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Postoperative changes in mandibular prognathism surgically treated by intraoral vertical ramus osteotomy

J. Nihara[a], M. Takeyama[a], Y. Takayama[b], Y. Mutoh[b], I. Saito[a]
[a]Division of Orthodontics, Department of Oral Biological Science, Niigata University Graduate School of Medical and Dental Sciences, Japan; [b]Department of Dentistry and Oral-Maxillofacial Surgery, Niigata Rosai Hospital, Japan

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Abstract. This study investigated short- and long-term postoperative skeletal changes following intraoral vertical ramus osteotomy (IVRO) for mandibular prognathism, as determined from lateral cephalograms. The subjects were 20 patients with mandibular prognathism who had undergone surgical orthodontic treatment combined with IVRO. Lateral cephalograms were taken at six time points: 1 month before surgery, and 1 day, 3 months, 6 months, 1 year, and approximately 2 years after surgery. Intermaxillary fixation (IMF) with four monocortical screws was maintained for 1 week in all patients. Mean posterior movement of the menton (Me) was 5.9 mm at surgery. 3 months after surgery, the FMA and FH-CorMe angles had increased 6.3 and 6.2 degrees, respectively, indicating clockwise rotation of the distal segment of the mandible. This rotation was observed in all 20 patients, suggesting that postoperative rotation of the mandible in the postoperative short term is likely to occur after IVRO and could be considered an adaptation of the mastication system newly established by surgery. In the long term after IVRO, Me had moved anteriorly by only 0.9 mm and the relapse ratio was 15.3%. These findings suggest the excellent long-term stability of surgical orthodontic treatment combined with IVRO in patients with mandibular prognathism.

Keywords: Orthognathic surgery; Stability; Intraoral vertical ramus osteotomy; Adaptive rotation.

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Sagittal split ramus osteotomy (SSRO) and intraoral vertical ramus osteotomy (IVRO) are well-established procedures for correcting mandibular prognathism. Both techniques have advantages and disadvantages.[1] The advantages of SSRO include large bony contact between the distal and mesial segments and application for both advancement and retraction and reduction in the duration of intermaxillaly fixation (IMF), with possible complications including inferior alveolar nerve (IAN) injury,[2] unfavourable split, and high blood loss.[3] IVRO affords a lower incidence of IAN injury, technical simplicity, low blood loss, and short duration of surgery. Its disadvantages include application for only retraction of the mandible, less bony contact between the proximal and distal segments, and requiring a relatively long period of IMF. Orthognathic surgeons must weigh up these advantages and disadvantages when deciding which surgical treatment to use in cases of mandibular prognathism.

Another important factor for surgeons to consider is postoperative stability. While the literature contains a number of studies on postoperative changes after SSRO[4–10] and a review paper by Costa

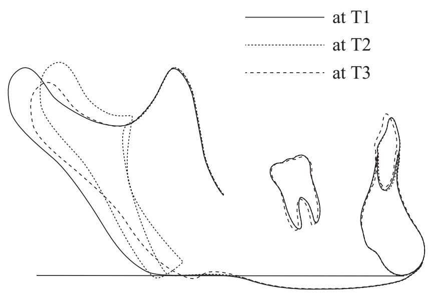

Fig. 1. Method for deciding the mandibular plane. The mandibular plane was identified by superimposition of the mandible with anatomical landmarks on all lateral cephalograms taken at the different time points, such as T1–T3. T1, 1 month before surgery; T2, 1 day after surgery; T3, 3 months after surgery.

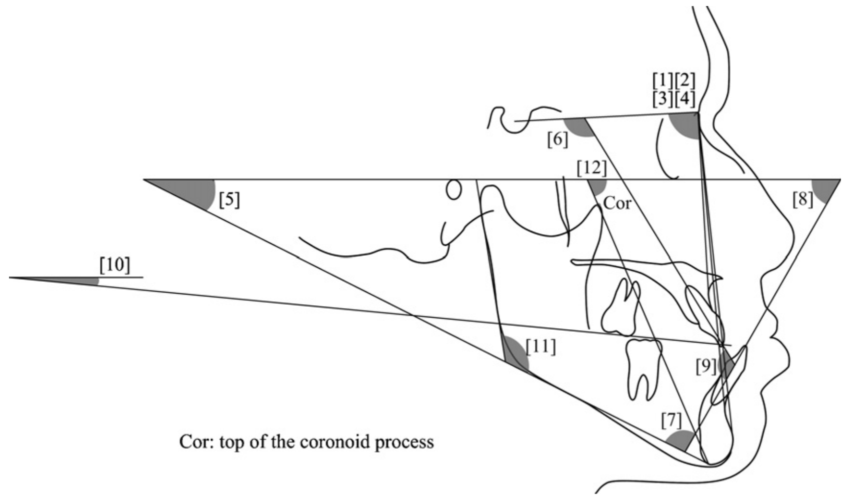

Fig. 2. Cephalometric angular measurements. [1] SNA, [2] SNB, [3] ANB, [4] SNP, [5] FMA, [6] U1-SN, [7] IMPA, [8] FMIA, [9] interincisal angle (I.I), [10] FH-occlusal plane (FH-Occ), [11] gonial angle (Go), [12] FH-CorMe.

et al.,[11] only a few reports concern postoperative stability after IVRO.[12–16] In addition, the evaluation period covers 2-year periods[15,16] at most, and only some changes have been examined.[12–14] The postoperative changes that occur after IVRO remain to be clarified. This study investigated short- and long-term postoperative skeletal changes following IVRO for the correction of mandibular prognathism.

Patients and methods

The patients were 20 adolescents or adults (4 males and 16 females; mean age 20.6 ± 6.0 years; range 16–36 years) who underwent orthognathic surgery by IVRO at a single institution between August 2003 and March 2008. The inclusion criteria were mandibular prognathism without asymmetry, no trauma or recognized syndromes, no additional surgery such as genioplasty before or after IVRO, and no facial growth at the commencement of orthognathic surgery. The study was conducted with institutional review board approval.

Cephalometric analysis

Lateral cephalograms taken at six time points were used to evaluate postoperative stability: 1 month before surgery (T1), 1 day after surgery (T2), 3 months after surgery (T3), 6 months after surgery (T4), 1 year after surgery (T5), and approximately 2 years after surgery (T6). All cephalograms were obtained with vertically adjustable head holders in the intercuspal position and were traced onto acetate paper by the same investigator (J.N.) in order to eliminate inter-examiner variability. Six cephalograms for each subject were superimposed by cranial structure on the S-N line at the sella to reduce measurement error.[17] The mandibular plane on all cephalograms was matched to the preoperative mandibular plane by superimposing the anatomical mandibular structures such as symphysis or mandibular canal (Fig. 1).

11 linear and 12 angular measurements were taken to assess the postoperative skeletal changes in each case. Cephalometric landmarks for the angular measurements and linear measurements taken are shown in Figs. 2 and 3, respectively. *X–Y* coordinates were constructed using a line parallel to the Frankfort horizontal plane (FHP) at the sella for the *X* coordinate and a perpendicular line drawn intersecting the *X* line at the sella for the *Y* coordinate. Six distance measurements on each cephalometric tracing were also made (Fig. 4).

Surgical procedure

All patients received preoperative and postoperative orthodontic treatment with the fixed standard edgewise appliance to

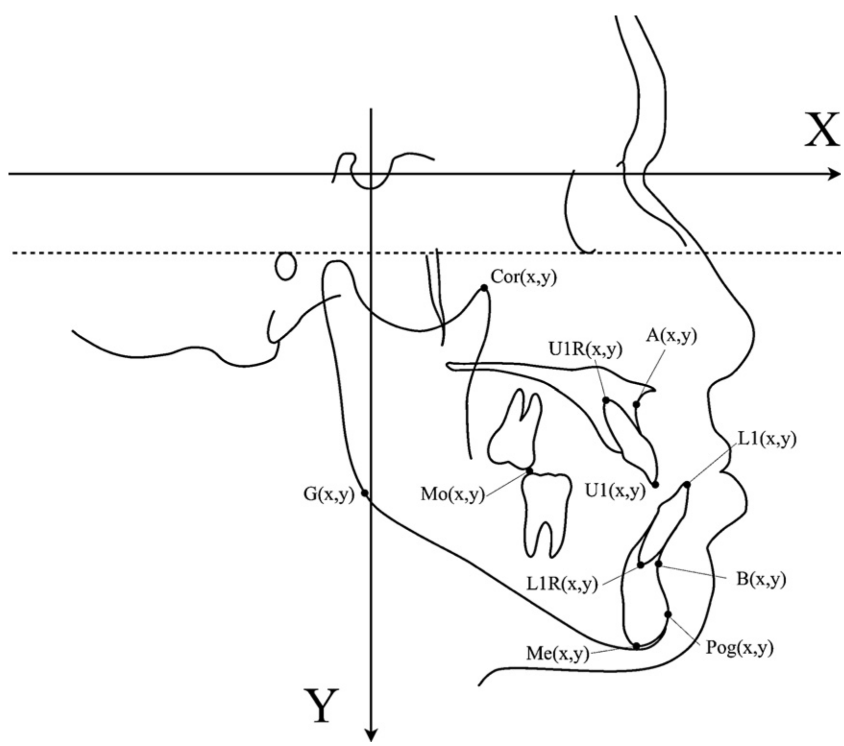

Fig. 3. Cephalometric linear measurements.