weeks, and 1, 3, and 6 months, and 1 and 2 years postoperatively for regular checkups, and clinical outcomes were evaluated using x-rays. The indices of the clinical outcomes were as follows: occlusion, periodontal considerations, temporomandibular joint function (including condylar positioning), screw breakage or loosening, vertical bone loss at the osteotomy site.

**Cephalogram Analysis**

Standardized frontal and lateral cephalograms were taken before the operation (Preop), within 2 days after the operation (Postop), 1 month af-
ter the operation (P.O. 1M), 3 months after the operation (P.O. 3Ms), 6 months after the operation (P.O. 6Ms), 1 year after the operation (P.O. 1Y), and 2 years after the operation (P.O. 2Ys) to examine the skeletal changes. Experienced orthodontists performed all of the cephalometric traces. The mandibular width between the mandibular angles (Mw) and mandibular point B in the Frankfort horizontal (FH) reference plane from the Porion (the top of external auditory meatus) and the vertical line perpendicular to the FH reference line were used to evaluate the skeletal changes of the repositioned mandible (Bx, By) at each time point (Fig. 3). The measurement of each point was done 3 times using electronic digital calipers and the mean values were analyzed using IBM SPSS, version 19 (SPSS, Armonk, N.Y.). The linear dimensions were reduced to compensate for cephalometric magnification. To evaluate the reliability, the same author repeated the same procedure 2 weeks later. The reliability and error analyses were performed using a paired t test at a 5% significance level.

3D-CT Imaging Protocol
CT imaging was performed using SOMTOM Definition (Siemens, Munich, Germany), under conditions of 120 kV, 280 mA (effective mAs). For the 3D-image analysis system, the 3D composition image data of 0.75 mm (0.4 mm intervals) from SYNAPSE VINCENT 3.0 (FUJI FILM, Tokyo, Japan) were used.

Statistical Analysis
Descriptive statistics were computed for each study variable. The data were analyzed statistically using IBM SPSS, version 19 (SPSS). Bivariate analyses (chi-square test and its associated P value) were computed to measure the association between any 2 variables of interest. A paired t test was used to examine the skeletal changes at each time point, and an unpaired t test was used to analyze the effects according to the association between variables. The levels of significance maintained an overall P value of < 0.05.12

CASE REPORT
A 25-year-old woman (Patient No. 13) was diagnosed to have skeletal class III facial asymmetry (Fig. 4). The features
of the diagnosis were protruded Point A (A to N (nasion), FH: 2.0 mm) (mean, 2.0 mm), protruded Point Pogonion (Pogonion to N, FH: 4.0 mm) (mean, 6.5 mm), small A-Nasion-B angle (ANB) (ANB, 1.0 degree) (mean, 3.0 degrees), facial asymmetry, mandibular shift to the right side, asymmetry of mandibular form, slight occlusal cant, and transverse discrepancy of width between upper and lower jaw. She had undergone presurgical orthodontic treatment for approximately 1 year. SimPlant OMS (Materialise) was used for treatment planning (See Supplemental Digital Content 1, which displays (a) presurgery frontal bone tissue with SimPlant OMS; (b) presurgery lateral bone tissue with SimPlant OMS; and (c) presurgery interval width of the mandibular first molars with SimPlant OMS, http://links.lww.com/PRSGO/A130 and Supplemental Digital Content 2, which displays (a) Virtual Surgery Planning (MC + IVROs) with SimPlant OMS. Postsurgery frontal bone tissue simulation; (b) Virtual Surgery Planning (MC + IVROs) with SimPlant OMS. Postsurgery lateral bone tissue simulation; and (c) Virtual Surgery Planning (MC + IVROs) with SimPlant OMS. Postsurgery interval width of the mandibular first molars, http://links.lww.com/PRSGO/A131).

The patient and her family decided that she should undergo Le Fort I (cant correction to counter clockwise rotation), an MC and IVROs after the procedure was explained. According to the cephalometric analysis, both skeletal and tegmental improvement were observed, as
follows: overjet: −3 mm → +3 mm; right-side shift of the midline of lower dental arch: +2 mm → ±0 mm; dental arch width (the interval width of the first molar): (before surgery) Maxilla, 58.30 mm < Mandible, 59.42 mm → (after surgery) Maxilla, 58.54 mm > Mandible, 57.82 mm (normal relationship). According to the facial image, both the facial asymmetry and the mandibular shift were found to have improved. Mw was reduced by 4.67 mm (91.78 mm → 87.11 mm), and mandibular point B in the FH reference plane from the Porion (the top of external auditory meatus) (Bx) moved −6.86 mm (setback) horizontally (77.71 mm → 70.85 mm) after the operation. The dental relationship was also very stable throughout long-term follow-up (Fig. 5).

RESULTS

Seventeen patients suffering from class III malocclusion and/or facial asymmetry with a transverse jaw width discrepancy presented to the Department of Oral and Maxillofacial Surgery at the Kochi Health Sciences Center between August 1, 2008 and August 31, 2011, and 16 of them were treated with this surgical method (MC + IVROs). There were 3 males and 13 females; the ages of the patients at the time of surgery were between 15 and 40 years (average, 23.1 years). Seven patients underwent an additional Le Fort I osteotomy, and 6 patients underwent a genioplasty (Tables 1, 2).

There were no intra- or postoperative complications, such as condylar luxation, bleeding, undesirable fracture of the mandibular bone, surgical morbidity, infection, dental/gingival injury, or avascular necrosis in any of the patients during the hospitalization. The average intraoperative total bleeding volume was 80.5 mL, and the average total length of the operation time was 3 hours and 53 minutes. Correction of the occlusal relationship and the facial appearance was achieved in all cases. The average amount of mandibular setback obtained with the postoperative position (Postop) was 4.48 mm (range, 2.0 (adv.)–12.0) and that of mandibular width constriction was 6.34 mm (range, 2.68–13.67) in comparison to the preoperative position (Preop) (Table 3: N = 16). Seven patients underwent an additional Le Fort I osteotomy (Case Nos. 4, 5, 9, 10, 11, 13, 14, 16, and 17), 6 patients underwent genioplasty (Case Nos. 7, 10, 12, 14, 16, and 17) and 1 patient underwent hemi-SSRO (Case No. 17) (Tables 1, 2: N = 17).

The summary of patient data on the operation of MC and IVROs was shown in Table 3.

Regarding postoperative complications with long-term follow-up, there were no major postoperative possible complications such as malocclusion, periodontal problems, temporomandibular joint

| Table 1. Patient Data |
|-----------------------|
| **Patient No.** | **Age (y)** | **Sex** | **Diagnosis** | **Osteotomy** |
|-------------------|-------------|--------|---------------|---------------|
| 1                 | 26          | F      | Class III + Asymmetry | IVRO + MC |
| 2                 | 15          | F      | Class III + Asymmetry | IVRO + MC |
| 3                 | 22          | M      | Class III + Asymmetry | IVRO + MC |
| 4                 | 58          | M      | Class III + Asymmetry | IVRO + MC |
| 5                 | 17          | F      | Class III + Asymmetry | IVRO + MC |
| 6                 | 24          | M      | Class III + Asymmetry | IVRO + MC |
| 7                 | 27          | F      | Class III + Asymmetry | IVRO + MC |
| 8                 | 40          | F      | Class III + Asymmetry | IVRO + MC |
| 9                 | 15          | M      | Class III + Asymmetry | IVRO + MC |
| 10                | 16          | F      | Class III + Asymmetry | IVRO + MC |
| 11                | 18          | M      | Class III + Asymmetry | IVRO + MC |
| 12                | 17          | M      | Class III + Asymmetry | IVRO + MC |
| 13                | 15          | M      | Class III + Asymmetry | IVRO + MC |
| 14                | 25          | M      | Class III + Asymmetry | IVRO + MC |
| 15                | 36          | F      | Class III + Asymmetry | IVRO + MC |
| 16                | 18          | M      | Class III + Asymmetry | IVRO + MC |
| 17                | 25          | M      | Class III + Asymmetry | IVRO + MC |
| **Mean**        | **23.2**    |        |               |               |
dysfunction including condylar positioning, screw breakage or loosening, and vertical bone loss at the osteotomy site. (Table 4: \(N = 16\); Fig. 6).

About skeletal stability of MC and IVROs, some skeletal relapse occurred at each time point over the follow-up period. The mean skeletal relapse with mandibular width constriction (\(\Delta M_w\)) was \(-0.62\) mm \((P > 0.05)\) at P.O. 1M, \(-0.72\) mm \((P > 0.05)\) at P.O. 3Ms, \(-0.61\) mm \((P > 0.05)\) at P.O. 6Ms, \(-0.58\) mm \((P > 0.05)\) at P.O. 1Y, and \(-1.17\) mm \((P > 0.05)\) at P.O. 2Ys in comparison to the postoperative position (Postop) (Table 5: \(N = 15\)). The mean skeletal relapse with mandibular setback (\(\Delta B_x, \Delta B_y\)) was \(-0.42\) mm horizontally, \(-0.27\) mm vertically in the FH reference plane \((P > 0.05)\) at P.O. 1M, \(+1.32\) mm horizontally, \(-0.38\) mm vertically in the FH reference plane \((P > 0.05)\) at P.O. 3Ms, \(+1.89\) mm horizontally, \(-0.54\) mm vertically \((P > 0.05)\) at P.O. 6Ms, \(+1.62\) mm horizontally, \(+0.16\) mm vertically \((P > 0.05)\) at P.O. 1Y, and \(+1.71\) mm horizontally, \(+0.27\) mm vertically \((P > 0.05)\) at P.O. 2Ys in comparison to the postoperative position (Postop) (Table 5: \(N = 15\)).

Though the number of cases was small \((N = 15)\), no significant difference was observed between each interval [in comparison to the postoperative position (Postop)]. The observed skeletal relapse did not affect the occlusal relationships of any patient. In addition, no significant difference on the skeletal stability of MC and IVROs was observed between the type of osteotomies (1-jaw surgery and 2-jaw surgery) (Table 5: \(N = 15\)).

**DISCUSSION**

The present study was designed to evaluate the combined procedures of MC and IVROs using lag screw technique for a transverse jaw width discrepancy.

The reduction in mandibular width was performed with no complications by the MC using lag screw technique. The intercuspal position (centric occlusion) of a close molar was successfully obtained by MC.

The satisfactory skeletal stability of MC using lag screws was observed. In the past, once the mandibular midline osteotomy was carried out, the left and right distal segments were fixed with a mini plate; however, currently, 2 lag screws are used, which significantly improves the stability of the segments fol-

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### Table 2. Summary of Patient Data Grouped by Study Inclusion or Follow-Up Status

| Variable | Sample | Lost to Follow-up or Excluded | \(P\) Value |
|----------|--------|-------------------------------|-------------|
| Sample size (\(N\)) | 17 | 2 | Not applicable |
| Gender | | | |
| Female | 13 | 1 | \(<0.01^*\) |
| Male | 4 | 1 | |
| Osteotomy | | | |
| Mandible alone (IVROs + MC ± genioplasty) | 9 | 0 | \(<0.01^*\) |
| Maxilla (LF1) + Mandible (IVROs + MC ± genioplasty) | 7 | 1 | |
| Maxilla (LF1) + Mandible (SSRO + IVRO + MC + genioplasty) | 1 | 1 | |
| Age (y) | \(23.2 ± 7.5\) | \(27.5 ± 3.5\) | \(0.439^†\) |

Data presented as \(N\).

*Chi-square test; †An unpaired \(t\) test.

IVROs, intraoral vertical ramus osteotomies; LF1, Le Fort I; MC, mandibular constriction; SSRO, sagittal split ramus osteotomy.

### Table 3. Summary of Patient Data on Operation

| Variable | Samples | Mand. Setback (mm) | MC (mm) | Total Blood Loss (mL) | Operation Time (hours:minutes) |
|----------|---------|--------------------|---------|----------------------|-------------------------------|
| Gender | | | | | |
| Female | 13 | \(5.83 ± 2.63\) | \(5.87 ± 1.95\) | \(72.1 ± 66.3\) | \(3:34 ± 0:52\) |
| Male | 3 | \(4.17 ± 4.25\) | \(8.39 ± 5.50\) | \(116.6 ± 136.1\) | \(5:16 ± 2:08\) |
| Osteotomy | | | | | |
| One-jaw surgery (IVROs + MC ± genio) | 9 | \(4.44 ± 4.59\) | \(5.58 ± 2.37\) | \(44.2 ± 48.6\) | \(3:09 ± 0:44\) |
| Two-jaw surgery (LF1 + IVROs + MC ± genio) | 7 | \(4.53 ± 3.31\) | \(7.33 ± 3.28\) | \(127.1 ± 90.1\) | \(4:51 ± 1:15\) |
| Total | 16 | \(4.48 ± 4.02\) | \(6.34 ± 2.85\) | \(80.5 ± 79.4\) | \(3:53 ± 1:17\) |

†An unpaired \(t\) test.

IVROs, intraoral vertical ramus osteotomies; Mand. setback, mandibular setback; MC, mandibular constriction; LF1, Le Fort I; genio, genioplasty.
Table 4. Summary of Postoperative Complications on Mandibular Constriction

| Variable                     | Sample | Occlusal Complications | Periodontal Problems | TMJ Dysfunction |
|------------------------------|--------|------------------------|----------------------|-----------------|
|                              |        | Yes | No | Yes | No | Yes | No | Yes | No |
| Sample size (N)              | 16     | 0  | 16 | 0  | 16 | 0  | 16 | 0  | 16 |
| Gender                       |        |    |    |    |    |    |    |    |    |
| Female                       | 13     | 0  | 13 | 0  | 13 | 0  | 13 | 0  | 13 |
| Male                         | 3      | 0  | 3  | 0  | 3  | 0  | 3  | 0  | 3  |
| Osteotomy                    |        |    |    |    |    |    |    |    |    |
| One-jaw surgery (IVROs + MC ± genio) | 9      | 0  | 9  | 0  | 9  | 0  | 9  | 0  | 9  |
| Two-jaw surgery (LF1 + IVROs + MC ± genio) | 7      | 0  | 7  | 0  | 7  | 0  | 7  | 0  | 7  |

Data presented as N.

IVROs, intraoral vertical ramus osteotomies; MC, mandibular constriction; LF1, Le Fort I; genio, genioplasty.

Fig. 6. Postoperative x-ray images with long-term follow-up. A, 3-year, postoperative panoramic x-ray image. B, 3-year, postoperative TMJ x-ray images.

Table 5. The Resulting Mean Length of Mandibular Width between the Mandibular Angles (Mw) and Mandibular Setback at the Mandibular Point B (Bx, By) in the FH Reference Plane (N = 15)

| Time          | Preop | Postop | P.O.1M | P.O.3Ms | P.O.6Ms | P.O.1Y | P.O.2Ys |
|---------------|-------|--------|--------|---------|---------|--------|---------|
| Mw (mm) Total (N = 15) | 94.32 ± 6.29 | 87.93 ± 4.74 | −6.39* | 87.32 ± 4.41 | −0.62† | −0.61† | −0.67† |
| One-jaw surgery (N = 9) | 92.24 ± 4.69 | 86.45 ± 4.25 | −5.79* | 86.21 ± 4.50 | −0.24† | 0.02†  | 0.05†  |
| Two-jaw surgery (N = 6) | 97.43 ± 7.49 | 90.16 ± 4.91 | −7.27* | 88.97 ± 4.50 | −1.19† | −1.53† | −1.75† |
| Bx (mm) Total (N = 15) | 79.66 ± 5.95 | 73.97 ± 6.47 | −5.69* | 75.29 ± 8.46 | +1.76† | +2.14† | +2.01† |
| One-jaw surgery (N = 9) | 79.86 ± 6.20 | 74.97 ± 5.55 | −5.69* | 76.73 ± 8.46 | +1.76† | +2.14† | +2.01† |
| Two-jaw surgery (N = 6) | 81.18 ± 4.70 | 75.52 ± 3.02 | −5.69* | 76.79 ± 4.28 | +1.27† | +1.89† | +1.62† |
| By (mm) Total (N = 15) | 73.90 ± 6.51 | 73.29 ± 6.10 | −0.61* | 72.64 ± 5.41 | −0.38† | −0.54† | −0.47† |
| One-jaw surgery (N = 9) | 75.50 ± 4.73 | 74.47 ± 4.15 | −0.61* | 71.61 ± 6.08 | −0.32† | −0.57† | −0.47† |
| Two-jaw surgery (N = 6) | 75.99 ± 4.83 | 74.47 ± 4.54 | −1.52* | 74.17 ± 4.26 | −0.48† | −0.47† | −0.47† |

*Compared to the time of Preop.
†Compared to the time of Postop.
lowing surgery. Because this reduces the amount of time in which the patient must wear a postoperative splint and removes the need for a firm metal splint, postoperative oral hygiene management is much easier. Therefore, the utility of this surgical method is now becoming increasingly well defined.

With regard to skeletal stability of $B_x$, $B_y$ when carrying out IVRO, a final splint must be installed for 1–2 months following surgery. The occlusal vertical dimension is decreased by the thickness of the splint as a result of removing the final splint, and the mandible rotates counterclockwise. Therefore, compared to P.O. 1M, $B_x$ tended to shift in a positive direction and $B_y$ in the negative direction after P.O. 3Ms.

Rafael et al.\textsuperscript{13} described that MC and mandibular advancement by SSROs actually resulted in less change in condylar angulation and width, especially at the medial pole, as a result of surgery than did mandibular advancement by SSROs alone, because MC reduces condylar rotation induced by mandibular advancement. Interestingly, in many cases developing a transverse jaw width discrepancy who exhibited class III malocclusion, condylar rotation during mandibular setback by IVROs caused by lateral displacement of the proximal segment. MC reduces condylar rotation induced by mandibular setback with IVROs, so that the proximal segment should be lateral to the distal segment smoothly with mandibular reduction and that a favorable positioning of the condyles should be maintained (Fig. 7).

The advantages of MC are that it is less invasive and easier to perform in addition to IVRO and/or SSRO compared to surgical maxillary expansion. The reduction of the treatment period and the avoidance of periodontitis (due to exposure of the root of the tooth and buccal side atrophy of the gums) are possible compared to orthodontic maxillary expansion and expansion of the alveolus. Additionally, the postoperative stability is satisfactory, which prevents both the angle reduction of the mandible after the operation (improving the esthetic outcome) and any unfavorable influence on the condylar head.

![Fig. 7. A, B, Condylar rotation during mandibular setback caused by lateral displacement of the proximal segment in skeletal class III cases with transverse jaw width discrepancy. C, D: Example of how mandibular constriction reduces condylar rotation induced by mandibular setback in skeletal class III cases with transverse jaw width discrepancy. A, C, axial image, B, D, frontal image.](image-url)
The disadvantages of MC are that the tongue space may be narrowed. However, because the mandible was too large originally, this may not be a problem for class III jaw deformities with transverse jaw discrepancy. Another disadvantage is that the procedure is somewhat complicated, requiring more attention than is necessary for simple IVROs. In addition, the mini plate is too weak, so fixation using lag screws is necessary. It is also necessary to avoid potential damage to the gums near the lower central incisors.

In conclusion, this clinical investigation showed that MC using lag screw technique gives a very stable mandibular width constriction and the combination of MC and IVROs offers a promising treatment alternative for patients with mandibular prognathism developing a transverse jaw width discrepancy.

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